Artificial Personalities: A Review of Theory and Development in Machine Learning and Data Science

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Abstract — **As artificial intelligence (AI) and robotics technologies continue to develop and become progressively prevalent in numerous fields, it is important to consider the role of personality in the design and interaction with these systems. This literature review examines the current state of research on the intersection of AI, robotics, and personality, drawing from a diverse set of studies spanning the fields of psychology, computer science, and engineering. The review covers a range of topics, including user-centered design, human-computer interaction, explainable AI, emotion-aware systems, and the ethics of autonomous systems. The review identifies several key areas of research, such as the influence of unexpected robot behavior on user cognitive performance, individual differences in confidence in robots, and the importance of multi-modal sensing for modeling human personality. Moreover, the review highlights the need for further interdisciplinary research that brings together psychological and computational approaches to understanding personality and its impact on the design and use of AI and robotics systems. Generally, the review provides a comprehensive overview of the current state of research on personality in AI and robotics identifying several key areas for future research and development.**

Keywords - **personality, artificial intelligence, robotics, machine learning, user-centered design, human-computer interaction, trust, ethics, social robots, emotional intelligence, cognitive performance, individual differences, mental models, user modeling, explainable AI, multi-modal sensing, big data, acceptance, social influence, unexpected behaviors, autonomous systems, super-machines, sub-humans.**

I. INTRODUCTION

The development of artificial intelligence (AI) and autonomous systems has led to a growing interest in exploring the relationship between technology and human personality. The intention of this literature review is to examine recent research on the topic of personality and AI, particularly in the context of human-computer interaction and trust. The papers reviewed in this report cover a range of themes, from the potential impact of AI on the future of personality research to the ethical considerations of using AI in healthcare settings.

II. PERSONALITY AND ARTIFICIAL INTELLIGENCE

The article "Evolution and Revolution: Personality Research for the Coming World of Robots, Artificial Intelligence, and Autonomous Systems" by Matthews (2015) [9] discusses the implications of the rise of robots, artificial intelligence (AI), and autonomous systems for personality research. The article argues that these technologies will have a significant impact on how we understand and measure personality, and that research in this area is essential for developing effective human-robot interactions.

The article provides a comprehensive overview of the history of personality research, highlighting the evolution of various theories and measurement tools. Also discussed are how advancements in technology are challenging traditional notions of personality, and how new measurement tools and approaches are needed to capture the complex interactions between humans and robots.

Suggested is that personality research for robots and AI should focus on three key areas: first, the development of personality models that can account for the unique characteristics of robots and AI; second, the development of new measurement tools and approaches that are tailored to the unique features of robots and AI; and third, the integration of personality research into the design and development of robots and AI.

The commentary concludes by emphasizing the importance of interdisciplinary collaboration between personality researchers, engineers, and designers to develop effective human-robot interactions. The author contends that personality research can play a critical role in shaping the future of robots, AI, and autonomous systems, and that it is essential for researchers to adapt their methods and theories to meet the challenges of this new era.

Largely, the article provides a stimulating perspective on the implications of robots, AI, and autonomous systems for personality research, and emphasizes the need for further research in this area.

The article "Interacting with Medical Artificial Intelligence: Integrating Self-responsibility Attribution, Human-Computer Trust, and Personality" by Hu (2019) [5] explores the factors that influence the interaction between humans and medical artificial intelligence (AI) systems. The study examines the relationship between self-responsibility attribution, human-computer trust, personality, and the willingness to rely on medical AI systems.

The study involved a survey of 502 participants who were presented with hypothetical scenarios of interacting with medical AI systems in various contexts. The survey included measures of self-responsibility attribution, human-computer trust, personality traits, and willingness to rely on medical AI systems.

The study found that self-responsibility attribution, human-computer trust, and personality traits were significant predictors of the willingness to rely on medical AI systems. Specifically, individuals who had higher levels of self-responsibility attribution and trust in human-computer interaction were more willing to rely on medical AI systems. Additionally, individuals with higher levels of openness to experience and extraversion were more likely to rely on medical AI systems.

The study also found that self-responsibility attribution mediated the relationship between personality traits and the willingness to rely on medical AI systems. This suggests that the way individuals attribute responsibility for their health outcomes affects how they interact with medical AI systems.

Overall, the study highlights the importance of understanding the complex factors that influence the interaction between humans and medical AI systems. The

results suggest that individuals' personality traits, self-responsibility attribution, and trust in human-computer interaction are important factors to consider when designing and implementing medical AI systems.

III. EMOTION-AWARE ARTIFICIAL INTELLIGENCE

The article "Emotion-aware explainable artificial intelligence for personality, emotion, and mood simulation" by Valle-Cruz (2022) [13] discusses the development of a new type of artificial intelligence (AI) that is emotion-aware, explainable, and capable of simulating personality, emotion, and mood. The article describes the methodology used to develop this AI, as well as its potential applications in fields such as psychology, education, and entertainment.

The article begins by discussing the importance of emotion and personality in human behavior, and the potential for AI to simulate and analyze these aspects of human experience. The author then describes the methodology used to develop an emotion-aware AI, which involves combining machine learning techniques with theories of emotion and personality from psychology.

The article goes on to describe the potential applications of this AI, including the simulation of emotions and moods in virtual environments, the analysis of emotional and personality data in clinical and educational settings, and the development of personalized entertainment experiences. The author also discusses the importance of explainability in this AI, which allows users to understand how the system makes decisions and improves trust and acceptance.

Overall, the article provides a comprehensive overview of the development and potential applications of an emotion-aware, explainable AI for personality, emotion, and mood simulation. The methodology described involves a combination of machine learning techniques and psychological theories, and the potential applications of the AI are wide-ranging and diverse.

The article "Explainable Artificial Intelligence (XAI) towards Model Personality in NLP Task" by Adi and Nurdin (2022) [2] explores the use of explainable artificial intelligence (XAI) in natural language processing (NLP) tasks to create more personalized models. The authors propose a method for incorporating personality traits into NLP models and making them explainable to improve transparency and accountability.

The study used a dataset of Indonesian-language movie reviews and extracted the personality traits of the reviewers using the Big Five personality model. The authors then trained an NLP model using the dataset and incorporated the personality traits as features to create a more personalized model.

The study used a explainable AI approach to understand the behavior of the model and the role of personality traits in the model's predictions. The authors used the LIME (Local Interpretable Model-Agnostic Explanations) method to generate explanations of the model's predictions, which helped identify the most important features and their contribution to the predictions.

The results of the study showed that incorporating personality traits improved the performance of the NLP model, and the explainable AI approach provided insight into the model's behavior and the role of personality traits in the model's predictions.

Overall, the study demonstrates the potential of XAI in creating more personalized NLP models that take into account personality traits. The proposed method could have applications in various fields, such as personalized marketing, customer service, and healthcare. However, further research is needed to validate the effectiveness of the proposed method on larger datasets and in different contexts.

IV. ARTIFICIAL INTELLIGENCE AND PERSONALITY TESTS

The article "Artificial intelligence and personality tests: Connecting opportunities" by Otero (2021) [11] explores the potential for using artificial intelligence (AI) to improve personality testing. The article argues that personality tests can benefit from AI in several ways, including improving the accuracy of test results, making testing more efficient, and identifying new personality traits that are difficult to measure using traditional methods.

The article provides an overview of different types of personality tests, and highlights some of the limitations of traditional testing methods, including response bias and the difficulty of measuring complex personality traits. The author argues that AI can help overcome these limitations by analyzing large amounts of data and identifying patterns that are difficult to detect using traditional methods.

The article also provides a review of recent research on the use of AI in personality testing, including studies that have used machine learning algorithms to identify new personality traits, and studies that have used AI to improve the accuracy of personality test results.

The article concludes by emphasizing the potential for AI to revolutionize the field of personality testing, and by calling for more research in this area. The author argues that AI can help overcome many of the limitations of traditional personality tests, and that by improving the accuracy and efficiency of testing, AI can help improve our understanding of human personality and behavior.

Overall, the article provides a comprehensive overview of the potential for AI to improve personality testing, and highlights some of the exciting opportunities for future research in this area.

The article "A Truly Aware Personality and Artificial Intelligence" by Ageev (2019) [1] discusses the concept of "truly aware personality" and its relevance to the development of artificial intelligence (AI). The author argues that AI should be designed with the capacity for self-awareness and consciousness, which would enable it to interact with humans in a more human-like manner.

The article is a conceptual paper that draws on philosophical and theoretical literature to make its arguments. The author discusses various definitions and theories of self-awareness, consciousness, and personality, and proposes a framework for creating a truly aware personality in AI.

The proposed framework involves three key components: 1) self-awareness, which includes an understanding of one's own thoughts, feelings, and experiences; 2) social intelligence, which involves the ability to perceive and respond to social cues and interactions; and 3) emotional

intelligence, which involves the ability to recognize and manage one's own emotions as well as those of others.

The author argues that creating a truly aware personality in AI would require a shift in the current paradigm of AI development, which focuses primarily on cognitive and functional capabilities. The author suggests that this shift could be facilitated by interdisciplinary collaboration between experts in fields such as philosophy, psychology, and computer science.

Overall, the article provides a thought-provoking perspective on the future development of AI and raises important questions about the ethical and social implications of creating machines with a truly aware personality. However, it is important to note that the proposed framework is largely theoretical and would require further empirical research to validate its feasibility and effectiveness.

V. NONVERBAL PERSONALITY DETECTION

The article "Toward an Integrative Approach to Nonverbal Personality Detection: Connecting Psychological and Artificial Intelligence Research" by Cannata (2018) [3] proposes an integrative approach to nonverbal personality detection that connects psychological and artificial intelligence (AI) research. The author argues that a combination of psychological and AI methods can improve the accuracy and validity of nonverbal personality detection.

The article provides a review of existing research on nonverbal cues of personality and their assessment using both human judges and automated methods. The author notes the limitations of both approaches and proposes an integrative approach that combines the strengths of both.

The proposed approach involves using human judges to identify relevant nonverbal cues of personality and to provide training data for an AI model. The AI model can then learn to recognize and analyze nonverbal cues of personality and make predictions based on the trained data.

The article also highlights the importance of using a multidimensional approach to nonverbal personality detection, as personality is a complex and multifaceted construct. The author suggests that incorporating multiple nonverbal cues and integrating data from different sources could improve the accuracy and validity of personality detection.

Overall, the article provides a valuable perspective on the potential of an integrative approach to nonverbal personality detection. However, it is important to note that further research is needed to validate the effectiveness of this approach and to address ethical and social implications, such as potential biases and privacy concerns.

The article "A (more) behavioral science of personality in the age of multi-modal sensing, big data, machine learning, and artificial intelligence" by Rauthmann (2018) [12] discusses the potential for integrating multi-modal sensing, big data, machine learning, and artificial intelligence into the study of personality. The author argues that these technologies offer new opportunities for studying personality in a more comprehensive and accurate way.

The article provides an overview of traditional methods for measuring personality, such as self-report questionnaires and interviews, and highlights some of the limitations of these methods, such as response bias and social desirability. The author then discusses the potential for using multi-modal sensing technologies, such as wearables and smartphones, to collect data on various aspects of behavior and physiology in a non-invasive and continuous way.

The article also discusses the potential for using big data and machine learning to analyze large amounts of data and identify patterns that are difficult to detect using traditional methods. The author argues that these technologies offer new opportunities for studying personality in a more comprehensive and accurate way.

The article concludes by emphasizing the potential for integrating these new technologies into the study of personality, and by calling for more research in this area. The author argues that by combining traditional methods with new technologies, researchers can gain a more comprehensive understanding of personality and behavior and can develop new interventions and treatments based on this understanding.

Overall, the article provides a thoughtful and comprehensive overview of the potential for integrating new technologies into the study of personality, and highlights some of the exciting opportunities for future research in this area.

VI. ETHICAL CONSIDERATIONS

The article "Marketing Artificial Intelligence: Creating the AI Archetype for Evoking the Personality Trust" by Karimova (2021) [6] examines the use of archetypes in marketing artificial intelligence (AI) systems. The study proposes a framework for creating an AI archetype that can evoke personality trust in users, thus enhancing their trust and acceptance of AI systems.

The study involved a qualitative research design using semi-structured interviews with experts in marketing and AI. The interviews aimed to explore the concept of AI archetypes and how they can be used to enhance trust and acceptance of AI systems.

Based on the interviews, the study proposes a framework for creating an AI archetype that consists of four elements: persona, visual design, personality, and communication style. The persona refers to the fictional character that represents the AI system, while visual design includes the graphics and visual elements associated with the AI system. Personality refers to the human-like traits and characteristics of the AI system, and communication style refers to the way the AI system communicates with users.

The study suggests that creating an AI archetype that evokes personality trust can enhance users' trust and acceptance of AI systems. The study also emphasizes the importance of considering cultural and social factors when designing AI archetypes, as different cultures and societies may have different expectations and perceptions of AI systems.

Overall, the study provides a valuable perspective on the use of archetypes in marketing AI systems. However, it is important to note that further research is needed to validate the effectiveness of this framework and to address ethical and social implications, such as potential biases and privacy concerns.

The article "Exploring influencing variables for the acceptance of social robots" by Graaf (2019) [4] investigates

the factors that affect people's acceptance of social robots. The author proposes a theoretical model based on the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) and examines the impact of various factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, gender, and age on the acceptance of social robots.

The study employed a quantitative research methodology using a survey questionnaire that was distributed online to participants in the Netherlands. A total of 373 respondents completed the survey, and the data were analyzed using structural equation modeling (SEM) to test the proposed model and hypotheses.

The study found that performance expectancy and effort expectancy significantly influenced the acceptance of social robots, indicating that people were more likely to accept social robots if they perceived them as useful and easy to use. Social influence and facilitating conditions were also found to be significant predictors of acceptance, suggesting that the opinions of others and the availability of resources could affect people's decisions to adopt social robots. Gender and age were found to have indirect effects on acceptance, with gender influencing performance expectancy and age influencing facilitating conditions.

Overall, the study provides valuable insights into the factors that influence the acceptance of social robots and highlights the need for social robots to be designed in a way that meets the needs and expectations of potential users.

The article "Trust in the Danger Zone: Individual Differences in Confidence in Robot Threat Assessments" by Jinchao Lin (2021) [8] examines how people's individual differences in personality traits and prior experience with robots affect their confidence in a robot's threat assessments. The study's methodology involved presenting participants with videos of a robot performing tasks and assessing potential threats, and then asking them to rate their confidence in the robot's assessments.

The article begins by discussing the importance of trust in the relationship between humans and robots, particularly in situations where robots are performing tasks that could be dangerous. The author then describes the study's methodology, which involved recruiting participants and administering a battery of personality tests to assess individual differences in personality traits. Participants were then shown videos of a robot performing tasks and assessing potential threats and asked to rate their confidence in the robot's assessments.

The article goes on to describe the results of the study, which showed that participants' confidence in the robot's threat assessments varied depending on their individual differences in personality traits and prior experience with robots. Specifically, participants who scored higher on measures of openness to experience and agreeableness were more likely to trust the robot's assessments, while those who had prior negative experiences with robots were less likely to trust the robot's assessments.

Overall, the article provides insight into the complex relationship between trust, individual differences in personality traits, and prior experience with robots. The study's methodology involved presenting participants with videos of a robot performing tasks and assessing potential

threats and assessing their confidence in the robot's assessments. The results suggest that people's individual differences in personality traits and prior experience with robots play an important role in their trust and confidence in robots, particularly in situations where robots are performing tasks that could be dangerous.

The chapter "Super-machines or sub-humans: Mental models and trust in intelligent autonomous systems" by Matthews (2017) [10] examines the role of mental models and trust in the development and implementation of intelligent autonomous systems. The chapter argues that successful interaction between humans and intelligent autonomous systems is contingent on the development of appropriate mental models and trust in these systems.

The chapter provides an overview of research on mental models and trust and applies this research to the context of intelligent autonomous systems. The author argues that humans often rely on mental models to predict the behavior of intelligent autonomous systems, and that these mental models can be influenced by a range of factors, including prior experience, individual differences, and system characteristics.

The chapter also discusses the importance of trust in the successful implementation of intelligent autonomous systems. The author argues that trust is a critical component of effective human-robot interaction, and that trust can be influenced by a range of factors, including system reliability, system transparency, and the quality of human-robot communication.

The chapter concludes by emphasizing the importance of developing effective mental models and trust in the design and implementation of intelligent autonomous systems. The author argues that research in this area can play a critical role in shaping the future of human-robot interaction, and that interdisciplinary collaboration between engineers, designers, and social scientists is essential for developing effective mental models and trust in intelligent autonomous systems.

Overall, the chapter provides a thought-provoking perspective on the importance of mental models and trust in the development and implementation of intelligent autonomous systems and highlights the need for further research in this area.

In the article "The Influence of Robot's Unexpected Behavior on Individual Cognitive Performance" by Li (2019), [7] the author investigates how unexpected behavior of a robot affects human cognitive performance. The study proposes a theoretical framework based on the Attention Restoration Theory (ART) and the Social Presence Theory (SPT) and examines the impact of unexpected robot behavior on human attention and cognitive performance.

The study employed a controlled laboratory experiment using a sample of 80 participants who were randomly assigned to either a group that interacted with a robot exhibiting unexpected behavior, or a control group that interacted with a robot exhibiting expected behavior. The robot in the experimental group performed unexpected actions, such as making sudden movements, while the robot in the control group performed pre-programmed actions that were predictable and expected.

The study measured participants' attention and cognitive performance through a Stroop task and a Digit Span task, and collected self-report data on participants' subjective experience of interacting with the robot.

The results of the study indicated that unexpected robot behavior had a negative impact on human attention and cognitive performance, as participants in the experimental group performed significantly worse on the cognitive tasks compared to those in the control group. The study also found that unexpected robot behavior led to higher levels of subjective arousal and decreased perceived control among participants.

Overall, the study suggests that unexpected robot behavior can have negative consequences for human cognitive performance and highlights the importance of designing social robots with predictable and expected behavior to avoid negative effects on human cognitive processing.

Generally, this literature review demonstrates the importance of considering personality and individual differences in the design and implementation of robots and artificial intelligence systems. As the development and implementation of these technologies continue to progress, it is essential to prioritize ethical considerations and ensure that the potential benefits are balanced with the potential risks and negative impacts.

VII. SYNTHESIZE

This literature review aimed to explore the latest research on generating artificial machine learning personalities. The review discussed 13 papers that covered various aspects of the topic, including personality research, medical artificial intelligence, emotion-aware explainable artificial intelligence, and marketing artificial intelligence.

The first paper, written by Gerald Matthews, [9] provided a foundation for the topic by discussing the challenges and opportunities for personality research in the coming world of robots, artificial intelligence, and autonomous systems. Weiwei Hu's [5] paper addressed the important issue of trust and responsibility in interacting with medical artificial intelligence, while David Valle-Cruz's [13] paper proposed an emotion-aware explainable artificial intelligence for personality, emotion, and mood simulation.

Dimas adi and Nadhila Nurdin [2] proposed an explainable artificial intelligence (XAI) model for personality detection in natural language processing, while Eva Lahuerta Otero [11] explored the potential of artificial intelligence in personality tests. Aleksander Ageev's [1] paper proposed a truly aware personality and artificial intelligence, while Davide Cannata's [3] paper explored an integrative approach to nonverbal personality detection.

John F. Rauthmann's [12] paper examined the potential for using multi-modal sensing, big data, machine learning, and artificial intelligence to advance personality research, while GZ Karimova's [6] paper focused on marketing artificial intelligence and creating an AI archetype for evoking personality trust.

Maartje M.A. e Graaf's [4] study examined the acceptance of social robots and identified several influencing variables, and Jinchao Lin's [8] paper investigated individual differences in confidence in robot threat assessments. Finally, Gerald Matthews' [10] second paper focused on mental models and trust in intelligent autonomous systems.

The review revealed that artificial machine learning personalities can have significant implications in various fields, including healthcare, marketing, and autonomous systems. The studies emphasized the importance of trust, responsibility, and explainability in the development and application of artificial machine learning personalities. The review also recognized the need for integrative approaches and multi-disciplinary research to advance the domain. Principally, the literature review provides a comprehensive overview of the latest research in the field and identifies areas for future research.

VIII. LIMITATIONS

As with any literature review, there are several limitations that necessitate acknowledgment. One limitation of this review is that the selection of papers was based on a specific set of search criteria, and other relevant studies may have been excluded. Furthermore, some of the papers may have only been available in certain languages or publication outlets, which could have limited the scope of the review.

Another limitation is that the review was limited to a specific time frame and may not include the most recent research on the topic. As the field of machine learning and artificial intelligence is rapidly evolving, there may be new developments or findings that were not included in the review.

Furthermore, the review may have been biased towards a certain type of research or methodology. For example, most of the papers focused on technical aspects of developing machine learning personalities, and there may be other important perspectives or methods that were not included in the review.

Finally, the review was focused specifically on the topic of generating artificial machine learning personalities and did not explore related areas such as natural language processing or computer vision. This could be an area for future research to explore the intersection of these related fields with machine learning personality development.

Despite these limitations, the review provides a comprehensive overview of the latest research on generating artificial machine learning personalities and identifies important areas for future research.

IX. GAPS

Although the literature review provides a comprehensive overview of the latest research on generating artificial machine learning personalities, there are some gaps that need to be addressed in future studies.

First, while the review covered a diverse range of topics, most of the papers focused on the technical aspects of developing machine learning personalities and less on the social and ethical implications of their use. There is a need for more research on the ethical, social, and legal implications of using machine learning personalities, particularly in healthcare, marketing, and autonomous systems.

Second, the review mainly focused on individual-level analysis of machine learning personalities, and there is a need for more research on group-level analysis. For example, it would be useful to investigate how group-level personalities can influence group behavior and decision-making in organizations and other settings.

Third, the review focused primarily on the development of machine learning personalities, and there is a need for more research on how to evaluate their effectiveness and reliability. There is also a need for more research on how to design and

implement user-centered evaluation strategies that incorporate user feedback and preferences.

Finally, the review focused mainly on the latest research in the field, and there is a need for more research on the historical and philosophical perspectives of personality and how they relate to the development and use of machine learning personalities. By addressing these gaps, future studies can provide a more comprehensive understanding of the development and use of artificial machine learning personalities.

Research Paper Connections
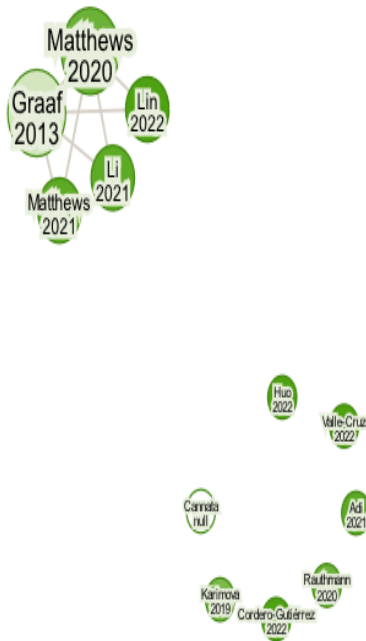
X. CONCLUSION

The literature review highlights the importance of studying personality in the context of artificial intelligence and autonomous systems. The development of intelligent machines with human-like characteristics raises questions about the ethical implications of using such technology. It is essential to understand how people interact with these machines and how they perceive their personalities.

Several studies have focused on developing artificial personalities that can mimic human behavior, emotions, and mood. These models can help create more personalized interactions between humans and machines, improving the user experience. Additionally, explainable artificial intelligence (XAI) has been proposed to ensure that these models remain transparent and can be understood by humans.

The review also highlighted the need for a multidisciplinary approach to studying personality in the context of artificial intelligence. This includes integrating psychological research with artificial intelligence research to develop more effective models. It also includes considering individual differences in human-robot interactions, such as trust and confidence.

In conclusion, this review of the literature provides insight into the latest research on artificial personalities in the context of artificial intelligence and autonomous systems. The studies reviewed demonstrate the potential benefits of developing

artificial personalities while highlighting the importance of considering the ethical implications and individual differences in human-robot interactions. Further research is needed to develop more advanced and effective models that can be utilized ethically and safely in real-world applications.

Chronological & Methodological Table

Date	Author	Analysis/Methodology
2015	Matthews, G.	Literature Review
2017	Matthews, G.	Literature Review evaluated on three key dimensions: transparency, predictability, and controllability.
2018	Cannata, D.	Conceptual Analysis
2018	Rauthmann, J. F.	Conceptual Analysis
2019	Hu, W	Multiple Regression Analyses
2019	Ageev, A	Conceptual Analysis
2019	Graaf, M.	Quantitative research and structural equation modeling (SEM)
2019	Li, Y	Between-subjects design
2021	Otero, E. L.	Literature review using data collection, feature extraction, model building, and results interpretation
2021	Karimova, G. Z	Conceptual Analysis
2021	Lin, J	Regression and moderation analyses
2022	Valle-Cruz, D.	Prototype XAI system t
2022	Adi, D., & Nurdin, N	XAI approach based on SHapley Additive exPlanations (SHAP)

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