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Investigating Students' Attitudes & Trust in AI During COVID-19

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ABSTRACT

Artificial Intelligence (AI) has been a part of society for a considerable amount of time since its formal foundation in 1956 and can be used to perform cognitive tasks at a level similar or greater than humans. In our modern era of advanced intelligence machines and processing capabilities, AI is being pushed further into society at a fast rate. With advancing AI like ChatGPT and self-driving vehicles, it is important for society to understand the implications of trusting this technology. Studies have discussed AI being used in the medical field to combat mental health issues and identify attitudes. However, there is a gap in research over adults' levels of trust towards AI and how those feelings have evolved over the course of COVID-19. This research paper explores how trust college/university undergraduate/graduate adults evolved over the COVID-19 pandemic and aims to fill that gap. To address the general attitudes and levels of trust towards AI, a mixed-method quantitative and qualitative study was conducted utilizing a survey. The survey inquired about general attitudes using the General Attitudes towards AI Scale (GAAIS) and open-ended questions to measure levels of trust in relation to the pandemic. It was concluded that while participants demonstrated a positive attitude towards AI (70.4%), most participants had low levels of trust reflected in their fears and concerns of future AI implementation. A high percentage of positivity towards AI coupled with low levels of trust indicates a complex attitude towards artificial intelligence.

1. Introduction

Artificial Intelligence (AI), once a subject of fiction and human imagination, has evolved to become commonplace in modern society. AI is often referred to as a computer or machine's ability to perform cognitive tasks like humans can (Technology and National Security, 2018). This technology is capable of learning from past experiences in order to understand and respond to problems (Thormundsson, 2022). In other words, ‘computers do the sorts of things that [human] minds can do” (Boden, 2016).

While we are not quite close to developing Artificial General Intelligence (AGI)[1], it is fair to conclude that fairly “weak” AI technology has a massive impact on human functionality (West, 2018). Weak AI, or narrow AI, focuses on tasks such as image/facial recognition, automated driving, and medical diagnosis (Flowers, 2019). Studies have shown that recent advancements in AI have been partially due to the progress within weak AI, such as faster, more reliable image recognition systems (Vaishya et al., 2020). Even so, with the immense advancements in AI, the technology still struggles to identify problems and complete tasks it is expected to. Self-driving cars, for instance, are often advertised as completely non-manual, when they actually require a human operator to pay attention and take control of the vehicle (Tate, 2021). It has been found, though, that public perception of AI can be shaped by science fiction in which strong AI is employed and dystopian expectations of AI replacing humans (Gunkel, 2012; Schepman, 2020).

Artificial intelligence is changing the way society functions and the resources available to them, such as

[1] This form of AI matches human intelligence, behavior, and problem-solving skills. It can adapt and apply learning experiences to varying situations (Grace et al., 2018; Flowers, 2019).

transportation and food (Anderson & Raine, 2018). The use of AI is growing at a fast pace and permeates many aspects of people's daily lives, both in personal and professional settings (Smith & Anderson, 2014; Makridakis, 2017). Self-driving cars and other AI technology can now allow us to complete tasks with ease and efficiency (Olhede & Wolfe, 2021). It is important to note, though, that all crucial technological advances in history have revoked doubtful attitudes, along with positive (Gessl et al, 2019). For instance, ChatGPT is a large language model developed by OpenAI that utilizes deep learning techniques to generate human-like text responses based on given prompts and a vast amount of knowledge from the internet. The AI has received mixed reviews as concerns about its limitations in understanding context, potential for misinformation, and lack of personalization has hindered its effectiveness in providing accurate and tailored educational support. Given the unpredictable, unknown nature of certain AI devices, it is important to consider both sides of the spectrum. In this ever-changing world, anxiety or discomfort reflecting distrust towards unpredictability has become an inseparable part of our lives (Makridakis, 2017; Olhede & Wolfe, 2021; Rossi, 2018). It is crucial that we understand how changing technological environments and times of crises, such as the COVID-19 pandemic, affect our attitudes and trust towards AI.

2. Literature Review

2.1 Overview of AI

Historically, across technological fields, definitions of AI have varied. In 1949, most computers lacked a key prerequisite for intelligence: they did not have the ability to store commands, only to execute them. During the early stages of computing, when computers were expensive and not readily available, only prestigious universities and large technology corporations had the financial resources to afford them (SITNFlash, 2017). To convince other organizations of the importance of investing in machine intelligence and building the groundwork for it, scholars needed to provide evidence of the concept's feasibility and garner support. The limited availability of computers meant that the potential of machine intelligence needed to be demonstrated and advocated by influential scholars and experts in the field. They had to showcase the possibilities and benefits that could arise from the development of machine intelligence. This proof of concept could involve showcasing early successes, such as solving complex problems or performing tasks that were previously thought to be exclusive to human intelligence. Years later, proof of concept was established at a Dartmouth workshop in 1955 where AI was defined as "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it" (McCarthy et al., 2006).

According to more recent sources, however, AI can be understood as a set of computational technologies that are inspired by human functions to sense, learn, reason, and act on a task. Other studies have identified AI as a simulation of intelligent behavior with computer programs (Kok et al., 2009). In its most advanced form, AI can be defined as having similar skills to learn, identify situations, problem solve, communicate in natural, understandable language, and self-learn, like social media (Lindenberg, 2020).

It is important to understand the different types of AI, aside from weak AI and AGI referenced in the introduction, to identify the forms of technology that exist within the scope of this field and their impact on society. In addition to 'Artificial Intelligence,' the term 'Augmented Intelligence' is referenced in many sources. This form of AI technology prioritizes deep learning and machine learning to work with humans in areas where they may be more efficient (Lecun et al., 2015). Both of these practices require the programming and training to complete complex tasks such as speech recognition, genomics and drug discovery. These types are composed of multiple processing layers to self-learn diverse data representations.

Despite the descriptive and technological differences in the definitions of AI, the concept of the technology imitating aspects of human intelligence stays consistent. Therefore, AI, in the context of this paper, can be defined

as a machine with computing capabilities, behaviors, and problem-solving skills similar to that of human intelligence.

2.2 AI in relation to COVID-19

In our modern era of advanced intelligence machines and processing capabilities, AI is being pushed further into society at a fast rate by corporate companies such as Tesla and Tiktok. More specifically, the latter example utilizes machine learning techniques to analyze user interactions, preferences, and trends in order to deliver personalized video recommendations and optimize content discoverability. Though the origins of AI go back decades, recent developments have boosted machine use due to increased computing power, improved algorithms, and prioritized funding (Lecun et al., 2015; Thormundsson, 2022). More specifically, over the course of COVID-19, AI was used in the medical field to monitor and control the spread of the virus (Vaishya et al., 2020). Countries such as China and India incorporated AI mask and temperature sensors into their pandemic protocols (Het Shah et al., 2022). There has also been extensive usage of AI in detecting COVID as well as developing vaccines (Shinde and Thorat, 2022). Therefore, rapid development and implementation of AI has been viewed as "central to the COVID-19 picture" (Silverman, 2020).

Most existing studies in relation to AI and COVID-19 generally discuss the machines through comparison of economy, societal acceptance and perception, as well as federal investment. For instance, one study discussed American acceptance of AI in comparison to China and differences in government policy. It was found that new technology in China was met with enthusiasm and opportunity, whereas in the U.S. it is met with public fear and risk (Carter & Crumpler, 2019). This was due to China's investment in AI politically, financially, and socially. They have passed the following policies: Made in China 2025, the New Generation AI Development Plan, and the 13th Five-Year Plan which all recognize the importance of AI development and further its manufacturing. No sources identified the relationship between AI and COVID-19 in terms of the attitudes or levels of trust people may have developed.

2.3 Trust and Attitude in the Context of AI

Literature has identified varying underlying attitudes and trust toward AI, generally analyzing respondents under specific connotations; those connotations are generally positive, negative, or neutral. One study identified the cynical hostility—reactions characterized by anger and mistrust of other people by interpreting their behavior through negative means—that high school students may have towards AI. It was found that AI is not perceived the same way humans are in terms of cynical hostility and that negative attitudes towards AI were not associated with personality (Bochniarz et al., 2021). This suggests that other factors aside from personality factors play a role in shaping attitudes towards AI in adolescents. The study proposed that the controversy around whether different attitudes towards AI machines are guided by the intention or functionality of the technology may actually be due the way user's conceptualize AI. The more hostile that the AI was perceived to be, the less governed and protected the AI was by the participants emotions, ultimately reflecting distrust. Other existing research has considered the unpredictability of AI and its effect on consumerism trust (Siau and Wang, 2018). No studies to the researcher's knowledge have researched the attitude and trust Americans have towards general application AI which is what this study aims to do.

Additionally, there is a gap in research over American adults' levels of trust towards AI and how that has changed over the course of COVID-19. One of the limitations of research in the AI field is that technology has not been surveyed for everyday use, but for a general perception and acceptance of it (Siau and Wang, 2018). In other words, it was not clear whether student's reactions to AI were based on their familiarity with it or the type of AI it was (intentional entity - superintelligence - or an element of augmented intelligence) (Bochniarz et al., 2021). The researchers also stated that their research should be broadened to the study of adults, which will be the focus of this

work. This research contributes to a fast-paced concept that needs to be understood quickly to anticipate how it impacts the people it intends to serve (Makridakis, 2017). Given this information, the following question is explored: To what extent have college students' attitudes and levels of trust towards artificial intelligence altered during the COVID-19 pandemic in the United States (2020-2022)?

3. Methods

3.1 Measures

3.3.1 Overview:

A small-scale anonymous online survey was conducted once IRB approval was granted. The survey was deployed for 13 weeks from January 2023 to April 2023 using the Google Forms questionnaire platform. The survey was conducted in English and based on college/university students in the U.S. The survey questions asked are shown in Appendix A. To measure attitude, a subscale was employed. To measure trust and its relationship to COVID-19, open-ended questions were asked.

3.3.2 Measured Variables:

The data that was collected using a mixed-methods approach. To establish the demographic of the survey sample, questions pertaining to age, major, grade, and college/university are asked in the second section. There are exactly 29 questions inquiring about AI and students' likelihood to trust it. The General Attitudes towards Artificial Intelligence Scale (GAAIS) utilizes a positive/negative subscale using a rating from one to five (Schepman & Rodway, 2022). After four questions have been asked, the survey requires an "Attention Check" (Schepman & Rodway, 2022). This section checks for participant compliance to ensure that each individual is answering thoughtfully. The scoring sheet then 'discounts' the compliance to the attention check from the final score. Participants who did not check "Strongly Agree" were not considered for analysis through GAAIS as it is inferred they were not paying attention to the scale questions. This scale is used to determine the overall attitude of the participant in relation to the pandemic. There are a total of 20 questions for this scale.

In order to identify the participants' attitudes and levels of trust in relation to the pandemic, nine open ended questions were asked. One of the questions includes, "Do you feel that the COVID-19 pandemic has contributed to the development of AI? Please explain." As a result, the final data from the scale was further supported by the open-ended questions as participants could explain some of their beliefs. To analyze the open-ended responses, an inductive content-analysis procedure was used for each question initially and then the final results were categorized into two categories using deductive content-analysis (see Appendix B). The content-analysis was approached using an inductive method that did not represent the nuances and details that the participants discussed in their responses, so a deductive analysis was added in hopes of achieving this. Then, the most common terms were used to code the responses into the following categories: Benefits & Hopes and Threats & Fears (Schepman & Rodway, 2020; Smith et al., 2014). Benefits of AI may include the enhanced effectiveness of a certain task and hopes may include AI making user lives easier. On the other hand, threats could reference data abuse or job loss, whereas fears reflect the dystopian expectation of AI replacing or taking over humans. This method allowed the final data to be analyzed effectively as well as take into account nuances in the responses.

3.2 Procedure Overview

3.2.1 Participants and Sample Size:

Participants for this study were recruited primarily through a snowball sampling method (Naderifar and Ghaljaie, 2017). The survey link was initially seeded to the researcher of this paper's family and friends. The survey link was also sent to affiliated professors. Given that the goal of this study is to understand general college and university students' levels of trust and attitudes towards AI, it was crucial that the sample size was optimized and that any student who met this criteria was included. This was also essential given the length of the survey is extensive. The survey is expected to be passed on to other students in college or university, which is explicitly stated in the fourth section and the submission page of the Google Form. The sample consisted of 38 students: 67.7% females and 32.3% males. Their mean age was M = 27.3 (SD = 9.7). The participants' majors were mostly S.T.E.M.[2] based with the most common major being Mathematics and the least common being Graphic Design & Illustration.

3.3 Ethics

In order to follow ethical research procedures, none of the research- nor demographic-related questions on the survey were required. Respondents were free to skip any subscale or open-ended questions. Missing data values from the subscale would make the GAAIS final score inaccurate, so those responses would be discarded. The respondents' email addresses were not recorded. The only identifiable information collected from the survey was age, gender, major/minor, geographic location (suburban, urban, or rural), and highest degree of education. None of these were required for the respondent to answer, however. The only required questions were the consent approval and date.

3.4 Limitations of the Method

The GAAIS does not measure trust towards AI or reference the COVID-19 pandemic. As a result, follow-up, open-ended questions were incorporated into the survey in an attempt to demonstrate the connection between attitude and trust. Given the extensive nature of the study, the number of questions were grouped together to make the interface easier to compute. As mentioned in the procedure, measures were taken to optimize the sample pool through reaching out to professors and students from colleges/universities.

Participants claimed at times that some of the subscale statements were vague and colloquial, making them difficult to interpret. An example includes, "I find Artificial Intelligence sinister." This may affect the way that they answered the questions and could affect their overall attitude towards AI.

Content-analysis is subjective, so the codes may be subject to the researcher's personal bias or knowledge on the subject. To combat this, the researcher attempted to share the content-analysis categories with other experts, but no inter-rater data was able to be collected. Additionally, the two content-analysis approaches used still fail to represent the nuances in the participants responses given that they generalize the participants responses.

4. Results

4.1 Demographic Overview

After 13 weeks deployment, a total of 38 responses were collected. 14 total responses were removed from the data set for the subscale. 1 was removed due to the respondent giving consent to participate in the survey despite being under

[2] Science, Technology, Engineering, Mathematics (S.T.E.M.)

the age limit. Four responses were removed as they selected no for the consent form. The remaining responses were removed given that they did not select “Strongly Agree” when asked to on the Attention Check. This may imply that the participants did not pay attention to the survey questions and clicked through the responses. The final dataset for GAAIS has 24 responses. Responses that did not select “Strongly Agree” were considered for open-ended questions, however, totaling to 32 responses for content-analysis. This is because the open-ended responses were separate from the scale.

4.2 General Attitudes towards AI

For the GAAIS results, a final score was calculated in order to represent the data in a clear and concise manner. The final score is the difference between the positive and negative subscale means. If the final score is negative, that implies that the general attitude towards AI is negative. If the final score is positive, that implies that the participants have an overall positive attitude. Most participants (70.4%) had a positive attitude towards artificial intelligence, as seen in figure 1, which implies that the majority of the participants may have a somewhat positive connotation towards AI when speaking of its trustworthiness in the open-ended responses.

Positive Subscale	Negative Subscale	Final Score
4.08	4.75	-0.67
3.5	3	0.5
3.5	2.75	0.75
2.92	2	0.92
3.42	2.88	0.54
5	3.38	1.63
3.42	2.63	0.79
3.83	1.63	2.22
4.67	2.13	2.54
3.08	3.13	-0.04
2.75	3	-0.25
2.92	2.88	0.04
4.17	2	2.17
1.92	3.75	-1.83
3.75	2.63	1.13
3	2.25	0.75
4.33	3.13	1.21
2.08	2.25	-0.17
3.5	4	-0.5
2.75	4.13	-1.38
3.58	2.63	0.96
4.5	1.38	3.13
4.25	2.75	1.5
4.17	2.25	1.92

Figure 1. General Attitudes towards Artificial Intelligence Scale (GAAIS). The following table demonstrates the results from the GAAIS test conducted. Some of the participants' responses were emitted due to complications with the attention check and google form.

It is important to note, however, that some participants had lower positive attitudes than others. For instance, one participant had a final score of approximately 2.54, while another participant had a final score of 0.5. Given that both of these values are positive, they both had an overall positive attitude towards AI, but at different values.

4.3 Trust in relation to the COVID-19 Pandemic

Levels of trust towards AI in relation to the pandemic were measured, partially, from the nine open-ended question frequency tables (see Appendix B). The first question inquired about the participants' trust towards AI and any types that may be more trustworthy than others. 10 (40%) of the respondents had varying[3] trust towards AI when the technologies completed mundane tasks and no personal or identifiable information was involved. Five (20%) of participants claimed that they only trusted predictable and reliable AI that was well-trained. The second and third questions pertained to the prevalence of AI pre- and post- pandemic in the American economy. Interestingly enough, most results were consistent across the board as 12 (48%) believed that AI was less prevalent pre-pandemic and 17 (68%) believed that AI is more prevalent in modern day due to its crucial role during COVID-19. Some participants claimed that any prevalence of AI before or after the pandemic was not related to the virus, but rather, due to developments and advancements in the field. Few participants believed that there was a similar or the same prevalence of AI pre-pandemic. The fourth question referred to the respondents opinion on COVID-19's impact on AI development in which 14 (56%) believed that the pandemic did contribute. The remaining respondents' opinions varied with three (12%) claiming that the pandemic did not contribute and four (16%) claiming they were unsure. The fifth question inquired whether AI had become more or less reliable over the pandemic. 13 (52%) argued that AI became more reliable and seven (28%) were unsure. The sixth question asked participants whether the COVID-19 pandemic increased their usage of AI. 11 (28%) claimed that their usage had not increased, but rather stayed the same or decreased. Eight (32%) of the respondents stated that their usage had increased due to jobs and school shifting from in-person to online. Some participants claimed that this was also due to their majors, as most were in a STEM based field. The seventh question asked about AI's impact on happiness based on its role in the pandemic. Eight (32%) believed that happiness varied depending on the person and often referenced the novelty of the technology. Despite this, participants argued that the joy of AI doesn't necessarily ensure long-term happiness and can often influence people negatively. Five (20%) of participants believed that AI development made people feel less happy and four (16%) believed that the development made others happier. The eighth question examined whether people will be better off with the emergence of new AI. Six (24%) of participants believed that people will be better off as emerging technology is making lives easier and urgent fields more efficient, such as the medical field. 11 (44%) had a neutral opinion and three (12%) claimed that people will not be better off. Finally, the ninth question inquired on whether the pandemic encouraged the development of harmful AI in which 10 (40%) believed that there was no development of harmful AI and 3 (12%) believed that there was development of harmful AI.

The second part of content-analysis was conducted through the following categories: Benefits and Hopes and Threats and Fears. Under the benefits and fears category, participants claimed that AI enhanced the effectiveness of certain tasks, assisted in medical and biological fields, and made their lives easier or simpler. Whereas, in the threats and fears category, participants discussed AI abusing their data and possibly taking over their jobs. Participants also discussed AI threatening their human rights or replacing/taking over humans.

[3] Varying implies that participants trusted AI only under certain circumstances or specific types of AI. For instance, one participant only trusted AI to receive groceries, but not to handle their credit card information when purchasing those groceries.

5. Discussion

Overall, this study identified a largely positive attitude and of trust in AI, but the relationship between trust and COVID-19 is not as prominent. In this article, participants' perceptions (attitudes and trust) in relation to the COVID-19 pandemic was investigated. It was found that users who report having a positive attitude towards AI were more likely to have trusted AI or felt an obligation to. The majority of respondents demonstrated a nuanced perspective of AI and its impact on their lives during COVID-19. However, it was also found that participants' understandings varied in terms of how they believed the pandemic affected their attitudes and trust towards AI.

5.1 Participant General Attitudes and Trust toward Artificial Intelligence

For the GAAIS results, a final score was calculated in order to represent the data in a clear and concise manner. The final score is the difference between the positive and negative subscale means. If the final score is negative, that implies that the general attitude towards AI is negative. Most participants (70.4%) had a positive attitude towards artificial intelligence, as seen in Table II. This implies that the majority of the participants may have a somewhat positive connotation towards AI when speaking of its trustworthiness in the open-ended responses. From this data, the overall positive attitude implied that there was an optimistic view on AI and its development during the pandemic. However, the majority outcome of attitudes towards AI did not imply that the participants were more likely to trust AI.

5.2 Participants Levels of Trust in relation to the COVID-19 Pandemic

In an attempt to measure levels of trust, the open-ended questions were split into two categories: levels of trust towards AI in everyday use and trust in terms of COVID-19. This was done so that the researcher could achieve a better understanding of the participants overall levels of trust before establishing relationships and clarify any confusing responses. Some participants stated that they believed there was no relationship between their trust towards AI and COVID-19, which is important to consider in the context of the amount of technology that emerged during this time. It may be possible that certain respondents were not affected or did not interact with AI due to their age or major.

A high prevalence of negative views was present. In a study conducted on general attitudes in the United Kingdom, it was found that participants often constructed narratives featuring their dystopian expectations of AI's future implementations (Schepman & Rodway, 2022). Given that participants mentioned AI taking over or replacing humans as a result of its advancements, this implies a consistency with Schepman and Rodway's findings. Other studies in relation to trust and attitude towards AI identified a high prevalence of concerns towards AI (Lewis & Marsh, 2021; Rossi, 2018). This is consistent with the results given that most respondents discussed their own concerns surrounding loss of control, ethical issues, and impact on the workforce. It was found by varying sources that while there is a general increase in optimism towards AI, there is still a strong prevalence of concerns in its implementation (Schepman and Rodway, 2022; Rossi, 2018; Bochniarz et al., 2021). In relation to this study, participants had an overall 70.4% positive attitude towards AI, a fairly high percentage (40%) of participants claiming that they trusted AI that did not deal with personal/identifiable information, 40% making the argument that the pandemic did not encourage the development of harmful AI, and 32% arguing that certain technologies encouraged happiness depending on the person. However, the prevalence of negative views is not a factor that can be ignored. Participants mentioned many threats and fears towards AI that were clearly pronounced. From fears of job loss to a fairly distributed perspective of the trustworthiness of AI, generally ranging from negative to neutral, participants demonstrated fairly low levels of trust.

5.4 Implications

The results of this study can encourage a deeper understanding of the prominence of AI as an emerging form of technology. Studies have identified the immense impact, both positive and negative, that AI can have on an individual and societal level (Brynjolfsson and Mitchell, 2017; Ikkatai et al., 2022). The emergence of advanced technology has led to a shift in public attention and attitudes towards AI, which makes it necessary to elaborate on perceptions. It is crucial that existing literature aims to increase the public literacy of new technologies and establish ethicality and morality of using complex machines. Individual, organizational, and societal education as well as expert judgment on AI implementation is crucial in understanding its impact (Awad et al., 2018; Liehner et al., 2021).

Despite the benefits of AI, it is pivotal that accurate knowledge of its potential and limitations is studied to balance the usage and perceptions of technology (Hick and Ziefle, 2022). This study creates a medium for the public and non-experts in technological fields to evaluate their benefits and barriers of AI (Olari and Romeike, 2021). Even so, more research must be conducted to generalize overall attitude and trust in AI to the entire United States.

5.5 Limitations

This study was not conducted on a large-scale similar to other research in the field and represents a small proportion of university students' attitudes and trust towards AI. Given that only 25 respondents were considered for GAAIS and 32 for content-analysis out of 38 total respondents, it can be concluded that the research may not be very generalizable at this time. Most participants had some form of S.T.E.M. background, which may play a role in the overarching positive attitude about the potential uses of AI but low levels of trust in AI. While there is an increase of reliability given that the only responses used were those that were compiled with the consent form and attention check, there is a lack of generalizability due to the small size of the sample population. A larger, more diverse pool of respondents may be needed to further the generalizability and reliability of this research. Additionally, demographic factors such as major, gender, nor age were not taken into account when analyzing responses.

6. Conclusion

People may view AI through a lens of optimistic skepticism; they may acknowledge promising and exciting technology, as well as its potential to enhance various aspects of life. However, they may also have doubts about the intentions or consequences of AI systems, leading to a cautious or skeptical attitude. The positive perception may arise from an appreciation for the capabilities and possibilities of AI. But, the low trust could result from a limited understanding of how AI works or concerns about its potential risks. This may indicate a need for better education and awareness about AI to build trust. Individuals might appreciate the positive aspects of AI, such as efficiency and convenience, but worry about ethical considerations, such as privacy infringement, bias, or job displacement. This mixed sentiment can reflect a desire for responsible and ethical implementation of AI. Similarly, people may have had negative encounters with AI systems or witnessed instances where AI failed to meet expectations, leading to a decrease in trust. Nevertheless, they still recognize the potential benefits and hold an overall positive outlook on AI's capabilities.

7. Fulfillment of Gaps in Research

This study addresses several gaps in pre-existing research. The first entails the establishment of general attitudes and levels of trust. In pre-existing studies, attitudes were researched under specific connotations or through niche types, such as cynical hostility. Models have been created to measure levels of trust, but no research identifies what those levels are. Second, this study surveys college/university students in America. In prior studies, attitudes and/or levels of trust were measured in high school students or adults in other countries (Bochniarz et al., 2021; Schepman &

Rodway, 2020; Brauner et al., 2023). Existing studies in relation to AI in the U.S. discuss the economic or social impact and value of AI. Finally, no previous study identified any form of attitude or trust in the context of the COVID-19 pandemic. Most sources have left this factor out and discuss their findings in the context of specific scales used. Contrastingly, this study inquired about attitude and trust provided the pandemic as an overarching factor. This gap served as the foundation for this study.

8. Areas for Future Research

This study's limitations are opportunities for new areas of research. The subject pool could potentially be expanded to include a larger demographic of participants, given the lack of responses that were generated from this research. Future research could also expand on each factor, general attitudes and levels of trust, individually instead of simultaneously. In order to represent the nuances in the participants' perspectives, future studies could identify the perspectives around only general attitudes along with using a scale such as GAAIS. Alternate attitudes or trust could also be measured. According to previous research, human to AI relationships are much different than human to human relationships (Lewis & Marsh, 2021). Given this, general attitudes or levels of trust could be further explored in the context of certain industries, such as consumerism or daily life.

References

Awad, E., Dsouza, S., Kim, R., Schulz, J., Henrich, J., Shariff, A., et al. (2018). The moral machine experiment. Nature 563, 59–64. doi: 10.1038/s41586-018-0637-6

Anderson, J., Rainie, L., & Luchsinger, A. (2018). Artificial intelligence and the future of humans. Pew Research Center. December https://www.elon.edu/docs/e-web/imagining/surveys/2018_survey/AI_and_the_Future_of_Humans_12_10_18.pdf

Brauner, P., Hick, A., Philipsen, R., & Ziefle, M. (2023). What does the public think about artificial intelligence?—A criticality map to understand bias in the public perception of AI. Frontiers in Computer Science, 5. https://doi.org/10.3389/fcomp.2023.1113903

Brynjolfsson, E., and Mitchell, T. (2017). What can machine learning do? Workforce implications. Science 358, 1530–1534. doi: 10.1126/science.aap8062

Bochniarz, K., Czerwiński, S. K., Sawicki, A., & Atroszko, P. (2022). Attitudes to AI among high school students: Understanding distrust towards humans will not help us understand distrust towards AI. Personality and Individual Differences, 185, 111299. https://doi.org/10.1016/j.paid.2021.111299

Boden, M. A. (2016). AI: Its Nature and Future. Retrieved from https://books.google.com/books/about/AI.html?id=yDQTDAAAQBAJ

Carter, W. A., & Crumpler, W. (2022, November). Smart Money on Chinese Advances in AI. Retrieved from https://www.csis.org/analysis/smart-money-chinese-advances-ai

Flowers, J. C. (2019). Strong and Weak AI: Deweyan Considerations. National Conference on Artificial Intelligence. Retrieved from http://ceur-ws.org/Vol-2287/paper34.pdf

Gessl, A. S., Schl ¨ogl, S., & Mevenkamp, N. (2019). On the perceptions and acceptance of artificially intelligent robotics and the psychology of the future elderly. Behaviour & Information Technology. https://doi.org/10.1080/0144929X.2019.1566499

Grace, K., Salvatier, J., Dafoe, A., Zhang, B., and Evans, O. (2018). When will AI exceed human performance? Evidence from AI experts. J. Artif. Intell. Res. 62, 729–754. doi: 10.1613/jair.1.11222

Gunkel, D. J. (2012). The Machine Question: Critical Perspectives on AI, Robots, and Ethics. Cambridge, MA: MIT Press.

Hick, A., and Ziefle, M. (2022). “A qualitative approach to the public perception of AI,” in IJCI Conference Proceedings, eds D. C. Wyld et al., 01–17.

Ikkatai, Y., Hartwig, T., Takanashi, N., and M., Y. H. (2022). Segmentation of ethics, legal, and social issues (ELSI) related to AI in Japan, the united states, and Germany. AI Ethics doi: 10.1007/s43681-022-00207-y

Kok, J. N., Boers, E. J., Kosters, W. A., Van der Putten, P., & Poel, M. (2009). Artificial intelligence: definition, trends, techniques, and cases. Artificial intelligence, 1, 270-299.

Lecun, Y., Bengio, Y., and Hinton, G. (2015). Deep Learning. Nature 521, 436–444. doi: 10.1038/nature14539

Lewis, P., & Marsh, S. (2021). What is it like to trust a rock? A functionalist perspective on trust and trustworthiness in artificial intelligence. Cognitive Systems Research, 72, 33–49. https://doi.org/10.1016/j.cogsys.2021.11.001

Liehner, G. L., Brauner, P., Schaar, A. K., and Ziefle, M. (2021). Delegation of moral tasks to automated agents The impact of risk and context on trusting a machine to perform a task. IEEE Trans. Technol. Soc. 3, 46–57. doi: 10.1109/TTS.2021.3118355

Lindenberg, G. (2020). Ludzko ś ć poprawiona. Jak najbli ższe lata zmienią świat, w kt órym żyjemy. Krak ów: Wydawnictwo Otwarte. https://books.google.com/books?hl=en&lr=&id=xq9yDwAAQBAJ&oi=fnd&pg=PT3&ots=pmuEAe3P7a&sig=ukMFJnggKLqP1GZMFhG_wh5UQdg#v=onepage&q&f=false

Makridakis, S. (2017). The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms. Futures, 90, 46–60. https://doi.org/10.1016/j.futures.2017.03.006

McCarthy, J., Minsky, M. L., Rochester, N., and Shannon, C. E. (2006). A proposal for the dartmouth summer research project on artificial intelligence (August 31, 1955). AI Mag. 27, 12–12. doi: 10.1609/aimag.v27i4.1904

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball Sampling: A Purposeful Method of Sampling in Qualitative Research. گام های توسعه در آموزش پزشکی, 14(3). https://doi.org/10.5812/sdme.67670

Olari, V., and Romeike, R. (2021). “Addressing AI and data literacy in teacher education: a review of existing educational frameworks,” in The 16th Workshop in Primary and Secondary Computing Education WiPSCE '21 (New York, NY: Association for Computing Machinery).

Olhede, S. C., & Wolfe, P. J. (2019). Artificial intelligence and the future of work: Will our jobs be taken by machines? Significance, 16(1), 6–7. https://doi.org/10.1111/j.1740-9713.2019.01224.x

Rainie, L., Anderson, J., Vogels, E. A., & Atske, S. (2021, June 21). Experts Doubt Ethical AI Design Will Be Broadly Adopted as the Norm Within the Next Decade. Pew Research Center: Internet, Science & Tech. Retrieved from https://www.pewresearch.org

Rossi, F. (2018a). Building Trust in Artificial Intelligence. Journal of International Affairs, 72(1), 127. Retrieved from https://www.questia.com/library/journal/1G1-583489792/building-trust-in-artificial-intelligence

Schepman, A., & Rodway, P. (2020b). Initial validation of the general attitudes towards Artificial Intelligence Scale. Computers in Human Behavior Reports, 1, 100014. https://doi.org/10.1016/j.chbr.2020.100014

Schepman, A., & Rodway, P. (2022). The General Attitudes towards Artificial Intelligence Scale (GAAIS): Confirmatory Validation and Associations with Personality, Corporate Distrust, and General Trust. International Journal of Human-computer Interaction, 1–18. https://doi.org/10.1080/10447318.2022.2085400

Shah, H., Shah, S., Tanwar, S., Gupta, R., & Kumar, N. (2021). Fusion of AI techniques to tackle COVID-19 pandemic: models, incidence rates, and future trends. Multimedia Systems, 28(4), 1189–1222. https://doi.org/10.1007/s00530-021-00818-1

Shinde, R. C. S., & Thorat, B. (2022). Applications of AI in Covid Detection, Prediction and Vaccine Development. International Journal for Research in Applied Science and Engineering Technology, 10(4), 2634–2637. https://doi.org/10.22214/ijraset.2022.41494

Siau, K., & Wang, W. (2018). Building Trust in Artificial Intelligence, Machine Learning, and Robotics. Cutter Business Technology Journal, 31(2), 47–53.

Silverman, D. (2020). Collecting qualitative data during a pandemic. Communication in Medicine, 17(1). https://doi.org/10.1558/cam.19256

Sindermann, C., Yang, H., Elhai, J. D., Yang, S., Quan, L., Li, M., & Montag, C. (2021). Acceptance and Fear of Artificial Intelligence: associations with personality in a German and a Chinese sample. Discover Psychology, 2(1). https://doi.org/10.1007/s44202-022-00020-y

SITNFlash. (2020, April 23). The History of Artificial Intelligence - Science in the News. Retrieved from https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/

Smith, A., Anderson, J., & Smith, A. (2022, September 15). AI, Robotics, and the Future of Jobs. Pew Research Center: Internet, Science & Tech. Retrieved from https://www.pewresearch.org

Thormundsson, B. (2022). *Topic: Artificial intelligence (AI) worldwide*. Statista. https://www.statista.com/topics/3104/artificial-intelligence-ai-worldwide/#topicOverview

Tate, D. (2021). Trust, Trustworthiness, and Assurance of AI and Autonomy. ResearchGate. Retrieved from https://www.researchgate.net/publication/355479055_Trust_Trustworthiness_and_Assurance_of_AI_and_Autonomy

Vaishya, R., Javaid, M., Khan, I. H., and Haleem, A. (2020). Artificial intelligence (AI) applications for COVID-19 pandemic. Diabetes Metabolic Syndrome Clin. Res. Rev. 14, 337–339. doi: 10.1016/j.dsx.2020.04.012

West, D. M. (2018). The Future of Work: Robots, AI, and Automation. Washington, DC: Brookings Institution Press.