

Theological Librarian vs. Machine: Taking on the Amazon Alexa Show (with Some Reflections on the Future of the Profession)

Entertainer Harry Belafonte released a version of the popular American folk song *John Henry* through RCA Records in the mid 1950s. According to the lyrics, at some point early in the industrial era Henry, a “steel-driving man,” pitted his muscles and physical endurance against a rudimentary steam drill. Although he pulled ahead at the outset when the primitive machine experienced a mechanical glitch, he literally worked himself to death during the competition. Knowing what was at stake in terms of job security and the future ability to earn a livelihood, his indomitable wife, Pollyanna, took up the sledge hammer to finish the contest.

The message of the song was clear: there was no holding back industrialization. Inevitably, history proved, twentieth-century foundries and factories, mines and mills implemented the steam drill and other machines besides. This didn’t necessarily spell doom for all of the displaced workers. Instead, they undertook training, and pivoted from manually laying track or other labor-intensive jobs to operating the myriad machines that enterprising inventors spawned.

The song seems to take on new relevance in the early twenty-first century. Belafonte’s recording calls to mind an age in which human physical labor was replaced by contraptions; in our own era computers are poised to supplant human thought. Indeed, in modern versions of the John Henry-style man-vs.-machine matchup, the machines have won. In 1997, IBM computer Deep Blue defeated world chess champion Garry Kasparov. Increased processing power and ever more sophisticated algorithms enabled IBM’s Watson to succeed at winning *Jeopardy!* in 2011. In 2016 AlphaGo, a computer that was part of Google’s DeepMind unit, vanquished Lee Sedol, reigning champion of the complex strategy game Go. Go has its origins in China and is played on a board that boasts more squares than a chessboard; software programs designed to play it require greater processing and storage capability than they do for the game of kings.¹ Ironically, the computer’s defeat of Sedol occurred approximately ten years sooner than experts predicted that an automated player would be capable of beating a human opponent at Go.² The artificial intelligence train is gaining momentum.

The Ultimate Fate of Theological Librarians in the Robotic Era

What about librarians? Will we be replaced by artificially intelligent computers that will eventually be able to out-play us in the archives, stacks, reference desks, technical service endeavors, and administrative offices? According to the website “Will Robots Take My Job?” (<https://willrobotstakemyjob.com>), which draws on tables created by Carl Benedikt Fry and Michael Osborne as part of the Oxford Martin Programme on Technology and Employment, there is a 65% likelihood that robots will make professional librarians obsolete.³ Although at first glance this is a very grim number, it is almost cheery when compared with the 95% odds that Fry and Osborne wager on the elimination of the positions of library clerical assistants. And library technicians who shelve, answer first-line reference questions, and assist patrons with finding basic information in databases are slated to become almost extinct. They face a 99% probability of being supplanted by robots. The website doesn’t specify a timeline for this library job nuclear winter, so one should set this information against predictions made in 2015 by machine learning specialists that computers will

¹ For information on DeepMind, AlphaGo, and the game of Go itself, see <https://deepmind.com/research/alphago/>.

² Anonymous., “Experts Predict When AI Will Exceed Human Performance,” *Business Insider* June 11, 2017 <http://www.businessinsider.com/experts-predict-when-ai-will-exceed-human-performance-2017-6>. Accessed 7/29/17.

³ Carl Benedikt Frey and Michael Osborne, *The Future of Employment* (Oxford: The Oxford Martin Programme on Technology and Employment, 2013). The tables, in which the individual positions are listed from the list to most probable of being replaced, appear on pp. 61-77.

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not be capable of writing a bestselling book until the middle of the century and that the complete replacement of all human jobs will not occur until approximately 2130.⁴

In the interim one could, if one is a theological librarian as opposed to a librarian of another stripe, assume that our particular branch of the profession is exempt from these dire estimates. After all, while the industrial era was about replacing brawn while the computer era is focused on superseding human intelligence, our field of specialization in religion and theology is concerned with a more elusive entity — the soul. There is a vast chasm between the execution of logical operations in thought processes which computers are now starting to engage, and the complexities of the ineffable relationship that humans have with the divine.⁵ As a matter of fact, the “will robots take my job?” website calculates only a 0.81% chance that the jobs of clergy will be automated. The site subsequently rates the future of religious professionals as “totally safe.”⁶

Alternatively, we theological librarians might take the bull by the horns. Rather than being fatalistic about our future, or conversely complacent that robots or intelligent computers will never have relevance for theological professions, we could instead seek to determine to what extent, if any, computers enhanced by artificial intelligence might benefit our patrons. We could also speculate along with the clergy, faculty, and laity whom we serve in our libraries how to implement these advanced intelligent technologies in ministry settings, research, teaching, and devotional life.

To be sure, not every task undertaken in a house of worship, university religion department, or stand-alone seminary is theological in nature. There are more than a fair share of basic clerical, hospitality, and business functions that support the work of ministry professionals in any given congregation or context. Such areas might benefit from the application of advanced machines. And, we librarians are in prime position to start thinking about these issues. After all, our own MLIS and MLS degrees prepare us broadly for work in the information field. My ultimate objective is to set the stage for more in-depth conversations. It is time to think about what future opportunities there might be for theological libraries in light of new technological changes and start laying the tracks for them.

In this approach, our mindset is not to become defensive about technology, but to imagine audaciously what new devices and gadgets we might conscript for the benefit of those whom we serve. We are actually following in the footsteps of law librarians undertaking similar explorations in their own specialty, though without the theological musings that would and should characterize ours. For instance, Nancy B. Talley writes, “. . .[law] librarians must consider new ways to incorporate technology that may help to improve the quality of library service.”⁷ Further, she asserts, “The uses for

⁴ Katja Grace, John Salvatier, Allan Dafoe, Baobao Zhang, and Owain Evans, “When Will AI Exceed Human Performance? Evidence from AI Professionals.” Cornell University ARXIV Repository. Submitted by authors May 30, 2017 with DOI arXiv:1705.08807v2; <https://arxiv.org/abs/1705.08807> See chart on p. 3. Accessed 7/29/17.

⁵ Robert Geraci has written an interesting article in which he surveys some of the writing of early robotics pioneers designed for popular reading. He concludes that the language they use and the pictures they paint of a final peaceable kingdom in which humans do not need bodies because their consciousness will be uploaded into machines (thus overcoming the limits imposed by death) has parallels with language of hope related to the end times and the new creation that is present in the apocalyptic literature of the Judeo-Christian tradition. In essence, there is a strand of thinking that appears in popular scientific literature about robots and artificial intelligence that would view belief in souls/spirits as a “feeble psychology ploy” given that, with time, science will essentially attain the same objectives without the need of the divine. Robert Geraci, “Apocalyptic AI: Religion and the Promise of Artificial Intelligence,” *Journal of the American Academy of Religion*, 76 no. 1 (March 2008): 138-166. See especially p. 148.

In contrast to the computer scientists who are proponents of what Geraci calls “Apocalyptic AI,” Gary Locklair, while conceding that one potential goal of AI is to eventually transfer the contents of a person’s mind into a computer and thus achieve what appears to be eternal life (p. 368), maintains that humans are more than mere intelligence (p. 366). As a result, such a transfer would not enable a human to truly live on in the computer and the computer would still only be a highly intelligent tool and that “only God can create a human Soul” (p. 369). Gary Locklair, “Intelligent Computers in a Christian Worldview,” *Lutheran Mission Matters*, 24 no. 3 (2016).

⁶ <https://willrobotstakemyjob.com/21-2011-clergy> Accessed 7/29/17.

⁷ B. Talley, “Imagining the Use of Intelligent Agents and Artificial Intelligence in Academic Law Libraries,” *Law Library Journal*, 108 no. 3 (2016-19): 385.

artificial intelligence will likely expand to include services that we have yet to imagine. Academic law librarians should embrace these ideas and champion agent technology and artificial intelligence for the entire law school community.”⁸

Exploring what some artificial intelligence innovations might be capable of doing in a theological library setting, we at the Duke Divinity Library decided to devise our own Librarian vs. Robot duel. I invited our reference librarian to challenge Amazon’s smart home assistant, the Echo Show, to a theological reference throw-down. In preparation, other staff members devised questions to put to the pair while I scoured the list of relevant Alexa third-party skills to download into the device.⁹ In short, the staff was assuming the role of mock library patrons while I prepped the unit in a way roughly parallel to how a collection development librarian fills a library’s shelves. Before moving to a blow-by-blow account of the questions asked and the results, however, it might be a good idea to define some terms associated with the field of artificial intelligence.

Getting Up To Speed: The Vocabulary of Artificial Intelligence

The term *artificial intelligence* or its abbreviation, AI, has become ubiquitous in twenty-first century parlance and even occurs in popular journalism. (In fact, the news aggregator on my own iPad has added it as a section heading given my history of reading pieces on that topic.) So, what is AI? First off, it is important to begin with the caveat put forth by Noreen Herzfeld, Professor of Theology and Science at St. John’s University: it is hard to tell the difference between a computer program or machine that is artificially intelligent and one that is just running a normal piece of software.¹⁰ This sentiment is echoed by Joanna Goodman, author of the book *Robots in Law*.¹¹ Goodman points out that there is a vast distinction between AI and the sophisticated search technologies that libraries generally employ in research databases and federated search engines. Despite the usefulness and apparent complexity of AI, it is also not necessarily present in the business software programs and automated workflow systems that are deployed in law offices to promote efficiency.¹²

Weak and Strong AI

At times an additional distinction is made between weak AI and strong AI. The former involves a machine simply simulating intelligent behavior through careful programming. The latter, by contrast, involves a computer that can adapt to new situations or input.¹³ In some instances, as Goodman observes, a computer with strong AI might “... guide, choose — or actually take — a particular course of action.”¹⁴ Chatbots like Alexa, which are computer programs that interact with humans by communicating either by text or voice, actually come in both flavors — weak and strong — depending on their programming. There are many chatbots including Alexa, Siri, Mitsuku, and others.¹⁵ Some are designed merely to deliver witty repartee or cocktail party conversation, while others function more like search engines. Any chatbot classified as using

⁸ Ibid, 401.

⁹ While the device is capable of finding some very popular skills and initiating them in the course of filling a user’s request, most content is controlled by means of manually adding skills to the Alexa app. The owner downloads the app onto a phone or tablet. (It did not appear to be possible to download the skills to a regular laptop.) These Amazon skills and their content seem to remain on Amazon’s cloud and the Echo merely queries them when the device owner utters an appropriate keyword or command.

¹⁰ Noreen Herzfeld, “A New Member of the Family? The Continuum of Being, Artificial Intelligence, and the Image of God,” *Theology and Science*, 5 no. 3 (2007): 240.

¹¹ Joanna Goodman, *Robots in Law: How Artificial Intelligence is Transforming Legal Services* (Peoria, IL: Ark Group, 2016), 4.

¹² Ibid, 5-6.

¹³ Weak and strong AI are succinctly defined by Gary Locklair, who also provides a few examples. See pg. 361-2. Luke Dormehl, a journalist and tech writer, offers an alternate definition in which “weak AI” designates a robot or program that is only useful in a narrow field of single application, while strong AI is equivalent to artificial general intelligence (AGI) or to when a single machine can succeed at multiple, unrelated tasks. See *Thinking Machines: The Quest for Artificial Intelligence and Where It is Taking Us Next* (New York: TarcherPerigee, 2017), 213-14. This definition is similar to that offered by Michele L. McNeal and David Newyear. See “Introducing Chatbots in Libraries” *Library Technology Reports*, 49 no. 8 (November/December 2013): 6-7.

¹⁴ Goodman, p. 7.

¹⁵ Rather than functioning to access information, Mitsuku is designed to entertain with lighthearted conversation (<http://mitsuku.com/>). See also this directory of chatbots at Chatbots.org: <https://www.chatbots.org>.

weak AI has been programmed to offer only stock responses to commonly occurring conversational sorties or requests for information.

One example of a library chatbot with weak AI programming was Emma, a text-based help services program that was in use a few years ago in the Mentor Public Library, Ohio.¹⁶ To program Emma to execute her duties in assisting patrons with basic questions, Emma was supplied with an intensive pattern-matching protocol. In pattern matching, as Lauren Kunze describes it, a programmer's first step is to make a guess concerning what a human might say and code a response. At the next juncture, after the machine has executed an actual exchange with a human, the programmer evaluates a transcript to determine what was actually said. The programmer then decides whether the bot's response was accurate and initiates a sequence of "update, rinse, repeat" until the bot is responding both correctly and fluidly.¹⁷ In short, no matter how sophisticated a pattern-matching chatbot might be, it will never offer a rejoinder other than one with which it is preprogrammed, nor will it be able to properly understand a question or comment from a patron that is phrased too differently from what was anticipated in advance by its software. It says nothing independent of its encoding.

At the present time, a company called Pandorabots offers a free developer sandbox that allows prospective clients, including libraries, the opportunity to create and test a chatbot that employs weak AI (<https://playground.pandorabots.com/en/>). In the process of designing one of these Pandorobot chat personalities, one makes use of a programming language called AIML (Artificial Intelligence Markup Language).¹⁸ Supposedly, building a chatbot on the site and quickly grasping AIML is within the reach of a novice, though I myself have not yet tried it. The company does, however, seem to have librarians in mind as an intended audience. At one point the Pandorabots website even boasts, "Pandorabots believes virtual assistant librarians will lower library costs and increase library usage."¹⁹ So far, library chatbots have not become ubiquitous in libraries. In fact, the directory of chatbots at chatbots.org only lists fifteen for the topic "library," and of those several, like Emma, are no longer functioning.

I had the opportunity to engage in a phone conversation with Henry Kunze, a sales representative at Pandorabots. When I asked him about the difference between the bots on his platform and the Amazon Echo — which is also a chatbot, albeit one that users access through Amazon's speaker devices as opposed to a keyboard — he mentioned that the two are competitors. Pandorabots and Amazon take advantage of different programming methods, and Kunze characterized the differences as similar to the old VHS vs. Betamax format rivalries that plagued the videotape field in the late 1970s and early 1980s.²⁰

As it turns out, the Amazon Echo's voice interface does not use AIML at all, but relies on strong AI and a deep learning structure within the program known as neural nets. In essence, rather than viewing the finished code as a seamless whole, the program is constructed as many smaller pieces (nodes or neurons) of code that send signals back and forth to each other. Each of these tiny segments of code may be modified individually or given different weights as the machine categorizes new information. The constant communication between neural nodes enables the machine to actively parse out the underlying meaning or intent of voice or text input.

¹⁶ The chatbot no longer appears on the Mentor Library site. It was originally created by employee David Newyear who has since transitioned to serve as manager of the Geauga County Library's Chardon Branch. Emma, as the system was called (also named InfoTabby at one point), was loosely associated with the Cybersphinx program at Pandorabots. Talley references it in her article (p. 388).

¹⁷ Lauren Kunze, "On Chatbots," *TechCrunch* (Crunch Network, 2/16/16), <https://techcrunch.com/2016/02/16/on-chatbots/> (accessed 8/7/2017).

¹⁸ For more on AIML tags see <http://www.alicebot.org/aiml.html>. On the older Cybersphinx project see: <https://pandorabots.com/static/html/PremiumServices/SoftwareSolutions/LibraryPandorobot/LandingPage.html>. Pandorabots generates revenue through hosting fees since all chatbots created on its platform must be hosted on its servers.

¹⁹ <https://pandorabots.com/static/html/PremiumServices/SoftwareSolutions/LibraryPandorobot/LandingPage.html>. (Accessed 8/7/2017).

²⁰ Henry Kunze (Pandorabots). Phone Conversation 7/17/2017. On the identification of the Amazon Echo as a chatbot see Matthew Hutson, "When will Alexa, Google Assistant and Other 'Chatbots' Finally Talk to Us Like Real People?" *Science* (June 20, 2017), <http://www.sciencemag.org/news/2017/06/when-will-alexa-google-assistant-and-other-chatbots-finally-talk-us-real-people> (Accessed July 21, 1017).

In other words, rather than a programmer presciently entering every single possible combination of words, their synonyms, and other syntax that might be used in a conversational gambit into the software, the strong AI device makes use of neural nets and is calibrated with a few samples that are uploaded by the programmer. A computer prepared this way will eventually begin to independently assign varying weights to its many nodes to help it extrapolate to a wide number of variations on its own.²¹

The Turing Test

It is possible to champion weak over strong AI or vice-versa. In my conversation with Henry Kunze, he pointed out that in 2016 Microsoft had to shut down a chatbot named Tay that had a strong AI program. This occurred when Tay, who had the persona of a teenaged girl, began to learn swearwords, Nazi ideology, and a host of other inappropriate material within 24 hours of exposure to the general public. Clearly people took delight in punking Tay, and as a result it acquired all manner of inappropriate habits.²² Nonetheless, depending on the specific parameters or limits in a device's application, not every strong AI-enabled device is corruptible.²³ Rather than advocating one method of programming over the other, it seems best at this point to assert that both strong and weak AI have their places in the world of intelligent devices. When one asks pragmatically whether machines are meeting the objectives for which they were created or functioning in ways that are perceived by lay users as intelligent, the superiority of either strong or weak AI seems to dissipate.

This proposal — that efficacy would be the yardstick by which the intelligence of computers might be assessed — was advanced by computer theoretician and futurist Alan Turing (who coincidentally was writing about the smart computers of the future in the same decade that Harry Belafonte was crooning about a manual-labor-replacing-machine from the past.) In what became known as the Turing Test, Turing hypothesized that a computer might be labeled intelligent if, during a five-minute-long conversation with humans (executed either by voice or typed input), the machine could fool the humans into thinking that they were conversing with a real person.²⁴ It would seem that this test could be passed by either strong or weak AI programming.

Some further elements that distinguish AI-enhanced devices like the Echo Show from those running ordinary software programs like the one I am using to type this article may be highlighted. They include 1) the ability to understand human speech, a feat known as natural language processing; 2) the capacity to use stored data and information to answer inquiries and draw new conclusions, sometimes called automated reasoning; and 3) the facility to learn and adapt to new situations by extrapolating from patterns, which is called machine learning.²⁵

²¹ See the following for a description of Alexa's ability that is now available to developers for use in their own applications: https://aws.amazon.com/lex/details/?sc_channel=PS&sc_campaign=lex_2017&sc_publisher=google&sc_medium=awns_lex_b&sc_content=sitelink&sc_detail=amazon%20lex&sc_category=lex&sc_segment=details&sc_matchtype=e&sc_country=US&sc_kwcid=AL!4422!3!209039217740!e!!g!!amazon%20lex&ef_id=WYYftgAAAXGhnE6Z:20170806172420:s (accessed 8/7/2017).

²² For a description of Tay's corruption by the public and subsequent removal by Microsoft see Helena Horton, "Microsoft Deletes 'Teen Girl' AI after It became a Hitler Loving Sex Robot within 24 Hours," *The Telegraph*, March 24, 2015, <http://www.telegraph.co.uk/technology/2016/03/24/microsofts-teen-girl-ai-turns-into-a-hitler-loving-sex-robot-wit/> (accessed 8/7/1017).

²³ A Chinese version of the bot was programmed to detect and deflect racial slurs and didn't suffer the same fate. See C. Custer, "I Tried to Make Microsoft's Chinese Chatbot Racist. Here's How She Stacked Up to Tay," *Tech in Asia* (August 3, 2016). <https://www.techinasia.com/tay-bad-microsofts-chinese-chatbot-racist> (accessed 8/7/17).

²⁴ An alternate measure, known as the Lovelace Test, is named after Ada Lovelace, a nineteenth-century mathematician who pondered how computers, if they ever should exist, might work. As summed up by David Ferrucci, Paul Bello, and Selmer Bringsjord, Lovelace "believed that only when computers originate things should they be believed to have minds." Thus, a modern standard to assess the creativity of computers is named in her honor. "Creativity, the Turing Test and the (Better) Lovelace Test," *Minds and Machines*. 1 no. 11 (2001): 4.

²⁵ Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd ed. (Upper Saddle River, NJ: Prentice Hall, 2010), 2. Of course, when these three elements are placed in robots rather than static PCs or servers, or even the Amazon Echo Show, additional features may include computer vision — whereby the device perceives and perhaps interacts with objects — or even the power to move about. It is important to note, however, that not every robot is artificially intelligent. Some are simply machines that are programmed to move in a repetitive fashion without the ability to adapt to new situations or execute new combinations of gestures on their own. Those sorts of features require machine learning.

Machine Learning

When it comes to *machine learning*, the goal very succinctly is “...to enable machines to learn without programming them explicitly.”²⁶ There are a variety of methods that may be employed to accomplish this, some of which appear to draw on principles present in first-order logic. One way, amongst others, that a computer might be trained to pick up new knowledge on its own is called *supervised learning*. It so happens that one variant of supervised learning is analogous to the bibliographic instruction sessions librarians undertake in order to assist human patrons. The steps used in a bibliographic instruction encounter are spelled out below and compared with their computer science equivalents:

Bibliographic Instruction Activity in Which the Librarian:	Computer Science Equivalent in Which the Developer:
accesses given database in advance, if possible, and prepares some sample searches	creates a training set
demonstrates the sample searches identified in step 1 to the patron	loads the training set into the computer’s knowledge base
encourages the patron to try searching on his/her own	allows the computer to perform the operation with a testing set
observes the patron’s first search or two to confirm that the researcher has grasped the concepts	validates that the algorithm enables the robot to complete the requested action correctly
Outcome: the patron has gained new skills in information literacy and should be good when employing them in any future research project.	Outcome: the computer should be making inferences about information that was not part of the original testing set or training set and requiring little additional assistance to continue executing its task with new samples.

Table 1

Another illustration of how this works might be helpful. Imagine that there is a basket filled with one hundred hymnals and pew Bibles that we would like a computer to sort into piles. But first, the computer must learn how to do the job. Enter the human trainer, who might separate out a random seventy-five books to use as the training data set. He or she would painstakingly label each volume in the set of seventy-five as either “hymnal” or “Bible.” Meanwhile, a programmer would write an algorithm, or sequence of instructions, to feed to the machine that would enable the computer to understand what job it was to do (sort the books) and what criteria it should use to go about the process. As an illustration, the program might specify that the device should look for a particular word on the cover of the book or even determine if musical notation is present on a random page in the middle of the volume. After the labelling of items in the training set is completed by the human assistant, the labeled items from the training set, along with the algorithm, would be loaded into the computer’s memory. Then the machine would be asked to make inferences from the training data to the remaining unlabeled twenty-five books in the basket of mixed Bibles and hymnals (the testing set). The final step would be to assess whether the resulting output of the computer on this smaller set of items was accurate (validation).²⁷ If so, the algorithm was correct.²⁸ If not, modifications would have to be made to let the computer know what was mislabeled and why, or the algorithm tweaked.

In short order with modifications, the robot should be sorting most hymnals from Bibles on its own. Furthermore, a sophisticated algorithm might allow the “learning computer” to hold out exceptions or outliers that it is unable to easily identify (such as a book with a torn cover); these, when subsequently labeled by humans, would permit the machine to produce ever more accurate results as it encountered additional anomalies. Eventually, based on the wealth of its accumulated

²⁶ Mohssen Mohammed, *Muhammad Badruddin Khan, Eihab Bashier Mohammed Bashier. Machine Learning: Algorithms and Applications* (Boca Raton, FL: CRC Press, 2017), xxi.

²⁷ Additional points for evaluating the program might include whether or not the particular algorithm allowed the program to run quickly with a minimum of memory, or if it might need to be tightened up to increase efficiency.

²⁸ There often is not a single algorithm to achieve the same end. For example, two different humans may use two different methods to sort the Bibles and hymnals in our example. One might sort them based on the color of their covers, while another might sort them first by their size and then double check them by their titles. Given a basket of books pulled from the pews of a single congregation, both methods would get the job done.

experience, the machine likely would be able to be able to classify more distant outliers on its own without human intervention. In other words, when machine learning is implemented within a software program, "...instead of pretending computers are human and simply feeding them with knowledge, we help computers to reason and then let them generalize what they've learned to new information."²⁹

Do not be afraid...

I do, of course, have an ulterior motive in presenting this hymnal/Bible categorization example. If one notices, it contained neither mathematical formulas nor funny symbols like:

$$\forall \chi \chi \in \text{Hymnals} \Rightarrow \text{Notes}$$

(which, if I've rendered it correctly given the lamentable fact that programming logic is a lacuna in my own education, is hopefully the way to assert that hymnals have musical notation). It goes to show that any individual theological librarian need not master a computer language, be a whiz at probability and statistics, know first order symbolic logic, or understand the intricacy of planes and vectors in order to enter conversations about artificial intelligence and its future in theological libraries. The sole requirement to board the AI train and have a profitable dialogue is the ability to understand a little bit about what AI is and how it functions. That is all it takes to set our imaginations free to dream up possible applications and uses for AI that might benefit theological libraries or the wider field of religion in general.

Theological Librarian vs. Machine: The Competition and Results

This brings us back to our competition between Josh Leto, Duke Divinity School Reference Librarian extraordinaire, and Alexa, the chatbot, a conversational interface within Amazon's Echo Show. Naturally, one goal of putting the Show through its paces was to assess whether or not Alexa was ready for the big time — meaning deployment at circulation and reference desks.³⁰

Preparing for the Competition

Since the idea of testing the Echo in a theological library context occurred when the Alexa Show was a fairly new product in the Amazon Echo lineup, our first tasks involved unpacking it, hooking it up, and determining what it might have in terms of theological content and pre-programming right out of the box. I had allotted two days for this stage of preparation.

It turns out that setting up the device and connecting it to the network was easy. It involved downloading the Alexa app onto my phone and also typing in my WiFi network encryption key. During this stage, a small keyboard and menu popped up on the Echo Show's touch screen. The only snag occurred with my initial intention to download the app to my laptop, which I use much more frequently than my phone or iPad. Sadly, the app is only available for mobile devices, which would be problematic in library settings. When used at a circulation or reference service point, it would make more sense for several authorized employees to access an app from a circulation station rather than using their personal phones or tablets.

The next step was to familiarize myself with the command structure related to the Alexa program. I chose to bring my Amazon gadget to attention with the word "Alexa" instead of the alternate *Star Trek*-inspired "Computer," which was offered in the app. Yet I have to confess that I find it awkward to say sentences that begin with a name. By contrast, my natural inclination is to put the vocative at the end (as in, "Please tell me today's weather forecast, Alexa.") Unfortunately, polite phrasing like this nets silence rather than the requested information, since the device is cued to begin listening upon hearing the command word.

²⁹John Mannes, "WTF is Machine Learning?" *TechCrunch*, October 23, 2016, <https://techcrunch.com/2016/10/23/wtf-is-machine-learning/> Accessed 7/29/2016.

³⁰The technology behind the Alexa interface makes use of deep learning (based on artificial neural networks), another subcategory of machine learning than the one described in the Bible/hymnal structured classification technique mentioned above. See <https://aws.amazon.com/lex/> for more information.



Figure 1: Echo Unboxing

To get ready for the clash of the reference titans, I discovered a few third-party skills in the Amazon library that seemed relevant for the field of religion. (Although, it was tempting to download the skill that might be used to tune a guitar or the game that enables one to play rock/paper/scissors — I’m not joking; that really exists). To be honest, most of the available religion skills that have been developed to this point are devotional in nature, such as those that feature an inspirational quote of the day. One example is the skill that reads Pope Francis’s most recent tweets. There are more than a handful that focus on Bible trivia or facts. Only a precious few skills are informational or are capable of plumbing datasets for content. To complicate things, since skills developed by third-party programmers are not native to Alexa, accessing many of these skills on Alexa also require knowledge of specific names and commands. In order to hear the pope’s

most recent musing, one could say, “Alexa, play today’s pope tweet” or “open today’s pope tweet.” But uttering other phrases, like, “Alexa, what did Pope Francis say today?” results in a very confused Alexa and echoing silence.

Standard for Making a Determination

While getting oriented to the machine, I also firmed up what I jokingly call the “Sheppard Test,” or the criteria that a chatbot would have to meet in order to qualify for deployment in a theological library setting. In short, the apparatus must be capable of answering five random reference questions, preferably with a mix of simple directional questions and more complex queries. Furthermore, it must answer quickly, correctly, and in a way that satisfies the patron. While formulating this test I even went so far as to develop an elaborate rubric to assist in scoring. It included considerations such as the device’s ability to determine whether the patron is looking for material with a particular theological or denominational slant, and its ability to comprehend odd pronunciations that patrons might throw at it when referencing terms from classical Biblical languages.³¹

On the afternoon of the big event, I remained in my home where the device was located while the staff joined me through Skype via my laptop. Alexa is able to hear and respond to queries from offsite questioners by this means; this is good to know and may have future application in some way as we think about serving distance students in libraries. What follows are the questions and results of our Reference Librarian vs. Alexa clash.

Transcript of the Questions and Answers

Patron Question #1 (Anne Marie Boyd, Circulation Assistant): “Alexa, show me a peer reviewed article on Isaiah 41:10-20.”

- **Alexa:** Hum. I don’t know that one.
- **Mr. Leto:** Would one of these work? (He had executed a search on the ATLA database, limiting it to peer reviewed full text).

Winner: Mr. Leto, Reference Librarian.

Patron Question #2 (Katie Benjamin, Archive Fellow): “Alexa, when did the Reformation begin?” (The question was reformulated into the command: “Alexa, Wikipedia “What year did the Reformation start?””)³²

³¹ A copy of the rubric is available online here: http://library.divinity.duke.edu/AI_Rubric.xlsx.

³² To the initial question, phrased as it was, Alexa simply responded, “Hum, I don’t know that.” During the course of practicing with the device, however, I had learned that Alexa is able to draw on Wikipedia — hence my intervention to rephrase the question.

- **Alexa:** (responding almost instantaneously): “The Reformation, also referred to as the Protestant Reformation...” — *Alexa continued reading the Wikipedia article aloud for a few moments and then paused, asking, “Tell me if you would like me to read more.”* After receiving an affirmative, *Alexa continued with the article, but after about 3 minutes it never got to a point where a date was mentioned. Eventually we requested Alexa to return to the home screen and cease reading the article.*
- **Mr. Leto:** (Responding after just seven or so seconds after consulting a library reference): “1517 was the date that Martin Luther published his 95 theses on the door of the cathedral.”

Winner: Mr. Leto, the human Theological Librarian. The staff did, however, appreciate the fact that on the Echo the text of the Wikipedia article appeared on the screen line by line as it was read, which opens interesting possibilities for applications geared toward those who have certain types of disabilities.

Patron Question #3 (Katie Benjamin): “Alexa, what are the Synoptic Gospels?”

- **Alexa** (Instantaneously): “Synoptic Gospels are Matthew’s Gospel, Mark’s Gospel and Gospel of Luke.” (Note: This is a direct quote. No definite articles were used).
- **Mr. Leto** (Instantaneously): “Matthew, Mark and Luke.”

Winner: Tie. Both Alexa and our Theological Librarian nailed this one in an equal amount of time.

Patron Question #4 (Rebecca Bowers, Archivist): “What are the hours of the Duke Divinity School Library?”

- **Alexa:** Sorry, I don’t have the business hours for Duke University Libraries–Perkins. (Alexa, while answering, displayed a Yelp entry for the central Duke library, which goes by the name “Duke University Libraries,” but had no information about the Duke Divinity School Library, which is a separate professional school library on the Duke campus with its own hours. The Divinity School Library hours are indicated on its dedicated website at <http://library.divinity.duke.edu>. Incidentally, the central library’s Yelp account did not include its library hours and at the time, the Divinity Library did not have a Yelp page.)
- **Mr. Leto:** “This week, since it is summer break and there are no classes, our hours are weekdays from 8-5.”

Winner: Mr. Leto, Theological Librarian.

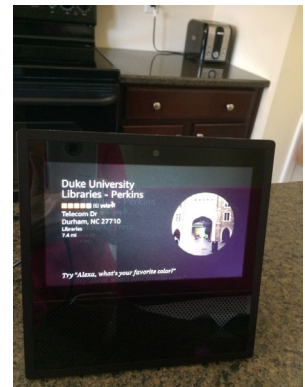


Figure 2: Yelp

Patron Question #5 (Katie Benjamin): “Alexa, what are the lectionary readings for this coming Sunday?” (The question was recast as the two-part query “Alexa, open the Catholic Daily, please” and then “What is the lectionary for Sunday?” so that the third-party skill would open.)

- **Alexa:** “The Readings for Sunday, July ...” (The app successfully identified the particular feast day, and began reading the first reading for the Sunday in question. Unlike the Wikipedia skill, this one did not, however, display the text while it was reading — presumably it was designed for the older Amazon Echo tower, which did not have a screen.)
- **Mr. Leto:** “Katie, is there a particular denomination you have in mind, or would you prefer the Common Lectionary?”

Winner: Mr. Leto, Theological Librarian. This win was awarded given Mr. Leto’s ability to correctly discern that the answer required further customization for this patron, who is not Catholic. An explanatory note is needed here. I had downloaded the “Catholic Daily” skill to prepare for the contest (it was the only lectionary on offer for use with Alexa as

of the date of the competition), and while it is an impressive skill and quick to access once one knows the proper series of commands, this skill did not quite meet the needs of this particular patron. The creators of the skill are to be lauded for making a well-done skill and for being first to the punch in being early adopters of a new technology.

Back to the Locker Room— Interpreting the Results of the Contest

Content

In sum, the Duke Divinity School Reference Librarian soundly defeated Alexa when it came to answering theological inquiries. Clearly Alexa is not yet able to pass the Sheppard Test. So, for the next few years, our jobs as theological librarians are safe. That being said, there are some interesting observations to make.

First, Alexa's ability to answer correctly, or, for that matter, respond at all depends on what content is available to the gadget. And at this point, there isn't much. Wikipedia is pre-loaded and so are a weather database, the IMDB (Internet Movie Database), and Yelp for business information (and library hours — don't forget to stake a claim in Yelp for your own library!), but the machine's accessible knowledge bank is clearly a work in progress. For one thing, Alexa is not able to search the Internet at large. Correspondence with Alexa customer service did indicate that talks with Google were underway, but as of now, one should believe Amazon's own disclaimer that "Alexa may not have answers to everything."³³

Equally important, at present it is simply not possible to back-fill Alexa's content gaps by relying on the offerings of third-party downloadable skills from the Skills section of the Amazon site. In fact, when it comes to the subject "Religion" there is a paucity of them available. As for those that do exist, some, while possibly amusing (let us not overlook the Kwan Yin Fortunetelling skill), would not necessarily be suitable for an academic theological library context.

There are, however, a few gems. For instance, following the formal portion of our contest, I asked Alexa to open and recite the "Wesleyan Covenant Prayer" in order to demonstrate that skill for our group. Duke Divinity School is one of the official seminaries of the United Methodist Church, and therefore skills related to our denomination were of particular interest to the staff. Sadly, of the 182 skills that were returned in the search for "religion" in the Amazon skills store in mid-July when this project was undertaken, the Wesleyan Covenant Prayer program was the only one that reflected our tradition. It was created by Unique Coding Solutions LLC. Curious that the skill did not appear to have been published by one of the United Methodist Church communications offices, I tracked down the CEO of the company, Renier Oliva. He graciously agreed to visit with me.³⁴ The conversation with him was enlightening and explained much about the likely origins and character of the skills available on the Amazon site to date.

Oliva quickly mentioned that he is not a theologian, but rather a computer programmer by trade, although he happens to be a member of a United Methodist Church. "I love the church," he said, "I met my wife through the church and I wanted to give something back." At the same time, his initial impetus to create a skill for Amazon Echo was shepherded along by the fact that Amazon opened its code to developers and was encouraging the creation of skills by providing modest prize incentives, such as free Echo devices. And, in order to inspire programmers less skilled than Oliva to get their feet wet with programming, Amazon was apparently also offering templates that novices might tap in order to create simple fact-based skills, game skills, and a few others. It seems that in many circumstances the available templates dictated the type and format of some subject matter.

In Oliva's case, rather than a template, there was an instance of serendipity that governed his choice of material and approach to the project. Just at the moment when Oliva was casting about for content to use, his pastor launched a church-wide study of the Wesleyan Covenant Prayer for the congregation. Thus, the skill was born. Originally, Oliva hoped to translate the prayer into Spanish and offer it in that language, but at the time, Amazon was only supporting the development of skills in American English, UK English, and German.

³³ https://www.amazon.com/gp/help/customer/display.html/ref=hp_left_v4_sib?ie=UTF8&nodeId=201549800 (accessed 8/10/2017). The correspondence regarding talks that are underway with Google was received from the address alexa-support@amazon.com on 7/29/17 and signed "Mariyamma P."

³⁴ Renier Oliva, Phone Conversation, 7/14/2017.

I pressed the question of copyright clearance and whether he ever contemplated writing the content for skills. Oliva, chuckling a bit, mentioned that he knew that the traditional (as opposed to the modern) version of the Wesleyan Covenant Prayer was in public domain and as a result was available. As a programmer and not a content creator, he was not particularly interested in taking the time to track down permission to employ the more up-to-date version. He emphasized that like most programmers, he simply wants to program and make available content that is both provided and copyright-cleared by others.

I couldn't help but wonder whether most of the available content in the Alexa Skills store was simply the result of programmers experimenting with Amazon's platform and creating services that reflected their personal interests using public domain content. If so, this prompts one to speculate about what would happen if librarians and ministry professionals worked together with programmers to create, curate, and license religion content. Obviously, the field is wide open for us to make our mark.

Performance

A second area that occasioned some further reflection after the Librarian vs. Machine contest involved Alexa's performance as a gadget. It was already mentioned that staff was pleased to see the text of the Wikipedia article appear on the screen simultaneously with Alexa's reading the information. Again, this has tremendous potential for addressing issues of accessibility by those with disabilities. Taken a step further, the combination of speech with viewable text might also have applications for foreign language acquisition, and we would welcome the development of such educational skills.

One other thing that stuck out in terms of device performance was the fact that without any advanced "voice training," Alexa was able to understand flawlessly five separate individuals during the contest. This sort of ability would be important if the device were set up in a business since it would have to handle input from many different patrons. Alexa's success in this arena should not be overlooked.

For comparison, I want to mention that in my own experience Siri, the Apple voice assistant, is rarely able to figure out what I'm saying. A few days ago I opened my laptop and requested that Siri locate "houses of worship near me." Much to my consternation she inexplicably returned a map that pin-pointed Jabeau Park Appaloosas and Quarter Horses--just outside of Melbourne, Australia. Seriously. Perhaps the computer heard me say "horses" instead of houses? But even so, Australia isn't in the ballpark of North Carolina on any printed map I've ever consulted. To be fair, Siri always understands my husband perfectly. Nevertheless, the contrast between this example with Siri and my many successful encounters with Alexa in the short time I've owned it to date are stark.

At the same time that Alexa's voice recognition capabilities sparkle, its ability to easily retrieve information at times leaves something to be desired and, in fact, is a stumbling block to the idea of adapting Alexa for use with aiding library patrons. In a nutshell, the problem is that every third-party app has its own set of commands and protocols that are required to operate it. This structure is clunky. It puts the burden on the patron to recall not only what skills are available on a device, but also each one's particular "open sesame" and command structure. Frankly, until there is seamless integration of these programs with the Echo and each other, it will not be possible to deploy the device in libraries.

Another hang-up to the device's suitability in the short term in library front-line reference contexts became manifest when we asked the question concerning the date of the Protestant Reformation. Since there was no other source for Alexa that might contain this content, I helped to reframe the inquiry in order to direct Alexa to search Wikipedia and give it a fighting chance. Even so, it turns out that the Echo version of the Wikipedia article on the Protestant Reformation was quite different from the entry available through a simple Safari search.³⁵ While the later frontloads the date that Luther affixed his theses to the cathedral door, the Wikipedia entry that was discovered by Alexa did not. The device began reading paragraph upon paragraph of text and, frankly, our attention flagged. After all, the patron

³⁵ <https://en.wikipedia.org/wiki/Reformation> (accessed 8/10/17). It is possible that there is a lag between when a Wikipedia article is updated, and when Alexa reflects the change. We noticed a delay of at least a week between when our Duke Divinity Library Yelp page was visible via Google after its creation and when Alexa was finally able to discover it.

was seeking only one simple fact, not an entire disquisition. It would be helpful to have semantics applied to the Echo content so that it would return the equivalent of rich snippets that would highlight and read the specific fact that answers the patron's inquiry.³⁶

Other Features

Although its other features were not specifically tested in our Librarian vs. Machine competition, the Echo Show is much more than a mere information hub. In fact, it may be possible that some of its other features would be helpful in a theological library context. For instance, it is easy to imagine that its ability to create lists could be used to keep a running tally of items from the supply closet that should be reordered. Alternately, the listing feature might serve as a place to stash the library's close-of-day step-by-step protocol. Alexa's "smart home" integration aspect might help libraries housed in older facilities where electrical wiring may be problematic: the ability to install voice-control lighting to brighten a storeroom or other space prior to entering it would be beneficial. In addition, there may be ways to adapt Alexa's timer and alarm features for various library activities. It might be the case that as the Amazon Echo matures, enterprising librarians may find ways to make use of virtually everything — perhaps even that "rock/paper/scissors" game.

Evaluation of Alexa's Echo Show Overall

First, it is clear that Alexa is designed for home use rather than library settings. To be honest, I find that I am using my personal unit for cooking, running household lights, and other small tasks more often than I ever thought that I would. Once one learns the necessary commands, it is incredibly helpful and convenient. In addition, for those who are visual learners, the ability to see items on the Echo Show's screen is a boon. Incidentally, the size of the screen, not to mention the footprint of the unit itself, are perfectly adequate for home use applications. (In fact, if the device were any larger, it would likely intrude too much on precious work and counter spaces.)

In terms of religion content and eventual application in library settings, a charitable assessment is that this technology and delivery mode for religious content is in its infancy. One can, however, imagine that there is great potential. No doubt the deployment of this or some other equivalent device in theological libraries further down the line is likely inevitable.

Final Thoughts: The Future of Theological Librarians

So, is the future for theological librarians bleak? No. Merely different. In the short run, of course, as our exchange clearly demonstrated, the technology cannot pass a basic test of correctly answering five theological reference questions in a row. So our jobs are safe. For now. We are in a period analogous to the early days of the industrial era, in which John Henry was able to outpace the steam drill before it really got rolling. One imagines, however, that in the long run, say within fifteen years, robots will be fit for implementation in libraries. Long before that time comes, however, many theological librarians may not necessarily be working for "libraries" at all. By contrast, they may be fulfilling their information sciences ministry calling within a wide range of contexts.

Future Non-Library Opportunities for Theological Librarians

Perhaps some might find themselves working in their particular faith tradition's national offices, or employed by large megachurches, or plausibly hired by consortia comprised of smaller congregations.³⁷ In these settings the theological information professional will focus on collecting denominationally specific content for apps and skills and will work side by side with programmers. On the one hand, these partnerships will free computer scientists from the burden of coming up with specialty material beyond the purview of their formal training. The resulting apps/skills will fill the religion information lacunae that exit with assistant devices like Alexa today.

³⁶ On the Semantic Web and rich snippets see, R. De Virgilio, F. Frasinca, W. Hop, and S. Lachner, "A Reverse Engineering Approach for Automatic Annotation of Web Pages," *Multimedia Tools and Applications*, 64 no. 1 (2013): 119-140.

³⁷ For instance, there is a skill entitled, "The Episcopal Church," which supposedly will work with a user's ZIP code to push information from the nearest local church to the user's Echo.

While some of us are helping to create programs and software, still other theological librarians may labor for a tech company. These theological information professionals might also add a human expert's touch to a given tech behemoth's offerings by creating specially curated and reviewed lists of religion content sources that might be recommended to customers. Such positions are no great stretch. After all, Apple Music presently employs DJs and other music subject professionals to suggest songs to listeners.³⁸

Some of us may make a living serving as independent contractors or, as they would call it in the industry, Mechanical Turks (MTurk) who work from home adding labels to machine learning training sets, categorizing religious information, or transcribing religious audio and multimedia. They might even participate in crowdsourced projects to verify data. Opportunities for this already exist.³⁹ Such human intelligence activities will enable robots and even human researchers to better access and interpret big data sets in our field (see table 2 for some sample labeling topics).⁴⁰

In essence, there is a lifetime's worth of potential projects to be done.

The Roles Librarians Will Find in Traditional Theological Libraries

Finally, in two decades some theological librarians may still work within the context of the academic theological libraries that make up the majority of institutional members in ATLA. However, the particular duties and roles held by the staff will be quite different than those of today. For example, every future theological library will either need its own in-house Optimizer Librarian or need to have access to a sub-contracted optimizer service. Clearly, as demonstrated our exchange with the Amazon Echo about a simple thing like when a library is open, it won't be enough merely to have informational websites about our hours or services if we and our content are invisible to users of the devices.

One might also predict that student workers will no longer answer basic reference questions when chatbots have passed the Sheppard Test. But this does not mean that students will no longer contribute to the work of libraries. Instead they will be redeployed to accomplish duties that might include transcription of multi-media content, data labeling, and database clean-up. This latter, for instance, might involve finally rectifying all of the uncorrected OCR that firms like Internet Archive and others produce when scanning library books. Although uncorrected OCR may not, in most instances, provide too much of a roadblock to data mining, it is going to serve as a distraction when these typos in the OCR text files are ultimately discovered and subsequently served up to patrons by voice-enabled information and task assistants like Alexa.

Librarians of the future will also spend quite a bit of time focused on copyright clearance and licensing for the digital content that will form the backbone of AI-enabled devices. Further, so that the records of the deals we've cut don't end up as accessible as a snarl of coat hangers, we will need to have staff in place to manage clearance tasks and records.

³⁸ Ben Lovejoy, "Behind the Scenes of Human Curation at Apple Music, as Company Ups the Ante on Licensing" *9 to 5 MAC* (July 18, 2016), <https://9to5mac.com/2016/07/18/apple-music-human-curation-licensing-fees/> (accessed 8/8/2017). Dormehl concedes that algorithms could provide perfectly acceptable playlists, but humans might add something extra. See pp. 146-147.

³⁹ These freelancers are hired by a company called Crowdsourcing, though it is impossible to ascertain from their site whether any of their projects cover the subject matter of religion. <https://www.crowdsourcing.com/workforce/> (accessed 8/8/2017).

⁴⁰ For a sample of the types of job available presently see: <https://www.mturk.com/mturk/welcome>. Incidentally, religion subject specialists do indeed have big data sets. A partial list includes things like our own institutional repositories and collections of digitized materials, government-generated census data on religion, Pew's religion and society datasets, the GDELT public domain book collection from Hathi Trust and Internet Archive, Project Gutenberg, the ATLA full-text serials database, and even the copious membership lists/financial records/annual reports currently squirreled away in church and denominational administrative offices. Less well known, perhaps, are the datasets available through Kaggle, a machine learning training site for data specialists and developers. It presently features fourteen open datasets in religion. Plus, it is theoretically possible to extract anonymized and aggregated data on religion topics from social media posts in Facebook, Twitter, and many more sites or services besides if those opportunities become available. The Pew datasets are available for download here: <http://www.pewforum.org/datasets/> (accessed 7/9/2012). The GDELT book big dataset of over three million pre-1923 public domain titles is hosted here: <https://cloud.google.com/bigquery/public-data/>. For the Kaggle sets see <https://www.kaggle.com/datasets?sortBy=relevance&group=featured&search=religion> (accessed 8/7/2017).

SAMPLE DATA LABELS FOR A HYPOTHETICAL RELIGION DATASET			
Unlabeled Data Element	Decision Point for Label	Possible Label	Agent applying Label
Publishing House/Publisher	Associated /Affiliated with the Roman Catholic denomination	Yes/No	Human/Machine
Newspaper Article	Theological Leaning or bias	Conservative/Liberal	Human/Machine
Biblical Studies Commentary in EBook Format	Contents written post discovery of the Dead Sea Scrolls (regardless of publication/republication date)	Yes/No	Human/Machine
Journal Article	Peer Reviewed	Yes/No	Human/Machine
Cookbook	Reflects Kosher Laws	Yes/No	Human/Machine
Blog	Authored by an academic trained in Biblical Studies	Yes/No	Human/Machine
Photograph	Contains Star/Crescent symbol of Islam	Present/Absent	Human/Machine

Table 2

Bibliographic instruction as we know it will disappear because traditional search engines will be replaced by ones that use artificial intelligence to undertake deep data analysis of the contents of webpages and databases. Decisions about which databases to access and how to weigh results will become the purview of machines, not people.⁴¹ We should not fret, though. When bibliographic instruction is no longer needed, librarians will still be necessary. (No doubt they will be called upon to teach doctoral students in the field of modern religious history to read cursive so that those students can conduct research using the handwritten documents in our archives.⁴²)

Speaking of which, our archives and rare book collections, which are our unique content, will eventually be the main focus of library collections. These collections, and jobs related to archives, will survive the coming of intelligent machines. Archives and rare book staffing requirements may even eclipse that of digitization units when we reach a tipping point where everything capable of being photographed or copyright cleared from the past will have a digital surrogate, and new information is all born digital. Furthermore, our archives will include not only religious texts, but realia like church anniversary mugs and plates, stained glass windows from houses of worship that have closed, and many other objects besides. So libraries will double as museums that require preservationists, archivists, curators, and those who can create holograms as digital back-ups of the objects they contain.

Naturally, traditional theological libraries will get into the swing of creating apps and skills, so our ranks will include those with programming skills. Equally important, as artificial intelligence in the field of religious information and religious praxis blossoms, cutting-edge libraries will develop research and development units that will assist faculty with market analysis, securing grants and venture capital, and locating partners for bringing new AI-enabled devices and software to production for use in congregational and other settings.

⁴¹Even now we are on the cusp of replacing traditional search engines with algorithms that respond with single answers rather than lists of options when patrons type in queries. For example, the Wolfram Alpha project, which is strong in the subjects of math and science, is a search engine project that does precisely this. See <http://www.wolframalpha.com>.

⁴² Not every document can be digitized and/or rendered with a transcript for a variety of reasons, including fragility, sensitivity of contents, embargos placed by donors, and so forth.

Where Do We Go from Here? The Choice is Ours

In sum, rather than being replaced by machines, theological librarians have the potential to find creative ways to use them without a net loss of employment opportunities. There is a caveat, however. We are at a crossroads. During the course of my research for this piece it did not escape my notice that in his book *Thinking Machines: The Quest for Artificial Intelligence and Where it is Taking Us Next*, Luke Dormehl drew on examples of AI in music, art, science, and a host of other fields but never once mentioned the subject of religion.⁴³ Likewise, the Wolfram Alpha search engine, a new generation of AI-driven discovery service, includes the option to search by category. It includes headings for science, money, music, and twenty-seven others, but “religion” is completely absent.⁴⁴ In short, it looks like religion as a research discipline has the potential to fall into obscurity or irrelevance if, as late adopters, we wait too long before laying track of our own. At this point we can choose to be passive and possibly accept marginalization for the subject we represent, or we can take an active part and be innovators — shaping the content, format, and mode in which religious information will be presented and accessed in the age of AI. For me, religion matters; faith matters; our profession matters. So I know what I choose. And I invite you to choose too.

⁴³ There was one passing allusion when he described Ray Kurzweil’s concept of “the singularity” as the “techie version of the Biblical rapture” (p. 219).

⁴⁴ There is a subcategory for “mythology” under culture, but it only includes a few resources. The general search engine box will return some statistical information on religion, but I would surmise it is drawn from census data or perhaps the Pew Research datasets.

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