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Role of pandemic in driving adoption of artificial intelligence in healthcare industry

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ABSTRACT

The global population continues to be affected by the ongoing coronavirus pandemic, resulting in a gradual depletion of the limited healthcare resources. In order to fully realize the potential benefits of clinical artificial intelligence (AI), it is necessary to ensure its widespread adoption and use. The current body of research investigates the inclination to use clinical Artificial Intelligence & Machine Learning using a comprehensive survey and identifies the factors that influence its adoption. This study examines the United States and Canada, two North American nations, using a sample size of 1068 individuals. The findings indicate that participants have a significant aversion towards artificial intelligence (AI). In a hypothetical scenario including pre-hospital triage for the coronavirus, just one out of ten individuals expressed a preference for clinical AI and machine learning over clinicians. The level of trust individuals place in clinical AI & ML, together with their level of receptiveness, are two crucial factors that impact the extent to which these technologies are embraced. Our study indicates that individuals who lack social ties and suffer sentiments of mistrust and neglect from human physicians are more likely to adopt clinical AI &

ML. These findings indicate that widespread acceptance of clinical AI and machine learning may need individuals to reduce their emotional attachment to humans and demonstrate less reliance on human physicians. Based on our findings, we recommend that prioritizing the establishment of trust, rather than diminishing confidence in physicians, should be the primary focus in any law regarding the use of clinical AI & ML.

Keywords: Healthcare, Artificial Intelligence, Machine Learning, Healthcare, Pandemic.

INTRODUCTION

Nevertheless, the worldwide ramifications of the coronavirus epidemic persist. Presently, the worldwide tally of COVID-19 infections has exceeded 160 million, leading to a death toll of around 3.5 million (1). An important challenge to worldwide efforts in controlling the pandemic is the emotional and physical fatigue experienced by healthcare staff, as well as the burden on clinical resources (2, 3). Modern technology is considered essential in providing the required support (4-6). Recent developments in cloud storage, processing capacity, and big data have significantly enhanced clinical artificial intelligence (AI), leading to improved speed, accuracy, and efficiency in clinical diagnostics and treatments in the battle against the crisis. To effectively lessen the workload on healthcare professionals and testing facilities globally, it is crucial to provide reliable and precise diagnoses. The widespread use of clinical AI & ML might potentially decrease the transmission of diseases. For example, clinical artificial intelligence (AI) has been used to detect coronavirus by analyzing audio recordings of persons producing sound. This technology has the potential to be integrated into mobile applications on current devices. At first, the use of clinical artificial intelligence (AI) and machine learning (ML) has the potential to be a less disruptive but similarly effective intervention compared to the existing limited techniques

Challenges to adopting Artificial Intelligence

The potential of clinical AI & ML to greatly enhance accessibility and delivery of healthcare services during the crisis is evident. However, investigations into the implementation of these technologies also highlight obstacles and challenges that may hinder their adoption. One such challenge is the reluctance of individuals to interact with clinical AI & ML as opposed to human doctors (13). Further studies indicate that patients possess a significant dislike for clinical artificial intelligence (AI), to the point where they have less trust in AI and machine learning (ML) compared to a human doctor (13-15). Although AI and ML are capable of recommending therapies that patients want and performing at a level equivalent to doctors, there is still a persistent lack of confidence (16).

These findings confirm the idea that people have a tendency to avoid depending on algorithmic advice. Sazu et al. (19) and Jahan et al. (14) have undertaken research indicating that individuals without expertise in the field highly appreciate algorithmic help in clinical scenarios, especially when it is derived from objective criteria. Studies have shown that when it comes to decision-making situations including utilitarian goals, artificial intelligence (AI) and machine learning (ML) algorithms are favored over human beings (20). This suggests that the use of clinical artificial intelligence (AI) and machine learning (ML) is intended to make up for something and that some people may favor algorithmic decision-making over human judgment. There is a lack of available

material. Interacting with the provider might possibly endanger their lives, as seen in the case of triage services for coronavirus (21, p. 447). Furthermore, several studies have shown that the level of acceptance of AI and ML agents relies on psychological aspects, such as consumer trust (22–24), as well as individual traits like open-mindedness.

Based on this reasoning, those who are doubtful about doctors may see AI & ML physicians as more reliable, leading to a higher inclination to accept and use clinical AI. This aligns with Turkle's (28) forecast: if our expectations for technology are elevated, our expectations for human contact may be diminished, and vice versa.

Overall, the existing study on the use of AI & ML by persons in the therapeutic domain is ambiguous and fails to consider the unique conditions of the present pandemic. Furthermore, these research only assess a limited number of instances where clinical AI and ML might successfully cooperate with physicians to mitigate the impact of the crisis and the social consequences of implementing clinical AI. This research aims to assess the extent to which humans are willing to embrace clinical AI & ML in the context of potential global health catastrophes, such as the coronavirus. Our goal is to facilitate a productive discussion on the factors that might impact the acceptability and use of clinical AI, with the aim of providing important insights to researchers and policymakers.

Method

During the early stage of the global crisis, America conducted two comprehensive polls from April to May 2020. The purpose of these surveys was to gather data from a representative sample of the public to aid in the implementation of coronavirus responses by applying methods from social and behavioral science. The surveys were implemented as part of an international research cooperation. The user's text consists of the number 29. The experiment received ethical approval from the Institutional Review Board. In addition, before participating in the surveys, each respondent provided written informed permission voluntarily. America used the Danish language, whereas Canada adopted the French language. Following the prescribed validation techniques (30). The surveys that participants answered were similar in character, starting with.

The study used a set of five metrics, presented in a random order, to assess participants' inclination to embrace clinical AI & ML (as opposed to human involvement) in addressing the coronavirus pandemic. Participants were provided with the option to choose either a human doctor or a clinical artificial intelligence and machine learning system for their diagnosis. The participants were directed to evaluate their level of trust in a human doctor by providing a score on a 7-point scale, ranging from 1 (no trust at all) to 7 (full trust). Furthermore, the participants were requested to evaluate their level of certainty in a clinical artificial intelligence and machine learning system using the same rating scale.

Please rate your degree of concern, on a 7-point scale, about the chance that a human physician, particularly a physician, may fail to recognize the uniqueness of your disease while examining your test results. Participants were instructed to evaluate their level of concern over the potential for clinical AI & ML to overlook their own circumstances while analyzing test results. The rating scale spanned from 1 (indicating no level of disturbance) to 7 (indicating a high level of worry). This statistic was obtained from a study done by Jahan et al. (13). The evaluation of concern about

the distinctiveness of your ailment is performed using a 7-point scale. On this scale, a rating of 1 signifies complete absence of worry, whilst a rating of 7 signifies a significant level of anxiety. This scale was derived from the study done by Sazu et al. (12).

Participants responded to seven standardized items assessing their support for anti-coronavirus legislation, belief in conspiracy theories, openness to new ideas (informed by Sazu (31)), dispositional traits (32), feeling of connection (33), and risk ideology (34). Specific items were intentionally created for this objective. Ultimately, the participants provided vital information on gender, economic status, and marital status. We examined individuals' endorsement of conspiracy theories, since the dissemination of false information has resulted in contentious associations between the transmission of the coronavirus and sophisticated technologies (35, 36).

RESULTS AND DISCUSSION

Our inquiry aims to predict the preference of participants for clinical AI & ML in comparison to human physicians. Considerations include the sense of uniqueness, lack of focus, and the perception of reliability towards both AI and ML, as well as human physicians. Furthermore, our evaluations include an analysis of personality traits, including support for anti-coronavirus measures, acceptance of conspiracy theories, openness to novel concepts, optimistic mindset, level of social connectedness, self-esteem, perception of the threat posed by the coronavirus, and political ideologies. Furthermore, we take into account demographic variables such as age, gender, and socioeconomic status.

Descriptive Statistics

Table 1 displays summary statistics on perceived religion, uniqueness comprehension, apathy, and physician selection in the United States. Both countries demonstrate that physicians had a greater mean score in terms of perceived trust and a comparable mean score in terms of perceived uniqueness and neglect, as compared to clinical AI. When it comes to selecting a doctor, it was found that clinical artificial intelligence and machine learning were chosen in less than 10 percent of cases. These findings indicate that most participants expressed a preference for human physicians rather than AI when it comes to detecting disorders connected to the coronavirus. However, a significant number of persons ($n_{\text{Canada}} = 54$ and $n_{\text{America}} = 53$) chose to use clinical AI, which allowed for the execution of the defined studies

Primary Analyses

The aforementioned characteristics were indicative of individuals' preference for clinical AI & ML as opposed to physicians. However, this analysis revealed that the nation variable had no significant impact on the models and was thus excluded.

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Table 1
Summary Data for the Primary Predictors and Selections for America.

		Denmark		France	
		Mean	SD	Mean	SD
Trust	Human	.76	.20	.85	.16
	AI	.56	.25	.63	.25
Uniqueness neglect	Human	.47	.24	.69	.23
	AI	.52	.24	.70	.25
		Count	Percentage	Count	Percentage
Physician choice	Human	512	90.46	542	90.79
	AI	54	9.54	55	9.21

Note: Responses standardized on a scale from 0 to 1.

The nation component was used as a covariate in the final model. The modeling outcomes are shown as an odds ratio (OR), which is a statistical measure that quantifies the association between an exposure and an outcome.

Table 2
Summary of Logistics Regression

Predictors	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Intercept	.03	.02 –.05	.03	.02 –.05	.03	.02 –.05
Uniqueness neglect [AI]	.75	.55–1.01	.77	.57–1.05	.76	.56–1.03
Uniqueness neglect [Human]	1.46	1.09–1.97	1.42	1.06–1.93	1.44	1.07–1.96
Trust [AI]	7.41	4.85–11.80	7.55	4.89–12.17	7.44	4.82–12.00
Trust [Human]	.31	.23 –.41	.31	.23 –.41	.31	.23 –.41
Personality traits						
Anti-COVID-19 policy support			.87	.67–1.14	.87	.67–1.14
Belief in conspiracy theories			.86	.65–1.13	.85	.63–1.11
Open-mindedness			1.79	1.08–3.00	1.92	1.14–3.26
Trait optimism			1.11	.82–1.52	1.09	.80–1.50
Social belonging			.61	.45 –.84	.64	.46 –.89
Self-esteem			1.14	.86–1.52	1.15	.86–1.54
COVID-19 risk perception			1.04	.82–1.33	1.00	.78–1.27
Political ideology			1.09	.86–1.38	1.12	.88–1.42
Demographics						
Age					.81	.63–1.03
Sex					.92	.72–1.16
Socioeconomic Status (SES)					1.00	.80–1.25
Rural residence					.83	.64–1.05
Country [France]					.97	.61–1.54
Observations	1129		1129		1129	
R ² Tjur	.20		.22		.23	
AIC	544.31		544.35		547.88	
BIC	569.45		609.72		638.41	

Model 1 focuses on the primary components that determine the result. The research revealed that three characteristics significantly forecast the selection of a certain category of physician. The variables influencing this are as follows: a lack of faith in human physicians (OR = .31, 95% CI (.23, .41)), a disregard for individuality by human doctors (OR = 1.46, 95% CI (1.09, 1.97)), and a belief in the efficacy of clinical AI & ML (OR = 7.41, 95% CI (4.85, 11.80)). Individuals who

possess a heightened awareness of their personal uniqueness, have less trust in human physicians, and rely more on AI and ML doctors are more likely to choose for clinical AI.

The observed effects on trust and uniqueness remain consistent. This implies that those who are more receptive to novel ideas and exhibit less conformity are more likely to choose for an AI & ML doctor.

Simultaneously model three variables together with the crucial demographic characteristics of the people. The findings indicate that demographic factors have little impact on the adoption of clinical AI. Furthermore, the results obtained from Models 1 and 2 remain consistent even after including demographic data, as seen in Figure 1.

Model 3 displays the ratios of the factors of clinical AI & ML usage in Figure 1. It is important to understand that in this specific situation, dots are used to represent odds ratios, while lines are utilized to display 95% confidence intervals. The color red is used to denote negative coefficients, whereas the color blue is utilized to indicate positive coefficients. Furthermore, the symbols * $p < .05$, ** $p < .01$, and *** $p < .001$ denote different degrees of statistical significance. The number is less than 0.001.

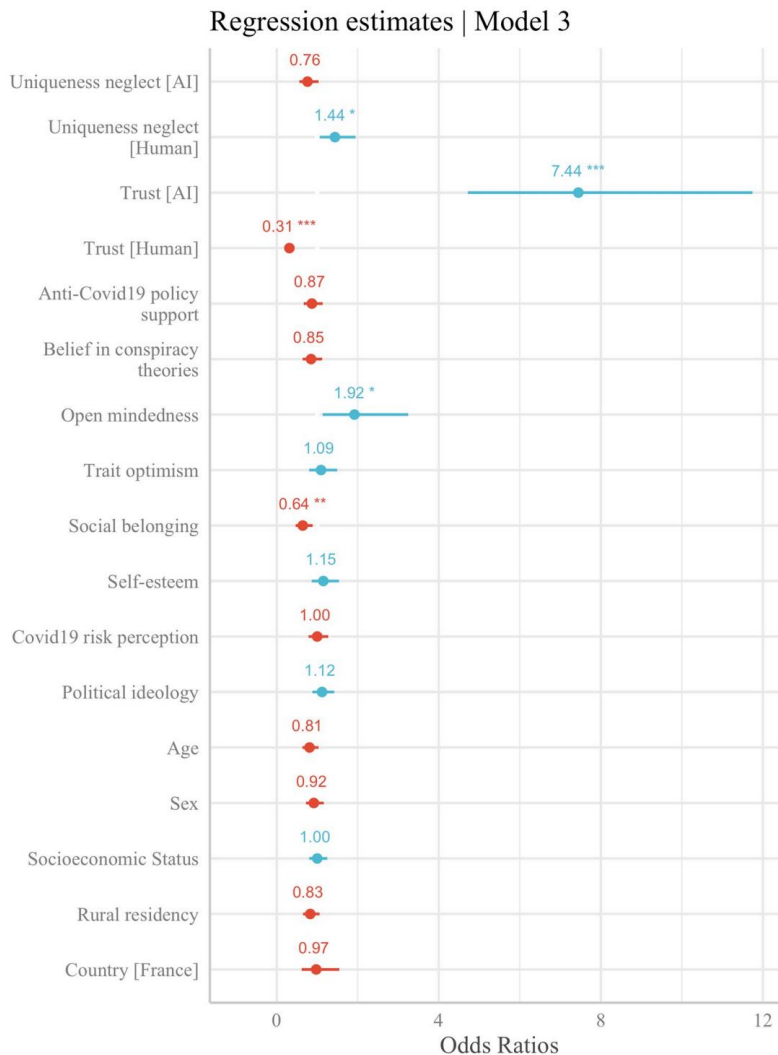


Figure 1: Ratio for Indicators of Clinical AI & ML Utilization

Discussion

This model predicts the likelihood of humans embracing clinical AI and ML during a worldwide crisis. According to our survey, which used two representative samples from Europe, over 10% of participants expressed a preference for an AI & ML physician over a human physician. Our research findings challenge the idea that people's decisions to adopt clinical AI & ML during the COVID-19 pandemic are influenced by AI's disregard for individuality. This study uncovers the impact of the perception that human physicians do not appreciate individuality, the decline in people's confidence in doctors, and their sense of being socially isolated (due to a lack of social connection) on the adoption of clinical artificial intelligence. Our research affirms the critical importance of belief in artificial intelligence and receptiveness in healthcare.

The author has made substantial contributions to the fields of cognition and social sciences. The current study offers significant contributions. This research highlights the crucial significance of trust in the adoption and application of artificial intelligence (AI), as shown by previous studies (16, 23, 24, 38). We are particularly focused on the importance of trust in the use of AI & ML in clinical decision-making (13–15), particularly in the context of a global health crisis.

AI and ML fail to adequately consider their distinctive characteristics (13). Recent research suggests that the acceptance of clinical AI is mostly impacted by human physicians' failure to recognize the apparent uniqueness of AI, rather than AI itself disregarding this uniqueness. This discovery contradicts earlier ideas. Surprisingly, this effect is beneficial. People are more inclined to go for an AI and ML doctor. Our research indicates that the impact of human physicians neglecting uniqueness is quite insignificant when compared to the dependence that individuals have on clinical artificial intelligence. The occurrence may be ascribed to the amalgamation of individuality and disrespect, which contribute to the cultivation of faith in artificial intelligence.

Additionally, our study indicates that persons had poorer ratings in recognizing clinical AI. People who have a sense of disconnection or isolation from people during times of crisis may have a higher inclination to form interactions with non-human alternatives. The idea is supported by the positive impact of both the skepticism and apathy of human physicians towards individual needs on the acceptance of clinical AI. The topic of technology's ability to promote separation and disconnect us from our inherent human traits has been widely discussed in the field of AI & ML philosophy and ethics (28, 39, 40). Unfortunately, due to the cross-sectional nature of our study, we are unable to definitively determine the source of this phenomenon. Hence, it is essential for future studies to examine if people exhibit a predilection for clinical AI & ML due to a sense of detachment from humanity, or conversely, whether their fondness for AI & ML leads to their disconnection from humanity.

Ultimately, we acknowledge open-mindedness as a crucial characteristic that may be used to accurately anticipate the inclination towards clinical AI & ML as opposed to a human doctor. Open-mindedness is a crucial need for humans to recognize and embrace innovations. This study (25) highlights the need of having a receptive attitude in incorporating artificial intelligence into the public sector. Moreover, this approach may be applied to the clinical judgments made by humans

Practical and Societal Consequences

Our research indicates that it is essential to prioritize the cultivation of trust in artificial intelligence. This is particularly evident in the field of therapy, where, despite the superior skills of AI and ML compared to human physicians in certain activities, such as performing specialized jobs, there is a lack of faith. Nevertheless, while it is important to enhance trust in clinical AI & ML, this should not be achieved by diminishing trust in human physicians. The purpose of AI & ML is to support and enhance humans rather than replace or harm them, therefore it should not be seen as a zero-sum game where one person's benefit comes at the expense of another. Hence, it is imperative for managers and policymakers to actively work towards enhancing confidence in clinical AI & ML, while simultaneously avoiding any actions that would erode trust in medicine, research, and human physicians.

Challenges

In order to assess its applicability to a broader population, the study was done on a representative sample of American individuals, although it lacked ethnic variety (42-45). In addition, the study does not investigate real-world behaviors. Instead, it employs cross-sectional data and self-report metrics to illustrate the factors behind people's inclination towards clinical AI & ML as opposed to physicians. This adds complexity to the process of establishing a cause-and-effect relationship (46–49). By using stringent processes to eliminate possible biases and use specialized expertise to examine causal linkages, we aim to optimize the accuracy and significance of our results (50). However, the capacity to reproduce this research could be restricted because of the exceptional circumstances linked to a worldwide crisis. Therefore, we suggest implementing additional fundamental principles investigated in this work, in order to strengthen confidence in the overall integrity of clinical AI & ML technology. When contemplating the use of AI & ML technology, it is intriguing to examine the required degree of trust to successfully reduce people's hesitancy towards these technologies in the context of compensating decision-making.

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Conflict of Interest Statement

No conflict of interest has been declared by the authors.