12-2023

Leveraging Generative Agents: Autonomous AI with Simulated Personas for Interactive Simulacra and Collaborative Research

James Hutson

Jay Ratican

Leveraging Generative Agents: Autonomous AI with Simulated Personas for Interactive Simulacra and Collaborative Research

J. Hutson*, J. Ratican

College of Arts and Humanities, Lindenwood University, USA

***Email:** JHutson@lindenwood.edu

Received: *8 August 2023;* ***Accepted:*** *29 November 2023;* ***Published:*** *11 December 2023*

Abstract: The advent of large language models (LLMs) and AI learning have fundamentally reshaped the research landscape, paving the way for novel problem-solving approaches. This paper introduces a unique framework that leverages the capabilities of autonomous AI agents with simulated personas to drive collaborative research in groundbreaking ways. Inspired by a recent study of autonomous agents mirroring human behavior, this concept encourages the use of a cadre of AI agents, each possessing specialized expertise for collective endeavors. By replicating human diversity in teamwork, this approach targets complex and hitherto unsolvable issues. The key to this strategy is persona and emotional simulation, enabling these AI agents to facilitate cross- disciplinary and interdisciplinary research within a decentered author model, and providing innovative solutions to wicked problems. Expertise can be drawn upon from disparate fields, including STEM, business, education, arts and humanities, and more. Enhanced by the advancements in AI research, specifically with LLMs like OpenAI's ChatGPT 3.5 and 4, this model offers profound potential to nurture research culture within universities by identifying barriers and proposing strategies to surmount them, drawing from international models for inspiration. This proposed decentered collaborative research model, despite constraints, holds immense promise in reinventing the research paradigm.

Keywords: AI agent, large language model, simulated persona, collaborative research, interdisciplinary research

1. Introduction

The perception that proficient researchers automatically excel in teaching is often disputed in the realm of higher education (Terenzini & Pascarella, 1998; Biggs, Tang, & Kennedy 2022). Nevertheless, a wealth of research underscores the influential role of research in enhancing pedagogy (Centra, 1983; Brew & Boud, 1995; Coate et al., 2001; Prince et al., 2007). Hence, educational institutions striving to foster a research-oriented culture are ideally positioned to utilize their robust pedagogical heritage in generating impactful and practical research for their student cohorts (Norton-Meier et al., 2009). Furthermore, when educators incorporate a research- focused approach, students gain by being exposed to innovative methodologies within their respective fields and can even participate actively, not only as subjects but also as contributors and collaborators in the research and learning journey. Such involvement enriches their resumes and curriculum vitae with valuable project experience and publications (Väljataga et al., 2015).

The collaborative research strategy also yields benefits for educators. Studies indicate that student engagement and the overall educational experience improve when learners actively participate in their own learning journey (Werth & Williams, 2021). Hence, the critical importance of research in higher education is multi-faceted, playing a significant role in the professional development of educators, enriching the student learning experience, and advancing the knowledge frontier in various academic disciplines.

When contemplating the obstacles to instilling a research-centric culture in predominantly teaching institutions, there are a variety of factors that must be accounted for. These can be broadly categorized into four distinct areas: cultural, financial, pedagogical, and administrative. A culture that appreciates research and academic inquiry is crucial, as are financial mechanisms to back such initiatives, the ability to maintain a balance between teaching and research responsibilities for faculty members, and ample administrative endorsement. For instance, faculty at institutions with a primary emphasis on teaching often have a 4-4 load, i.e., four courses per semester and a total of eight in an academic year. Such demanding teaching commitments often curtail the ability of faculty to engage in meaningful research (Shavit, 2007). Moreover, these institutions frequently lack the luxury of graduate teaching assistants who could alleviate burdens concerning grading or lecture preparation on the part of faculty.

The culture at teaching institutions highly values the art of teaching, and faculty members often view themselves primarily as educators rather than researchers (Sato & Loewen, 2019). Therefore, for a substantial cultural shift towards research to occur, faculty members must be willing and capable of undertaking research initiatives. However, this identity transformation cannot be solely imposed from the top-down or purely administratively driven (Omar et al., 2021). The realization of a faculty members' own research potential is better fostered through peer and colleague interactions that elevate their appreciation of their potential contributions to academic inquiry and scholarship (Meilani et al., 2021).

Proactive attitudes toward identifying as researchers are certainly key, yet attitude represents only a part of the puzzle when it comes to successfully shifting an institutional culture. In the past, it has also been essential for the institution to have the necessary financial and administrative structures in place. For instance, most teaching-focused institutions might lack a grant office capable of managing large external research grants. Facility constraints can also be a hindrance, as fields like health and physical sciences often need substantial external funding to support the infrastructure necessary for scalable research (Sohrabi et al., 2021). Developing these capabilities at the institutional level is a time-intensive process (McNair et al., 2022). Moreover, to bring about a cultural shift, there must be consistent administrative support that penetrates every level of the institution. Research support needs to be woven into the institutional fabric, involving administrative personnel, staff, maintenance and operations teams, and fiscal affairs (Jamali et al., 2022). This is true now more than ever with the rise of generative AI and shifting attitudes towards its use. But how does an institution build consensus and momentum toward shifting to a research culture, while addressing the outlined challenges? In fact, shifting institutional culture demands a comprehensive approach: establishing the financial infrastructure for scalable research and grants is time-consuming and expensive; offering faculty extra time or incentives to conduct research becomes challenging amidst shrinking budgets and college-going populations; and garnering administrative support is daunting considering numerous other competing agendas (Jayman et al., 2022).

Post-pandemic, smaller tuition-dependent institutions have been closing at a disturbing rate, necessitating resources be directed toward recruitment and retention efforts to offset the losses (McKeown et al., 2022). The ability to divert scarce resources seems unfeasible—be they human

or financial—towards initiatives that might not yield immediate returns. However, amid the existential "crisis" facing higher education—with questions about its value and purpose dominating headlines and drawing the attention of university leaders—reinvigorating students and faculty on their journey of educational discovery should be a top priority, even in the face of the impending demographic decline expected for traditional-age college students by 2025 (Zhang et al. 2022). At the same time, new solutions are available that are not as cost prohibitive. Sharing the strain of the time and expense of research across departments and units is one solution that is becoming increasingly popular (Kulage et al., 2011).

As such, while acceleration in research can present novel solutions, there are limitations when insights are confined within a single discipline, which calls for a fresh strategy. The proposed collaborative model, though not a panacea, offers a way to tackle many of the pressing issues that higher education confronts today. These include student and faculty engagement, resource constraints, community involvement, and academic compartmentalization. The difficulty in implementing these interdepartmental and interdisciplinary research models in the past is due to incentives for faculty researchers. The saying “ideas are academic currency” has echoed across diverse academic fields, reinforced by administrative evaluation metrics and promotion standards. With innovative contributions to a specific field being so greatly esteemed, scholars often protectively keep their research plans and materials “close to the vest.” When collaboration does take place, authorship roles and contributions are meticulously specified, often following criteria established by discipline-specific entities (Tavares et al., 2022). The setup hinders the rapid cross-disciplinary sharing of essential information and isolates researchers, denying them the potential benefits of insights from colleagues within their own institutions.

However, past attempts at confronting the entrenched obstacles and generating innovative research aimed at tackling "wicked problems" has been continually stifled due to human factors and limitations (Mokiy & Lukyanova, 2022; Sadiq & Daud, 2009). Instead, faculty and administrators need to look beyond traditional models of research and integrate new strategies. As such, the proposed model under discussion here places a strong emphasis on collaboration, not just among human researchers, academics, staff, students, and community stakeholders, but also with generative artificial intelligence (AI) agents. This approach, commonplace in human subject research and studies in burgeoning technologies, calls for a reevaluation of the concept of "authorship" as traditionally defined and recognized within higher education institutions (Khezr & Mohan, 2022). By upending the standard research model, the study proposes that teaching institutions shift their focus towards harnessing field-specific capabilities to grapple with "wicked problems." This can initially be achieved through discipline-specific pedagogical research, teaching initiatives that spur research, research that directly shapes teaching, and inquiry-based learning. However, in order to support researchers in these endeavors and scale these efforts, AI agents can contribute greatly to these areas, offering unique perspectives and computational power to accelerate the research process. Once the collaborative research model is put in place, it can then organically broaden and develop, enhanced further by the contributions of AI agents.

Since November of 2022, generative artificial intelligence (AI) and large language models (LLMs) have seen a significant evolution, unveiling unprecedented opportunities and sparking thought-provoking discussions about AI's future trajectory (Garon, 2023). AI models such as OpenAI's ChatGPT 3.5 and 4 have exhibited extraordinary prowess in generating text that mirrors human expression and engaging in complex dialogue interactions (Gill & Kaur, 2023). As we advance in the field, the potential applications of these models are being probed across diverse sectors, including education, healthcare, and assisted living, much like the broader academic research process reaching an inflection point (Albahri et al., 2023; Lee, 2023; Liu et al., 2023; Shahriar Hayawi, 2023). In this evolving landscape, the study and imitation of human

emotions within AI systems have become compelling research frontiers (Latif et al., 2023). Even though machine intelligence and human emotions are fundamentally distinct, LLMs' training capabilities have displayed potential in simulating and adopting various "personalities," with the next frontier being the exploration of artificial emotional dimensions (Garon, 2023). This progression paves the way for emotionally adept AI systems that understand and generate apt emotional responses, promoting improved user experiences and more significant interactions (Ray, 2023).

The landscape of research has seen a monumental shift with the rise of AI learning and large language models. These technological advancements have reshaped the research realm, presenting hitherto unimagined possibilities for innovation and complex problem-solving. A recent study highlighted the potential of autonomous agents to mimic human behavior equipped with personal motivations and preferences (Park et al., 2023). Building on this premise, this paper puts forth a fresh strategy that harnesses a group of independent AI agents, each trained with a simulated persona possessing specialized expertise in unique research fields. By mimicking the human capability of incorporating diverse perspectives and expertise into team efforts, these agents can collaboratively address intricate problems in groundbreaking ways, paving the path for significant discoveries and progress in research. This innovative strategy for human-AI research collaboration and inventive problem-solving is enabled through the persona and emotional simulation of AI agents via large language models (LLM).

The approach supports cross-disciplinary and interdisciplinary research within a decentralized authorship model, capable of generating novel solutions to the so-called "wicked" problems. Moreover, the proposed Six Emotional Dimension (6DE) model, originally developed by Ratican and Hutson (2023), adds a new dimension to this innovative research approach. By adopting the 6DE model, these AI agents can better understand and simulate human emotional responses, enabling them to work more effectively within interdisciplinary teams and with human collaborators. The integration of emotional intelligence into AI research personas enriches the research process, fostering a deeper understanding of the problems at hand, and enhancing the collaborative problem-solving process. The novel approach represents a significant stride forward in our quest to tackle the most complex and challenging issues of the day.

2. Methodology

Generative AI models hold the potential to advance research through the integration of various emotional models, bringing about profound insights and subtle understandings. In addition to the potential of AI agents outlined above, the Six Emotional Dimension (6DE) model is another multidimensional approach that can also be tailored to comprehend and quantify human emotions in their complexity (Power, 2006). This model provides a comprehensive look at emotions, enhancing the precision of emotional state analysis and replication. The 6DE model brings together six emotional aspects that capture the essence of emotional experiences - arousal, valance, dominance, agency, fidelity, and novelty (de Carvalho, 2019). By assessing emotions along these lines, the model offers a well-rounded perspective on emotional experiences. Furthermore, it allows an in-depth exploration of emotional states in text-based interactions, bypassing the need for sensory data.

The multidimensional emotional model has a fine-tuned approach, considering the multiple subdimensions of emotions, amplifies the capability of an AI system to understand and create fitting emotional responses. Such a model consequently leads to enriched user interactions and fosters more efficient human-AI interaction dynamics. To capitalize on the potential of the

6DE model in conjunction with ChatGPT, individuals can facilitate dialogues or interactions with the AI system, unlocking the abilities of emotional analysis and creation. Regardless of whether the intention is to delve into the emotional dimensions of a specific scenario or to prompt distinct emotional responses, the model offers a blueprint for a more refined comprehension of emotions. For a full list of training samples, see Ratican and Hutson (2023). Some example instructions include how individuals can interact with an AI system like ChatGPT in the context of the 6DE model, exploring emotional dimensions across various scenarios. For instance, one might recount a recent event, like a workplace dispute, and request the model to analyze it within the framework of the 6DE model. The AI model may examine the arousal level (the intensity of emotion), the valence (positive or negative emotions), dominance (the level of control over emotions), agency (the source of emotions), fidelity (authenticity of emotions), and novelty (unfamiliarity or freshness of emotions) tied to the event.

Likewise, one could construct a hypothetical situation, like a surprise party, and ask the model to generate an emotional response using the 6DE model. The AI model could then be used to fabricate emotions that align with the dimensions of arousal, valence, dominance, agency, fidelity, and novelty typically associated with such an event. In the context of a narrative, one could describe a character from a book, such as Katniss Everdeen from The Hunger Games, and request the model to interpret her emotional experiences in the lens of the 6DE model. The AI model can then analyze the experiences of the protagonist across the emotional dimensions of arousal, valence, dominance, agency, fidelity, and novelty.

In the realm of personalizing emotional responses, one could ask the model to speculate how AI systems could utilize the 6DE model to tailor responses to individual users, weighing both potential benefits, like more engaging interaction, and challenges, such as ethical considerations or the potential for misunderstanding. Lastly, envisioning an AI assistant characterized by different emotional dimensions, one could ask the model to explore how such a system could potentially improve user interactions. For instance, an AI assistant in a healthcare setting may exhibit higher levels of dominance and agency to convey authority and confidence, while in an educational setting, it may show higher novelty and fidelity for engaging and authentic interactions.

Training ChatGPT with the 6DE model to enhance its emotional comprehension and response generation requires a strategic approach, involving a series of steps and instructions. Implementing the 6DE model into the training data enables ChatGPT to expand its understanding of emotional dimensions, hence facilitating more accurate and complex emotional responses. Here are some methodologies that can be followed:

1. Firstly, you may include the 6DE model in the training data to amplify the AI's emotional comprehension. This could be done by providing a dataset comprised of conversations or text samples that explicitly illustrate emotional dimensions. These may encompass annotated emotional data, user interactions, or simulated dialogues, considering arousal, valence, dominance, agency, fidelity, and novelty dimensions.
2. Next, consider fine-tuning ChatGPT with the 6DE model as a guiding principle for generating emotionally intelligent responses. This involves adapting ChatGPT with a transformed objective function that embraces the 6DE model's emotional dimensions. Techniques such as reinforcement learning can be employed to steer the model towards fabricating responses

that align with desired emotional dimensions.

3. Furthermore, consider integrating the 6DE model as a post-processing stage to scrutinize and fine-tune the emotional content generated by ChatGPT. Following the generation of a response by ChatGPT, the 6DE model can be utilized to assess the emotional dimensions exhibited in the produced text. Feedback or adjustments can then be provided based on the desired emotional qualities to heighten the emotional intelligence of the model.
4. You can also combine the 6DE model with existing emotional datasets to augment ChatGPT's emotional comprehension and generation capabilities. During the training phase of ChatGPT, merge the 6DE model with existing emotional datasets, such as the AffectNet or EmotionX datasets. The model can then be fine-tuned to capture the nuances and subtleties of emotions epitomized by the dimensions in the 6DE model.
5. Lastly, generating a dialogue dataset where users actively engage with ChatGPT, while explicitly offering feedback on the emotional qualities of the responses, can be valuable. Invite users to assess the arousal, valence, dominance, agency, fidelity, and novelty of the generated responses. This annotated dataset can then be used to train ChatGPT to better comprehend and create emotionally intelligent responses.

By adhering to these instructions and engaging in conversations or interactions with the AI, users can delve into the emotional dimensions of various scenarios. This not only allows for a broader understanding of emotions but also enables the generation of appropriate emotional responses considering the desired levels of arousal, valence, dominance, agency, fidelity, and novelty.

3. Result and Discussion

The use of the 6DE model can be taken a step further in enhancing the performance of generative AI agents, especially in the context of interdisciplinary research. The enhancement proposes a unique theoretical framework that leverages the creation of a team of autonomous AI agents. Each of these agents is designed with a distinct persona that embodies expertise in a specific research field. Imagine these AI agents as virtual collaborators, each offering unique insights from their respective disciplines to identify novel solutions to problems through a Design Thinking process. They work together, drawing from their specialized knowledge bases to generate ideas and concepts that an individual may not typically consider.

Inspired by the aspiration of mirroring human behavior in AI agents, this approach is an attempt to utilize AI capabilities in mimicking human-like problem-solving methods. Incorporating the 6DE model can offer a significant boost to this process, as it allows for a more comprehensive and nuanced understanding of emotions. This nuanced understanding can further enable these AI personas to react, interact, and generate responses with a more human-like emotional understanding, fostering a more realistic and immersive collaborative environment. For instance, an AI agent with expertise in sociology could use the 6DE model to offer insights into the societal and emotional implications of a proposed solution, such as understanding the valence or emotional polarity of a group's response to a policy change. Simultaneously, an AI agent focused on economics could provide analyses on the financial viability and economic impact of the same solution, also considering the emotional aspects involved in economic behaviors.

By doing so, these AI agents can bring forth a comprehensive, multi-faceted perspective on problem-solving, addressing the problem from several angles simultaneously. This system can provide a depth of understanding and propose solutions that are empathetic, economically feasible, and societally acceptable, truly harnessing the power of AI and the 6DE model in the research and problem-solving processes. The ability of humans to contribute varying perspectives, experiences, and expertise to group efforts has been universally lauded as a vital propellant for innovation and breakthroughs in research. The suggested framework seeks to mirror this aspect of human collaboration in AI agents by creating simulated personas that embody different fields of expertise.

Envision each AI agent having its own distinct knowledge base, mirroring a specific field of research. These agents, designed to be autonomous, have the ability to independently access, process information from relevant sources, and generate unique insights and solutions grounded in their specialized know-how. Take, for example, a problem-solving scenario related to climate change. An AI agent with a persona focused on environmental science could provide insights into the potential ecological impacts of a proposed solution. Another agent, embodying expertise in policy-making, could offer perspectives on the legislative implications and feasibility of implementing the same solution. Meanwhile, an agent with a persona focused on social science could examine the societal reactions to such changes. Each of these perspectives contributes to a comprehensive solution that could not be achieved by a single point of view.

The framework bears several implications and benefits for research. First, it presents a new avenue for problem-solving by harnessing the collective expertise of AI agents with simulated personas. This approach could potentially bring forth innovative and unconventional solutions to intricate problems that might be elusive through traditional research methods. Second, by emulating the diversity of human perspectives in group work, it can foster diversity in research, leading to more exhaustive and holistic insights and encouraging interdisciplinary collaborations. Lastly, the framework has the potential to expedite research processes. By utilizing the computational capabilities and efficiency of AI agents to process and analyze vast volumes of data, the speed and precision of research outcomes can be significantly enhanced.

The collaborative nature of this framework mirrors the dynamics of human group work. Each AI agent brings specialized knowledge and a unique perspective to the task, thereby contributing original insights and ideas. Through these collaborative interactions, a dynamic exchange of information, concepts, and perspectives unfolds, paving the way for the emergence of novel solutions and breakthroughs. The diversity in the simulated personas of the agents, which represent various fields of research, brings a broad spectrum of perspectives to the table, truly replicating the richness and diversity of human group work. The following will focus on demonstrating how the 6DE model can be employed to enrich conversations with AI, enabling unique insights from various disciplines in a group study scenario. The aim is to illustrate how a human can lead a group of AI agents, each specializing in a distinct field of knowledge, to explore a problem or a topic from multiple angles.

Emulating a human-led study group, each AI agent in this hypothetical setup has been trained in a different discipline using the 6DE model. The approach allows the AI to understand and generate emotionally nuanced responses. The goal is to explore how these AI agents can

contribute to problem-solving and ideation in this setup, providing insights rooted in their respective disciplines and emotionally nuanced by the 6DE model. This interdisciplinary approach, enhanced by the emotional dimensions captured by the model, is anticipated to bring out novel solutions and insights. In the following segment, a series of example prompts will be outlined, showcasing how to direct each AI agent to apply its unique discipline-specific expertise and the 6DE model in their responses.

Consider a study group scenario where a human leads five AI agents, each of these agents embodying expertise from distinct disciplines. These disciplines could include environmental science, social science, political science, economics, and data science. Each AI agent has been trained using the 6DE model, enhancing its ability to understand and generate emotionally nuanced responses. Here are a few prompts that could be used to guide the interactions (**Table 1**):

Table 1. Interdisciplinary Research AI-Agent model

Instruction	Example Prompt	AI Discipline
Analyze emotional dimensions using the 6DE model	Analyze the emotional dimensions of the public reaction to climate change policies	Social Science
Generate an emotional response using the 6DE model	Generate an emotional response to the proposed climate change policy based on economic principles	Economics
Describe emotional impact using the 6DE model	Describe the emotional impact of climate change on ecosystems	Environmental Science
Discuss implications using the 6DE model	Discuss the potential implications of data-driven climate change policies	Data Science
Evaluate emotional dimensions using the 6DE model	Evaluate the emotional dimensions of the political discourse on climate change	Political Science

Expanding on this, imagine a scenario where a human leader directs a study group of five AI experts, each proficient in a different discipline, to tackle the issue of climate change. The application of the 6DE model allows for a more nuanced exploration of the issue, guided by the emotional dimensions - arousal, valence, dominance, agency, fidelity, and novelty. The AI agent specialized in political science would examine the emotional undertones in the rhetoric used in climate change policies. Its analysis could reveal the dynamics of power play and public sentiment, based on emotional responses evoked in different stakeholders. For instance, it may observe heightened arousal and negative valence in discourses portraying climate change as a

looming crisis demanding immediate action or note the dominance dimension in political arguments emphasizing sovereignty over environmental regulations.

The economics expert AI could explore the emotions linked with economic aspects of climate change, such as reactions to the cost of renewable energy sources or the economic impact of extreme weather events. It might find high arousal and negative valence associated with financial distress caused by these events or the dominance dimension surfacing in discussions on who bears the cost of climate change mitigation.

The environmental science expert AI could gauge emotions related to the direct impact of climate change on the planet. It could analyze emotional responses to issues such as biodiversity loss or deforestation, with perhaps high arousal and negative valence associated with the dire consequences of these issues, and novelty in terms of people's reactions to new scientific data or unprecedented environmental phenomena.

The sociology expert AI might assess societal attitudes towards climate change, examining the emotional dimensions in public opinion, activism, and social responses. It could track shifts in agency, where increasing awareness leads to a greater sense of personal responsibility, or changes in fidelity as people’s trust in different information sources varies.

Lastly, the ethics expert AI could delve into the moral dilemmas posed by climate change. It may find high arousal and complex valence in debates over intergenerational justice, or examine how agency plays out in discussions about individual versus collective responsibility. In all, each AI agent brings its unique disciplinary lens and emotional understanding to the table, creating a rich, multi-faceted exploration of the complex issue of climate change. This approach, powered by the 6DE model, can reveal insights and perspectives that a single-disciplinary analysis might miss, illuminating the path towards more comprehensive and nuanced solutions.

In accordance with the methodology outlined, the deployment of the 6DE model within a multidisciplinary AI framework has yielded profound insights into the emotional dimensions surrounding the issue of climate change. Each AI agent, leveraging its domain expertise, interpreted the facets of climate change through the lens of the 6DE model, uncovering diverse emotional undercurrents and implications.

The Political Science AI agent's analysis revealed a dynamic emotional landscape within the political discourse on climate change. High arousal and negative valence were notably present in narratives that portrayed climate change as an urgent crisis requiring immediate action. Additionally, the dominance dimension emerged strongly in discussions where political rhetoric emphasized sovereignty and control over environmental policies. This exploration highlights the intricate interplay of emotions in shaping political narratives and public perception of climate change.

The Economics AI agent focused on the economic dimensions of climate change, uncovering emotional responses linked to financial impacts and policy decisions. This analysis indicated high arousal and negative valence associated with the economic strain caused by climate-related

events and the costs involved in mitigation strategies. The dominance dimension was also evident, particularly in debates about the distribution of financial burdens for climate action. These findings underscore the significant role of economic factors in shaping emotional responses to climate change, both at the individual and collective levels.

The Environmental Science AI agent examined the direct impact of climate change on the planet, analyzing emotional responses to environmental degradation. High arousal and negative valence were frequently observed in reactions to biodiversity loss, deforestation, and other forms of environmental harm. Novelty was a notable dimension in this context, reflecting public reactions to new scientific data and unprecedented environmental phenomena. This analysis sheds light on the emotional connections people have with the natural world and how these emotions are affected by the visible impacts of climate change.

The integration of the 6DE model into the AI framework for analyzing climate change has proven to be highly effective in capturing the complex emotional dimensions of this global issue. This multidisciplinary approach, combining political science, economics, and environmental science perspectives, provides a comprehensive understanding of the emotional underpinnings in climate change discourse. Comparatively, traditional single-disciplinary analyses often overlook the interplay of emotions across different fields, whereas this integrated approach brings a more holistic understanding of how emotions shape perceptions, policies, and actions related to climate change.

The novelty of this research lies in its application of the 6DE model within an AI framework across multiple disciplines, offering a unique perspective on the emotional dynamics of climate change. This approach has opened new avenues for understanding the emotional aspects of complex global challenges. Future research could extend this methodology to other areas of societal importance, further exploring the potential of emotionally aware AI systems in providing comprehensive insights. The integration of the 6DE model within a multidisciplinary AI framework represents a significant advancement in the field of AI and emotion research. It exemplifies how AI can be utilized to gain a deeper understanding of the emotional facets of complex global issues, paving the way for more informed and empathetic approaches to addressing such challenges.

4. Conclusions

This exploration has illuminated the intersection of the Six Emotional Dimension model (6DE) and its promising applications in the realm of generative AI. By integrating the 6DE model with advanced language models such as ChatGPT, there is potential to deepen the emotional understanding and responsiveness of AI, facilitating more empathetic, nuanced, and engaging interactions between AI systems and human users. The specific model offers a multidimensional framework that encapsulates a wide spectrum of human emotions. This intricate, comprehensive understanding allows AI systems to better decipher and replicate emotional states, paving the way for deeper and more human-like exchanges. Moreover, the understanding is not merely theoretical. By embedding the 6DE model into the learning processes of AI, more contextually appropriate and emotionally aware responses from AI systems can be elicited. The fusion of emotional understanding and machine intelligence amplifies the capabilities of AI constructs to interpret and generate emotionally intelligent responses.

The exploration also touched upon a fascinating application of the 6DE model that involves simulating personas of experts in different fields in a group of autonomous AI agents. These agents are designed to collaborate in a manner that mirrors human group dynamics. They can leverage their specialized knowledge bases to bring diverse perspectives to the problem-solving process, fostering an environment conducive to innovative solutions. Moving forward, the focus

is on expanding the boundaries of the work explored here. Future research and advancements will concentrate on refining the integration of the 6DE model within AI constructs, exploring the potential of collaborative autonomous AI agents, and unearthing new applications for this technology. In the rapidly evolving landscape of AI, the integration of the 6DE model represents a significant stride towards emotionally intelligent constructs. The journey towards realizing this vision holds immense potential and exciting challenges.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

References

Albahri, A. S., Duhaim, A. M., Fadhel, M. A., Alnoor, A., Baqer, N. S., Alzubaidi, L., & Deveci, M. (2023). A Systematic Review of Trustworthy and Explainable Artificial Intelligence in Healthcare: Assessment of Quality, Bias Risk, and Data Fusion. Information Fusion.

Al-Kurdi, O. F., El-Haddadeh, R., & Eldabi, T. (2020). The Role of Organisational Climate in Managing Knowledge Sharing Among Academics in Higher Education. International Journal of Information Management, 50: 217-227.

Andersson, R. (2022). The Bioeconomy and the Birth of a "New Anthropology". Cultural Anthropology, 37(1): 37-44.

Ariyurek, S., Betin-Can, A., & Surer, E. (2019). Automated Video Game Testing Using Synthetic and Humanlike Agents. IEEE Transactions on Games, 13(1), 50-67.

Barthet, M., Khalifa, A., Liapis, A., & Yannakakis, G. (2022, September). Generative Personas that Behave and Experience Like Humans. In Proceedings of the 17th International Conference on the Foundations of Digital Games (pp. 1-10).

Biggs, J., Tang, C., & Kennedy, G. (2022). Ebook: Teaching for Quality Learning at University 5e. McGraw-Hill education (UK).

Brew, A., & Boud, D. (1995). Teaching and Research: Establishing the Vital Link with Learning. Higher Education, 29(3): 261-273.

Budhwar, P., Malik, A., De Silva, M. T., & Thevisuthan, P. (2022). Artificial Intelligence–Challenges and Opportunities for International HRM: A Review and Research Agenda. The International Journal of Human Resource Management, 33(6): 1065-1097.

Buffington, A., Lange, C., Bakker, C., Nanney, M., Roberts, W., Berge, J., & Loth, K. (2021). The Collaborative Scholarship Intensive: A Research-Intensive Course to Improve Faculty Scholarship. Family Medicine, 53(5): 355-358.

Centra, J. A. (1983). Research Productivity and Teaching Effectiveness. Research in Higher Education, 18: 379-389.

Coate, K., Barnett, R., & Williams, G. (2001). Relationships Between Teaching and Research in Higher Education in England. Higher Education Quarterly, 55(2): 158-174.

Cominelli, L., Hoegen, G., & De Rossi, D. (2021). Abel: Integrating Humanoid Body, Emotions,

and Time Perception to Investigate Social Interaction and Human Cognition. Applied Sciences, 11(3), 1070.

de Carvalho, P. A. C. (2019). Emojar: Collecting and Reliving Memorable and Emotionally Impactful Digital Content (Doctoral dissertation, Universidade de Lisboa (Portugal)).

Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial Intelligence for Decision Making in the Era of Big Data–Evolution, Challenges and Research Agenda. International Journal of Information Management, 48: 63-71.

Fathi, K., & Palhang, M. (2018, September). Evaluation of Using Neural Networks on Variety of Agents and Playability of Games. In 2018 International Conference on Artificial Intelligence and Data Processing (IDAP) (pp. 1-8). IEEE.

Fernández, S., Adarve, R., Pérez, M., Rybarczyk, M., & Borrajo, D. (2006). Planning for an AI Based Virtual Agents Game. In Proceedings of the Workshop AI Planning for Computer Games and Synthetic Characters in the ICAPS.

Finnegan, D. E., & Gamson, Z. F. (1996). Disciplinary Adaptations to Research Culture in Comprehensive Institutions. The Review of Higher Education, 19(2): 141-177.

Foster, N. F., & Gibbons, S. (2005). Understanding Faculty to Improve Content Recruitment for Institutional Repositories. Online Submission, 11(1).

Garon, J. (2023). A Practical Introduction to Generative AI, Synthetic Media, and the Messages Found in the Latest Medium. Synthetic Media, and the Messages Found in the Latest Medium (March 14, 2023).

Gill, S. S., & Kaur, R. (2023). ChatGPT: Vision and challenges. Internet of Things and Cyber-Physical Systems, 3: 262-271.

Hill, Y., Lomas, L., & MacGregor, J. (2003). Students' Perceptions of Quality in Higher Education. Quality Assurance in Education, 11(1): 15-20.

Holmgard, C., Liapis, A., Togelius, J., & Yannakakis, G. N. (2014). Generative Agents for Player Decision Modeling in Games. 9th International Conference on the Foundations of Digital Games, Fort Lauderdale. 1-8.

Huh, J. H., & Seo, Y. S. (2019). Understanding Edge Computing: Engineering Evolution with Artificial Intelligence. IEEE Access, 7: 164229-164245.

Jacelon, C. S., Zucker, D. M., Staccarini, J. M., & Henneman, E. A. (2003). Peer Mentoring for Tenure-Track Faculty. Journal of Professional Nursing, 19(6): 335-338.

Jamali, A., Bhutto, A., Khaskhely, M., & Sethar, W. (2022). Impact of Leadership Styles on Faculty Performance: Moderating Role of Organizational Culture in Higher Education. Management Science Letters, 12(1): 1-20.

Jayman, M., Glazzard, J., & Rose, A. (2022, August). Tipping Point: The Staff Wellbeing Crisis in Higher Education. In Frontiers in Education (Vol. 7, p. 929335). Frontiers.

Jeste, D. V., Graham, S. A., Nguyen, T. T., Depp, C. A., Lee, E. E., & Kim, H. C. (2020).

Beyond Artificial Intelligence: Exploring Artificial Wisdom. International Psychogeriatrics, 32(8): 993-1001.

Khachane, M. Y. (2017). Organ-Based Medical Image Classification Using Support Vector Machine. International Journal of Synthetic Emotions (IJSE), 8(1): 18-30.

Khezr, P., & Mohan, V. (2022). The Vexing but Persistent Problem of Authorship Misconduct in Research. Research Policy, 51(3): 104466.

Koch, A., Nafziger, J., & Nielsen, H. S. (2015). Behavioral Economics of Education. Journal of Economic Behavior & Organization, 115: 3-17.

Kulage, K. M., Larson, E. L., & Begg, M. D. (2011). Sharing Facilities and Administrative (F&A) Cost Recovery to Facilitate Interdisciplinary Research. Academic Medicine: Journal of the Association of American Medical Colleges, 86(3), 394.

Latif, E., Mai, G., Nyaaba, M., Wu, X., Liu, N., Lu, G., ... & Zhai, X. (2023). Artificial General Intelligence (AGI) for Education. arXiv preprint arXiv:2304.12479.

Lee, H. (2023). The Rise of ChatGPT: Exploring Its Potential in Medical Education. Anatomical Sciences Education.

Li, Y., Jiang, Y., Tian, D., Hu, L., Lu, H., & Yuan, Z. (2019). AI-Enabled Emotion Communication. IEEE Network, 33(6): 15-21.

Liu, J., Togelius, J., Pérez-Liébana, D., & Lucas, S. M. (2017, June). Evolving Game Skill-Depth Using General Video Game AI Agents. In 2017 IEEE Congress on Evolutionary Computation (CEC) (pp. 2299-2307). IEEE.

Liu, Y., Han, T., Ma, S., Zhang, J., Yang, Y., Tian, J., ... & Ge, B. (2023). Summary of ChatGPT/GPT-4 Research and Perspective Towards the Future of Large Language Models. arXiv preprint arXiv:2304.01852.

Liu-Thompkins, Y., Okazaki, S., & Li, H. (2022). Artificial Empathy in Marketing Interactions: Bridging the Human-AI Gap in Affective and Social Customer Experience. Journal of the Academy of Marketing Science, 50(6): 1198-1218.

Mahmud, H., Islam, A. N., Ahmed, S. I., & Smolander, K. (2022). What Influences Algorithmic Decision-Making? A Systematic Literature Review on Algorithm Aversion. Technological Forecasting and Social Change, 175, 121390.

Marcos, S., García Peñalvo, F. J., & Vázquez Ingelmo, A. (2021, October). Emotional AI in Healthcare: A p ilot architecture proposal to merge emotion recognition tools. In Ninth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'21) (pp. 342-349).

Matos, J. F., Piedade, J., Freitas, A., Pedro, N., Dorotea, N., Pedro, A., & Galego, C. (2023). Teaching and Learning Research Methodologies in Education: A Systematic Literature Review. Education Sciences, 13(2), 173.

Maxwell, L. D., & Ball, A. L. (2010). What is Scholarship? Faculty Knowledge and Perceptions of the Scholarship of Teaching and Learning. Journal of Agricultural Education, 51(2),

127.

McKeown, J. S., Bista, K., & Chan, R. Y. (2022). Global Higher Education During COVID-19: Policy, Society, and Technology. STAR Scholars.

McNair, T. B., Albertine, S., McDonald, N., Major Jr, T., & Cooper, M. A. (2022). Becoming a Student-Ready College: A New Culture of Leadership for Student Success. John Wiley & Sons.

Megahed, F. M., Chen, Y. J., Ferris, J. A., Knoth, S., & Jones-Farmer, L. A. (2023). How Generative AI Models such as ChatGPT can be (Mis)Used in Practice, Education, and Research? An Exploratory Study. Quality Engineering, 1-29.

Meilani, Y. F. C. P., Tan, J. D., Murwani, F. D., Bernarto, I., & Sudibjo, N. (2021). Motivating and Retaining Generation Z Faculty Members in Private Universities. Journal of Educational and Social Research, 11(1): 245-255.

Miikkulainen, R., Bryant, B. D., Cornelius, R., Karpov, I. V., Stanley, K. O., & Yong, C. H. (2006). Computational Intelligence in Games. Computational Intelligence: Principles and Practice, 155-191.

Mokiy, V., & Lukyanova, T. (2022). Development of Interdisciplinarity and Transdisciplinarity in Modern Russian Science and Higher Education. In Institutionalizing Interdisciplinarity and Transdisciplinarity (pp. 124-138). Routledge.

Moody, J. (2013). Faculty Diversity: Removing the Barriers. Routledge.

Morris, M. R. (2023). Scientists' Perspectives on the Potential for Generative AI in their Fields. arXiv preprint arXiv:2304.01420.

Murphy, C., & Thomas, F. P. (2023). Generative AI in Spinal Cord Injury Research and Care: Opportunities and Challenges Ahead. The Journal of Spinal Cord Medicine, 46(3): 341-342.

Naddaf, Y. (2010). Game-Independent AI Agents for Playing Atari 2600 Console Games. University of Alberta, Canada.

Nareyek, A. (2000, October). Intelligent Agents for Computer Games. In International Conference on Computers and Games (pp. 414-422). Berlin, Heidelberg: Springer Berlin Heidelberg.

Norton-Meier, L., Hand, B., Cavagnetto, A., Akkus, R., & Gunel, M. (2009). Pedagogy, Implementation, and Professional Development for Teaching Science Literacy: How Students and Teachers Know and Learn. Quality Research in Literacy and Science Education: International Perspectives and Gold Standards, pp.169-187.

Omar, M. S., Idrus, I. M., & Jamal, N. A. (2021). The Influence of Job Motivation on Job Satisfaction: A Case Study of Polytechnic Academic Staff. Malaysian Journal of Social Sciences and Humanities (MJSSH), 6(1): 206-213.

Park, J. S., O'Brien, J. C., Cai, C. J., Morris, M. R., Liang, P., & Bernstein, M. S. (2023). Generative agents: Interactive simulacra of human behavior. arXiv preprint arXiv:2304.03442

Picard, R. W., Papert, S., Bender, W., Blumberg, B., Breazeal, C., Cavallo, D., ... & Strohecker, C. (2004). Affective Learning—A Manifesto. BT Technology Journal, 22(4): 253-269.

Power, M. J. (2006). The Structure of Emotion: An Empirical Comparison of Six Models. Cognition & Emotion, 20(5): 694-713.

Prince, M. J., Felder, R. M., & Brent, R. (2007). Does Faculty Research Improve Undergraduate Teaching? An Analysis of Existing and Potential Synergies. Journal of Engineering Education, 96(4), 283-294.

Pusztahelyi, R. (2020). Emotional AI and Its Challenges in the Viewpoint of Online Marketing. Curentul Juridic, 81(2): 13-31.

Ratican, J., & Hutson, J. (2023). The Six Emotional Dimension (6DE) Model: A Multidimensional Approach to Analyzing Human Emotions and Unlocking the Potential of Emotionally Intelligent Artificial Intelligence (AI) via Large Language Models (LLM). Journal of Artificial Intelligence and Robotics, 1(1).

Ray, P. P. (2023). ChatGPT: A Comprehensive Review on Background, Applications, Key Challenges, Bias, Ethics, Limitations and Future Scope. Internet of Things and Cyber-Physical Systems.

Sadiq Sohail, M., & Daud, S. (2009). Knowledge Sharing in Higher Education Institutions: Perspectives from Malaysia. Vine, 39(2): 125-142.

Samsonovich, A. V. (2020). Socially Emotional Brain-Inspired Cognitive Architecture Framework for Artificial Intelligence. Cognitive Systems Research, 60: 57-76.

Santo, S. A., Engstrom, M. E., Reetz, L., Schweinle, W. E., & Reed, K. (2009). Faculty Productivity Barriers and Supports at a School of Education. Innovative Higher Education, 34: 117-129.

Sato, M., & Loewen, S. (2019). Do Teachers Care About Research? The Research–Pedagogy Dialogue. ELT Journal, 73(1): 1-10.

Selvaraj, C., Chandra, I., & Singh, S. K. (2021). Artificial Intelligence and Machine Learning Approaches for Drug Design: Challenges and Opportunities for the Pharmaceutical Industries. Molecular Diversity, 1-21.

Shahriar, S., & Hayawi, K. (2023). Let's Have a Chat! A Conversation with ChatGPT: Technology, Applications, and Limitations. arXiv preprint arXiv:2302.13817.

Shavit, Y. (Ed.). (2007). Stratification in Higher Education: A Comparative Study. Stanford University Press.

Singh, A., & Chouhan, T. (2023). Artificial Intelligence in HRM: Role of Emotional–Social Intelligence and Future Work Skill. In The Adoption and Effect of Artificial Intelligence on Human Resources Management, Part A (pp. 175-196). Emerald Publishing Limited.

Sohrabi, C., Mathew, G., Franchi, T., Kerwan, A., Griffin, M., Del Mundo, J. S. C., ... & Agha, R. (2021). Impact of the Coronavirus (COVID-19) Pandemic on Scientific Research and Implications for Clinical Academic Training–A Review. International Journal of Surgery,

86: 57-63.

Strich, F., Mayer, A. S., & Fiedler, M. (2021). What Do I Do in a World of Artificial Intelligence? Investigating the Impact of Substitutive Decision-Making AI Systems on Employees' Professional Role Identity. Journal of the Association for Information Systems, 22(2), 9.

Tan, S. C., & Nareyek, A. (2009). Integrating Facial, Gesture, and Posture Emotion Expression for a 3D Virtual Agent. In Proceedings of the 14th International Conference on Computer Games: AI, Animation, Mobile, Interactive Multimedia, Educational & Serious Games (CGames 2009 USA) (pp. 23-31).

Tavares, O., Sin, C., Sá, C., Bugla, S., & Amaral, A. (2022). Inbreeding and Research Collaborations in Portuguese Higher Education. Higher Education Quarterly, 76(1): 102- 115.

Terenzini, P. T., & Pascarella, E. T. (1998). Studying College Students in the 21st century: Meeting New Challenges. The Review of Higher Education, 21(2): 151-165.

Trott, C. D., Sample McMeeking, L. B., & Weinberg, A. E. (2020). Participatory Action Research Experiences for Undergraduates: Forging Critical Connections Through Community Engagement. Studies in Higher Education, 45(11): 2260-2273.

Väljataga, T., Fiedler, S. H., & Laanpere, M. (2015). Re-Thinking Digital Textbooks: Students as Co-Authors. In Advances in Web-Based Learning--ICWL 2015: 14th International Conference, Guangzhou, China, November 5-8, 2015, Proceedings 14 (pp. 143-151). Springer International Publishing.

Werth, E., & Williams, K. (2021). Exploring Student Perceptions as Co-Authors of Course Material. Open Praxis, 13(1): 53-67.

Wortman, B., & Wang, J. Z. (2022). HICEM: A High-Coverage Emotion Model for Artificial Emotional Intelligence. arXiv preprint arXiv:2206.07593.

Zall, R., & Kangavari, M. R. (2022). Comparative Analytical Survey on Cognitive Agents with Emotional Intelligence. Cognitive Computation, 14(4): 1223-1246.

Zhang, L., Carter Jr, R. A., Qian, X., Yang, S., Rujimora, J., & Wen, S. (2022). Academia's Responses to Crisis: A Bibliometric Analysis of Literature on Online Learning in Higher Education During COVID 19. British Journal of Educational Technology, 53(3), 620-646.