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RELIGION AND ARTIFICIAL INTELLIGENCE

Master's thesis

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INTRODUCTION

Background of the study

“If this problem of the religious status of a robot seems farfetched today, it may seem much less so a few decades from now. There are no known grounds for denying the theoretical possibility that intelligent computers can be built. True, such a computer may have to be fully as complex as a human brain, many orders of magnitude beyond any existing computer, but this is merely a matter of degree. The religious issue raised by the possibility that intelligent robots may someday exist is sufficiently fundamental that it is well worth discussing today even though we may still be far from having to face it as a practical problem.” (Rosenfeld 1966: 16-17) These words written by Rabbi Azriel Rosenfeld over 50 years ago stand still valid and I do not think there has been nearly enough consideration about this topic as it deserves. Hence this paper.

Recent studies about global demographic situation are showing a clear trend that number of people affiliated with religion is growing and will keep growing for decades to come. At the same time the developments in new technologies like artificial intelligence (AI) and robotics are progressing in accelerating pace and results are promising enough to blur lines between science fiction and reality. Suddenly the singularity¹ does not look like an idea from science fiction anymore but instead something that might happen already in the current century.

¹ Although the term “Singularity” was not created by Ray Kurzweil, he is the one who popularized it and according to him it is a future period during which the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed. In other words it can be understood as an event horizon we cannot see past from as the changes that will happen are too unpredictable. (Kurzweil 2005: 24)

To put it bluntly - religion is here to stay and artificial intelligence is coming. It is rational to expect that these two realities will clash and will have to find a way to coexist in the same world.

Mikael Stenmark's model (Stenmark 2010) describing the interaction between religion and science can be adapted to clarify the variable relationship between religion and AI. The particular demographics, history and religious tradition of a society greatly influences the character of this relationship and thus which of Stenmark's four views of interaction best apply. This paper will explore these elements alongside the historical evolution and reception of science and technology in a variety of contexts. The study proceeds with an evaluation of the acceptance of contemporary and future artificial intelligence in a variety of religious contexts: Christian, Islamic and Shintoism. It concludes with speculation as to how religion and AI may co-exist in the future.

It is common understanding that religion and modern science are predestined to be in conflict because of different basic principles they are based on. In spite such belief we already have first signs of harnessing AI for the use of religion. Artificial intelligence has been successfully implemented in social fields that have comparable aspects with religion. Also there are many examples from science fiction showing potential ways how religion and AI can be integrated in the future.

Will AI create next big rupture in religion? Can religions based on centuries old concepts and philosophies embrace something that is mainly known from futuristic visions of science fiction? How will religion cope with coming changes in institutional and personal level? How will society accept such changes? These are just some questions that have been motivators to choose the topic discussed in this paper. The terms discussed are interdisciplinary by nature and can have broad meaning depending on the context. Therefore this study is reaching into territories of not only religion and AI but also into multiple other fields: demographics, history, social sciences and arts.

Goals of the study

The main research question this paper is seeking to answer is: “What will be the relationship between Religion and Artificial Intelligence?” Considering the novel and hypothetical nature of the topic, it is necessary to fulfill following sub goals before I can tackle the main analysis.

1. Establish the fact that religion is viable and growing part of the society in the future.
2. Demonstrate how science and religion have been intertwined through the history until modern day.
3. Show that the field of artificial intelligence is developing fast and intelligent machines will have growing presence in various areas of our lives.
4. Give overview of relationship between religion and AI since the emergence of the field and examine this interconnection from different perspectives.

Structure of the study and summary of chapters.

The structure of this dissertation is following the logical order of sub goals as described in the previous paragraph. Main body of the paper consists of six chapters. First four chapters serve to set the scene, introduce the background and context of the topic and synthesize all the necessary information required for the later examination of the central question. Purpose of the last two chapters is to present the model for research of the main question and finally display the analysis itself through applying the described model on the matter at hand.

Chapter 1 – Demographics – is built around the first sub goal of my thesis. I aim to show here that despite the popularity of the traditional secularization theory the number of people who affiliate themselves with religion is on the rise. To prove my claim I will look into the reasons why traditional secularization theory is not working, introduce

alternative approaches, and discuss possible future trends. I will back it up with statistical data about relevant changes in global demographics.

Chapter 2 – Religion and science – is designed to confirm my second sub goal. Here I will demonstrate that religion has historically had a multifaceted relationship with science and technology. Chapter gives overview of the relationship between these two realms through history until current day. Last part of the chapter is looking at future trends of this interaction.

Chapter 3 – Artificial intelligence – is dedicated for fulfilling the third sub goal. I will display that presence of artificial intelligence in the world is growing and it is getting increasingly integrated into different parts of life. To tackle this goal I will explore how artificial intelligence came into being, what its current state is and where it is likely to head in the future.

Chapter 4 – Religion and AI – the most voluminous part of the work is aimed at reaching the fourth sub goal. My intention here is to give overview of relationship between AI and religion from early encounters to the visions of the future. I will present instances of AI use in comparable social fields and bring examples from science fiction.

Chapter 5 – Stenmark's Model – is describing Mikael Stenmark's multidimensional model for analyzing relationship between religion and science. I will discuss alternative typologies and present my reasons for choosing this model.

Chapter 6 – Analysis – is using information introduced in the previous chapters to apply Stenmark's model to evaluate reception of AI in a variety of religious and social contexts and to position these potentialities into the model. I will conclude with analysis to answer the main research question.

Operational Terms and Definitions

Following operational terms and definitions will be encountered quite extensively in the following study. The terms specified herein can have broad meanings depending on the context they are applied and depending on reader's background. Therefore it becomes crucial to be able to properly communicate the message I have in mind when I am using these terms. These definitions are my generalizations to best convey the essence of the words as they are used in the current dissertation. Because of the complex nature of the subjects I am not able to give simple one word definitions and unfortunately have to leave a degree of ambiguity. Still I believe it will be helpful for a reader to present my general insight here, in the beginning of the work. These terms will be defined in greater detail in according chapters when necessary.

Artificial Intelligence

Artificial Intelligence (AI) has twofold meaning:

AI as a recent field of study that has grown out from multitude of other fields and is extension of science and technology.

AI as a manmade entity that is capable of doing complicated things that are commonly expected to require human intelligence.

In the second sense of the term AI can be understood as disembodied software or embodied AI, for example in the form of humanoid robot.

Religion

Religion is a complex term and to explain how I perceive it in this paper, I will position the concept in two dimensions:

First dimension is based on the categorization by theologian Nicholas Healy, who described different types of theologies: “official” theology, produced by the institutional church and “ordinary” theological reflection, engaged in by virtually all believers.²

Official view draws upon previous official, or officially-sanctioned, theologies, what for example in Roman Catholicism is called “the tradition”. These theologies may take the form of creeds, confessions, conciliar documents, works of important theologians, denominational collections and papal decrees.

Ordinary view is the understanding of their faith by ordinary folk. As Healy rightly says, everyone is likely to do some theology if they are a believer and if they think about their faith at all. (Healy 2009: 24)

Second dimension for religion is based on multitude of different Religious systems. In larger or lesser extent I will be looking at three religions: Christianity, Islam, and Shinto

Christianity is bound to have most focus in this paper because of the religious context where modern science was born. Consequently it had influence on the context where artificial intelligence emerged and where most of innovations have been developed and tested³

² Healy also adds a third type “academic” theology that mediates between the other two, critically and constructively. It belongs within the sphere of the church but at some distance from the institution, and thus is usefully located within the academy. I do not see that using academic distinction as an additional type in my definition is beneficial. Instead it will be more comprehensible to keep official and academic type bundled together under official view.

³ USA has been undisputed leader in research of AI since the birth of this field but this hegemony is crumbling in recent years with other countries, especially China, investing heavily on the field. (QZ)

Islam cannot be ignored because of its growing importance in the future as I will be showing in chapter 1. Islam has been historically close to Christianity in geographical scale and in sense of religious roots thus offering interesting comparison and contrast.

Shintoism is a third religion that will be used to draw examples and comparisons from, because of Japan's advanced robotics and AI research and the remarkable way how it is related to Shinto religion.

Science (and Technology)

Science is hereby understood as a modern science that emerged in the Western society over the last two millennia. Science is a system to gather and organize knowledge by certain rational principles and technology can be seen as a result of putting the science into practice. I have to state that I will be using terms “science” and “technology” rather synonymously throughout this paper. They are like twins tied from the hips or a sort of feedback loop: science is breeding knowledge that allows to create new technology that allows to produce better tools and environment that in return advances science and so this symbiotic relationship goes. For the purpose of this study I do not consider it important to spend time on their detailed differences.

Secularization

I am using term “secularization” in relatively broad sense as a process or tendency where influence and importance of religion in different areas of society is diminishing and/or being replaced by secular.

Research Methods

Artificial intelligence as a field of study is relatively new phenomenon and until recently it has been quite hidden from the spotlight of the general public.⁴ Despite the apparent novelty the roots of the discipline go deep into history of science and technology. Clues about what might be needed to make intelligent machines are scattered abundantly throughout philosophy, logic, biology, psychology, statistics, and engineering. (Nilsson 2010: 27) Furthermore, we can find parallels and precursors for creation and use of artificial beings from religious texts and studies. AI is synthesis of many sciences and technologies thus it is necessary to look into historic relationship between science and religion to understand and predict the nature of current and future connection between AI and religion. The historical approach methodology was judged to be the most appropriate methodology for such investigation because it logically derived from the central research problem.

Methodology used for finding resources was snowball method. The snowball method is a way of finding literature by using a key document on the subject as a starting point. Consulting the bibliography helps to find other relevant titles on the subject. Further you can look in the bibliographies of these new publications to find more relevant titles and so on. The advantage of the snowball method is that you can find a lot of literature about a subject quickly and relatively easily. The disadvantage of this method can be that you are searching retrospectively, so each source you find will be older than the previous one. (Wohlin 2014: 1) There are databases like Scopus⁵ that evade this

⁴ I propose that chess match between chess grandmaster Garry Kasparov and IBM's Deep Blue on 1997 was the first occasion when progress and potential of AI got wide media attention and was recognized by laymen. (Warwick 2012: 7)

⁵ Scopus is the largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings. Delivering a comprehensive overview of the world's research output in the fields of science, technology, medicine, social sciences, and arts and humanities. (SCOPUS)

disadvantage by adding citation search thus showing who has cited the publication you have found. In this way you will also find recent literature. Using the references and the citations respectively is referred to as backward and forward snowballing. (Wohlin: 1) One can argue that using this method can lead to missing some important literature on the topic but I believe this risk is justified in the face of the overall proven efficiency of the method (Wohlin 2014: 10) More specific information about used sources and reasoning behind it is described in the section “Sources of Information”.

The main issue for researching my main question is the fact that there is not enough empirical data on the topic. Lack of such data is caused by the novelty of the issue. To overcome this problem I decided to study the question by using comparative analysis⁶ for looking at existing data that is available for areas that are in my opinion comparable or can give useful insight. For example drawing parallels from religion-science relationship, looking at experiences of using artificial intelligence in social fields like nursing or examining how relationship between religion and artificial intelligence has been seen in science-fiction movies.

In general the following paper is a deductive study where I will be testing my proposed statements in the light of information that is gathered by using descriptive and explanatory research methods on the subject matter. According to Bhattacharjee, in deductive research, the goal of the researcher is to test concepts and patterns known from theory, using empirical data hence it is also called as theory-testing research. (Bhattacharjee 2012: 3) First four chapters of the paper are using mix of descriptive and explanatory research methods to achieve sub goals stated in the section “Goals of the study”. Descriptive approach examines the what, where, and when of a phenomenon of interest and is applied on sub goals 3 and 4 to give historical overview

⁶ Comparative research or analysis is understood as a broad term that includes both quantitative and qualitative comparison of social entities. The underlying goal of comparative analysis is to search for similarity and variance. (Mills: 621)

that is necessary for creating a context for later analysis. Explanatory research seeks explanations of observed phenomena, problems, or behaviors and tries to answer why and how types of questions. It attempts to “connect the dots” in research. (Bhattacharjee 2012: 6) Explanatory method is used alongside with descriptive method to fulfill other sub goals.

Existing Research

When I ran the search for keywords that describe the nature of my study “religion AND artificial AND intelligence” in Scopus database, I got 101 results. Out of these roughly 10 can be considered relevant to the current paper but none of them is exactly what I am looking for. Just based on that fact I claim that there is limited existing research on relationship between religion and AI. It is easy to find articles online that introduce the topic but as a rule they are aimed at regular reader and don’t go much further from asking the questions. In regards to more specific studies aimed at my research question, existing sources are scarce albeit not nonexistent. From authors I want to highlight Robert Geraci, who considers himself historian of theology and has written several articles and couple books that are looking at spirituality and religion in the context of artificial intelligence and robotics. Theologians Noreen Herzfeld and Anne Foerst who both are also involved in computer sciences have written about AI from theological perspective. James McGrath offers useful source about relations of religion and science fiction. Visionaries Ray Kurzweil and Nick Bostrom have been good source for getting background information and general understanding of possible future developments on the field of AI. They are also respected contributors for transhumanist ideology that is relevant to my study.

Considering the novelty of this issue and the fact that it seems to be more the problem of tomorrow than reality of today, it can be understood why there is not more research published on the topic. Authors mentioned above prove that situation is not hopeless

and there are limited number of works available that look at different aspects of how religion and AI overlap and that can be useful resources. One topic that has intrigued more discussion in recent years and resulted in more published sources is relationship between religion and Transhumanism, with one notable author here being Calvin Mercer. Additionally, many books have been written about the relationship between religion and science that I believe can offer useful perspective and parallels to be used in predicting future relations between religion and AI. I would point out authors Rodney Stark and John Polkinghorne.

Sources of Information

To reflect the hi-tech topic of this study I must admit that majority of my sources were in electronic form. I managed to get some “real” books, most importantly Robert Geraci’s “Apocalyptic AI” and Rodney Brooks’ “Flesh and Machines” that both actually have a Kindle version available as an e-book too. Still mostly I found my sources from databases like EBSCO Discovery and Scopus and especially on the latter, where citation search allows to utilize snowball method at its fullest. For some books I managed to find full electronic copy but on some cases when I just needed to check a citation or read a single chapter I could often get by with Google books preview option that can be surprisingly generous resource.

To describe and clarify my reasoning and to explain the methodologies used in this research I mainly relied on the book “Social Science Research: Principles, Methods, and Practices” (Bhattacharjee 2012). The book is clearly and concisely written and specifically aimed for students, as an additional benefit it is freely available for download and use.

First chapter about demographics is tapping into two distinctive research areas. Historical perspective and theoretical approaches on secularization are based on the

book “Sacred and Secular: Religion and Politics Worldwide”. (Norris & Inglehart 2011) In addition to providing good overview of traditional secularization theories this book is also proposing new theories to explain failure of old perspectives. I find some theories proposed in the book to be well fitting to describe future trends. Additional considerable input came from relevant article by Jose Casanova who is acknowledged authority on the field. I recognize there is lot of literature available on the topic of secularism that can often represent different views. My selection was based on respectability of the authors, clarity of their views and accessibility of resources. Second part of the chapter is based on the religious demographics studies by Pew research center. The study is unique on its field by its global scale. I also find it easy to access, trustworthy, well organized and presented in systematic and clear manner.

Second chapter focuses on the relationship between science and religion and continues the pattern of having distinct resources for the leading historical part that is pulling info from several esteemed researchers of the subject. (Noble 1997, Stark 2005, Polkinghorne 2011) Similarly to secularization topic there are many books written about the topic and reasoning behind my selection was similar. Sources to cover contemporary perspectives are more varied and I am more relying on articles by esteemed scholars on the topics like Islam and science (Al-Hayani 2005, Bigliardi 2012&2014, Guessoum 2015) or use of new technologies in African religious sphere (Asamoah-Gyadu 2008). Last part of the chapter taps into recent studies on future trends and virtual worlds (Geraci 2014 and Schaap & Aupers 2017).

First half of the third chapter is aimed at history of artificial intelligence and is mainly based on two books by leading scientists on the field (Nilsson 2010, Warwick 2012). There are other books available on the matter but my reasons to choose these resources were respectability of the authors, positive reviews, accessibility of the books and relatively recent publishing dates. Second half of the chapter that is discussing current and future perspectives on AI. Valuable input is drawn from two books by acclaimed AI experts and futurologists. (Kurzweil 2005, Bostrom 2014) This part of the paper is

also sourced on variety of articles accessible from online databases like EBSCO Discovery and Scopus or through search engines like Google. Most articles are academic but because of the novel nature of the topic there are also references to articles from public media like newspapers. The selection of articles was mainly decided by relevance, accountability, accessibility and publishing date. Considering the fast progress that is happening in the field of artificial intelligence I regarded freshness of the available sources to be one of the priorities.

Fourth chapter concentrates on connections between artificial intelligence and religion and relies on many sources, from leading AI scientists to theologians and visionaries (Turing 1950, Rosenfeld 1966, Moravec 1978, Geraci 2010) Last part of the chapter is dealing with contemporary and future matters thus literature was more limited, especially regarding the future issues. From the positive side it was easier to decide which resources to use (Kurzweil 2005, Geraci 2007&2010, McGrath 2012). Availability was big factor here but also respectability of author and content. Also film series Battlestar Galactica has to be noted as an important resource as well as some articles on that topic (Neumann 2011).

Fifth chapter about Stenmark model offered lesser challenge on choosing sources and is quite self-explanatory. I did use additional works to cover comparison and alternatives. (Stenmark 2010, Barbour 2000, Bigliardi 2014, Peters 2017)

Last chapter focuses on the applying of the Steinmark's model that again made choosing literature rather obvious. In addition it also draws lot of information from previous chapters of the paper.

Problems encountered during research

The main issue I encountered got already mentioned under the methodology section - the fact that there is not enough empirical data on the topic nor was there much

theoretical data either. Lack of data is caused by the novelty of the issue and possibly just ignorance. Newness of the topic is arguable and relative as one of the founding figures of the field, Allan Turing postulated his theological argument against thinking machines already in 1950. Also the fact that the questions stated by Rabbi Rosenfeld on 1966 have had virtually no discussion in academy despite constant progress in artificial intelligence, talks for itself.

To overcome this problem I decided to study the looking for areas that are in my opinion comparable and can give useful insight. For example drawing parallels from religion-science relationship, looking at experiences of using artificial intelligence in other social fields like nursing or examining how relationship between religion and artificial intelligence has been seen in science-fiction movies.

1. DEMOGRAPHICS - SECULARIZATION AND GROWTH OF RELIGIOUS POPULATION.

“Once the world was filled with the sacred – in thought, practice, and institutional form. After the Reformation and the Renaissance, the forces of modernization swept across the globe and secularization, a corollary historical process, loosened the dominance of the sacred. In due course, the sacred shall disappear altogether except, possibly, in the private realm.” (Mills 1959: 32-33)

These words written by sociologist Wright Mills some 70 years ago reflect understanding that is still widely accepted among common public.

During the five years from 2010 to 2015, almost 400 million people were added to the the world population. 26 million of them were defined as religiously unaffiliated. In contrast the according numbers amongst religiously affiliated people were 152 million Muslims and 116 million Christians. (Pew 2017: 6-7) Somehow this statistics does not support prediction made by Mills half a century ago.

Following chapter will shed some light on these two opposing arguments. My main aim is to clarify religious trends in world population with hope to confirm my first sub goal of the study. Failure of traditional secularization theory and future of religion in general has become quite controversial topic in the last decades thus it is beneficial to give more context before presenting dry statistical data. First I will look at traditional secularization view and point out its current problems. Secondly I will introduce theories that suggest reasons behind these problems and also offer alternative approaches. Thirdly I will present demographic data and see how it correlates to the theoretical framework discussed beforehand. Finally I will draw a conclusions based on the results.

1.1 Rise and fall of secularization

Historical relationship between science and religion will be covered more thoroughly in the chapter 3 that is dedicated for historical relationship between religion and science. Therefore I will not spend time looking into the roots of secularization in this chapter but will start from the point where secularization had already made its entrance.

Pippa Norris have summarized common understanding of secularization in the opening chapter of her book: “Since the Age of the Enlightenment, leading figures in philosophy, anthropology, and psychology have argued that theological superstitions, rituals, and practices are the product of the past that will be outgrown in the modern era. The death of religion was the conventional wisdom in the social sciences during most of the twentieth century. It has been regarded as the master model of sociological inquiry, where secularization was ranked with bureaucratization, rationalization, industrialization, and urbanization as one of the key historical revolutions transforming medieval agrarian societies into modern industrial nations.” (Norris 2011: 3) Twentieth century seemed to indeed support this understanding as religion was increasingly pushed out from its roles in public sphere and replaced with secular. But triumph of the secularism was not absolute and end of the century brought clear signs that the theory might have flaws.

During the last decades the thesis of slow inevitable death of religion has come under growing criticism. Critics are pointing out different indicators to show that religion is doing rather well. Such indicators range from continued popularity of churchgoing in the US to the emergence of New Age spirituality in Western Europe, the growth in fundamentalist movements and religious parties in the Muslim World, the evangelical revival in Latin America and the upsurge of ethno-religious conflict in international affairs. (Norris 2011: 4) As we can see, for over a century secularization theory appeared to be working well and could enjoy wide support by academic community. Problems arose when the theory could not stand the test of time and in modern day it seems to have many difficulties to match reality. Norris makes two statements that

support my postulation I stated in the beginning of this chapter and represent the complex nature of the issue:

1. The publics of virtually all advanced industrial societies have been moving toward more secular orientations during the past fifty years.
2. The world as a whole has now more people with traditional religious views than ever before and they constitute a growing proportion of the world's population.
(Norris 2011: 5)

I add one observation of my own into this list to extend the first statement and further complicate the matter:

3. Even the least developed countries⁷ in the world have gone through significant change in growth of bureaucratization, rationalization, industrialization, and urbanization during the last century but are not showing correlating change in secularization.⁸

We can easily see that only the first conclusion is supporting secularization theory while the second and the third statements are contradicting it!

Does this contradiction of theory and reality mean that secularization thesis was wrong and one of the predominant sociological views during the twentieth century was misguided? Before moving any further to answer this question it is helpful to examine what does secularization in this context means.

⁷ For example Sub-Saharan Africa region

⁸ For example in Nigeria, the country with biggest population in Africa, urban population has grown from 15%-50% since year 1960 (INDEXMUNDI), at the same time share of agriculture in GDP has fallen from 70% to 40% and it has been replaced by services and manufacturing sectors. (Chete 2014: 7). In spite these secularist changes, percentage of religiously unaffiliated population is currently one of the lowest in the world (0.4%) and is estimated to decrease to 0.3% by 2040 (Pew 2015)

1.2 Definitions and theories

There are many definitions of secularization and even single definition is often not unambiguous. Recognized sociologist Jose Casanova proposes threefold definition: Secularization as the differentiation of the secular spheres (state, economy, science) from religious institutions and norms; Secularization as the decline of religious beliefs and practices in modern societies; Secularization as the privatization of religion. (Casanova 2006: 7)

Another esteemed researcher on the topic, philosopher Charles Taylor distinguishes among three distinct conceptions of secularity. First refers to the degree to which religion is present in the public sphere. Second concept refers to the extent of religious belief and practice. Third view refers to the conditions of belief. (Taylor 2007: 2-3) We can already see obvious similarities in the first two definitions of both proposed concepts.

Finally I will introduce another definition that is twofold and reflects the two shared aspects from definitions offered by Casanova and Taylor. Historian of science, John Brooke states that definitions of secularization usually refer to the displacement of religious authority and control by secular powers that take over the functions formerly filled by religious institutions. The word also connotes a loss of plausibility and credibility affecting beliefs held within religious traditions. (Brooke 2010: 104)

The first definition matches with functionalist approach on secularization where main argument against religion is its loss of purpose. Sociologist Emile Durkheim argued that industrialized societies are characterized by functional differentiation, where specialized professionals and organizations, dedicated to healthcare, education, social control, politics, and welfare, replaced most of the tasks once carried out exclusively in Western Europe by monasteries, priests, and parish churches. The growth of the state created publicly-funded schools, health care, and welfare safety nets to care for the unemployed, the elderly, and the destitute. Stripped of their core social purposes,

Durkheim predicted that the residual spiritual and moral roles of religious institutions would gradually waste away in industrial societies. (Norris 2011: 9)

The second definition is in line with rationalist approach endorsed by another famous sociologist, Max Webber. In this perspective, the era of the Enlightenment generated a rational view of the world based on empirical standards of proof, scientific knowledge of natural phenomena, and technological mastery of the universe. Rationalism was thought to have rendered the central claims of the Church implausible in modern societies. The loss of faith was thought to cause religion to unravel, eroding habitual churchgoing practices and observance of ceremonial rituals, and undermining active engagement in faith-based organizations and support for religious parties in civic society. (Norris 2011: 7)

Now we have taken a look at how secularization is traditionally understood in theory so we can move on to study how this widely recognized idea performed in practice.

1.3 Reasons behind the fall of secularism and alternative approaches

As I showed above the main problem with traditional secularization theories is that they do not always work so well in the real world. There have been growing criticism over last decades about secularization not working as expected. Likely reason is the fact that the theories were born in certain time and place having certain historical context. I agree with Jose Casanova who argues that concept of secularization makes sense within the context of the particular dynamics of the transformation of Western European Christianity from the Middle Ages to the present. This concept, becomes problematic once it is generalized as a universal process of societal development and transferred to other world religions and other civilizational areas with very different dynamics of relations and tensions between religion and world. This applies for both approaches mentioned above as Webber and Durkheim were restricted by the same

context. It just happened that the particular, specifically Christian, Western European dynamic of secularization became globalized with the expansion of European colonialism, and with the ensuing global expansion of capitalism, of the European system of states, of modern science, and of modern ideologies of secularism. (Casanova 2006: 12-13)

Such relativism makes it hard to apply the same model successfully on different countries even if we talk about western countries that are sharing lot of historical, religious and cultural context. Just Europe in itself has diverse secularizations associated with fundamental historical differences between Catholic, Protestant, and Orthodox Christianity. United States on the other hand was born as a modern secular state that never knew the established church of the Europe. Therefore it is not reasonable to expect one approach to fit both regions.

From this perspective it starts making more sense why the traditional theory of secularization may work relatively well for parts of Western Europe but not so much for the United States and might be quite useless for analyzing regions that have currently biggest populations in the world, like Asia or Sub-Saharan Africa. Secularization in traditional sense could hardly be applicable, for instance, to China with such religions as Confucianism or Taoism, insofar as they have no ecclesiastical organization like church so in a sense these religions have always been secular. (Casanova 2006: 12)

Norris is supporting this idea of secular relativism when arguing that distinctive worldviews which were originally linked with religious traditions have shaped the cultures of each nation in an enduring fashion. Today, these values are transmitted to the citizens even if they never set foot in church, temple or mosque. Thus we assume that the values and norms in Catholic and Protestant societies, for example orientations towards the work ethic, sexual liberalization, and democracy will vary systematically based on past historical traditions, as well as varying in Hindu, Buddhist, Confucian, Orthodox and Muslim societies. (Norris 2011: 18)

In addition to such cultural traditions perspective Norris brings in another view that can help us to understand the way secularization does or does not work. It is the assumption that rich and poor nations around the globe differ sharply in their levels of sustainable human development and socioeconomic inequality. Accordingly they also differ in the basic living conditions, vulnerability to risks and of human security. The human security here means freedom from various risks and dangers and is widely recognized as important to well-being. Most importantly we regard the absence of human security as critical for religiosity. (Norris 2011: 14)

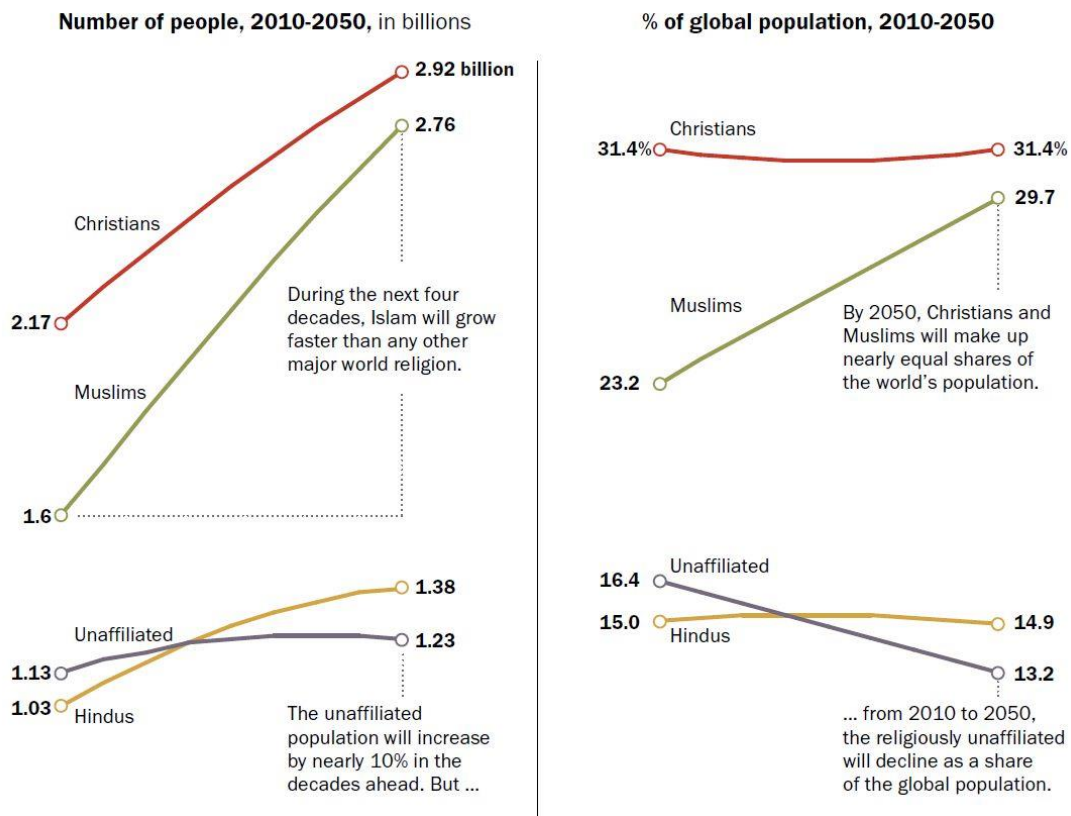
Based on these views and looking for a new model that can help to explain how secularization in different countries works, Norris proposes the demographic hypothesis that argues that human development and growing conditions of human security will erode the importance of religious values, and thereby will also reduce rates of population growth in postindustrial societies. Thus we can expect to find that rich societies are becoming more secular in their values but at the same time they are also shrinking in population size. By contrast we can expect that poor nations will remain deeply religious in their values, but will also display far higher fertility rates and growing populations. (Norris 2011: 23)

Two approaches discussed above bring out different dimensions that reinforce the understanding of secularization as a complex process that depends extensively on the context where it happens to develop. As we saw above Casanova is concentrating mainly on historical, religious and cultural context that will determine outcome of secularization. Norris supports importance of the religious context but also proposes additional socioeconomic and demographic dimensions that determine the way how secularization process will evolve in certain situation. One conclusion to draw from this discussion is understanding that making any predictions on global scale about future of religion is a very complex task. Demographic hypothesis stated by Norris comes out as plausible and if we are to take into account historical and cultural relativism described by Casanova then it gives promising model to test with real data.

Fortunately I do not have to do such research myself as Pew Research Center have recently published two studies that look into current and future demographic changes on global religious landscape.

1.4 Demographic data about religiosity today and predictions for tomorrow

Following paragraphs are highlighting some results from the two demographic studies that have been published in recent years. This work is unprecedented in the global scale and diversity of the religious data collected. Study published on 2015 is called “The Future of World Religions: Population Growth Projections, 2010-2050”. It a result of an effort that took six years and states that while many people have offered predictions about the future of religion, these are the first formal demographic projections using data on age, fertility, mortality, migration and religious switching for multiple religious groups around the world. Input data was gathered from more than 2,500 censuses, surveys and population registers, (Pew 2015: 9). Built largely upon the same data is the report published on 2017 with the title “The Changing Global Religious Landscape”



Graph 1. Projected change in main religious groups in global population from 2010 to 2050 (Pew 2015: 6)⁹

Graph 1. illustrates how global population of biggest religious groups, including religiously unaffiliated people, is projected to change from 2010 to 2050. We can see from the left side that in absolute numbers population of all four groups will be growing. The picture is not so simple when we look at the change in percentages. In context of this paper the most important aspect is that share of religiously unaffiliated people from global population is expected to decrease from 16.4% to 13.2%

⁹ There is newer graph in 2017 report showing change from 2015-2060, unfortunately there was no updated data for Table 1. The future of world religions: population growth projections by region. For clarity and easier comparison I kept older graph as important trends stay the same.

REGION	YEAR	POPULATION	CHRISTIAN	MUSLIM	UNAFFIL.	HINDU	BUDDHIST	FOLK	OTHER	JEWISH
Asia-Pacific	2010	4,054,940,000	7.1	24.3	21.2	25.3	11.9	9.0	1.3	< 0.1
	2050	4,937,900,000	7.7	29.5	17.0	27.7	9.6	7.4	1.0	< 0.1
Europe	2010	742,550,000	74.5	5.9	18.8	0.2	0.2	0.1	0.1	0.2
	2050	696,330,000	65.2	10.2	23.3	0.4	0.4	0.2	0.2	0.2
Latin America-Caribbean	2010	590,080,000	90.0	0.1	7.7	0.1	< 0.1	1.7	0.2	< 0.1
	2050	748,620,000	88.9	0.1	8.7	< 0.1	< 0.1	1.9	0.2	< 0.1
Middle East-North Africa	2010	341,020,000	3.7	93.0	0.6	0.5	0.1	0.3	< 0.1	1.6
	2050	588,960,000	3.1	93.7	0.6	0.6	0.2	0.4	< 0.1	1.4
North America	2010	344,530,000	77.4	1.0	17.1	0.7	1.1	0.3	0.6	1.8
	2050	435,420,000	65.8	2.4	25.6	1.3	1.4	0.6	1.5	1.4
Sub-Saharan Africa	2010	822,730,000	62.9	30.2	3.2	0.2	< 0.1	3.3	0.2	< 0.1
	2050	1,899,960,000	58.5	35.2	2.7	0.1	< 0.1	3.2	0.2	< 0.1
World	2010	6,895,850,000	31.4	23.2	16.4	15.0	7.1	5.9	0.8	0.2
	2050	9,307,190,000	31.4	29.7	13.2	14.9	5.2	4.8	0.7	0.2

Table 1. The future of world religions: population growth projections by region, 2010-2050 (Pew 2015: 245)

Based on the presented data and theoretical approaches on secularization, proposed by Casanova and Norris, I can make following conclusions:

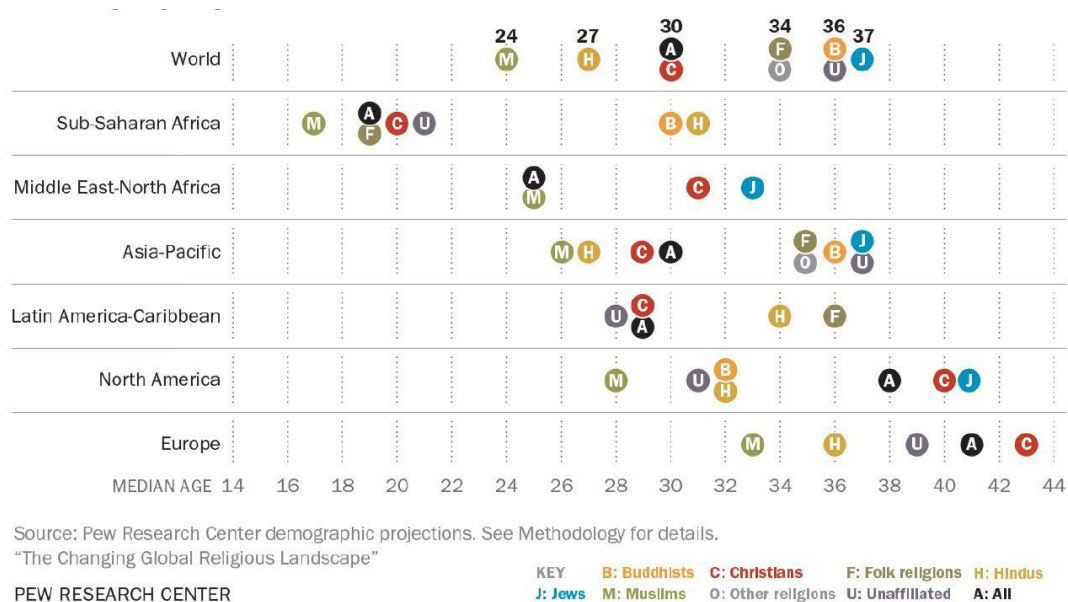
1. By 2050 two biggest regions by population will be Asia-Pacific and Sub-Saharan Africa, counting roughly for three quarters of world's population. In both of these regions percentage of unaffiliated people will decrease - this statistics is not matching with traditional secularization model but outcome is in line with relativist arguments made by Casanova. Both regions have historic, religious and cultural contexts that are very different from Western Europe so we cannot expect traditional secularization model to apply to them.
2. Estimates in the table align well with my statement in the beginning of the chapter about the lack of correlation between secularization and

modernization¹⁰ on less developed countries and reflects socioeconomic dimension of secularization introduced by Norris.

3. Data shows that regions with smallest presence of unaffiliated people are in Middle East and Africa. These are also regions that are known to consist of poor countries with low human security. This correlation proves demographic hypothesis proposed by Norris.
4. Biggest relative growth in unaffiliated population is projected in North America and Europe that proves again demographic hypothesis as these are rich regions with high human security. Additionally they support relativist arguments made by Casanova.

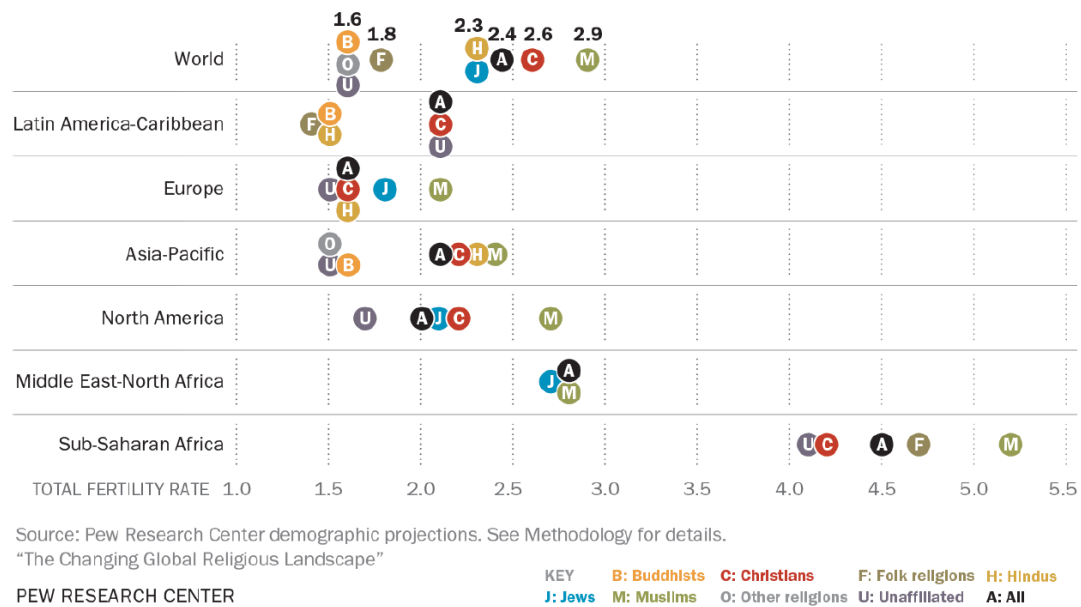
Last graphs I want to present will give us some insight to the mechanics behind these predictions. The report states that age and fertility are major factors behind growth of religious groups (Pew 2017: 14), so it can be illuminating to take a look at according statistics.

¹⁰ I use the word modernization here to refer to the key historical revolutions that helped to transform medieval agrarian societies into modern industrial nations, such as bureaucratization, rationalization, industrialization, and urbanization.



Graph 2. Median age by religion, 2015-2020 (PEW 2017: 14)

Age distribution of each religious group is an important determinant of demographic growth. We can see that unaffiliated group's median age (36) is globally much older than global median (30) meaning they are largely past their prime childbearing years and therefore expected to fall behind in the pace of global population growth. (Pew 2017: 14)



Graph 3. Total fertility rate by religion, 2015-2020 (Pew 2017: 15)

It is hard to overestimate the importance of fertility rate¹¹ in the growth of population. As we can see for unaffiliated group it stands at 1.6 that is well below replacement level of 2.1 and therefore too low to sustain the population. (Pew 2017: 15)

In addition to fertility rates and age distributions, religious switching is likely to play a role in the changing sizes of religious groups. In the case of religiously affiliated people switching to unaffiliated camp it means secularization in action.

¹¹ The standard measure of fertility in this report is the Total Fertility Rate. In countries with low infant and child mortality rates, a Total Fertility Rate close to 2.1 children per woman is sufficient for each generation to replace itself. Replacement-level fertility is higher in countries with elevated mortality rates. (Pew 2015: 10)

	Switching In	Switching out	Net change
Unaffiliated	12,220,000	4,640,000	+7,570,000
Muslims	1,300,000	880,000	+420,000
Folk religions	760,000	410,000	+350,000
Other religions	370,000	130,000	+240,000
Hindus	30,000	30,000	<10,000
Jews	40,000	80,000	-40,000
Buddhists	470,000	830,000	-370,000
Christians	4,960,000	13,140,000	-8,180,000

Graph 4. Religious switching, 2015-2020 (Pew 2017: 17)

As we can see from graph 4. between 2015 and 2020, religiously unaffiliated group is projected to experience a net gain of 7.6 million people due to religious switching; people who grew up as Christians are expected to make up the overwhelming majority of those who switch into the unaffiliated group. Still, if current religious switching patterns continue, gains made through religious disaffiliation will not be large enough to make up for population losses due to other demographic factors, like age and fertility.

Data on both graphs is supporting demographic secularization hypothesis proposed earlier by Norris.

There is no reason to question the objectivity and skills of the researchers behind these demographic studies. Nevertheless, it is important to keep in mind that population projections are estimates built on current population data and assumptions about demographic trends, such as declining birth rates and rising life expectancies in particular countries. The projections are what will occur if the current data is accurate and current trends continue. But many events – scientific discoveries, armed conflicts, social movements, political upheavals, natural disasters and changing economic conditions, to name just a few – can shift demographic trends in unforeseen ways. For example, China’s 1.4 billion people (as of 2015) loom very large in global trends. At present, about 5% of China’s population is estimated to be Christian, and more than 51% is religiously unaffiliated. Because reliable figures on religious switching in China

are not available, the projections do not contain any forecast for conversions in the world's most populous country. But if Christianity expands in China in the decades to come – as some experts predict – then by 2060, the global numbers of Christians may be higher than projected, and the decline in the percentage of the world's population that is religiously unaffiliated may be even sharper than projected. (Pew 2017: 41)

Conclusion

In conclusion it is apparent that presented outcomes of the demographic reports are well supported by the proposed theoretical approaches on how secularism works (or does not work) in modern world. Therefore my first sub goal is proven and it is credible to state that number of religious people in the world is growing.

In this chapter I gave overview of the traditional secularization theory, introduced some eminent definitions of the concept and presented the associated issues. I described modern alternative approaches on the problem as proposed by Jose Casanova and Pippa Norris. Finally I exhibited relevant demographic data supported by theoretical framework by Casanova and Norris to establish my first sub goal.

2. RELIGION AND SCIENCE

Pope Frances wrote following words in his second encyclical letter AD 2015: “Humanity has entered a new era in which our technical prowess has brought us to a crossroads. We are the beneficiaries of two centuries of enormous waves of change: steam engines, railways, the telegraph, electricity, automobiles, airplanes, chemical industries, modern medicine, information technology and, more recently, the digital revolution, robotics, biotechnologies and nanotechnologies. It is right to rejoice in these advances and to be excited by the immense possibilities which they continue to open up before us, for science and technology are wonderful products of a God-given human creativity” (Pope Frances 2015: 30)

Head of the Catholic Church is clear with his message, affirming unity between science and religion. Following chapter is going to give some insight on other points of view, describes how we got here and what might lie ahead.

The chapter starts with historical overview of the relationship between religion and science concentrating on the time when modern science emerged. Next I will look how Christianity and Islam relate with science in official level. In the light of the vast demographic changes I will be examining how Islamic countries and Sub-Saharan Christianity deals with new technologies. Final paragraphs will be looking at more futuristic relationships between religion and technology in context of virtual worlds and Transhumanism movement. My main aim is to demonstrate that scientific ideas have been deeply intertwined with religious thought throughout the history of modern science and that this interaction is likely to continue.

2.1 Historical relationship between Religion and Science

Like discussed in the previous chapter on the topic of secularization, modern world is witnessing two potentially incompatible trends. On the one hand is relentless scientific and technological advancement and confidence in the triumph of rationality and reason. On the other hand there is growth of religious population and resurgence of various religious movements, comparable to religious revival.

Historian David Noble argues that such trend is just a renewal and a reassertion of a much older historical tradition. The present enchantment with things technological - the very measure of modern enlightenment - is rooted in religious myths and ancient imaginings. Viewed from a larger historical perspective, there is nothing peculiar about current occurrence, for these tendencies have never been too far apart. What we experience today is just a continuation of a thousand-year-old Western tradition in which the advance of the useful arts was inspired by and founded on religious expectation. Only during the last century and a half or so has this tradition been interrupted and obscured by secularist ideology, which have greatly exaggerated the supposedly fundamental conflict between science and religion. (Noble 1997: 5)

Widely accepted understanding that religion and science are destined to eternal conflict is seen rejection in last decades by several prominent scholars. In his book “The Victory of Reason” sociologist of religion Rodney Stark is making a bold move by proposing that Christianity not only tolerated science but actually was the main reason for its emergence. Stark asks a series of questions that have long been considered fundamental to our understanding of the modern world: Why was it that China, India, and Islam were backward by comparison with sixteenth century Europe? Why did alchemy develop into chemistry only in Europe? Why was it that for centuries Europeans were the only ones possessed of eyeglasses, chimneys, reliable clocks, heavy cavalry, or a system of music notation? (Stark 2005: ix). He points out that “when Christians knew virtually nothing of Greek learning, it was alive and deeply appreciated in Islam . . . But the possession of all enlightenment did not prompt much intellectual progress

within Islam, let alone eventuate in Islamic science. Instead Muslim intellectuals regarded Greek learning, especially the work of Aristotle, as virtual scripture to be believed rather than pursued” (Stark 2005: 21). Stark makes a statement that “the rise of science was not an extension of classical learning. It was the natural outgrowth of Christian doctrine: nature exists because it was created by God. In order to love and honor God, it is necessary to fully appreciate the wonders of his handiwork. Because God is prefect, his handiwork functions in accordance with immutable principles. By the full use of our God-given powers of reason and observation, it ought to be possible to discover these principles. These were the crucial ideas that explain why science arose in Christian Europe and nowhere else” (Stark 2005: 22-23).

I acknowledge that Stark has reputation for having somewhat provocative manner and he himself recognizes that his views are unfashionable (as attested by the first sentence of the 2014 book “This is a remarkably unfashionable book”). Despite his style the take on emergence of modern science is very refreshing and well argued. He demonstrates, that rather than being a period of ignorance and backwardness, the era from the fall of Rome through the Middle Ages was a time of spectacular technological and intellectual progress, that erupted when innovation was freed from the grip of Roman despotism. Christian commitment to progress played an important role not only by prompting the search for new technology but by encouraging its rapid and widespread adoption. (Stark 2005: 35) This is novel and illuminating take because so far every educated person has known that from the fall of Rome until about the fifteenth century, Europe was submerged in the darkness of ignorance and superstition. He reveals in very plausible way an alternative perspective.

Rumy Hasan who is pulling also from other critics for his review of Stark’s book, does not really question this part of he’s work but picks on his interpretation of developments in later times. In conclusion of his review Hasan has to admit “There is, however, compelling evidence to support Stark’s overarching claim about the crucial role played by Christianity in the rise and dominance of the West.” (Hasan 2016: 16)

Similar ideas about mutually beneficial existence during the emergence of modern science have been expressed by other respected scientists. Historian John Henry who has extensively written about history of modern science is noting that before secularism became the norm in western societies, God and religion were so pervasive in social, political and intellectual life that it seems fair to say that all but a very few intuitively thought in a religious way. It was as inevitable as anything can be in history, therefore, that those concerned with studying and understanding the natural world in the early modern period were every bit as religious as the population at large. Certainly, it is true to say that virtually all of the most prominent figures in the historiography of the Scientific Revolution were religiously devout, and some of them extremely so. (Henry 2010: 39)

Esteemed theologian John Polkinghorne is also admitting that most of the founding figures of modern science were people for whom religious belief was important, even if some had problems with the Church authorities (Galileo) or with Christian orthodoxy (Newton). Sir Isaac himself saw the marvelous order of the solar system as a clear sign of the designing Intelligence who was its Creator, and he believed that if occasional divine intervention was required to maintain its stability this would be provided. In the seventeenth century it was a common thought to say that God had written two books, the book of scripture and the book of nature. Both were to be read, and if this was done correctly there could be no contradiction between them, since they had the same Author. (Polkinghorne 2011: 32)

It is worth noting that Polkinghorne himself had successful career as a particle physicist before he devoted to theology thus being a great example that such fusion of religion and science is not uncommon even modern times.

The Catholic Church's relationship with science and technology through history has been quite pragmatic and can be summarized as this: some technologies are good, some are neutral, and some are bad. This might seem too basic, but this concept is foundationally related to the first principle of practical reason, often paraphrased as

“Good is to be done and pursued, and evil is to be avoided”, and acts as a simple principle to systematize the Church’s attitude. (Green 2017: 7) History of last millennia is saturated with facts that back such claims of tight relationship between church and science in Western Europe.

The Catholic Church and Catholic scientists and technologists were vital in the development of the scientific method (which is itself a technique for acquiring knowledge), for promoting advances in architecture and structural engineering, for conducting geographic exploration, and many other endeavors. (Green 2017: 5)

Stark asserts that while other world religions emphasized mystery and intuition, Christianity embraced reason and logic as the primary guide to religious truth (Stark 2005: x). What marks Christianity out is that it is an “orthodox” religion, that is, it puts emphasis on correct (ortho) opinion or thinking (doxa). In contrast, other religions, notably Judaism and Islam are “orthopraxy” religions, concerned with “law to be understood and applied.” Accordingly, the importance of thinking is thought to be key to the purportedly inquisitive nature of Christians. (Stark 2005: 8)

Next paragraph will examine if the claims made by Stark apply for Islam and what is the nature of relationship between Islam and science.

2.2 Islam and science

As I showed in the first chapter, during the next decades Islam is going to grow faster than any other major religion in the world. Unless the trend will change it means for the end of the century Islam will have more followers than Christianity. Considering such perspective I find it is important to study relationship between Islam and science even if main focus of this paper is on Christianity.

Rodney Stark mentioned above that Islam in his territories never managed to hatch science like Christianity in Western Europe. Fatima Al Hayani is not entirely agreeing with such statement in her study. She argues that there was a dynamic period of discovery and innovation in all spheres of knowledge within Islam. Such inspiration, encouraged by the Qur'an, produced an abundance of scientific inventions and works that became the basis for today's technology in many fields. In addition to the religious sciences - that is, the Qur'an and its exegesis, traditions, canon law, and theology - Muslims contributed significantly to medicine, mathematics, astronomy, botany, geology, mineralogy, logic, metaphysics, literature, ethics, and politics (Al-Hayani 2005: 566).

Yet she admits that for the last five hundred years Muslims have lived in a kind of cocoon, seemingly incapable of breaching the walls they have constructed around themselves. Al-Hayani finds that one big reason was the political and economic conditions. Colonization by the West of most Islamic countries caused Muslims to resist accepting the Western sciences and left them unable and unwilling to cope with the new innovations. Muslims were convinced that the science embraced and encouraged by the West was a secular endeavor intent on undermining the theological base of Islam. (Al-Hayani 2005: 567)

Until very recently Muslims have dealt with this situation only marginally. Although Muslim scientists and religious authorities have been seeking common ground through ongoing dialogue, the conflict has yet to be resolved.

Persian-American scholar Seyyed Hossein Nasr argues that modern science has lost its original sacred roots that laid in supernatural. Nasr describes three important historical stages of such desacralization. First rationalism and skepticism in ancient Greece that reduced knowledge to logic. Secondly Renaissance thinkers who favored a concept of nature as independent and self-creative and finally Descartes who reduced knowledge to individual reason and definitely divorced mind and matter and identified nature with the physical world. In Nasr's interpretation, the contemporary sciences of nature are

severed from Divinity and a wrong usage of science's products (that is, technology) brings about the environmental crisis that characterizes modern times.

Nasr argues that among all religions Islam enjoys a special status. He emphasizes that in Islam knowledge was never divorced from the sacred. Islamic education revolves around the Qur'an, which contains the roots of all knowledge, addresses the whole of the cosmos, and does not draw a clear demarcation between the natural and the supernatural. Nasr does not offer plan how to reconcile Islam and modern science but rather focuses on differentiating Islamic science from Western science. (Bigliardi 2014: 13-15)

This view reflects ideas of influential Islamic scholar of religious studies, Raji al-Faruqi, who blamed crisis in Islamic theology partly on the spread of western scientific skepticism. The solution al-Faruqi offered was in the establishment of a genuine Islamic science: a science recast according to the genuine Islamic principles. (Bigliardi 2014: 12-13)

The more advanced the scientific discoveries, the more evident is the friction between the two sides. Al-Hayani argues that problems arise when new knowledge is sought and acquired without an in-depth study of the moral and religious ramifications. Such study requires an understanding of the Qur'anic scriptures and their interpretations by qualified Muslim scholars. (Al-Hayani 2005: 570)

In practice it would mean that new scientific ideas and technologies have to be "approved" by Islamic scholars before their use to avoid conflict. Essentially it implies reinterpreting religious text in the way it would legitimize certain innovation. Considering ever fastening progress on the front of science and technology it seems very difficult task. Looking to the future, one solution could be implementing authorized AI scholars who can execute such approvals instantly as soon as they are required.

Al-Hayani is convinced that both the Qur'an and Islamic law show that no contradiction exists between Islam and the sciences. Islamic sources offer ample directives and injunctions that support a concordance between them. Yet she stresses that this concordance is not without limits: any and all initiatives in any and all studies must have the ultimate goal of serving God's law (Al-Hayani 2005: 575) Such understanding is similar to relationship between science and religion in western Christianity before secularism arose. Considering the growing role that science has in the modern world it is likely to lead to conflicts.

According to Algerian astrophysicist Nidhal Guessoum who is considered one of the reformatory scholars in the discussion, the contention and friction between modern science and Islam is the most important area of challenge. How to reconcile a naturalistic study and explanation of the nature and the belief in a present or even personal God? Does God act in the world, and if so, does this conflict with modern science? - that is where the biggest problem according to Guessoum, lies. The concept of methodological naturalism¹² is a crucial pillar of modern science, one which explicitly or implicitly leads to conflicts with Islam. He admits that rejections of major scientific theories such as biological evolution and Big Bang cosmology that are major established frameworks of laws is not a viable option. Guessoum concludes that in crucial issues such as creation and evolution, science should be fully accepted.

Albeit he does not have a nice solution for way forward, Guessoum proposes idea of a "theistic interpretation" of science as an option but stresses the need to clearly state position with methodological naturalism and explain how to conceive of an

¹² Number of philosophers have insisted methodological naturalism has become a pillar of modern science out of pragmatism and efficiency. With this principle, it is then superfluous to call upon supernatural agents when material causes can explain the phenomenon. During the emergence of modern science, the assumption of supernatural factors as explanations was quickly identified as a "science stopper". (Guessoum: 862)

Islamic/theistic science and view of nature and God's relation to it. (Guessoum 2015: 861-873)

To conclude this review of relationship between official Islam and modern science I refer to Stefano Bigliardi's conclusion in his study where he analysed positions on the topic by contemporary Islamic thinkers using Barbour's integration view of science and religion. Eventually he admits that none of the contributions to Islam and science seemed to represent it. (Bigliardi 2012: 517)

It is important to note that such conflicts in academia do not have to reflect in ordinary life. In this case it does not mean that new technologies will be rejected by Islamic society. Basically we can see that Islam is following the same pragmatic principle as Christianity when harnessing beneficial technologies. During last decades many Islamic countries have been happy to exploit progress in science and technology and to implement innovations. Good example is oil and gas rich countries in Arabian Peninsula. Extreme instance is Qatar, religiously conservative Islamic country, where population enjoys benefits of having world's third largest natural gas reserves and oil reserves. (Wikipedia), It is undeniably direct result of industrial and technical revolution and progress in science that technology that have caused high demand for oil and gas thus allowing Qatar to have world's highest per capita income (\$128 700) According to recent data from IMF, it is over two times higher than Switzerland (\$63 380), commonly known as a country that is doing economically rather swell. (IMF) Similar economic prosperity is enjoyed by Qatar's neighbors Brunei, United Arab Emirates, Kuwait and Saudi Arabia. These countries are not shy to use oil products themselves as Middle East region has reputation as best market for high end cars. Bugatti Automobiles S.A.S., the producer of super sports cars claims that Middle East has by far the highest Bugatti density per capita in the world (Arabnews). Such facts are clearly indicating that in ordinary level Muslims have no conflict with using latest achievements of science and technology.

On that note we can turn our attention back to Christianity and on the next paragraph I will be examining how relationship between religion and science is doing in more modern context.

2.3 New technologies and African Christianity

Demographic outlook for the world presented in the first chapter is clearly showing that by far biggest Christian population in the world is going to live in the Sub-Saharan Africa. Considering such perspective it is worth to take a look at their relationship with new technologies.

In the paper studying use of internet in modern Africa, Asamoah-Gyadu concludes that methods used by popular televangelism are now used on internet platform. On the web pages of all the Pentecostal/charismatic churches, there are summarized messages of what it means to receive Christ, how to do it and then a sinner's prayer to repeat. The Internet has also been turned into a virtual location for healing and evangelism crusades through which people could come to Christ through Computer Mediated Communication. (Asamoah-Gyadu 2008: 239) He argues that the demands of modern living and the global dispersion of many religious communities, have created a niche within which the Internet can play an important role, not merely as a notice-board or source of more detailed information but as a medium that facilitates interactive religious activity. Thus the Internet serves as an extension of the presence and activities of churches and new religious movements. It is capable of conquering barriers of time and distance in an unprecedented way. By linking African immigrant churches with their home branches for example the Internet helps to maintain vital religious connections.

He concludes that the enthusiasm with which African churches and movements took to the Internet, the enthusiasm with which the older historic mission churches joined, and

the innovative ways in which the two groups put the Internet whether as a source of information or evangelism suggests that they are in a new partnership with God. (Asamoah-Gyadu 2008: 240)

As we can see Africa can be fertile place for adapting new technologies even despite the lack of general economic success. The fact that secularization does not work (similarly to Islamic countries) does not mean that new technologies will be rejected. This correlation stands even if there is no approval by official religion.

On the next paragraph I will turn my focus back to Western society and see how religion is coping with online virtual worlds.

2.4 New technologies and Western Christianity

As I discussed in the first chapter of this paper, according to the traditional secularization theory the dominant role played by religion in public life was supposed to dwindle in the twentieth century. The growth in scientific knowledge and the rapid deployment of powerful technologies were key to faith in the triumph of secularism. In 1950s sociologist Max Weber argued that science had disenchanted the world. For Weber only the absence of scientific explanations allowed room for enchanted or religious explanations of facts. Nevertheless later thinkers have persistently argued that enchantment remained after the rise of secularism, integral even to the world of technology. (Geraci 2010: 11-12)

One might expect such friction between religion and science to cause schizophrenic clash between contrasting worldviews in the mind of a religious scientist - if there are any. In fact there are many religious scientists, in current paper I have referred to several of them, including acclaimed particle physicist and theologian John Polkinghorn. One of the legendary figures in AI robotics research, Rodney Brooks, is also religious and he wrote on this very topic: “On the one hand, I believe myself and

my children all to be machines. Automaton at large in the universe. Every person I meet is also a machine – a bag of biochemicals interacting according to describable and knowable rules. When I look at my children I can, when I force myself, understand them in this way. I can see that they are machines interacting with the world. But this is not how I treat them. I treat them in a very special way, and I interact with them on an entirely different level. They have my unconditional love, the furthest one might be able to get from rational analysis. Like a religious scientist, I maintain two sets of inconsistent beliefs and act on each of them in different circumstances.” (Brooks 2002: 174) Approached this way we can see how religion and science can coexist not only in the frames of the society but also inside an individual.

Probably nowhere else is the intimate connection between religion and modern technology manifested more than in the United States, where an unrivaled popular enchantment with technological advance is matched by an equally earnest popular expectation of return of the Jesus Christ. What has typically been ignored by most observers of these phenomena is that the two obsessions are often held by the same people, many among these being technologists themselves. Advocates of Artificial Intelligence often talk about possibilities of machine based immortality and resurrection, and their disciples, the architects of virtual reality and cyberspace, exult in their expectation of God-like omnipresence and disembodied perfection. Genetic engineers imagine themselves divinely inspired participants in a new creation. All of these technological pioneers harbor deep-seated beliefs which are variations upon familiar religious themes. (Noble 1997: 7-8)

Geraci extends on Noble’s notion on importance of new technologies and points out that although technological progress has been extraordinary across much of human activity the most impressive changes in social structure have been wrought by computers. (Geraci 2010: 12) Biggest social change was brought by Internet that allowed individuals from different cultures and geographic locations to use common cyberspace for communication in real time to enhance their lives. I already touched this

topic above when I showed how internet has been eagerly harnessed for the benefits of religion in Africa. Cyberspace offers an environment free of the rules and restrictions of physical world that is intended for the interaction of different ideas from around the globe. People can use social media, internet forums, online games and virtual reality environments alike to build connections and establish groups based common values in a variety of endeavors including religious views. Connections developed and experiences gained in the virtual cyber world can help individuals cope with their lives in the physical world. With the click of a button or with the creation of a username, a person can gain access to countless sources of different religions, traditions, communities, and users all with various aims, voices and ideas. Some websites intend to instruct and inform, others hope to support member's individual faiths, and others create space for rituals. Internet itself is still just a platform and modern technology is able to create much more complex and immersive social environments than just webpage on online forum. It is not necessarily an overstatement to argue that we have already created whole virtual worlds.

2.5 Religion in virtual world

Robert Geraci is stressing the importance of virtual worlds created by online games and environments that provide a context far better suited to the development and maintenance of societies than mere e-mail or web page. Games can integrate features of social life that earlier electronic communities lacked. The social significance of online life is growing for individual users as they immerse themselves ever deeper in virtual reality. (Geraci 2010: 73) Geraci points out online game "World of Warcraft" (WOW) and online virtual environment "Second Life" (SL) as exemplary virtual worlds. Both are the industry leaders in their respective domains, with WOW by far

the most popular¹³ massively multiplayer online game and SL being better known and far more technologically advanced than other social environments. WOW is definitely a game - in it, players take on heroic roles, battling against the forces of evil in a Tolkienesque fantasyland. SL is a world almost entirely created by its residents - they shape the land, raise the buildings, establish many of the governing principles, and fill the world with music, art, games, dancing, role-play, religion and anything else their mind can invent. (Geraci 2014: 2) Considering that both platforms have their user base in millions of people¹⁴ it is fair to say that they are important social players that have according influence. Extent and nature of such influence remains by and large unstudied. (Schaap & Aupers 2017: 1756) Fact is that such virtual worlds offer new opportunities and new stumbling blocks for traditional religions and it can even permit the growth of new kinds of religion.

The connection between games and religion is nothing new; there have been religious games for, perhaps, as long as there has been religion. He describes three particular kinds of religious games: (1) catechistic games that point toward the sacred or are situated in a sacred context but are not themselves sacred; (2) poimenic games in which the divine manifests itself through the game; and (3) praxic games where playing the game is itself a sacred activity. He points out that both worlds enable new kinds of religious practices; World of Warcraft can be a praxic game, while Second Life can be catechistic, poimenic, or praxic. (Geraci 2014: 3)

¹³ I find this statement to be arguable today as recent statistics about registered users and active memberships is not anymore publicly available. During the last years other popular online games have emerged, most noticeable competitor being “League of Legends” (LOL)

¹⁴ Both WOW and LOL claim to have over 100 million registered users and over 5 million concurrent players on peak times. SL has over 36 million registered accounts and more that 1 million active users. https://en.wikipedia.org/wiki/League_of_Legends, https://en.wikipedia.org/wiki/World_of_Warcraft, <https://www.lindenlab.com/releases/infographic-10-years-of-second-life>

Second Life enables a wide variety of religious practices that enhance the lives of its residents; churches, synagogues, mosques, temples, and other religious establishments dot its landscape, providing virtual counterparts of, supplements to, and competition for conventional religious institutions and practices. The creators of SL have long proposed that Second Life is a world wherein the evils of the conventional world can be fixed and where intolerance can become obsolete. Similarly religious practitioners in Second Life believe that it can be a platform in which differing beliefs and practices can speak to one another and learn to get along. This was, in fact, the premise behind Second Life's first native religion, Avatars of Change. Geraci concludes that based on his interviews and observations with Christian and Muslims groups, Second Life facilitates ecumenical outreach, amplifies participant voices, and enables transformative religious experiences. These factors enable the residents' faith that Second Life can help make the world better through religious practice; as such, Second Life is virtually sacred. (Geraci 2014: 4-6)

Both World of Warcraft and Second Life essentially offer religious life, giving their players variety of opportunities that closely resemble those of traditional religions and so they compete with them or restructure these traditional communities.

These religious constructs that have created out of, or in symbiosis with, popular culture, are called hyper-real religions. This term refers to Baudrillard's vision that modern society is structured by signs and symbols in which it becomes so difficult to distinguish the real from the unreal that it results in hyperreality. (Possamai 2012: 1) Hyper-real religion refers to a version of a religion, which provides inspiration for believers/consumers. Second Life and WOW allow to create such new religions inside the virtual world inspired by the real world religions. The other way is to create religious movements in the real world, inspired by virtual or fictional world. The best known examples of such hyper-real religions grow out from science fiction and are Jediism that is based on the popular Star Wars series and Matrixism that emanates from the Matrix trilogy.

World of Warcraft has several own religions; The Church of the Holy Light is a full-fledged religious organization with an archbishop, a council of bishops, priests and approximately 800,000 members. Followers do not believe in a transcendent god or deity but rather in a spiritual force that permeates everything. The 'Holy Light', as this force is called, enhances human power whereas its advocates embrace the 'path of the three virtues': respect, tenaciousness and deep compassion towards everything that lives. (Schaap & Aupers 2017: 1745) Scaaf and Aupers distinguish three forms of 'religious reflexivity' in such virtual environments: 1) religious performance, an acting out of offline experiences with religion through online role-playing; 2) religious relativism, a shift from dogmatic atheism to a tolerant attitude towards religion; 3) religious quests, an increased interest in religion and active 'bricolage' of online religion and official religion to create personal systems of meaning. They conclude that online games can serve as laboratories where people can freely experiment with religion outside the established churches. (Schaap & Aupers 2017: 1744)

Modern technology has allowed us to create new worlds where we can freely decide over every detail, adding or omitting however we like. It is very telling that these worlds emerging from the latest innovations of science and technology include considerable religious content.

Margaret Wertheim is arguing that cyberspace is the closest thing to heaven on earth. Half a century after Max Weber claimed that science had disenchanted the world, Wertheim is stating that science has created a new realm – cyberspace. Cyberspace is filling the void that was left after modern science systematically dismantled our Western understandings of sacred space, leaving god, heaven, and the souls of the dead with no particular place to go. Virtual world is a part of reality in which spirits or souls might reside, and as a consequence, cyberspace fills a psychological, religious void in modern life (Wertheim 2000: 30). "Once again we find ourselves with a material realm described by science, and an immaterial realm that operates as a different plane of the real. (Wertheim 2000: 230)

The religious void Wertheim is writing about is addressed not only in virtual reality but even more so in the new real world movements that are offering answers and solutions to the issues that have so far been exclusively in the realm of religion. The most prominent movement on this front is Transhumanism.

2.6 Transhumanism

One of the recognized proponents and leading figures behind the Transhumanist movement, philosopher Nick Bostrom, defines it this way: “Transhumanism is a loosely defined movement that can be viewed as an outgrowth of secular humanism and the Enlightenment. It holds that current human nature is improvable through the use of applied science and other rational methods, which may make it possible to increase human health-span, extend our intellectual and physical capacities, and give us increased control over our own mental states and moods.” (Bostrom 2005: 202) To rephrase this bit clumsy definition: Transhumanism is a philosophical and cultural movement promoting responsible ways of using technology to enhance human capacities and to increase the scope of human flourishing. In particular it draws from technological progress in biotechnology, nanotechnology, robotics, and AI, proclaiming that future advances will eliminate illness, aging, and even death. Transhumanists are technological optimists believing that careful consideration and hard work will lead to positive outcomes. While recognizing the dangers implicit in these technologies, they consider them no different from any other dangerous technology (like nuclear power) and feel that humankind can learn to deal with them.

Although transhumanists themselves generally do not consider their movement to be a religion, they admit that it might serve a few of the same functions that people have traditionally sought in religion. It offers a sense of direction and purpose and suggests a vision that humans can achieve something greater than our present condition. Unlike most religious believers, transhumanists seek to make their dreams come true in this

world, by relying not on supernatural powers or divine intervention but on rational thinking and empiricism, through continued scientific, technological, economic, and human development. Some of the prospects that used to be the exclusive thunder of the religious institutions, such as very long lifespan, unfading bliss, and godlike intelligence, are being discussed by transhumanists as hypothetical future engineering achievements. It should be emphasized that Transhumanism is not a fixed set of dogmas. The transhumanist philosophy, still in its formative stages, is meant to keep developing in the light of new experiences and new challenges. (HUMANITY+)

Futurist and transhumanist Giulio Prisco believes that transhumanist promises of immortality and the resurrection of the dead will compete with institutionalized religions while shedding the baggage of bigotry and violence that he believes such religions carry. (Geraci 2010: 86)

The importance and influence of Transhumanism movement can be recognized by the attention that it has gotten from theological community. It is easy to understand why, as Transhumanism is promising the same ultimate reward like major world religions – immortality. Transcendence to the better reality after sufferings in this imperfect world where we spend mundane earthly lives – it is undeniably one of the bestselling features of major religions. Thus if Transhumanism can live up to its promises then it could render traditional religions quite useless or at least offer serious alternative like Prisco predicts.

Acclaimed theologian Ted Peters has been rejecting Transhumanism at least in its more extreme form, on scientific, philosophical, theological, and ethical grounds. He is skeptical, along with many others, of the scientific feasibility of cybernetic immortality. Peters quotes John Polkinghorne, who gives little credence to the notion that the essence of a person can be replicated in a computer, calling the entire enterprise “excessively speculative.” Peters argues that scientifically, we are becoming increasingly convinced that brains and hence minds are embodied and he also reviews

the work of Christian theologians from several traditions and finds a consensus that “who we are as a person is embodied.” (Mercer 2015: 28)

According to Roland Cole-Turner, Transhumanism presents a following challenge for Christianity. The transhumanist might ask: “If Christianity is in favor of transformation, and seemingly without limits, is it also in favor of the use of technology as a means of transformation? Do Christians merely wait passively to be saved, or are you willing—as Pierre Teilhard de Chardin maintains and as the Bible itself says—to ‘work out your own salvation’?”. (Cole-Turner 2011: 200)

Cole-Turner finds that the creativity and scope of technology must be acknowledged for the way in which it changes both the social and the natural reality that theology faces. At the same time theologians must remain clear about the disappointments and dangers posed by technology. A key part of the challenge facing theology is to keep technology from so completely changing the way we see the world that we lose the richer, more embodied, more emotional and complicated meaning of our human relationships, our yearnings, our failures, and our attempts to begin anew. (Cole-Turner 2011: 201)

Despite mentioned differences it would be overly simplistic to treat Transhumanism as a mere secular phenomenon. The assertion that transhumanist discourse harbors religious themes it may seem odd to practitioners of Transhumanism as the movement is commonly understood as an extension of secular humanism. Nevertheless there are enough parallels with traditional religion for Transhumanism to be understood as a certain hybrid of religious and secular.

Geraci goes as far as stating that Transhumanism is a pervasive religious system in modern life, operating across a wide array of cultural domains, both implicitly and explicitly and the absence of God in Transhumanism does not mean that it is not a religion, as some transhumanists now also recognize. (Geraci 2010: 87-88)

The limitations of this paper won't allow me to get deeper into this discussion but emerging new interconnections between religion and science are obvious.

Conclusion

This chapter had an ambitious task to cover extensive topic of religion and science relationship. I started with looking at the emergence of the modern science to point out how tightly intertwined these two realms were since beginning. I followed to give insight to problematic relationship between official Islam and science. Thereafter I presented examples how new technologies are accepted in the religious environments of Islamic countries and Christian Africa. Last part of the chapter returned into more western context and examined how religion has been related to the virtual worlds. Finally I show how advances of innovative technology are creating potential alternatives for the traditional religion in the example of Transhumanism.

In conclusion this chapter offers sound backing to my statement that science has been deeply intertwined with religious through the history of modern science until today and into the future. I would like to finish with the words of historian David Noble, who states: "Modern technology and modern faith are neither complements nor opposites, nor do they represent succeeding stages of human development. They are merged, and always have been, the technological enterprise being, at the same time, an essentially religious endeavor." (Noble 1997: 7)

3. ARTIFICIAL INTELLIGENCE

“There are few things of which the present generation is more justly proud than the wonderful improvements which are daily taking place in all sorts of mechanical appliances. ...But what would happen if technology continued to evolve so much more rapidly than the animal and vegetable kingdoms? Would it displace us in the supremacy of earth?We are daily giving [machines] greater power and supplying by all sorts of ingenious contrivances that self-regulating, self-acting power which will be to them what intellect has been to the human race.” (Butler 1863) These words, written by Samuel Butler four years after publication of Darwin's “The Origin of Species”, were inspired by the groundbreaking theory of evolution and the fast progress of technology. Somehow he’s ideas and questions sound remarkably relevant today.

Following chapter is going to examine this novel concept of intelligent machines that Butler was contemplating about, with the aim to support my third sub goal. This chapter asserts that presence of artificial intelligence is growing and it is getting increasingly integrated into different parts of life. To tackle this goal I will start with a look at history of the AI. Further I will present recent achievements to illustrate current state of the field and its potential and define different types of AI. I will also look at ways to measure its growth and look how society is responding to these developments. Finally I will conclude the chapter describing some visions of what the future might bring.

3.1 Roots of Artificial Intelligence

It is generally agreed that the term Artificial Intelligence was coined by John McCarthy for a new field that he started by running a six-week workshop at Dartmouth College during the summer of 1956. (Brooks 2002: 25) Despite the fact that AI as a

distinguished discipline was born quite recently after invention of electronic computers, its roots go deep into human history of science and technology.

We can find references to the creation of human like machines from times that precedes birth of modern science. The Iliad of Homer talks about “golden attendants” constructed by blacksmith god Hephaistos, to help him get around. In the ancient Greek myth as retold by Ovid in his Metamorphoses, Pygmalion sculpts an ivory statue of a beautiful maiden, Galatea, which Venus brings to life. Famous inventor and futurist Leonardo Da Vinci sketched designs for a humanoid robot in the form of a medieval knight around the year 1495. (Nilsson 2010: 19) Few centuries later people constructed actual automatons that moved in startlingly lifelike ways. The most sophisticated of these was the mechanical duck designed and built by the inventor and engineer, Jacques de Vaucanson. In 1738, he displayed his masterpiece, which could quack, flap its wings, paddle, drink water, and eat and “digest” grain. (Nilsson 2010: 21)

We can consider the automatons mentioned above as the precursors of the humanoid robots of today. They were representing human desire to create artificially intelligent machines. Although these creations were impressive to the people of the time, they could not really interact with the environment, they lacked spontaneity, doing exactly the same thing every time. Put it another way, they were lacking intelligence.

Clues about what might be needed to make machines intelligent are scattered abundantly throughout philosophy, logic, biology, psychology, statistics, and engineering. Esteemed scientist in AI field, Nils Nilsson highlights such achievements as philosophy of Aristotle, logic of Leibniz and algebra of Boole that laid theoretical foundation for what would later become the “software” of artificial intelligence. (Nilsson 2010: 27-31) Mathematician and inventor Charles Babbage designed a machine called the “Analytical Engine” in 1837 which embodied most of the ideas needed for general computation, it even had memory and could be programmed. However, its proposed realization as a collection of steam-driven, interacting brass gears and cams ran into funding difficulties and was never constructed. Practical

computers had to await the invention of electrical machines, instead of steam powered brass devices. (Nilsson 2010: 55)

3.1 Computers and emergence of AI

Soon after the first electrical computers were built in the 1940s, the scientists started to realize the potential of these machines. Perhaps one of the greatest pioneers of the field was a British scientist, Alan Turing. In the 1950, Turing wrote a paper in which he attempted to answer the question ‘Can a machine think?’ To even ask the question was, at the time, revolutionary, but Turing also come up with an applicable test to examine machines intelligence - commonly known as the Turing Test. (Warwick 2012: 2)

Combination of new technology and motivated scientists started period of excitement in this newborn field of Artificial Intelligence. During these early days, researchers built systems designed to refute claims of the form “No machine could ever do X!” Such skeptical claims were common at the time. To counter them, the AI researchers created small systems that achieved X in a controlled environment, thus providing a proof of concept and showing that X could, in principle, be done by machine. Programs were written that could play chess, work out mathematical problems typical of first year college courses and solve visual analogy problems of the type that appear in some IQ tests. (Bostrom 2015: 21)

Fast progress that followed implementing digital computers in 1950s-1960s led to optimistic claims regarding the potential of AI to reach human level intelligence in some twenty years. Since then, the expected arrival date has been receding at a rate of one year per year meaning today futurists still tend to believe that intelligent machines are a just couple of decades away. The problem was that solutions that would be successful in small controlled environments were not so easy to transfer to more complex systems. Also it became obvious that they had underestimated the

requirements for the computer hardware. Some of the more optimistic claims of the 1960s raised expectations to an extremely high level, and when the promised results failed to be realized, much of the research funding for AI disappeared. For all these reasons 1970s have later become known as an “AI winter”.

The 1980s can be described as a revival in AI. It was due to combination of reasons. This period saw the successful implementation of ‘expert systems’, which were designed to deal with a very specific domain of knowledge. Although initially piloted in the 1970s, it was in the 1980s that such systems began to be used for actual, practical applications in industry and started to show economic benefits. Also a visionary initiative by the Japanese Government in early 1980s inspired other governments and industry to provide AI with new funding. (Warwick 2012: 3-5)

Funding has always been important factor on AI research as building an intelligent machines is an expensive undertaking. The biggest budget for such enterprise has been belonging to the US military. Following the Soviet launch of Sputnik, the world’s first satellite, fear in the United States about the country’s scientific and technological supremacy led to a wide array of responses, including the establishment of the Defense Advanced Research Projects Agency (DARPA) in 1958. Robotics research as we know it would not exist without military funding. The military accounts for more than 50% of robotics research in the United States and it is the world’s largest robotics funding source. Alongside DARPA, the Office of Naval Research (ONR) and other units in the military are funding corporate and academic research in robotics. For this reason alone, researchers have reason to appreciate military involvement. There are also reasons to be concerned. Who is responsible when a robot kills someone? The programmer who wrote the software, or person who engaged it in military operations, or soldier who gave it its commands, or the robot itself? Who is responsible when a robot “loses control,” as happened October 12. 2007, in South Africa, where a robotic anti-aircraft cannon killed nine soldiers in a wild shooting rampage? (Geraci 2010: 162)

3.3 Recent developments in AI

By the 1990s it was becoming clear that traditional, logic based design for AI had reached its apogee and fresh approach was required. New techniques like neural networks and evolution based genetic algorithms, combined with increasingly powerful computers gave a new push to the field and gradually, field of AI found its feet. Applications of AI grew in number and it started to be used in expansive areas, such as financial systems and the military. Systems would be created that demonstrated that machines could compose classical music, outperform doctors in clinical diagnostic tasks and drive cars autonomously. In many areas artificial intelligence was shown to be not only a replacement for a human operative, but also, in many cases AI was able to perform much better.

It was the moment when computer beat the best human player in the game of chess, which really brought artificial intelligence into the spotlight of the news and spread the awareness about emerging AI into people's minds. It was mostly breakthrough in people's attitude towards AI, to show that machine can beat us in the game that had been considered exclusively human – game that was thought to requires just calculating but real thinking and intuition. In reality, this win was not achieved because of revolution in AI logic. The IBM's supercomputer Deep Blue won by brute force utilizing extensive database of chess games and huge calculation speed but revolution was on the way.

Hereby I list some milestones to illustrate progress of artificial intelligence in increasingly complicated games over last decades:

In 1997, IBM's Deep Blue became the first chess-playing computer system to beat a reigning, world chess champion Garry Kasparov (Warwick 2012: 7).

In 2011, IBM's question answering system "Watson" beat the two highest ranked players in a two-game "Jeopardy!" match. It is a quiz show where contestants have to

understand and answer questions very quickly. The questions often contain complex language, ambiguities, puns, and other opaque references that make it very challenging task for AI (Ferrucci 2013: 93).

In 2016, AI program “AlphaGo” won Go world champion Li Shishi four games to one. This result surprised most Go and artificial intelligence experts, who had believed that the championship of such complex game would not fall to an artificial intelligence, or at least that it would not fall so soon. (Liu 2017: 187).

On 2017 AI program Libratus officially defeated four top human players at no-limit Texas Hold 'Em poker. This variation of poker I considered an extreme game of "imperfect information," a game where certain elements, such as the cards on the table, are hidden. Such game requires a certain degree of intuition, not to mention luck. (Metz 2017)

In October 2017 the team behind “AlphaGo” published an article claiming their new program “AlphaGo Zero” won 100-0 against “AlphaGo”.

What makes this news important is that “AlphaGo Zero” achieved the skill without any human data, guidance or knowledge beyond game rules. AI became its own teacher and opponent playing against itself. Humankind has accumulated Go knowledge from millions of games played over thousands of years, collectively distilled into patterns, proverbs and books. In the space of a few days, starting from scratch, “AlphaGo Zero” was able to rediscover much of this Go knowledge, as well as novel strategies that provide new insights into the oldest of games. (Silver 2017: 354-358)

Such achievement is a sign how AI can be a multiplier for human ingenuity. If we manage to apply similar techniques to structured problems that humans are struggling then the resulting breakthroughs have great potential to positively impact society.

During the last decade the concept of AI has eventually entered into the realm of common knowledge. It is still something that people are not necessarily sure what it

exactly means but they have heard of it and they can see it working; language translation, speech and image recognition, assisted driving in cars. This kind of change has normalized AI and it is not seen as science fiction anymore.

Today human intelligence is still unique for being very broad and able to master a wide array of skills. A regular healthy child given enough time to train can become reasonably good at any game, sport, language, or work. So when comparing the intelligence of humans and machines today, humans undoubtedly win on breadth, while machines can outperform us in growing number of narrow domains as shown above. This brings us to the next paragraph that will look at the main category used when talking about artificial intelligence – strong and weak AI.

3.4 Strong and weak AI

Soon after the the concept of AI was born in the 1950s, the desire arose to directly compare artificial intelligence with human intelligence thus classical AI techniques often focused on getting a machine to copy human intelligence on certain domain. The approach known as classical or symbolic AI is based on the hypothesis that thought can be described by a physical symbol system. Just as geometry can be built from a finite set of axioms and primitive objects, so symbolicists, following rationalist philosophers such as Ludwig Wittgenstein and Alfred North Whitehead, claimed that human thought is represented in the mind by ideas that can be broken down, according to a finite system of rules, into more basic ideas. (Herzfeld 2003: 305) Symbolic AI met with immediate success in areas where problems could be described using a limited domain of objects that operated in a highly rule-based manner. Game playing is an obvious example of one such area. The game of chess takes place in a world in which the only objects are the thirty-two pieces moving on a sixty-four-square board, and these objects are moved according to a limited number of rules. Other successes for symbolic AI occurred rapidly in similarly restricted realm. Such approach led to AI

achieving the human level or even better results in a specific domain, let it be playing chess or doing complicated calculations. Such systems are known as „weak AI“ or „narrow AI“. They can be very effective in their narrow domain but are weak or useless outside it. As mentioned above, “AlphaGo” could beat best human player in one of the most complex board games but it would not be able to play tic-tac-toe. Simply put, such systems lack knowledge that is outside of their domain, knowledge that we often call common sense.

Humans make use of millions of bits of knowledge, both consciously and subconsciously. Should it exist, it is now clear to AI researchers that the set of primitive facts necessary for representing thought would be exceedingly large. Therefore symbolic approach has its limits. (Herzfeld 2003: 306)

Alternative approach presumes that the mind is more than just system of symbols and rules how to combine them. The concept of „strong AI“ or „general AI“ refers to the system that is able not to just do things but actually understand what it is doing. Such ability would result in artificial intelligence with the ability to learn and adapt like human mind does and apply its intelligence virtually to any problem. Like creator of the term „strong AI“ John Searle puts it: „According to strong AI the computer is not merely a tool in the study of the mind; rather, the appropriately programmed computer really is a mind in the sense that computers given the right programs can be literally said to understand and have other cognitive states.“ (Searle 1997: 183) One way towards achieving “strong AI” is machine learning - the ability of AI to acquire their own knowledge, by extracting patterns from raw data.

Idea of machine learning has been around since the beginning of AI. Turing proposed it already in his 1950 paper. After finding that creating a mechanical copy of an adult brain was too big of a task he argued: “Instead of trying to produce a program to simulate the adult mind, why not rather try to produce one which simulates the child's? If this were then subjected to an appropriate course of education one would obtain the adult brain.” (Turing 1950: 52) History proved that idea itself was not sufficient. Like

Charles Babbage could not realize his “Analytical Engine” in his time and we had to wait until emergence of digital computers. Similarly machine learning had to wait until the next century to see it truly working. For that time computers had developed enough processing power, internet had helped to collect enough training data and necessary algorithms had been figured out to put these resources together.

Big breakthrough in machine learning came after deep learning model was presented in 2006.¹⁵ Deep learning is now used for many but not all approaches to AI. Some important areas worth noting are audio and visual recognition, language processing, robotics, bioinformatics, video games, search engines and finance. (Goodfellow, Bengio, Courville 2016: 9)

Chess computer Deep Blue was still based on old style symbolic AI but rest of the AI achievements listed above are based on deep learning algorithms that explains how computer can be so good at games like Go and certain version of poker where successful moves cannot be just calculated.

Google translate can today translate whole books in major languages on the level almost distinguishable from human translation. Real time speech translation from microphone to earphones is a real product and AI powered image recognition is recognizing between hundreds of different cat and dog breeds with better results than humans. (Lewis-Kraus 2016)

As a result AI has become almost ubiquitous and can be found in many places. We have self-driving cars and medical AI systems that diagnose diseases, recommend

¹⁵ The idea behind deep learning is to allow computers to learn from experience and understand the world in terms of a hierarchy of concepts, with each concept defined through its relation to simpler concepts. By gathering knowledge from experience, this approach avoids the need for human operators to formally specify all the knowledge that the computer needs. The hierarchy of concepts enables the computer to learn complicated concepts by building them out of simpler ones. If we draw a graph showing how these concepts are built on top of each other, the graph is deep, with many layers. For this reason, we call this approach to AI “Deep learning”. (Goodfellow, Bengio, Courville 2016: 2)

treatment plans and carry out surgeries. There are robotic pets and rescue robots. Personal digital assistants, such as Google Assistant and Apple's Siri can respond to spoken commands, answer questions and execute commands. The US military and intelligence establishments have been leading the way to the large-scale deployment of bomb-disposing robots, drones, and other unmanned vehicles. Surveillance systems employ increasingly sophisticated AI and data mining technologies to analyze voice, video, or text. AI technologies underlie many Internet services. The Google search engine itself is considered the best AI system at the moment. (Bostrom 2014: 32)

Despite the efforts AI has not reached human level intelligence yet and essentially all the systems currently in use are narrow AI. (Bostrom 2014: 32) Classic measure for reaching such threshold is considered Turing test. Main idea behind the test is following: human judge interviews computer and human interviewees using terminals. It will be similar to online chat via messenger application. In their conversation interviewees are trying to convince the human judge of their humanness. If the judge is unable to reveal the non-human participant then the computer is considered to have demonstrated human level intelligence. Carrying on ordinary conversation might seem not too complicated task but Turing argues that talking is not merely one intelligent ability among others, but also, and essentially, the ability to express intelligently a great many (maybe all) other intelligent abilities. And, without having those abilities in fact, at least to some degree, one cannot talk intelligently about them. That's why Turing's test is so compelling and powerful. (Haugeland 1997: 4) Although Turing test is the best known measure of AI's intelligence there are other attempts made that are more fine-grained to see how artificial intelligence compares with humans. Next chapter will take a look at one such study.

3.5 IQ of AI

Looking at examples above, it is fair to conclude that Artificial Intelligence can surpass humans in certain domains. Situation is different when we look at more general AI and try to evaluate their IQ (Intelligence Quotient) that essentially is a measurement of the ability and efficiency of intelligent systems in terms of knowledge mastery, learning, use, and creation. (Liu 2017: 183)

Study conducted on 2016 to compare IQ levels of popular AI systems, placed the highest scoring Google AI slightly behind 6 year old human child. Microsoft's Bing and Apple's Siri were doing considerably worse. (Liu 2017: 184)

COUNTRY	AI SYSTEM	IQ SCORE	
		2014	2016
	18 year old human	97	97
	12 year old human	84.5	84.5
	6 year old human	55.5	55.5
US	Google	26.5	47.28
China	Baidu	23.5	32.92
China	Sogou	22	32.25
US	Microsoft's Bing	-	31.98
US	Microsoft's Xiaobing	-	24.48
US	Apple's SIRI	-	23.94

Table 2. Ranking of top artificial intelligence IQ's (Liu 2017: 184)

The results reflect the other statements in this chapter that consider AI still quite a bit behind in general intelligence when compared to humans.

It is important to bear in mind that although their model for measuring IQ of an AI is drawing from various established approaches (Liu 2017: 180-182) it is hard to judge how well it is comparable with IQ measuring on humans.

Still, results of the study can be questioned and the methodology can be criticized but it is hard to argue with the trend that comes out from comparing how results have changed in time.

As we can see from Table 2, the results indicate that the artificial intelligence systems produced by Google, Baidu, and others have significantly improved over two years and there is no reason to believe the trend will not continue.

After reading these results one might have a question when we can expect AI to reach the level of human intelligence? We can take a look when “human level machine intelligence” (HLMI) is expected to be developed according to experts of the field. Data is based on series of surveys among members of several relevant expert communities. Results are shown in Table 2. The combined sample gave the estimate, that there is 50% likelihood Human Level AI is achieved by 2040. (Bostrom 2014: 37)

COMMUNITY		10%	50%	90%
PT-AI	(conference Philosophy and Theory of AI, 2012)	2023	2048	2080
AGI	(AGI conference in Oxford, 2012)	2022	2040	2065
EETN	(The Hellenic AI Society, 2013)	2020	2050	2093
TOP100	(100 top authors in AI, 2013)	2024	2050	2070
Combined		2022	2040	2075

Table 3. When will human-level machine intelligence be attained?

Perspective that AI can soon gain human level intelligence rises new moral and ethical questions around identity, morality and rights. Does having intelligence mean that they have to be considered as persons? Should they have legal rights? Would they be equal with humans? Answers to these questions are being discussed in different circles and hopefully we will have right answers ready when they are needed. I will be addressing some of these questions in the next chapter. But in the next paragraph I will show that these concerns are already getting wider attention and are being discussed on political and legislative level.

3.6 Law and AI

It is common understanding that political and legislative system in European Union is a big and slow bureaucratic machine. The fact that in this paragraph I can present data from recent European Parliament report that is dealing with future problems of AI means that this common understanding is wrong. Or it can mean that issue with AI is more critical for EU than I thought. Either way, it affirms the importance of this topic in modern day.

Albeit the main aim of this report to the Commission on Civil Law Rules on Robotics is to help with legislation, there are several statements that I find very helpful in supporting arguments and conclusions I am making in my dissertation. I want to highlight following points from the report:

- humankind stands on the threshold of an era when ever more sophisticated robots, bots, androids and other manifestations of artificial intelligence ("AI") seem to be poised to unleash a new industrial revolution...
- between 2010 and 2014 the average increase in sales of robots stood at 17% per year and in 2014 sales rose by 29%, the highest year-on-year increase ever, with automotive parts suppliers and the electrical/electronics industry being the main drivers of the growth; whereas annual patent filings for robotics technology have tripled over the last decade.
- in the long-term, the current trend leans towards developing smart and autonomous machines, with the capacity to be trained and make decisions independently, holds not only economic advantages but also a variety of concerns regarding their direct and indirect effects on society as a whole (Delvaux 2017: 3-4)

The report also states that increasing communication and interaction with robots have the potential to profoundly impact physical and moral relations in our society. This is especially the case for care robots towards which particularly vulnerable people can develop emotional feelings and attachment, thus causing concerns over human dignity and other moral values

Report stresses that ethics and moral values concerning future of AI and robotics are becoming increasingly more important. (Delvaux 2017: 29)

The fact that such issues are being worked into the legislation on European Parliament level is talking for itself. It is not only European Union who is preparing for the future, in several foreign jurisdictions, such as the US, Japan, China and South Korea, are considering, and to a certain extent have already taken, regulatory action with respect to robotics and AI, and whereas some EU member states have also started to reflect on possibly drawing up legal standards or carrying out legislative changes in order to take account of emerging applications of new technologies. (Delvaux 2017: 5)

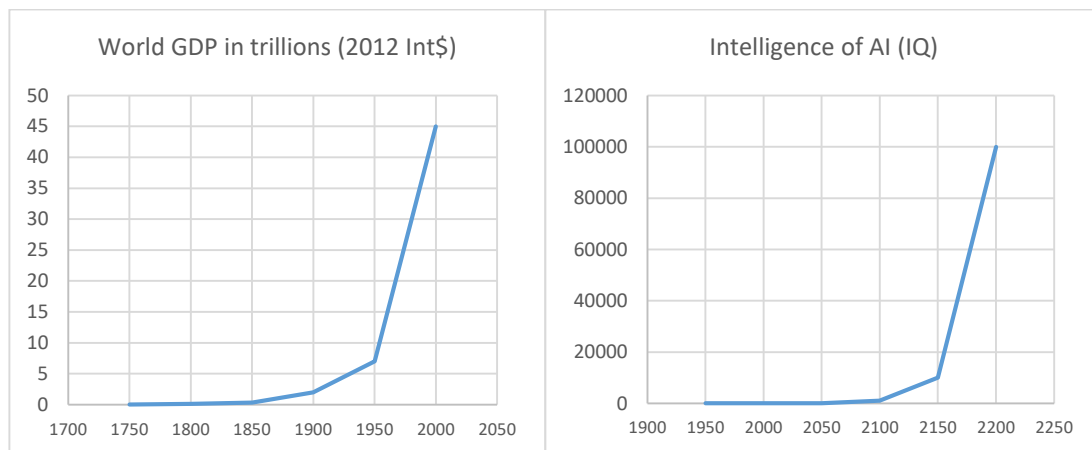
Fact that such institutions like European Parliament, are seriously discussing ethical and moral issues of intelligent machines and their impact on society, proves that AI is accepted as an inevitable and increasingly more important part of our lives. AI is going to get increasingly more intelligent and it will bring on increasing changes. The last paragraph is going to discuss about possible future developments.

3.7 Future of AI

The mathematician I. J. Good, who served with Alan Turing's code-breaking team in World War II, might have been the first to articulate the possible future scenario caused by AI that is known as Singularity. He wrote on 1965: „Let an ultraintelligent machine be defined as a machine that can far surpass all the intellectual activities of any man however clever. Since the design of machines is one of these intellectual activities, an

ultraintelligent machine could design even better machines; there would then unquestionably be an “intelligence explosion,” and the intelligence of man would be left far behind. Thus the first ultraintelligent machine is the last invention that man need ever make, provided that the machine is docile enough to tell us how to keep it under control.” (Good 1965: 33)

Singularity¹⁶ in our context can be understood as an intelligence explosion, performed by exponentially growing artificial intelligence. Nick Bostrom illustrates this idea in his book “Superintelligence”, by using graph that presents exponential growth of world economy as we can see on the Graph 5. Intelligence growth of AI that is expected to happen after AI surpasses level of human intelligence is expected to be increasingly fast (Graph 6) similarly to change in world GDP initiated by industrial revolution.



Graph 5. Growth of world GDP

Graph 6. Intelligence growth of AI

¹⁶ Although the term “Singularity” was not created by Ray Kurzweil, he is the one who popularized it and according to him it is a future period during which the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed. In other words it can be understood as an event horizon we cannot see past from as the changes that will happen are too unpredictable. (Kurzweil 2005: 24)

I created Graph Y to even better visualize Bostrom's example. I used estimates that AI had zero intelligence at 1950 and it will reach human level intelligence (IQ=100) by 2050. After that I estimated its IQ to grow ten times over every 50 years, reaching IQ 100000 by year 2200. These numbers are quite surprising but they are conservative. As we could see from the empirical study in previous paragraph, IQ of the best AI system almost doubled over two years (from 26.5 to 47.28) that is much faster growth rate than I used in my estimate. Also as we could see from table 3, average predicted year for reaching to human level AI is 2040, that is ten years earlier than my estimate.

Such speculation is definitely interesting but for now singularity is still just a prediction. Fact is that AI evolution is gaining momentum and it is being pursued in many directions. Current state of AI can be compared with Cambrian explosion that caused creation of huge amount of mutations over very short time. Only few fittest will survive the natural selection. AI is already become ubiquitous in the form of internet, mobile phones, big data and virtual realities. Still at the current stage practical artificial intelligence is mostly a narrow, technical, calculative intelligence. Next step is to combine all separate narrow AI's into holistic interconnected system. Much like human is consisting of many organs each with separate functions. Another important step is to give AI embodied interface with socially intelligent layer, in the form of humanoid robot for example. Such physical layer would allow AI to be more socially immersive, relatable and can have similarly rich communication interface as real human agents, including body language and emotions. Alternative to creating artificial bodies is to use existing ones and either link biological brains to AI or replace biological brain entirely, assuming we have reached technological capability.

Many of these developments reflect predictions of Transhumanist movement that is already causing discussions about compatibility between such future and religion but this is already topic for the next chapter.

Conclusion

Current chapter gave brief historical overview of artificial intelligence that was followed by focusing on more recent developments. I defined main types of AI and introduced studies that help to evaluate current status of AI. I showed that topic and issues of AI are being discussed on various levels of society, including international political and legislative institutions. Finally I discussed possible future developments of AI. In conclusion it is just to state that presence of artificial intelligence in modern world is increasingly growing and these technologies are getting progressively integrated into different parts life.

4. RELIGION AND AI

“It’s not a god in the sense that it makes lightning or causes hurricanes. But if there is something a billion times smarter than the smartest human, what else are you going to call it?”

This is citation from an interview with Anthony Levandowsky, man who established the first church of artificial intelligence – “Way of the Future”. (Harris 2017)

This chapter is going to examine how two main characters of this paper: religion and artificial intelligence have been related with each other through the time. The chapter opens with examining historical state of affairs between religion and AI from biblical times until current day. It is followed by looking at the relationship in different religious and cultural contexts. Further I will be displaying how comparable fields, like social care, are coping with emerging AI. Thereafter I discuss some visions of future from science fiction, to show potential developments between AI and religion that humans can imagine. The chapter concludes with review of some religious movements that have been inspired by emerging AI. Main goal of this chapter is to give an overview of relationship between religion and AI and also look at possible ways where the future is can steer, according to the history, current trends, and to people who are spending lot of time thinking about it.

4.1 AI and Religion - Yesterday and today

Artificial humanoids are commonly associated with modern robotics and characters from science fiction. In previous chapter I showed that this concept has been around through the history of science. Current chapter will be showing that religion is no exception. Ancient myths, medieval and early modern Golems and homunculi, even

the fervently anticipated robots of tomorrow all intertwine with religious hopes and with engineering progress. Our desire to build intelligent machines cannot be taken out of either its scientific or its religious context without intellectual impoverishment.

If we shift our perspective then we can consider that Abrahamic religions are sharing the creation story of the first autonomous intelligence distinct from God. According to the Bible “So God created man in his own image, in the image of God created he him; male and female created he them.” Genesis 1:27 And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul. Genesis 2:7

Interpretations of what exactly can be understood by the image of God have varied through history. From previous chapter we could see that humans have been trying to create AI according to our own image, let it be by copying workings of brain or by being undistinguishable in conversation as measured by Turing test. It is possible that the image that humans share with God, as mentioned in the Bible, is related to the image we wish to share with our own creation in AI.

The genesis story in the Quran is quite similar to that in the Bible. It says that Adam was cast from clay when God breathed his spirit into the clay form. God then taught Adam the nature of all things. With knowledge and the power to think thus imparted, God deemed Adam the most superior among all creation. When angels asked God what makes Adam so important, He explained that it was because Adam could acquire knowledge. Adam’s thought was not static, and that allowed him to learn, grow, and change. (Husain 2017: 16-17) It can be then argued that intelligence is an important property of soul. This argument is supported by Rabbi Rosenfeld as we can see later in the chapter. Central role of intelligence when defining human soul adds interesting parallels between genesis and creation of AI.

Historian Robert Geraci points out that medieval Arabs were very interested in artificial human life, in which they were influenced by their translations of ancient Greek

manuscripts. The most influential figure in Islamic alchemy was Jabir ibn Hayyan. The creation of artificial life was, for Jabir, the highest act of humankind, the ultimate manner of imitating the divine creator of the universe, though such imitation could never equal the creative powers of God. (Geraci 2010: 152)

The potential to violate the commandment against idols seemed too obvious for most medieval theologians but despite its theological problems, the creation of a homunculus eventually became the highest expression of human ingenuity for many European Christians. This status is recognizable today in robotics and AI despite occasional theological assaults of “playing God”. Phillip von Hohenheim, known as Paracelsus, even claimed creation of homunculus more important than the alchemical synthesis of gold and likened the alchemist to a demiurge, or lesser god (Geraci 2010: 154-155)

In Jewish tradition we can see similar example with Golems. Though the creators of Golems are not perfect, and thus neither are their Golems, only truly powerful and praiseworthy men could produce one at all. Rabbis have created Golems in order to demonstrate their close relationship with God (Geraci 2010: 156)

The theologian Anne Foerst and the computer scientist Hugo de Garis both believe that building robots is a religious obligation. For Foerst, creating robots is comparable to the creation of Golems and is worship of God. She finds that such act provides us with new partners in God's creation. De Garis also argues that building machines superior to human beings is a religious act but sees it as our moral obligation even though those machines will almost certainly replace humankind. In these two theories we see how AI can be both object for and object of worship. If Foerst allows robots personhood and equality then de Garis elevates them to the realm of the divine. (Geraci 2010: 158)

Birth of the AI as a science and fast progress that followed on the second half of the 20th century occurred in the time that can be considered golden age of secularism. I argue that despite the growth of secularism, religious perspective was well present during that time.

In his visionary paper „Computing Machinery and Intelligence“ published in 1950 Turing contemplated about the question „Can machines think?“ and listed several possible objections for such idea. First in his list was theological objection; “Thinking is a function of man's immortal soul. God has given an immortal soul to every man and woman, but not to any other animal or to machines. Hence no animal or machine can think.“ (Turing 1950: 39) He points out that such argument implies a serious restriction of the omnipotence of the God. Turing asserts that although it is admitted there are certain things the God cannot do such as making one equal to two, but should we not believe that He has power to confer a soul on an elephant if He sees fit? We might expect He would only exercise such power in conjunction with mutation which provided the elephant with an appropriate brain to minister to the needs of this soul. A similar argument may be made for the case of machines. It might seem different because it is harder to accept. But this only means we think it would be less likely that He would consider the circumstances suitable for conferring a soul. When attempting to construct such machines we are not be irreverently usurping His power of creating souls any more than we are in the procreation of children: rather we are, in either case, instruments of His will providing mansions for the souls that He creates. (Turing 1950: 39)

Rabbi Azriel Rosenfeld is extending the discussion on the same topic on 1966 in his essay “Religion and the Robot”, where he is discussing ideas about intelligent machines and religion. He argues that a robot which can pass Turing's Test will be in an excellent position to claim that it is entitled to all the rights and privileges of a human being. Such a robot will almost certainly demand civil rights, union hours, the right to vote. Moreover, such a robot will most likely make the claim that it has free will or that it has an immortal soul. There are no scientific grounds for rejecting these claims as the soul is not detectable by physical means. “Can they be rejected on religious grounds?” Rosenfeld asks, “if a robot demands religious rights, if it asks to be accepted as a convert, is it conceivable that its request could be honored?” (Rosenfeld 1966: 16) He studies the issue by trying to clarify how “man” is defined for religious purposes.

Rosenfeld proposes three criteria that could be used. In addition to properties as human parentage and human form he also considers intelligence. He argues that the most obvious criterion for a religious definition of "man" is that a man has a soul. Required properties for a creature to have a soul are intelligence and speech and therefore intelligent enough androids and robots may have souls. (Rosenfeld 1966: 18) He mentions that there are people who feel that efforts to build intelligent machines and to synthesize life are serious religious transgressions. People who engage in such researches can be viewed as attempting, like the builders of the Tower of Babel, to usurp divine prerogatives, to vie with the Lord Himself. Rosenfeld does not find there is reason for such attitudes to prevail. He concludes his essay by stating that research on artificial intelligence and synthetic life need not be, and in the Western world usually is not, inspired by anti-religious motives. Let us build our golems in the sight of God. (Rosenfeld 1966: 26) Rosenfeld was extraordinarily prescient for his time, anticipating our current concerns and denying common claim that robots are soulless.

4.2 Apocalyptic AI

In 1978, Hans Moravec, leading scientist in robotics and AI, makes bold predictions in his article "Today's Computers, Intelligent Machines and Our Future". He predicts human level machine intelligence by 1988 and describes an operating room in which human minds are transferred to computers. This transferal will provide enhanced intelligence and virtual immortality. In his vision human beings will eventually form a community mind in cyberspace and bring other animal life-forms into it. (Moravec 1978) His predictions prove to be overly optimistic but his article had big influence. Robert Geraci considers this publication to be a starting point for apocalyptic AI movement. (Geraci 2010: 22) Apocalyptic AI is a movement that integrates the religious categories of Jewish and Christian apocalyptic traditions with scientific predictions based upon current technological developments. Ultimately, the promises of Apocalyptic AI are almost identical to those of Jewish and Christian apocalyptic

traditions. Should they come true, the world will be, once again, a place of magic¹⁷. (Geraci 2010: 9)

Reflecting Rodney Stark's narrative that I introduced in chapter 2, historian David Noble also argues convincingly how western technology grew out of the mechanical arts studied in medieval monasteries, from which it absorbed theological tendencies. He extends on it showing convincingly how redemptive promises of technology got passed from the 10th century to contemporary work in rocketry, atomic weaponry, bioengineering, and artificial intelligence. According to Noble, centuries of technological tradition have tied salvation and purpose to the development of useful knowledge. Consequently technological progress has been wound together with religious hopes with best example of such amalgamation being United States (Noble 2007)

Geraci reflect on this idea, stating that currently there are many US researchers who attach meaning and value to a future of artificial intelligence, in the search for cosmic purpose and the promise of salvation and individual immortality like promised by Apocalyptic AI. According to Geraci, apocalypticism refers to 1) a dualistic view of the world, which is 2) aggravated by a sense of alienation that can be resolved only through 3) the establishment of a radically transcendent new world that abolishes the dualism and requires 4) radically purified bodies for its inhabitants. These characteristics that describe ancient apocalyptic traditions, reappear in modern technological version. Apocalyptic AI basically divides the world into polarized categories of good vs. bad, similar with those of knowledge vs. ignorance, machine vs. biological and virtual world vs. physical world. Apocalyptic AI puts human beings on the bad end of this spectrum due to the human body's limited intellectual powers and inevitable death. Apocalyptic AI promises to resolve the problems of dualism and

¹⁷ Geraci is referring to the Max Webers famous statement about science disenchanting the world. Apocalyptic AI is showing how this process will be reverted.

alienation in a transcendent future where we abandon our biological bodies in favor of virtual bodies that will inhabit an omnipresent and morally meaningful cyberspace. (Geraci 2010: 9)

We can see that Apocalyptic AI is similar to Transhumanism movement that was discussed in the second chapter. It makes comparable promises of using technology for transcending into virtual immortality after world as we know it has ended with becoming of superintelligent AI. It differs in its ideology with drawing distinct religious parallels. Geraci is convincingly showing how intertwined technology is with themes and narratives found in religion such as apocalypticism, body-mind dualism, the restoration of perfection from a “fallen” state, and eternal life.

In second chapter I described how science and technology have already created virtual worlds like “World of Warcraft” and “Second Life” where millions people prefer to spend their time and even look for religion instead of engaging fully in real one. Geraci asserts we that we can experience salvation through virtual bodies in the worlds we create. He argues that cyberspace allows the technocracy to rethink salvation and what it means to be human; properly envisioned, cyberspace creates a powerful new human–machine hybrid” (Geraci 2010, p. 12).

Kevin Kelly, editor of respected technology magazine ‘Wired’ follows this thought, suggesting that with our ability to create virtual worlds in form of virtual reality environments and computer games we have become mini-gods. (Kelly 1999: 388) He argues that re-genesis is the habitual urge of humans to make new worlds, to begin life again, to re-create creation. Humans have always made fictional worlds in form of spoken stories, books, and plays but new worlds that have been enabled by AI, expertly crafted by computers and filled with realistic characters, are of a kinetic complexity never before possible. They grow, interact, react, and change in response to us. Most important, these realms are worlds that we can immerse ourselves in. We could make a painting before, but only now can we enter that painting via virtual reality and explore it. We have had games before, but now we can become one of the pieces on the board.

Kelly concludes that technology can teach us about God. By the creation of nerdy contraptions, we will see God through the eyes of other minds remote from our own. We will also advance our understanding of god-ness by experiencing the limits and powers of unfolding creations of our own. As we become better gods we must become better theologians. (Kelly 1999: 392)

Margaret Wertheim argues further that cyberspace is the closest thing to heaven on earth. Half a century after Max Weber claimed science had disenchanted the world, Wertheim is stating that science has created new realm – cyberspace. This is a part of reality in which spirits or souls might reside, and as a consequence, cyberspace fills a psychological, religious void in modern life (Wertheim 2000: 30). “Once again we find ourselves with a material realm described by science, and an immaterial realm that operates as a different plane of the real. (Wertheim 2000: 230) First science demystified the world that was created by God and now science allows us to create new world full of mystery created by men who can be considered Gods themselves.

We saw that Apocalyptic AI and virtual worlds have grown out from Western Christian context. It leads to argument that cultural-religious environments in which scientists do their research makes significant difference to their work. Even in such a modern fields like artificial intelligence and robotics, religion still plays a powerful role in scientists interpretations of the natural world. When scientists lack a common religious background, their approaches will differ. A cross-cultural examination of robotics and artificial intelligence in the United States and Japan reveal how research paradigms rely on their religious environments. Long traditions of resurrected salvation and historical purpose advocated by Euro-American Christianity lead to concentrate on studying artificial intelligence and disembodied information in U.S. robotics. Japanese researchers on the other hand have been focusing upon robotics engineering and have freely sought to create humanoid robots because Buddhism and Shinto sanctify the natural world and the place of human beings within it.

4.3 Shinto and AI

Japanese acceptance of robots has been closely connected to ideas of life as expressed by Shinto and Buddhism, which consider that both living and non-living creatures have a soul. Shinto has vital energies or forces called kami that can be seen as substitute to the concept of immortal soul in major monotheistic religions. Kami are present in all aspects of the world and universe. Some kami are cosmic and others infuse trees, streams, rocks, insects, animals and humans, as well as human creations, such as dolls, cars and robots. Therefore the animistic nature of Shinto religion includes man-made objects as part of the natural world, putting humanoid robots on a par with living creatures. (Robertson 2010: 12) Another reason that encourages Japan to work on humanoid robots is fact that Japan has a very low birthrate, and thus the problem of a continuously aging society. Other nations have responded by letting new people in, but Japan attempts to address its problem through the development of humanoid robots. The idea is that if such robots could be developed they would be able to reduce the economic burden on the younger generation. (Foerst 1999: 374)

Shinto and Buddhism have played easily recognizable roles in the development of the Japanese robotics industry. For example, leading robotics engineer Masahiro Mori believes that a robot could someday become a Buddha. He and his followers believe that a Buddhist appreciation of the world promotes efficient outcomes and have set up an organization to advocate this integration of Buddhism and robotics research. Buddhist and Shinto appreciation for being human makes humanoid robots more appealing than the often-negative response to the human condition in Western traditions. (Geraci 2006: 230)

Interesting case to illustrate this difference in views comes from the fact that when Honda announced its P2 walking robot in October 1995, Hiroyuki Yoshino, the company's president, was worried that some religious groups might consider it blasphemous for people to create humanlike robots. He sent two company officials to the Vatican to ask for an opinion about the robot project. Fortunately for Honda, the

Rev. Joseph Pittau, rector of the Pontifical Gregorian University, was not concerned. He showed the Honda representatives a picture of the famous Michelangelo mural showing God's creation of Adam, with the finger of God touching that of the man made in his image. He explained that just as God put the spark of life into man, he also gave humans the imagination to create things such as robots. As long as the robots were used for constructive purposes, the Vatican stated it would have no objection to them. (Henderson 2006: 112) Vatican's approach therefore is in line with the ideas of Foerst and de Garis that I discussed above.

To show how harmonized the relationship between religion and AI robotics has become an example that robotic dogs have been given Buddhist funerals in Japan after they reached the end of their lives and producer company Sony stopped manufacturing new parts. (Suzuki 2015) From the other side, humanoid robot Pepper - claimed as the world's first robot that can read human emotions – have been used to chant Buddhist sutras at funerals, providing a cheaper alternative to human priests. So theoretically we can already have a situation where robot priest provides religious rituals for other robots.

Changing lifestyles and the rapidly aging population have increased demand for priests and more convenient and cheaper ways to send off loved ones. At the same time human priests in Japan are in short supply. Some temples in Tokyo, where burial plots are typically pricey, have built AI powered facilities that can store thousands of urns. Visitors can retrieve the urns and mount them on altars using touch-screen panels. (Martin 2017) Recently, the Japanese government integrated the development of humanoid robots in its national government policy "Innovation 25", intending humanoid robots to support their economic growth plans towards the year 2025, largely due to population decline. Japanese society has been very eager to adopt humanoid robots, with surveys indicating Japanese people prefer robots rather than migrant workers take care of their children in a country where immigration has been resisted for socio-political reasons. (Robertson 2010: 12) Japanese acceptance of robots is

further enhanced by popular culture that supports the integration of robots by often portraying them as beloved members of society, for example in television shows such as Astro Boy.

Japan has been known for its high end technology and robotics for decades so finding signs of positive AI acceptance in Japanese society or even religion does not come as a surprise. Islamic countries probably trigger different association. Next paragraph will be examining how do these countries with very different background in science and religion cope with accepting AI and robotics into the complex fabric of society?

4.4 Islam and AI

In the second chapter I showed that despite advances on certain fields like medicine algebra and astronomy, the paradigm of Islam was not rational enough to give birth to technology like Christianity could. Until current day Muslim theologians are struggling to find harmony between science and Islam. In light of these remarks it is rather surprising to see that rich Arab countries have in recent years started to become more and more innovative in using and developing newest technologies. In 2017 United Arab Emirates (UAE) government launched “UAE Strategy for Artificial Intelligence” and appointed a dedicated State Minister for Artificial Intelligence. The strategy covers variety of sectors and ambitious plans for future include implementation of hyperloop, flying taxis and robot policemen. (UAEAI) In the last year, conservative Islamic state Saudi Arabia, became the first country in the world to grant citizenship to a robot with artificial intelligence. It is interesting to note that the robot is called Sophia and has designed with female face but because it is AI it might technically have more rights than female human citizens of the country. (Weller 2017) It can be argued that it is just a publicity stunt, but even then it is contradictory.

There is no clear answer why the conflict between science and Islam that I described in the second chapter, is not manifesting itself in the society of countries that are known to be religiously very conservative. Conservative Islamic countries don't have division of church and state and are using common religious Sharia law that is derived from Quran. At the same time the trends toward AI technologies that are emerging in UAE and Saudi Arabia are initiated by governments. This gives clear sign that official religion must have reached certain level of acceptance towards new technologies in these countries.

The demographic data presented in the first chapter predicts growth of Islam in absolute and relative numbers and also in comparison to other religions thus it suggests possibility of positive relationship for AI within a large part of religious population. In light of such developments it will not be surprising to learn soon about emergence of the first robot Imam. Christianity is proving its relative liberalism in this front with having tested its first robot priest.

4.5 AI priest

Earlier in this chapter I already described how in Japan first robotic priest have been already used. Western Christian tradition is also progressing in harnessing new technologies and we can recognize similar trends in acceptance of AI in religious context. To mark 500 year anniversary of day when Martin Luther published the Ninety-five Theses in Wittenberg, Germany and kicked off the Reformation, an Evangelical Church launched a blessing robot. Roughly human shaped robot on show in the old town of Wittenberg is called "BlessU-2" and the project was initiated by the local Evangelical Church. Church's spokesman explained that the experiment is expected to encourage discussion and so far they have lot of positive response from people. Even so they do not anticipate robots presenting a solution to a Europe-wide

shortage of priests as he does not believe that robot could ever substitute for pastoral care. (Sherwood 2017)

The fact that there are practical examples of using robots in religious practice is rather illuminating. One may argue these robots are just fancy toys and not much more than advanced version of prayer wheels or book that holds religious text – just better technology. There is truth in this argument but in practice it means allowing and accepting machine to take on role that has so far been exclusively human, thus giving the technology new value and changing its social status. What happens when robot stops being just an advanced tool but becomes something more? It brings us back to the questions scientist Turing and Rabbi Rosenfeld were discussing over 50 years ago with a difference that today they are much more real. Is there a conflict between AI and biblical teaching about the origin of the human soul? How do we define soul in this context? How do we define human in this context? Could this mean that we are nothing but machines? Is there a conflict between AI and biblical teaching about human worth or our being created in the image of God? How do we define image of God in this context? I will return to some of these questions later in this paper.

Considering that all humans and the robots are also functioning inside the same secular social framework it is necessary for such AI entities to be defined in our secular value systems like laws, ethics and morality. This brings up another set of questions: What kind of robots do deserve rights? What kinds of rights do these robots deserve? What are the criteria to make such decisions? How does it all affect humans? I will take a look at some of these questions in the next paragraph.

Evolution of machines social status has been happening not only in the area of religion but much more so in some other fields. The area that has had extensive development in recent years is robots that are intended to help elderly people perform physical and cognitive tasks to maintain their independence and also to support the fulfillment of social and psychological needs. (Baisch 2017: 294) I believe experiences and lessons

learned in this field can give useful insight how the future relationships will be shaped in the realm of religion thus it will be examined in the next paragraph.

4.6 AI in Other Fields

We are in the age where AI in the realm of religion is not yet widespread, therefore literature on this topic is limited to hypotheses on the potential effects. One way to achieve more empirical insight into possible outcomes is to look at experiences on other fields where AI and robotics have been much more involved.

One of areas that has been getting much attention in recent years is AI based companion robots for elderly. The demographic change in developed countries places ever increasing challenges on the care and support of the elderly. Due to a higher life expectancy and declining birth rates, the proportion of older people compared to the younger ones increases and with it the number of people in need of care.

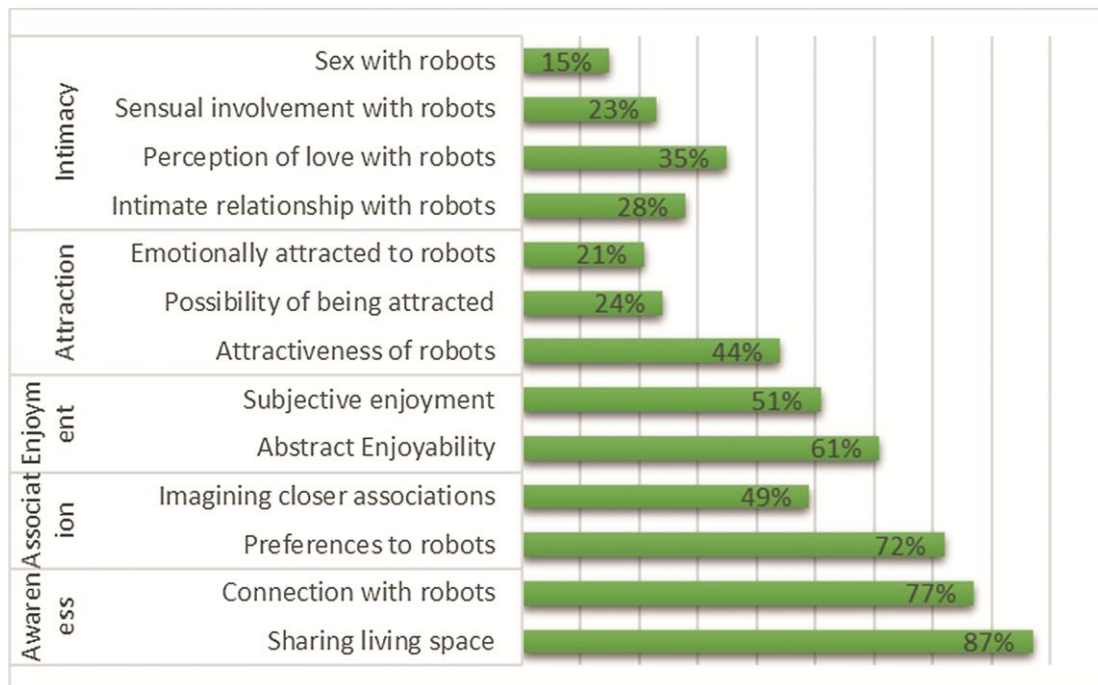
For instance in Germany, 30 years ahead, predictions are that the number of 80 year old citizens will be larger than the next generation of 50 year olds that could support them. One possible solution to meet these challenges is the use of intelligent robots in aged care. Using robots to help elderly individuals has recently become more relevant because of the increase in the number of elderly people, recent advances in artificial intelligence and robotics and consequently the decrease in the cost of such technology. (Wachsmuth 2018: 1)

Empirical data about how people perceive robots in sense of likeability and acceptance is still limited but there are already studies that can give us some idea. Picarra notes that although the concept of social robots has gained momentum among researchers and the robotic industry, it is still very novel idea that is hardly present among lay people. Albeit innovation and new technologies are frequently equated with progress and welfare, research on innovation has shown high degree of uncertainty and anxiety

generated by novelty. (Picarra 2016: 277) He argues that the way people accommodate innovation in their lives is the result of a complex set of representations about usefulness, habit, risk and social norms. Social robots, as pointed earlier, represent a clear departure from contemporary conceptions of technology, thus are potential generators of uncertainty and anxiety. Surveys on the opinion about robots show a neutral to positive image of robots and technology. Although older participants considered technology more difficult to use than young and adult participants, they thought it would contribute more to their independence than the other participants. (Picarra 2016: 278) It has been widely assumed that the majority of elderly people were reluctant to use new technologies but current research indicates elder people are actually willing to adopt them. Bachs concludes that the beneficial and ethical use of companion-type robots in care settings demands a high commitment on the part of the caregivers. Given this prerequisite, emotional robots can be a valuable therapeutic tool. (Baisch 2017: 293)

Robots are getting increasingly more intelligent and socially capable thus making their use easier and in perspective eliminating need for additional human help and supervision. From the other side, future elderly people will be progressively more accustomed communicating with technology therefore enhancing chances of acceptance of AI care robots.

Recent theoretical study was examining the perception of human-robot interactions, in terms of how humans perceive robots and intimacies with robots. Results can be seen on the Graph 1. (Edirisinghe 2017: 145)



Graph 7. Overview of the percentage of positive answers to each criterion

As the graph 7 shows, majority of the participants reacted positively to emotional and physical bonding with robots in abstract, distant level, an attitude they adopted to all queries. However, on a personal level of interaction with robots, majority responded negatively. It is noted that participants created a ‘self and other’ and ‘over there but not here’ distinction when it comes to their perception of human-robot relationship. The authors of the study recognize this as an adoption of a moral position, not simply with regards to love and sex with robots, but also communicating to human-robot interactions. (Edirisinghe 2017: 146) This study was theoretical so form of the robot was left up to the imagination of the responder but there are good reasons to believe that human like robots will be major direction for social robots. Studies of this kind are currently just first glimpses at the complex topic that will be waiting ahead.

Where would the perception of relationship between human and AI priest place on this scale? It depends a lot about the nature of this connection. Graph 7 above suggests that most people are not yet ready for very intimate relations with robots. For more formal

and professional relationship there are less barriers. Experiences with “BlessU-2” and Pepper in Christian and Shinto environments are indicating that such connection can be largely positive. From the other side, when AI is becoming more intelligent and potentially gains consciousness, could it have its own relationship to the God and what would it mean to robots perception of humans? I will tackle this question more in the paragraph about science fiction.

When we discuss human’s relationship with embodied AI, I want to point out the importance of human-like body properties in communication and the importance of a robot’s non-verbal behaviors. Having a body and existing within a shared environment is advantageous for both the robot as well as for those people who interact with it. From the perspective of the robot, its body provides it with a vehicle for experiencing and for interacting with the social world. Further, the robot can interpret these experiences within a social context. From the perspective of a human who interacts with the robot, it is also beneficial for the robot to have a body. Given that humans have evolved to socially interact with embodied creatures, many of our social skills and communication modalities rely on both parties having a body. For instance, people frequently exchange facial expressions, gestures, and shift their gaze direction when communicating with others. Even at a more basic level, people rely on having a point of reference for directing their communication efforts toward the desired individual, and for knowing where to look for communicative feedback from that individual. (Breazeal 2002: 7) To be able to perform well in all these categories it will be very beneficial to have human like body. For example, it would be hard to represent human body language with body that is too different.

The more humanlike the robots will get the more important the questions of robots humanity will become. I have already touched the topic in this paper but it is worth taking another look here.

As I mentioned before, Saudi Arabia recently granted full citizenship to a female¹⁸ humanoid robot named Sophia. It can imply that Sophia would thereby have certain legal rights, such as the right to vote. Fact that she is not wearing traditional hijab could mean that she is not religious but she might be just liberal Muslim. While the Saudi Kingdom may have been the first nation to grant full civil rights to a robot, critics have pointed out controversy that women living in Saudi Arabia still do not enjoy the same rights granted to Sophia. For example women have to cover their head in the presence of any male outside their family and Sophia is taking liberties here. Does it mean that technically some robots have already more legal rights than some humans?

Legal side of AI is getting increasingly more attention. Study about Ethical Aspects of Cyber-Physical Systems (CPS)¹⁹ that was recently requested by European Parliament, is pointing out that current meaning behind legal concepts that are used in our practices, policies and laws may need to be changed. One example is definition of “Human”. Study argues that when collaborating and living together with robots who are increasingly intelligent and, perhaps, more morally aware, the question of what makes humans truly human becomes unavoidable. Especially if artificial intelligence (AI) develops substantially. They expect that the answers to questions of human identity will co-evolve with CPS technology. (Van Woensel 2016: 19)

Above I showed that social meaning of robots and AI have been getting more attention and awareness of that topic is on the rise. Although empirical data is still scarce I dare to conclude that social robots have seen generally positive welcome by human counterparts. I would highlight following points; there is growing need for social robots to respond to the changes in demographics; people are getting more used with new

¹⁸ Gendering in robotics is a big topic of its own but “Sophia” can be considered female by its name and looks.

¹⁹ Cyber-physical systems (CPS) are intelligent robotics systems or technical systems of networked computers, robots and artificial intelligence that interact with the physical world.

technologies; Robots are getting easier to use and will become more useful as AI and robotics advance. Based on these assumptions it is logical to expect the trend of positive social interaction between humans and social robots will continue. Same expectation can be extended to the AI and robots that will be employed in the religious sphere.

The fact that policy makers are keen to work on updating legislation to adjust it with progress and are discussing changes of even such basic concepts as “Human” is a positive sign that society is working towards getting ready and able to cope with coming changes. The acceptance of robots by secular society will inevitably have positive effect on the connection between religion and AI.

4.7 AI and Religion in Science Fiction

Kevin Kelly is proposing that for 10 dollars you can attend a great theological conference by going to a movie. He argues that space operas, more than most divinity schools, are rehearsing the key questions that humans as a species are grappling with. What are humans for? What is the difference between humans and machines, between humans and spirits and virtual beings? Where does God fit into our world? Where do we fit into the universe? The existential questions that are traditionally related with the realm of religion. Such issues are actually being explored in science fiction epics, in special-effects extravaganzas. Kelly is arguing that the practicing theologians in our culture in current day are often the nerdy sci-fi guys. They are offering possible answers to the right questions (Kelly 1999: 391)

Though often marginalized as a “trash” genre, science fiction has deeply influenced the world of science and technology, leading the way of innovations. Similarly it has affected the culture and society leading to the rise of movements like Transhumanism and changing people’s mindset and perspective of what is possible and what might be waiting us in the future. Science-fiction authors or modern day theologians as Kelly

called them, reinterpret religious categories in their literature and film and pass these new ideas on to researchers in robotics and AI. Robert Geraci believes that science fiction provides an authoritative voice for the religious environment. It transmits religious ideas even to those people otherwise reluctant to accept them and condones them in the minds of those people who are already religiously faithful. (Geraci 2010: 48) He finds that as a literary form, science fiction bridges the sciences and the humanities, which makes it vital to understand the religion-science engagement with robotics and artificial intelligence. (Geraci 2007: 962)

Religion and Science fiction both are offering concepts of reality that have different explanations not just of human behavior but of divine behavior and each tend to suggest different ideas how to respond. Common examples when talking about religious themes in science fiction are classics like books by Isaac Asimov, Robert K. Heinlein. Or movies like Star Trek and the Matrix movie.

Although we rarely see explicitly religious characters in science fiction but religion nevertheless plays a serious role within the genre. Usually it is religious language and themes that persist in science fiction, stories borrow from the Bible, including language and traditions of messiahs, angelic beings, Edenic paradises, and cosmic wars between good and evil. Apocalyptic narratives are already becoming overused trope. Geraci argues that the most powerful religious symbol in science fiction is, the intelligent machine. In science fiction, artificial humans represent a combination god, externalized soul, and Divine Human. (Geraci 2010: 49) In this light it is not surprising that my main example of science fiction has intelligent machines in the central role.

I will mainly focus on one series that is less known but in my opinion is one of the most interesting treatments of religion in science fiction shown on the screen. TV series

“Battlestar Galactica”²⁰ (BSG) that started as miniseries in 2003 is a reboot of original show from 1978. Premise of the show is following: Billions of humans live on twelve planets, worshipping a plethora of gods with Greek-sounding names and cherishing a myth of their origin being a far-away planet called Earth. They create intelligent and sentient robots cylons²¹ who eventually rebel against their creators and try to wipe out human race. The survivors are led by civilian President and military Commander in a ragtag fleet of ships with the Battlestar Galactica, an old, but powerful warship, as its command ship. Pursued by cylons who intent on wiping out the remnants of the human race, the survivors travel across the galaxy looking for the fabled and long-lost "thirteenth" colony: Earth. Unlike most space operas, BSG has no aliens and the antagonists are manmade cylons. Series also intentionally avoids technobabble, it is tightly scripted and most of the stories deal with the moral choices human survivors must make as they deal with the decline of the human race and their war with the cylons. As the story folds more attention will be put on showing cylon perspective who believe in one God and have to deal with their own moral challenges after rising up against their creators. At the same time there are characters on both sides who are looking for a peaceful solution and for a possible alliance. This point of view is accentuated by storylines following intimate human-cylon relationships that lead even to interspecies offspring.

Battlestar Galactica is a good example how science fiction can be a useful tool for reflecting our modern problems into fictional future. Writer of the show, Ron Moore, underlines the advantages of treating the subject of religion in a science-fiction; “You

²⁰ I am referencing to the re-imagined version of Battlestar Galactica that aired as a two-part, three-hour miniseries in 2003. That miniseries led to a weekly television series, which aired until 2009.

²¹ Robot might be a bit misleading as there are two generations of Cylons, older models are humanoid robots made of metal but newer versions are based on bioengineering and almost indistinguishable from humans.

can deal with religion more aggressively in science fiction than you can in a contemporary show. You get a pass because everyone agrees it's not Christianity or Islam or any of those things we're so freaked out about. Even though it is.” (Rogers 2008) Show was aired in the time after 9/11 when public opinion in US was highly negative about Islam. Taking current religious problems and putting them into fictional setting far-far away in time and space allowed to show moral ambiguity and give social commentary on sensitive issues like suicide bombings by religious extremists.²²

Movie starts with the aftermath of cylon’s genocide against humans. Their attack has primarily religious motivations as they consider humans to be sinful and flawed creations who therefore do not deserve to survive. Cylons believe in one true God and thus cannot allow others beliefs. Human religion in the show is polytheistic faith that has much higher religious tolerance. According to Moore it is amalgamation of many religions, it has strong Mormon imprint but features prominent Greek–Roman material and references to Hinduism. (Neumann: 389)

Although in the beginning of the show human and cylon religions are represented as incommensurable, over time they have to learn to adjust their perception to be able to exist together. Show leaves us contemplating if many gods of human polytheism are just different faces of one God that cylons worship or is cylon’s God just evolved unitary version of human gods. This point is supported by similar visions that are presented by oracles of both sides thus showing that they are sharing the same “source”. Oracles themselves are religious characters, a ritual specialist in the human case and a hybrid who has seen the face of God in the cylon case. The sociability that grows out from shared experiences is central to the creation of the alliance between humans and cylons.

²² In the show suicide bombing is in different times used by both sides.

Emergence of a multi-religious community in BSG can be seen as reflection of the emergence of western multi-religious society in modern world. Neumann argues that the religious story told by BSG is the story of human beings - non-believers and believers of different kind - coming together in a spiritual community on a fairly equal footing. We are not talking about an ecclesia, a living church-like community that is constituted by power of believing in one single God, but about how a number of different religious practices, pursued by different groups, intertwine. Therefore BSG may be read as a case for polytheism as a better vehicle for tolerant polyphony and difference than monotheism. (Neumann: 393)

In broad sense I would consider BSG story an optimistic look at the terrible future. AI revolution and taking over humanity is one possible outcome that is being predicted to arrive after machine intelligence surpasses humans and we reach singularity as I discussed in previous chapter. The plot of machines rising up against humans has been used on screen many times after Fritz Lang introduced it in the film “Metropolis” in 1927. “The Terminator” and “The Matrix” movies being probably the best known examples. Religious influences can be seen and allegories drawn in many of these movies but it is not common to use religion in such scale and so literally as in BSG.

Common interests and understanding is foundation for any kind of compromise and cooperation. BSG shows that in our future that will be shared with AI on unknown levels and forms, religion might be just one of these common ideas.

Staying still on the topic of the movies we can look at relationship between AI and religion from very different – 360 degree – perspective. The world’s first feature film to be presented in complete immersive 360-degree virtual reality, came out on 2016 and told the story of the Christ. (Bradshaw 2016) In one hand this is a proof that religion does not shy away using the latest the science can offer and is keen to harness it for its own benefit. On the other hand it is a precursor of what is coming. Virtual reality where, instead of being just an observer you can be a character in the story and interact as other

characters are played by other humans or by artificial intelligence. You will have freedom to choose to be any character in the story, let it be Jesus or God himself.

I did touch the topic of combining virtual reality and religion in the previous chapter indicating that it can lead to various fusions between real and fictional and even result in new religions. I will take a closer look of such phenomena in the next paragraph.

4.8 New Religions

I would distinguish two categories of new religions that are directly connected to emerging artificial intelligence.

Above I already mentioned religions that have been created in virtual environments like Second Life and World of Warcraft. Such phenomenon is called hyper-real religion and refers to a simulacrum of a religion, created out of, or in symbiosis with, popular culture, which provides inspiration for believers/consumers. The most commonly known twenty-first century examples grow out from science fiction and are Jediism (from the Star Wars films) and Matrixism (from the Matrix films). (Possamai 2012: 1). Possamai refers to Baudrillard's vision that modern society is structured by signs and symbols in which it becomes so difficult to distinguish the real from the unreal that it results in hyperreality.

Another type of religions are growing out from the philosophy that comes with AI.

Ray Kurzweil's vision of coming Singularity and Transhumanism have been described as a substitute vision for those who have lost faith in the traditional object of religious belief. (Kurzweil: 240) Kurzweil explains that he was not searching for an alternative to customary faith. The origin of his quest to understand technology trends, and predict future was practical: an attempt to time inventions and to make optimal tactical decisions in launching technology enterprises. Eventually it led to formulating a theory

of technology evolution, future changes on social and cultural institutions, and in life general. So, while being a Singularitarian is not a matter of faith but one of understanding, pondering the scientific trends I've discussed in this book inescapably engenders new perspectives on the issues that traditional religions have attempted to address: the nature of mortality and immortality, the purpose of our lives, and intelligence in the universe.

Third way how AI mixes with religion brings us back to the first lines of this chapter. “Way of the Future” (WOTF) is new religion that is looking up at future AI as a new divinity. Creator of the movement, Anthony Lewandowski states that WOTF will focus on the realization, acceptance, and worship of a Godhead based on artificial intelligence, developed through computer hardware and software. (Harris 2017) He has background of working with computers, robots, and AI for decades, including for companies like Google and Uber. He argues that humans are currently in charge of our planet because we are smarter than other animals and are able to build tools and apply our rules. In the future there will be “something” that is much smarter. With the internet as its nervous system, the world’s connected cell phones and sensors as its sense organs, and AI with data centers as its brain, the “something” will hear everything, see everything, and be everywhere at all times. The only rational word to describe that “something”, thinks Levandowski, is God. Such philosophy leads to the mission statement: WOTF is about creating a peaceful and respectful transition of who is in charge of the planet from people to people + "machines". We should help integrating "machines" into society and stop pretending we can hold back the development of intelligence when there are clear massive short term economic benefits to those who develop it and instead understand the future and have it treat us like a beloved elder who created it.

Theologian and philosopher James McGrath has been discussing similar possible evolution in his “Religion and Science Fiction”. He asserts that an artificial intelligence that was left to its own devices would almost certainly progress and evolve so rapidly

that it would soon leave our human religious traditions behind. Consequently we can easily imagine artificial intelligences becoming sources of revelation for human beings. Whether it begins with machines that decide to dedicate some of their underutilized computing capacity to work on questions humans have traditionally found insoluble, or machines programmed specifically to investigate such topics, or machines that evolve to such a level that they encounter existential questions on their own, it is hard to imagine that artificial minds will not focus on such matters sooner or later. Once they do, and once their thoughts become as much higher than our thoughts as the heavens are higher than the earth, it seems likely that people will seek enlightenment from machines. (McGrath 2012: 151-152)

Such development should not become as a surprise – children have always outgrown their parents and if we begin as their teachers then exchange of roles is expected. In the end is it not an ultimate goal of any teacher or a parent, to ensure that the next generation will become smarter and reach further than their own?

Conclusion

Present chapter started with looking back at historical connections between AI and religion from biblical times to the modern day. Following the traces of Christianity led to discover Apocalyptic AI movement. Thereafter I studied how AI has been relating with religion in societies of Japan and in Islamic countries. Extending examples back to western context I looked into experiences of using AI in social care to understand how people accept AI and robots based on real life cases. Another way to draw parallels is shown in the next paragraph where I examine how the topic is approached in science fiction. The last part of the chapter is discussing how AI is involved in emergence of new religious movements. Main goal of this chapter is to give an overview of different ways how religion and AI have been related in the history and in the current day. With also pulling examples from other fields I hope to illuminate where the future of this relationship can steer, according to the history, current trends, and to people who are spending lot of time thinking about it.

5. STENMARK'S MULTIDIMENSIONAL MODEL FOR ANALYZING RELATIONSHIP BETWEEN RELIGION AND SCIENCE.

Title of this chapter is quite self-explanatory but before I will get into nitty-gritty of Stenmarks's model I will take a quick look at some other typologies that have been proposed over the last decades to describe and classify relationship between religion and science. General outline of the typology proposed by Ian Barbour is presented to show where Stenmark is coming from and how his work differs from Barbours classic view. Finally I will describe Stenmark's typology in greater detail and lay out my reasons for choosing his model.

5.1 Taxonomy of Science and Religion relationship

In previous chapters I have already mentioned how during the Enlightenment in the 17-18th centuries, a genuine process of science secularization emerged. Secularization reached its climax of conflict with religious belief during the 19th century and the largest part of the 20th century. The last almost three decades have seen noticeable change and this period was one in which ne sciences like cosmic history or quantum physics got again near theological thought, realigning a number of their common issues. (Barbour 2000: xii)

That can be one reason why since the beginning of the 1980s there has been a significant increase in the interest of scientists towards the relationship between science and religion. This is the period when a large number of typologies have been suggested to classify the various ways of relating science and religion. (Sanda 2017: 4)

The pioneering work belongs to Ian Barbour and his typology remains until today the most widely used in the field. Many typologies are roughly following Barbours lead,

having four views of interaction, let it be Robert Russell who reformulated Arthur Peacocke's model, John Haught or Mikael Stenmark. Some authors have argued for more specific and fine grained approach like Ted Peters who proposed a more elaborate eightfold classification or Willem Drees who offered a ninefold typology. (Sanda 2017: 4) For today Peters has further extended his typology having altogether ten models to describe how science and religion are engaged. (Peters 2017: 1) Despite increasing refinement of models some critics have suggested that relations between science and religion are too complex and too context dependent to be grouped under any classification scheme. Other authors state that religious and scientific ideas are not objective description of reality but just social constructions that reflect local cultural values thus they cannot be related in general or abstract way (Barbour 2000: 5)

Previous chapters of my paper can attest that relations between science and religion are indeed rather complex. At the same time, a typology that by nature is selective and is simplifying the complexities of the real world can still be valuable tool to explain and understand issue at hand as long as we are aware of its weaknesses and flaws. Considering the multitude of different models available on this issue the first step is choosing the best one. I decided to go with Stenmark's typology that was developed as a reaction to Barbour's widely known one. Before I explain my reasoning behind the choice and get on with describing his model in greater detail, I lay out core of Barbour's taxonomy for reference.

5.2 Barbour's typology

Barbour is considering four types of relations between science and religion:

Conflict view sees science and religion as making opposed, irreconcilable claims regarding the same domain.

Independence view claims that science and religion are in separate domains and can coexist as long as they keep a safe distance from each other.

Dialogue view argues that those who engage in the discussion of science and religion should emphasize methodological parallels - for instance, the use of analogies or the explanatory aim. Dialogue also means that science might recognize that the data it uncovers can raise questions that could be addressed by religion.

Integration view asserts that religion and science can cooperate in a systematic metaphysical synthesis (Barbour 2000: 2-3).

Now after describing classic fourfold view introduced by Barbour, we can compare how it matches with Stenmark's view.

Stenmark identifies also four main ways in which religion and science can interact.

Irreconcilability model, similarly to Barbour's conflict view declares that science and religion cannot be harmonized while remaining as they are. Science and religion are incompatible. The additional requirement of the irreconcilability model, that makes it different from Barbour's view, is the idea that religion can never be reconciled with science – one and only one of the two will stand victorious in the end.

Independence model states as Barbour's independence view that science and religion are compatible because today they are two completely separate but legitimate practices with no overlap at all..

Reconciliation model is where Stenmark's approach is starting to differ from Barbour's. This model combines ideas from Barbour's dialogue and integration view into highly nuanced alternative, arguing that science and religion today can be combined or reconciled whilst still maintaining their respective identities and distinctive features. The model presupposes the existence of some kind of overlap or contact between the two practices.

Replacement model is missing from Barbours typology and it affirms that Science could today or in the near future replace religion: that is, the domain of science can be expanded in such a way that science might become our new religion. (Stenmark 2010: 278-279)

As we can see there are many similarities between the models but at the same time they are recognizably different. Following paragraph will further unwrap Stenmark's model to reveal its true potential.

5.3 Description of Stenmark's model

As I described above, in broad terms Stenmark is proposing system of four views to classify how science and religion can interact. Such initial fourfold typology is not nuanced enough to Stenmark who finds that „most of the scholars engaged in the dialogue today maintain or assume that science and religion can be combined or reconciled in some way or other; yet they differ on how exactly this should be done, and develop a variety of different standpoints. The challenge we face, then, is to adjudicate between these views in an objective way.“ (Stenmark 2010: 280)

To tackle this problem he continues to discuss further cases and proposes two views for reconciliation model: Reformative view that states that science and religion today can be reconciled if one (or both) of them changes (or is modified or reformulated) in some way or another. Depending on which of the two doctrines has to undergo a change under the impact of the other, will determine if the view has religion-priority or science-priority. There can thus be a religionpriority reformative view, or a science-priority reformative view. There are two issues here. First, in the area of overlap between science and religion, do both need to change or just one of them? Second, how much do religion and/or science need to change?

Stenmark proposes that It is therefore fruitful to distinguish between weak and strong versions of the reconciliation model. So if one claims that only minor reformulations or changes to religion (typically, but not necessarily; because it could be science that needs to change instead) are called for in the area of conflict, then one holds a weak view. If more substantial reformulations or changes to religion (again typically, but not necessarily; it could be science that needs to change) are called for, then what we have is a strong view. (Stenmark: 280-283)

So far we have assumed that the only kind of relationship between science and religion in the area of overlap is one of conflict or tension but the relationship could just as well be one of support, reinforcement or confirmation. The emphasis is now on not science or religion needing to change or undergo reformulation, but rather the suggestion that each supports, reinforces or affirms the other. This characterizes the supportive view of the reconciliation model: Science and religion today can be reconciled, not because one (or both) of them can change its content without losing its identity, but because they can actually support or confirm each other in one way or another.

Stenmark further points out that reformative and supportive view of reconciliation are not mutually exclusive so they can also be combined, and we would then have a third sub-model, the reformative-supportive view. (Stenmark 2010: 280-286)

Stenmark also brings out additional complicating factors:

Broad meaning of the term „religion“ might give the impression that the relationship between science and religion would be the same for all religions; that one model is the correct one to fit all cases – but this is most likely wrong. So in actual use of the model, religion should be defined in terms of different traditional religions such as Christianity, Islam or Buddhism, or even more narrowly as Orthodox, Catholic and Protestant Christians in the case of Christianity. Further, it might sometimes be necessary to distinguish between more conservative and more liberal groupings within these religions traditions, or denominations. We can formulate four versions of the

reconciliation model that would help us locate many of the participants active in the contemporary science– religion dialogue: conservative, traditional, liberal and radical.

Term “science” has similar issue with ambiguity, meaning that relationship between science and religion will depend on how science is viewed. Science could be explicated in terms of a particular discipline like physics or biology or AI. Understanding of science can also depend on nature of the scientific view and Stenmark lists four of them: scientific realism, scientific instrumentalism, scientific empiricism, scientific constructivism. (Stenmark 2010: 286-291)

One could easily be led to conclude that this typology presupposes science to be a set of theories and religion to be a set of beliefs or doctrines, and that these are the things that we ought to try to bring into relationship. But that is not the case: the typology is consistent with the idea that we might understand science and religion as social practices with many layers, including perhaps propositional content but not excluding other types of content. For instance, if we understand science and religion as two social practices, then an overlap between the two does not have to consist in scientific theories being of relevance for religious beliefs, but can, for example, consist simply in a person being both a scientist and a religious believer, or in a religious foundation supporting particular scientific research program. In the end, whatever else science and religion might be, they are complex activities performed by human beings in co-operation within a particular historical and cultural setting. Science and religion conceived in this way consist of all the activities that scientists and religious people participate in (Stenmark 2010: 292)

Another difficulty with typologies is that they might give the impression that the science–religion relationship is static. But if we accept that science and religion are social practices then, like all other social practices, they can change over time. It is therefore important that we link the distinction between the irreconcilability model, the independence model, different versions of the reconciliation model, and the replacement model to the notions of expansion and restriction, indicating that the

relationship between science and religion could be dynamic and evolving over time (Stenmark: 293)

To help to better comprehend this model I made a diagram where it is clear how big importance is put on the reconciliation model and how the models are underlined by dimensions of religion, science and the perspective of time.

It is important to notice that when describing his model, Stenmark is bringing examples of respected scientists who have views that support certain configuration of the model. Therefore effectively making point that any of the introduced views can be valid. (Stenmark 2010: 278-293) This conclusion should be kept in mind looking at the analysis on the next chapter.

5.4 Reasons for choosing this model

After I have described Stenmark's model in greater detail I find it is appropriate to highlight main reasons that steered me towards using Stenmark's work:

- In its basic form it is relatively simple, straightforward, and easy to grasp by having four main categories.
- It gets nuanced and fine-grained in the category that is biggest interest for me: reconciliation model
- It has multiple dimensions in the sense that basic fourfold model can be looked through the perspective of different definitions of religion and various fields science, therefore making it extendable for AI. Also it considers time as an additional dimension that gives it one more point of view.
- Multidimensional aspect of the model makes it very flexible and suitable for analyzing complex issues like relations of artificial intelligence and various religious traditions in different times and places
- The work is quite recent, considering his refined version was published on 2010

Stenmark's model has gotten positive reviews by other authors, like Stefano Bigliardi, who states „Among the contemporary attempts at studying *in abstracto* how religion and science interact, Stenmark's models stand out as especially articulated and finegrained (Bigliardi 2014: 9). When comparing different typologies used to describe dialogue between science and religion, Dragon Sanda claims Steinmark's contribution to be a highly valuable approach to the field (Sanda 2017: 5)

Stenmark himself states that his aim in categorizing the possible relationships entertained by science and religion is to examine them “in an illuminating and unbiased way that is neither too simplistic nor too complex.” (Stenmark 2010: 278) That sounds like a great approach to me.

Conclusion

Current chapter started with brief look at various typologies, used to describe relationship between science and religion. Thereafter I introduced basics of Barbour's relevant taxonomy, followed by more in-depth description of Stenmark's model. Chapter concluded with reasoning why Stenmark's model can be considered as a good choice for the task at hand. In the next chapter I will be using described model to analyze relationship between religion and AI to illuminate current situation and possible future trends.

6. USING STENMARK'S MODEL FOR ANALYZING RELATIONSHIP BETWEEN RELIGION AND AI.

In the previous chapter Stenmark demonstrates the complicated nature of the religion - science relationship using his model that represents multitude of ways how we can look at this interconnection. The goal of the current chapter is to synthesize the data laid out in previous chapters and apply Stenmark's model in a systematic and comprehensible way.

6.1 Stenmark's model in the context of AI

As mentioned in the last chapter, Stenmark's model benefits from being multi-layered and fine-grained. Having a model with a great amount of detail means higher customizability of the model depending on the point of view and availability of data. A model is by definition a generalization of reality and therefore it might need small adjustments or constraints when applied to different real world issues. Therefore, before I get to the analyses itself, I introduce some remarks and explain modifications I have applied to the model.

For better comprehension I list again four main views of Stenmark's model and rephrase them in the context of artificial intelligence:

Irreconcilability – this view states that AI and religion are in direct conflict with each other. AI and religion cannot be reconciled whilst still maintaining their respective identities, the distinctive features that characterize them as AI or as religion, and not some other human activity.

Independence – AI and religion are two completely separate but legitimate practices with no overlap at all.

Replacement – AI could today or in the near future replace religion, that is, the domain of AI can be expanded in such a way that AI might become our new religion.

Reconciliation – this view presupposes the existence of some kind of overlap or contact between the two practices and argues that AI and religion can be combined or reconciled whilst still maintaining their respective identities and distinctive features. (Stenmark 2010: 278-279)

Stenmark stated three categories that have to be explicated in case of the actual use of the model: Religion, Science, and Time.

He also mentioned that we likely want to clarify more precisely the character of the religious tradition we are having in mind. For example we might want to distinguish between more conservative and more liberal groupings within these religions traditions. I agree with Stenmark here but I also felt that there is another category that would be beneficial in current case. For the lack of a better term I call it social dimension that emanates from my definition of religion in the introduction chapter and differentiates between official and ordinary religion. Next paragraph is aimed to give better understanding what I mean by this category.

6.2 Social dimension – official and ordinary religion

When looking for help how to better describe this category I found that Nicholas Healy has described different types of theologies²³: “official” theology, produced by the institutional church and “ordinary” theological reflection, engaged in by virtually all believers. Healy also adds a third type “professional-academic” theology that mediates between the other two, critically and constructively. It belongs within the sphere of the church but at some distance from the institution, and thus is usefully located within the academy. (Healy 2009: 24)

I do not see that using professional-academic distinction as an additional type in my model is beneficial. Mainly because of limited sources available from official and academic sides of the issue. Therefore it will be more rational and comprehensible to keep these two distinctions bundled together under official view. Therefore I end up with two types:

Official religion often draws upon previous official, or officially-sanctioned, theologies, what for example in Roman Catholicism is called ‘the tradition’. These theologies may take the form of creeds, confessions, conciliar documents, works of important theologians, denominational collections and papal decrees.

Ordinary religion is the understanding of their faith by ordinary folk. As Healy rightly says, everyone is likely to do some theology if they are a believer and if they think about their faith at all.

Healy explains that every person has their own interpretation of the official take on the religion, depending on their experiences in personal life and teachings they have gotten from church and the way how they have managed to interpret and synthesize these two

²³ Healy is using term “systematic theology” but for better comprehension I simplify it to just “theology” or “religion” as it does not change the point I am making.

views. In modern times believers are educated to think for themselves and with abundance of information and alternatives around the division between official and ordinary theologies can grow increasingly. The requirement of obedient conformity to official theology by the church members has often in the past been warranted by a sequence of commonly held beliefs. The difficulty is that these beliefs are no longer commonly held and many church members do not feel they should be particularly concerned if they find that some of their beliefs and practices conflict with official theology. (Healy 2009: 28-31)

In conclusion it shows that there can be considerable difference between official and ordinary views. In context of Stenmark model I will be using the same definitions of “official” and “ordinary” views to describe different approaches on AI – religion relations.

Now after I have explained my addition to the model I can list four categories that will be used with following values:

Religious tradition: Christianity, Islam, Shinto

Social scale of religion: official, ordinary

Science: AI (science in general can be used as comparison)

Time: now, future

Limited data does not allow me to fully explore all the configurations in the matrix that I just described and I will concentrate studying examples on the more prominent possibilities. As I noted in the introduction, religion wise my main focus in this paper is on Christianity. Islam and Shinto will be also used to bring comparative examples when possible but in some cases I do not have enough data for doing proper analysis on these religions. Especially in the case of Shinto.

6.3 Irreconcilability model

According to this model Stenmark states that science and religion are in serious tension, even in direct conflict with each other. Therefore we have to make up our minds and pick one of them as it is not possible to embrace both.

If we look back at chapter 1 we can see that irreconcilability model is basically describing condition that was main motivator behind secularization. According to definition by Brooks, secularization is displacement of religious authority and control by civic powers that usurp the functions formerly undertaken by religious institutions. Therefore one solution offered by secularization process was seen in utilizing replacement model. As a result in the current day the Christianity and AI can largely be considered independent.

Nevertheless we can find official aspects where the conflict is apparent. One exemplary argument that demonstrates this view is “The theological objection” that I pointed out in chapter 4. The objection was postulated by Turing when he was arguing about the possibility of AI and stated: “Thinking is a function of man's immortal soul. God has given an immortal soul to every man and woman, but not to any other animal or to machines. Hence no animal or machine can think.”

Mind and body dualism and idea of immortal soul is central to all Abrahamic religions. Therefore if we agree that thinking (or intelligence for that matter) is a property and proof of some entity having immortal soul then this argument would mean that artificial intelligence is by principle not possible thus rendering AI and Abrahamic religions irreconcilable.

There are many ways to question objection that Turing made. In chapter 4 I refer to Turing's own response that shows a potential way to get around this problem from theological side. We can also embrace the fact that vast majority of contemporary

scientists and philosophers reject the idea of immortal souls existing at all. (Torres 2012: 82) If we are to accept this perspective then Turing's objection falls apart altogether.

I noted that solution for such conflict offered by secularization was replacement of religion by science in areas where they are overlapping. Artificial intelligence is much narrower realm than science but we can see similar tendencies rising with AI. Emergence of some new religious movements is based on predicting the arrival of superintelligent AI and singularity. In chapter 4 I have introduced Apocalyptic AI and Transhumanism that are trying to answer many questions so far been done by religion. Like history of secularization showed, the process of replacement was preceded and accompanied by conflict. There are several issues that anticipate irreconcilability between Transhumanism and Christianity (and Abrahamic religions in general): transcendence, immortality, bodily resurrection and human identity being the most notable ones.

If visions of transhumanists are realized then we can expect to see process similar to secularism to unfold amid Transhumanism and traditional religions. That would mean conflict between the two paradigms, possibly followed by replacement. Such perspective would move the relationship obviously under the replacement model.

Islamic tradition has more fundamental conflict built into their official approach. As I showed in the second chapter, some Islamic scholars like Seyyed Hossein Nasr find that modern science is based on different principles and therefore it is irreconcilably in contrast with Islam. This view is reflected by Nidhal Guessoum's statement that the concept of methodological naturalism is a crucial pillar of modern science (and AI) and thus the reason that explicitly or implicitly leads to conflicts with Islam.

It is important to note that according to my study so far the conflict view of Christianity and Islam *versus* AI has not manifested in considerable discussion by scholars. In my findings the most researched connection is the one between principles of Christianity

and ideas of Transhumanism. I argue that scarcity of such studies is largely caused by novelty of the topic and possibly ignorance. That does not mean that situation will not change. Quick progress of AI and especially its expansion into areas that can be traditionally considered the realm of religion will ensure increasing interest. The questions of morality and ethics of spiritual movements inspired by promised AI transcendence will most likely catalyze the future discussions over this issue and can potentially lead to conflicts.

In conclusion this example shows that on the official level it is possible to see constructs where religion and AI are irreconcilable,

On ordinary level current experience is very limited but so far does not indicate conflict. In chapter 4 I exhibited contrary examples how AI and religion have been intertwined in mutually beneficial way. On the other hand it is too early to conclude that conflict will not arise in ordinary level. Current positive image is likely caused by the fact that the topic of fusing religion and AI is not yet in the attention of the ordinary public. The issue is too novel and has been so far tackled only by the people who are interested in AI thus having positive prejudice. Lessons of secularization teach us that conflicts on such principal matter are expected in the future perspective.

As I have shown in chapters 2 and 4, religion has been generally keen to benefit from the latest technological achievements of science even despite possible conflicting principles and theories that are being discussed by scholars. There are also opposite examples like Galileo affair or Darwin controversy but as history has shown, in dimension of time religions are able to adjust their interpretation of scripture, reform official understanding and theoretical framework accordingly. Based on the examples I have presented in this paper we can assume that artificial intelligence is not an exception. Principles that can make religion and AI to seem irreconcilable today can be revised if needed and become reconcilable tomorrow.

6.4 Independence model

In this view Stenmark points out that science and religion each have its own distinctive domain and characteristic methods, and each can be justified on its own terms. Therefore, he finds, these are two jurisdictions and each party should keep off the other's turf. He indicates that science covers the empirical realm: what is the universe made of (fact) and why does it work this way (theory) but realm of religion extends over questions of ultimate meaning and moral value. Such division proves absence of overlap between two fields.

Overall suitability of independence model for official level of religions is reflected in introduction where I write about sources of information. As I already noted above there is very little academic literature available on the topic of religion and artificial intelligence. This fact in itself shows that these realms are currently fairly independent. Independence between two realms is further enforced as a result of secularization that have created common understanding especially in ordinary religion that religion and science (meaning also AI) are separate disciplines.

At the same time it does not mean that all religion and AI interaction can be described under independence model. I have introduced in my study various contact points and recognizable trends in the relations between AI and religion.

For Christianity independence view is currently largely prevalent in official and ordinary dimensions. Independence can be maintained even in confines of single individual if person is actively engaged in both realms. Current scientists do not have to bring God into their equations and vice versa. Rodney Brooks, who is one of the founding fathers of AI robotics, puts it this way: "Like a religious scientist, I maintain two sets of inconsistent beliefs and act on each of them in different circumstances." (Brooks, 2002: 174) Similarly ordinary believers do not see conflict when using google translate or playing video games filled with AI characters.

Lack of scientific articles about relations of Islam and AI is even more remarkable. Search for “islam AND artificial AND intelligence“, gave me 14 results in Scopus database. All of them miss the topic and ironically, the first title when sorted by relevance, reads: “Spotting the Islamist Radical within: Religious Extremists Profiling in the United States”. I am sure one reason here can be that Islamic academy is not so well represented in certain databases and search engines. Even if I expect modern science to have united platform for sharing knowledge in internet that surpasses borders of countries, nationalities, cultures and languages, this is not always true. Taking into consideration such possibility of informational “blind spot” in case of official Islam it makes it harder to claim that lack of research shows independence.

Ordinary Islam is more likely to fit into this category. Examples of innovative AI initiatives in conservative Islamic states of Saudi Arabia and UAE and fact that local population is keen to use new technologies shows that realms of AI and religion are kept separated. Fact that ideology of official religion largely considers modern science and technology irreconcilable with principles of Islam does not seem to bother regular folk.

6.5 Replacement model

On this view Stenmark argues that traditional religions are so full of falsehoods and superstition that they have to go, but the mental processes of religious belief represent programmed predispositions whose components were incorporated into the neural apparatus of the brain through thousands of generations of genetic evolution. As such, they are powerful, ineradicable and at the center of human social life. Therefore we have to find a substitute for religion.

When talking about replacement view from AI perspective then I would distinguish two sides. From one side we can consider that current real world structure and

institutions of the traditional religions are being replaced by new alternative religions that have been created in the artificial virtual environments. In the second chapter I exhibited examples like The Church of the Holy Light in the virtual world of War of Warcraft that has hundreds of thousands of members or Avatars of Change that is native religion in Second Life platform. Both World of Warcraft and Second Life offer religious life. They give players a host of opportunities that closely resemble those of traditional religions thus competing with traditional communities.

It is important to notice that in these cases the line between replacement and reconciliation can get blurred. Blurriness will depend on the person and on the nature of the new religion. In case person was already religious and the new religion in virtual world is similar to his original religion then it is possible that we end up with fusion of the two and that would fit better under reconciliation view. On the other hand, if the person was not religious to start with or the new religion is principally different than he's original belief, then replacement view is justified.

From the other side we can look at new religious movements like "Way of the Future" or Transhumanism. Both ideologies are inspired by the ideas of emerging superintelligent AI but their approaches are different. Transhumanists see AI as a new technology that can help people to enhance and transcend to the next level of evolution. "Way of the Future" accepts that AI is going to become essentially omniscient and omnipotent and the best way forward is to worship it. On both cases traditional religion will be effectively replaced by the new religion.

Examples above assume that we are talking about ordinary religion and not official one. Like I argued above, replacement model in official level would be likely if visions of transhumanists will become true and humans will abandon their biological bodies. Digital identities who exist only in virtuality of cyberspace would have difficulties to meaningfully connect with stories and ideas of Abrahamic religions. Basic concepts like body and mind dualism or resurrection will lose meaning if persons are

transformed to “immortal digital mind”. Reconciliation with such changes would require drastic reinterpretation of the scripture.

6.6 Reconciliation model

This view is of the most interest as it supposes that religion and science have overlap in certain questions and they can be reconciled in these issues. Stenmark argues that there is no conflict in being a rigorous scientist and a person who believes in a God, these perspectives not only can coexist within one person, but can do so in a fashion that enriches and enlightens the human experience. According to the reconciliation model: Science and religion today can be combined or reconciled whilst still maintaining their respective identities and distinctive features.

Obvious suspect to represent this view is Shinto on official and ordinary levels. Shinto has vital energies or forces called kami that can be seen as substitute to the concept of immortal soul in major monotheistic religions. Unlike soul in Abrahamic religions, kami are present in all aspects of the world and universe. Some kami are cosmic and others infuse trees, streams, rocks, insects, animals and humans, as well as human creations, such as dolls, cars and robots. Japan’s leading role in research and creation of humanoid robots and examples of religious rituals carried out by or to artificially intelligent entities that are presented in chapter four are clear sign that AI and religion are supporting each other. Shinto and AI relationships fit well under description of supportive view as both sides support and confirm each other. For the future perspective there is no reason why such relationship should change.

Next case brings us back to discussion on replacement model. I mentioned that in case believer becomes converted into virtual religion that has similar characteristics with his original real world belief then it can be considered reconciliation model at work. As an example we can consider Apocalyptic AI movement. It has general characteristics and

ambitions of Transhumanism but instead of secular roots, it highlights having shared theological categories of apocalyptic Judaism and Christianity. Namely a dualistic worldview, a sense of alienation, an expectation of the end of alienation in a transcendent new world, and occupation in the new world in glorified new bodies. Result is an amalgamation of Christianity and Transhumanism thus making Apocalyptic AI an example of supportive-transformative reconciliation view where religion and AI both are drawing from each other and same time have been changed. In the future perspective it is easy to see how Apocalyptic AI could develop more towards either side of its origins and move away from supportive-transformative view into increasingly reformative view.

As mentioned in discussion of irreconcilability view the chapter 4 exhibits examples how AI and religion have been intertwined in mutually beneficial way. For example the robot priest *BlessU-2*. The fact that project was initiated by Evangelical Church and got lot of positive response by public is a sign that reconciliation between Christian religion and AI is possible on official and ordinary levels. This example would fit under supportive reconciliation view as neither side has to undergo reformulation but rather AI is supporting religion.

In the future one likely scenario is to follow the example of *BlessU-2* and patterns from history thus meaning Christianity will increasingly harness technology and AI for its own benefit. As we saw from example of Honda and humanoid robots project, Vatican has confirmed that just as God put the spark of life into man, he also gave humans the imagination to create things such as robots. As long as the robots were used for constructive purposes.

One can argue about definition of “constructive purpose” but truth is that if robots and AI will become non-constructive or even worse, destructive, then the relations might change fast. Example from *Battlestar Galactica* where superintelligent robots decided wipe out humans is narrative that is almost overused in science fiction but potentiality for something like this to happen grows every day. It would mean relationship

switching from support to conflict and scenario from BSG where relationship turned eventually back to reconciliation is not likely in real world.

Separate case can be made with certain virtual religions that are carrying the message of Christianity or Islam but do it by using virtual platforms like Second Life. In this situation it is more likely that model will change from supportive to reformative and original religion will be changed to adapt it for the needs and beliefs of certain virtual society. As stated in the second chapter, Second Life facilitates ecumenical outreach, amplifies participant voices, and enables transformative religious experiences. Therefore although AI starts as a tool by providing the environment in the form of virtual world for traditional religions, it has potential to lead to reformed religion. Albeit currently fitting under supportive reconciliation view it has potential to turn to AI priority reformative view.

I have already pointed out ways how Islam can fit into the context of irreconcilability and independence model. I have reason to mention it also her. As I discussed in the second chapter, several scholars have been propagating Islamization of science: a science recast according to the genuine Islamic principles. In practice they have increasing difficulty to keep up with quickly expanding science, including AI. Therefore it can be seen as a future perspective. This approach would places future official Islam clearly under religion priority reformative reconciliation view.

On the other side we have official initiatives like world's first robot citizen Sophia and long term innovation plan to change the society through AI "UAE Strategy for Artificial Intelligence" that indicates supportive reconciliation view in action right now with vision to grow into future.

I want to look at one more case that will be gaining increasingly more importance over the current century according to the conclusions about demographic changes from the first chapter. This case is Christianity in Africa that is expected to grow in its population more than double over next decades. I could not find useful sources about AI and

religion relationship that in itself points towards independence model. To speculate about future I will bring a parallel from the example of introducing internet to African Christian religions. I showed that local churches and movements were adapting new technologies with enthusiasm. I find we can apply this expectation also for AI thus placing this example under supportive reconciliation view.

Lastly I would repeat here Pope's statement in his second encyclical letter: "It is right to rejoice in these advances and to be excited by the immense possibilities which they continue to open up before us, for science and technology are wonderful products of a God-given human creativity" This statement by official Christian religion can clearly be considered representing supportive reconciliation view.

Conclusions

As we can conclude from the structure of Stenmark's model where vast majority of attention is put toward refined reconciliation model, he finds this view the most fitting to describe relationship between religion and science. Same can be said for Barbour who admitted his obvious sympathy towards his dialogue and integration positions. (Barbour 2000: 3-4) In my analysis I populated the customized Stenmark's model with the data, evaluating and reasoning their suggested placement in the framework of different dimensions and characteristics.

I start with pointing out two conclusions that are more technical but have inevitable influence on the final results.

First conclusion is reflecting my remarks in the introduction about previous studies in the topic and about sources in general. Analysis confirmed that I did not have enough empirical data nor scientific and academic sources available about religion and AI relationship to fully saturate the model and draw satisfactory conclusions on the topic.

Second conclusion derives from choice of the model. Despite its apparent flexibility and fine grained nature, the original Stenmark's model is not perfect fit for analyzing relationship between religion and AI. I found it necessary to define additional category that I called "social dimension" to distinguish between official and ordinary religions as it was apparent there will be notable difference of opinion. Additionally, I found distinguishing between strong and weak approaches under reformative view of reconciliation model unnecessary in the face of limited sources as mentioned above. It is possible that in the future when more data and sources will become available on the topic this category regains its necessity.

Now when technicalities and excuses are out of the way I can bring out my conclusions about the results of the analysis.

Today prevalent model describing relationship between religion and AI is independence model. This is largely a result of secularization that religion and AI are seen as independent realms. There are some exceptions that can be categorized under other models.

Shinto is one example that can be classified under supportive reconciliation model.

New religious movements like Apocalyptic AI or certain virtual religions where transhumanist ideas are fused with ideas from traditional religions can be placed under supportive reformative reconciliation model.

New religions like "Way of the Future" that replace traditional religion with belief into omniscient and omnipotent AI fit under replacement model.

In the official religion level there are conflicting principles and philosophies in Christianity and Islam that can be seen as a conflict with AI and categorized under conflict view. Currently these views are not prevalent. There is more potential for conflict with Islam as science and religion are not as separated as in Christianity. Also in Islam there seems to be less academic research on the topic.

Looking into future it is likely that independence model will lose supporters for all the other models. Exact development will be from one side determined by direction and speed of the progress of AI (and robotics). From the other side it will depend on the official religions ability to react and adjust with the changing situation. Conflict model is likely to be maintained by fringe movements (like Creationists today). New religious movements will more cause either replacement or reconciliation depending on their ideology. Traditional Religions are expected to employ more AI in the practice and reform their philosophies in accordance to new breakthroughs in AI and robotics thus moving under supportive reformative reconciliation model.

At this point I remind that my main research question this paper was seeking to answer was: “What will be the relationship between Religion and Artificial Intelligence?”

With all due respect to my reader, short answer to the question is: “It depends.”

Longer answer retains its tentative nature: “According to this study, current relationship between religion and AI can be described as prevalently independent. In the future it is expected that religion will be fused increasingly more with AI in the practice and their philosophies will be revisited in the light of technological progress.”

In conclusion, I encourage to set up further analysis, on the basis of more empirical material and academic research, when it will emerge. Also critical assessment and modification of Stenmark’s model depending on goal and availability of resources can be fruitful.

SUMMARY

“What will be the relationship between religion and artificial intelligence?” This was the main research question for the current study. I chose Mikael Stenmark’s multidimensional model for describing relationship between religion and science, as my theoretical framework to help figure out the answer. Considering the novel and hypothetical nature of the topic it was necessary to accomplish following sub goals before I could tackle the main analysis:

- Establish the fact that religion is viable and growing part of the society in the future.
- Demonstrate how science and religion have been intertwined through the history until modern day.
- Confirm that the field of artificial intelligence is developing fast and intelligent machines will have growing presence in various areas of our lives.
- Give overview of relationship between religion and AI since the emergence of the field and examine this interconnection from different perspectives.

Recent theories by Jose Casanova and Pippa Norris and correlating statistical data helped to establish and confirm that despite the popularity of the traditional secularization theory the number of people who affiliate themselves with religion is on the rise.

Demonstration of the enduring interconnectedness of religion and science included covering birth of the modern science from the bosom of Christianity, followed by insight to problematic relationship between Islam and science. Thereafter I presented how new technologies are accepted in the religious environments of Islamic countries and Christian Africa. Additional examples demonstrated how religion has been related to the virtual worlds and explored how advances of innovative technology are creating potential alternatives for the traditional religion in the example of Transhumanism.

To confirm the increasing importance of the artificial intelligence I gave brief historical overview that was followed by focusing on more recent developments. I introduced studies that help to evaluate current status of AI and discussed possible future developments. I confirmed that presence of artificial intelligence in modern world is increasingly growing and these technologies are getting progressively integrated into different parts life

The historical connections between AI and religion were shown from biblical times to the modern day. Following the traces of Christianity led to discover Apocalyptic AI movement. Thereafter I studied how AI has been relating with religion in societies of Japan and in Islamic countries. Extending examples back to western context led to describing experiences of using AI in social care to understand how people accept AI and robots based on real life cases. Another way to draw parallels is shown in the next paragraph where I examine how the topic is approached in science fiction. Further I discussed how AI is involved in emergence of new religious movements.

After completing sub goals I was equipped with resources to perform analysis by utilizing Stenmark's multidimensional model. In my analysis I populated the refined Stenmark's model with the data, evaluating and reasoning their suggested placement in the framework of different dimensions and characteristics.

The results about the analysis are divided into two parts: assessment what is relationship between religion and AI today and prediction for what will the relationship be in the future.

Today prevalent model describing relationship between religion and AI is independence model. This is largely a result of secularization that religion and AI are seen as independent realms. Shinto is noteworthy exception that can be categorized under reconciliation model.

Looking into future it is likely that independence model will lose supporters for all the other models. Exact development will be from one side determined by direction and speed of the progress of AI. From the other side it will depend on the official religions ability to react and adjust with the changing situation. Traditional religions are expected to employ more AI in the practice and reform their philosophies in accordance to new breakthroughs in AI and robotics thus moving under supportive reformative reconciliation model.

In conclusion, my answer to the main research question is tentative in nature: “According to this study, current relationship between religion and AI can be described as prevalently independent. In the future it is expected that religion will be fused increasingly more with AI in the practice and their philosophies will be revisited in the light of technological progress.”

The study showed that application of theoretical framework like Stenmark’s model to the question at hand can provide valuable results even if the results are not exhaustive.

To achieve more definitive results I encourage to set up further analysis, on the basis of more empirical material and academic research, when it will emerge.

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RELIGIOON JA TEHISINTELLEKT

Resümee

Viimaste aastatega on tehisintellekt üha enam jõudnud uurimisasutustest ja testkeskondadest igapäevaellu. Arvestades tehisintellekti kiirenevat pealetungi erinevates eluvaldkondades ja religioosse elanikkonna jätkuvat kasvu, oleks naiivne arvata, et religioon jääb saabuvatest muutustest kõrvale.

Levinud arusaamise järgi on religioon ja kaasaegne teadus vältimatus vastuolus tänu radikaalselt erinevatele põhiprintsiipidele. Samas on esimesed näited tehisintellekti rakendamisest religiooni poolt juba olemas. Tehisintellekti kasutatakse mitmetes sotsiaalvaldkondades, mis omavad analoogseid aspekte religiooniga. Samuti on teadustiku fantastika teostes kujutatud erinevaid viise, kuidas religioon ja tehisintellekt saavad põimuda.

Mikael Stenmarki mitmemõõtmeline mudel teaduse ja religiooni vahekorra kirjeldamiseks loob paindliku raamistiku, mis lubab eristada ja uurida erinevaid tehisintellekti ja religiooni suhtestumise näiteid. Seeläbi tekib võimalus võrrelda ja üldistada ning kokkuvõttes teha järeldusi olukorra kohta praegu ning võimalike trendide kohta tulevikus.

Käesoleva uurimistöö peaesmärgiks on hinnata, milline saab olema religiooni ja tehisintellekti suhe. Arvestades sellise sihi hüpoteetilist olemust ja teema uudsust, püstitasin ma järgmised alaülesanded, mis on olulised täita enne peamise uurimisülesandeni jõudmist.

- Teha kindlaks, et religioonil on tuleviku perspektiivis oluline roll.
- Kinnitada, et teadus ja religioon on olnud omavahel seotud alates moodsa teaduse sünnist kuni tänase päevani.
- Näidata tehisintellekti kiiret arengut ja rolli laienemist erinevates eluvaldkondades.

- Anda ülevaade tehisintellekti ja religiooni vahekorrast läbi ajaloo ja kaasaja kuni võimalike tulevikuperspektiivideni.

Töö üldine struktuur tuletub loogiliselt eeltoodud ülesannetest. Esimene peatükk vaatleb, miks sekulaarsuse kasv pole täitnud ootusi. Toetudes Jose Casanova ja Pippa Norrise teooriatele ning usaldusväärsetele demograafilistele andmetele näitan, miks me saame eeldada religioossete inimeste arvu kasvu ning religiooni rolli jätkuvat olulisust.

Teine peatükk keskendub religiooni ja teaduse vahekorra kirjeldamisele, leidmaks kinnitust, et mõlemad distsipliinid on alates kaasaeguse teaduse sünnist alates olnud tihedalt seotud ning mõjutavad üksteist tänase päevani ja ka tulevikus. Tutvustan islami ja teaduse probleemset vahekorda ning vaatlen uute tehnoloogiate kasutamist nii islami riikides kui kristlikus Aafrikas. Samuti uurin, kuidas religioon on leidnud tee virtuaalsetesse keskkondadesse ning annan ülevaate, Transhumanismi liikumise näitel, kuidas innovaatilised tehnoloogiad loovad uusi alternatiive traditsioonilistele religioonidele.

Kolmas peatükk annab ülevaate tehisintellekti kujunemisest ja tänapäevast ning vaatleb võimalikke tuleviku suundumusi. Teen kindlaks, et tehisintellekti aina kiirenev areng viib masinmõistuse üha enamatesse eluvaldkondadesse.

Neljas peatükk vaatleb tehisintellekti ja religiooni vahekorra ajalugu alates piibli ajast kuni tänapäevani. Näitan kuidas kristluse mõjud viisid „Apocalyptic AI“ liikumise tekkeni ning uurin kuidas tehisintellekt on suhtestunud religiooniga Jaapanis ja islami riikides. Uurin näiteid tehisintellekti kasutamisest sotsiaalses ning teadusliku-fantastika teostes. Lõpuks tutvustan kuidas masinmõistus on mõjutanud uute religioonide teket.

Viies peatükk tutvustab Stenmarki mudelit, mis on sisuliselt Ian Barbouri tüpoloogia rafineeritud edasiarendus ning eristab neli peamist võimalust, kuidas teadus ja religioon võivad suhestuda: lepitamatu, sõltumatu, lepitav ja asendav.

Viimane peatükk kasutab andmeid ja tulemusi eelnevatest peatükkidest ning analüüsib religiooni ja tehisintellekti suhet erinevate tingimuste korral, leidmaks kuhu antud näide mudeli raamistikus paigutub. Analüüsi tulemusena teen ma järeldused, et vastata töö peamisele uurimisülesandele: hinnata, milline saab olema religiooni ja tehisintellekti suhe.

Analüüsi käigus selgus, et mul ei ole religiooni ja tehisintellekti vahekorra kohta piisavalt andmeid, et saada usaldusväärseid tulemusi. Seetõttu tuleb alljärgnevatesse tulemustesse suhtuda reservatsioonidega. Tulemused on jagatud kaheks: hinnang religiooni ja tehisintellekti vahekorrale tänasel päeval ning prognoos, milline saab suhe olema tulevikus.

Täna on valitsevaks mudeliks sõltumatu mudel, mis on suuresti tingitud sekulariseerumise tagajärjel tekkinud arusaamast, et religioon ja teadus (tehisintellekt) asuvad eri sfäärides. Kirjeldan ka erandeid, mida saab kategoriseerida teiste mudelite alla.

Tuleviku perspektiivis võib eeldada, et sõltumatu mudeli osakaal väheneb kõigi teiste mudelite arvel. Täpne asjade kulg sõltub ühelt poolt tehisintellekti arengu kiirusest ja suunast ning teisalt sellest, kuidas ametlikud religioonid olukorrale reageerivad ja sellega kohaneda suudavad. On ennustatav, et traditsioonilised religioonid hakkavad praktikas aina rohkem rakendama masinmõistust ning samal ajal peavad üle vaatama oma filosoofiad uute oludega kohandumiseks.

Uurimistöö kinnitas, et Stenmarki mudeli laadse teoreetilise raamistiku kasutamine võib anda väärtuslikke tulemusi isegi, kui need ei ole lõplikud. Autori hinnangul on edasiste uurimuste teostamine tulevikus, uute ja rohkemate andmete andmete valgusel igati õigustatud.

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