Financial Literacy Voice Virtual Assistant
(Research Topic)

The Power of AI and its Resulting Ethical and Societal Implications
(STS Topic)

A Thesis Prospectus
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By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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I. Introduction

The term “Artificial Intelligence” was originally coined in the 1950’s, and was very generally rooted in the idea that machines or computers could one day display human intelligence (Helm, 2020). Now, 70 years later, artificial intelligence (AI) is finally coming to fruition – or so we think. Yes, it is true to believe that artificial intelligence is finally in our sights, but that is only in the over-simplified sense of the term, where most people think about a robot that can act entirely autonomously or a system that can execute a task from start to finish without human intervention. In reality, artificial intelligence is already here and it is currently playing a much larger role in our lives than most people think. In the more general context of this prospectus, it is extremely difficult to apply a singular, holistic definition of “artificial intelligence” as it comes in so many different forms and applications. For the purposes of this investigation artificial intelligence will be defined very generally as the ability of a computer or machine to gather information and determine the proper course of action to take.

My technical project is the creation of a voice virtual assistant in the education sector in order to better teach children financial literacy. This is moderately connected to my STS topic of exploring artificial intelligence because the virtual assistant will utilize AI in order to determine and tailor the level of difficulty of the lesson, as well as how to respond to the student’s answers or questions. This will be an extremely relevant and interesting topic to explore, as AI will continually see evermore usage in our society. Education is merely one of hundreds of sectors and industries that has been, and will be continue to be transformed by AI in the coming decades. This prospectus will explore the magnitude and scope of AI, as well as address some of its societal and moral concerns.

II. Technical Topic: Financial Literacy Voice Virtual Assistant

Financial Literacy is an extremely important set of skills to learn from a young age, as it can be a precursor to financial well-being in adulthood. Teaching our youth financial literacy gives them the foundation to make better decisions with their money in the future, and will help them avoid financial struggles such as saving and investing, which plague many of America's adults today. This is imperative because financial well-being has been associated to serious health issues linked with chronic stress – whether they be mental battles such as depression, anxiety, and emotional health, or even physical ailments such as elevated blood pressure and immune functionality (Choi, 2009). Even though we have all heard the phrase "money cannot buy happiness" – it does not necessarily mean that the antithesis is untrue. The power of financial freedom goes far beyond one's 'buying power' – it can have serious implications on one's well-being.

Currently, only about half of K-12 teachers report teaching some form of financial literacy to their students (Godsted, 2007). As highlighted previously, it is extremely important to be teaching our youth about financial literacy. Having only half of our teachers educating students on the topic simply isn't enough. The quality of these financial literacy lessons is also in question, as there is very little uniformity as to the method of teaching our youth financial literacy, with either unclear or nonexistent standards. In fact, the lack of specific academic standards pertaining to financial literacy education was also noted as a leading obstacle to conducting these lessons (Godsted, 2007). Teaching our K-12 children financial literacy does not have to be difficult, mundane or boring, but rather can be done in a fun and engaging way. This is our goal with the financial literacy voice assistant. Our team wants to employ artificial

intelligence in order to make the voice assistant engaging and adaptable to the specific needs of each student.

Our goals for this project are twofold: to create a financial literacy lesson plan for K-12 students, and to build a voice assistant through which we can teach the lesson plan. Creating the voice assistant will be the more difficult task, as a complex user interface will need to be designed, as well as the AI necessary (decision making) for the voice assistant in order to properly conduct the lesson plan, which includes gauging the proper difficulty level and responding to questions and answers. The creation of the lesson plan will be less difficult, but will require extensive research on current lesson plans, as well as creating the dialogue framework necessary for each lesson plan. This process will have to be replicated to create multiple lessons within each difficulty category, which has been broken down into 3 groups of grades: K – 4^{th}, 5^{th} – 8^{th}, 9^{th} – 12^{th}. The author's responsibilities include determining the proper cloud-based service, studying and formulating engaging voice-oriented lesson plans, and creating a flow process diagram for the use of the virtual assistant.

III. STS Topic: The Power of AI and its Resulting Ethical and Societal Implications

Artificial intelligence is utilized in a myriad of different applications across a wide variety of industries, therefore having a massive sphere of influence over thought, society, and the future. This STS topic will explore the societal implications of artificial intelligence as we move into the future, and it has a very strong connection to the framework of The Social Construction of Technology. Currently, over 90% of leading companies are investing an AI technology (Lin, 2020). Some of the main ways that AI is being used is in predictive modeling, supply chain logistics, autonomy, and personalization. AI plays a huge role in determining the

advertisements that you see on your phone, forecasting for financial and weather services, or even helping doctors make more informed and accurate diagnoses (Borana, 2016). The role in which artificial intelligence will play in our future will only expand into new developments as well as increase in magnitude where it is currently being applied. Looking to the future, the global artificial intelligence market is expected to reach $267 billion by 2027 (Lin, 2020). AI is here to stay, and it is up to us as the main creators and users to determine if it will foster innovation and equality, or do just the opposite.

The scale and impact that artificial intelligence will have in our future means that we need to be hyperconscious about the implications of this technology. “Artificial Intelligence (AI) algorithms are widely employed by businesses, governments, and other organizations in order to make decisions that have far-reaching impacts on individuals and society“ (Ntoutsi, 2020). Yes, these systems may be mutable – as we are able to change the code – but that does not change the fact that they can “run off” with a mind of their own. For example, when coding these artificial intelligence algorithms, if we include biases in the code, then the system will reflect that with the decisions it makes. This is extremely dangerous for two reasons: subconscious and conscious biases, also known as implicit and explicit biases, respectively. Even though it is nearly – if not completely – impossible to eliminate all biases from society, AI provides much scarier implications to these biases. If we code in implicit biases that we do not even consider, then these massive AI systems that we employ will perpetuate these biases to a degree of magnitude far larger than ever before possible.

For example, there is an implicit bias of gender in the English language, when referring to the order of a list. Generally, the male counterpart is stated first (eg. man and woman, husband

and wife, son and daughter), implying that there is a ranking order among these two groups (Leavy, 2018). This bias can be recognized by AI and utilized into perpetuity, possibly always listing men before women in cases that may have more dire consequences, such as organ transplant lists, for example. Even though to humans, it may very simply be our diction and not affect the manner in which we create lists, having AI recognize this pattern and utilize it for its decision-making highlights how implicit biases that have been perpetuated by people can have far more serious implications when employed in the context of AI.

From a more ethical standpoint, people may purposefully include explicit biases in their AI systems in order to bend users to their will. Again, this can have extremely dangerous results when magnified using the power and reach of AI. For example, Facebook uses artificial intelligence algorithms to determine the content that their users see every day, in addition to tailoring advertisements toward their interests and preferences. Any sort of bias in this algorithm can change what gets put in front of the eyes of billions of people. A recent development pertaining to Facebook's ability to bend their AI algorithm to their will had to do with COVID-19 information. Due to developing information, on May 26, 2021, Facebook announced that it would no longer be censoring posts containing the claim that COVID-19 was man-made (Purnell, 2021). By no means is this exploration going to take sides, or explore the correctness of "either side" of this ongoing debate. Rather, what is so alarming about this announcement is not that they decided to stop censoring these posts, but the fact that Facebook was doing it in the first place – making the decision to censor ideas from the eyes of billions of users simply because it did not agree with their own biases. Even though the context of this debate may be trivial, the implications that it holds are extremely worrisome. Using AI to advance one's own interests and suppress diversity of thought – especially at the scale made possible by AI – has extremely

concerning implications because diversity of thought is what creates a more equitable, inclusive, and innovative world for us to live in. By using such a powerful tool to advance their own beliefs and stifle diversity of thought, Facebook showed us the dangers of an entity actively imparting their own explicit bias upon artificial intelligence.

Artificial intelligence is an extremely powerful tool that has immense promise and possibilities for human advancement – but with great power comes great responsibility. We need to be hyperconscious of the methods in which we use artificial intelligence as well as the biases – both implicit and explicit – which we may be imparting upon the algorithms we create. The biases in which we encode into AI can have implications far beyond our intentions or our knowledge due to the fact that we are now working with a tool that goes far beyond our knowledge, and for many of us – our understanding.

Next Steps

Timeline	*STS Tasks*
Nov. 2021	Submit Final Prospectus to STS 4500 professor and Capstone advisor Get sign-off from STS 4500 professor and Capstone advisor
Dec. 2021	Submit post-prospectus Evaluation

Capstone Task Timeline

- November: Conversational dialogue
    - Focus on kindergarten benchmarks as separate lesson plans.
        - Lesson plans will be upwards of 15 minutes long
    - Determine overall structure so it's uniform.
    - Develop the conversational dialogue for each level.
    - Members will work in teams of two and be assigned 2-3 levels (i.e. kindergarten/1st).
- November: Revision + AWS
    - Review created dialogue and ensure it's appropriate for each grade level
    - Begin trial and start learning courses on AWS, so everyone has the same foundational knowledge.
    - Translate conversation to cloud-based service (AWS)
- 12/4/21
    - Interim Design Report
    - Interim Design Review Presentation given by team to client/sponsor midway through project
- February
    - SIEDS Abstract
- April
    - SIEDS paper, presentation, and poster, contingent on abstract being accepted to SIEDS
- 5/8/21

- Final technical report is written that is independent of the SIEDS paper and a final presentation delivered to the client

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