Discover Artificial Intelligence

Brief Communication

Attachment to AI- generated self-image in a twinning society: a perspective from empty self

Tharaka Wijesundara[1] · **Chamil Rathnayake**[2]

Received: 10 September 2024 / Accepted: 8 October 2024
Published online: 18 October 2024

Abstract
The rapid expansion of artificial intelligence (AI) across various fields has significantly impacted how individuals construct and present their identities, particularly on social media. This brief communication explains the concept of digital twinning within the public sphere, where AI-generated images create virtual twins. We examine the phenomenon of attachment to AI-generated self-image, proposing that a perceived sense of emptiness predicts attachment to AI-generated self-image. Using the empty self-theory as a theoretical foundation, we argue that individuals experiencing feelings of emptiness are more likely to form deep emotional bonds with their AI-generated self-image. They may find solace by associating their sense of emptiness with AI-generated self-images, similar to idealised images in advertising. This attachment can manifest as either subjective, where users believe the AI-generated image truly represents them, or objective, where the image is seen as a possession. In future research, it would be valuable to investigate the various factors that contribute to an individual's inclination to form an attachment to AI-generated self-images. Deep exploration of the difference between objective and subjective attachment and quantifying this proposed relationship through empirical studies could provide valuable insights into the interplay between technology and human psychology.

Keywords AI-generated self-image · Empty self · Digital twining · Attachment · AI

1 Introduction

The rapid expansion of the use of AI across various fields, from art [1] to medicine [2, 3], shows a dramatic intensification in the reliance on technology whereby society increasingly depends on computational processes. Social technologies are no exception in this context, as a wide range of AI tools shape how social media users construct their selves, develop identities, and interact with each other. The emergence of a third generation of social media manipulation, primarily driven by AI, blurs the boundary between real and synthetic content detectable by humans and machines [4]. Parallel to this development is the emergence of 'digital twins'— a wider transformation in technology where computational models are used to develop digital representations of real-life entities or systems [5]. Current academic work on digital twins strongly emphasises technological design and development [6–8]. We expand the notion of 'twining' to include networked social contexts consisting of social actors, objects that consist of the space, and relationships among actors that are digitally constructed and negotiated. An enhanced version of a photo (upgraded photo with the support of technology), generated through AI (using AI application) and shared on social media, can create a twin of an individual. When many AI-generated images are created, they can form a virtual society of twin, blurring the lines between reality

✉ Tharaka Wijesundara, T.wijesundara@gre.ac.uk; Chamil Rathnayake, chamil.rathnayake@strath.ac.uk | [1]University of Greenwich, Maritime Greenwich Campus, Old Royal Naval College, London SE10 9LS, UK. [2]University of Strathclyde, Glasgow, UK.

and the digital world. Therefore, the technical conceptualisation of twinning can be repurposed to understand digital twinning in the social world, particularly in the social media context. With the widespread use of smartphones and photo editing apps, it has become increasingly common for people to enhance and alter their photos before sharing them on social media platforms [9–11]. For example, social media users change photo features such as facial effects and skin colour with the support of photo editing apps before they upload it as a profile picture. The latest development is generating an enhanced version of photos using AI applications. This enhanced version of the image is a digital 'twin' representation of the individual in the virtual world and a form of enhanced self-image. Attachment to AI-generated self-image (twin) deserves scholarly attention as it helps understand networked society in an increasingly twining context. In this brief communication, we aim to make a theoretical contribution by providing a conceptual understanding of the concept of digital twinning within the public sphere. Additionally, we will explore the theoretical rationale behind the attachment to AI-generated self-image within a twining society, specifically approached from the perspective of the perceived sense of emptiness.

2 Conceptualising digital twining in the social world

Digital twinning is a dynamic digital representation of a physical system [12] and is applied in the industrial sector to increase competitiveness [13]. This concept was initiated in the early twenty-first century; however, it did not become popular until the middle of the last decade [14]. According to this conceptualisation, there are three main components—materialised product in the real world (physical reality), dematerialised representation of the product in the virtual world (virtual representation) and process to connect real and virtual products (data interconnection) [15]. Physical reality represents the object that needs to be modelled, virtual representation represents an idealised form of physical reality, and interconnection means the data and information exchange between physical reality and virtual representation.

The same technical conceptualisation can be applied to the digital social context. Digital twins in social relations are feasible in the context of the Metaverse [16]. Platforms such as Facebook create space for individuals to share their information by breaking traditional geographical boundaries [17] and it has become an important platform for self-presentation [18, 19]. The proliferation of digital technologies, such as video games, social networking sites, and virtual worlds, has allowed individuals to create, own, and sell digital objects while having fun and socialising [20]. The profile picture is one such digital object (specific feature) available on Facebook, and it can be a photograph or any other image that represents the user. With the development of technology, showing an enhanced version of a photo in a profile picture has become an easy task [21]. Mobile applications are available to digitally alter an image before uploading it as a profile picture. Several studies have examined the different aspects of photo editing behaviour in the social media context [11, 22, 23]. However, rare attention has been given to AI-generated photos that are similar to the individual.

With the proliferation of AI technology, especially after late 2022, AI tools such as ChatGPT have been made openly and freely available for users [24]. AI has affected many sectors, including healthcare [25], education [26], automobile [27], food and agriculture [28]. However, image processing is one of the most directly affected areas [29]. AI applications provide many options for users, such as stylish photo effects, picture ideas, AI photo templates, AI photo enhancers, background removal, dripping effects, and AI profile pictures.

This enhanced version of the image is a digital representation of the individual that helps to enhance the self-image. As per the technological conceptualisation described above, the first component of digital twining is a physical product in the real world that resembles a physical individual. The AI-generated image functions as a visual representation of the person in the virtual world. In a computer-mediated social context, the third component (i.e., the exchange of data) is different from a technical twinning process. Rather than producing a digital equivalent of an offline character, AI-based image production tools often produce ideal images that, to some extent, resemble the offline 'source'. To a great extent, this process actualises self-perfection, distancing the source while reproducing it. While the AI-modified self-image remains as a relatively stable visual representation of the user, other performances surrounding such image (e.g., posts uploaded by the user, user interaction through comments) provide a constant feed of data to social network sites that shapes the perception of and engagement with users represented by virtual self-images. Accordingly, twinning of social contexts does not occur in the same way as technical twins (e.g., a virtual car engine that needs a data feed to work). However, the person behind the image has to reply and engage with comments. Based on this understanding, we conceptualise digital twinning in the context of social media as a *digital representation of a physical person through an image generated by AI*. Twining in the social world has some unique features. For example, in this process, individuals become 'freed' from offline visual constraints and become able to 'construct' their visual twin. This is a self-fulfilling experience as

current AI tools provide functionality for designing a plethora of aesthetically appealing imaginary self-images. At the same time, individuals succumb to the constraints of technology and are subject to a restrictive experience where social media users need to find a balance between self-fulfilment and technological capabilities. Furthermore, individuals have the ability to change the digital representation according to their idealised image and, from time to time, change the twin for different versions. Freeing from offline constraints means that self-images allow (re)construction of gender, ethnicity or other elements of user identity. This is a double-edged sword as it may result in the misappropriation of self-images for nefarious purposes. More interestingly, AI-based self-images may result in the construction and internalisation of 'fantasy selves' that do not depend on offline identity categories. This may cause the emergence of new forms of 'game-like' digital identities, and the mainstreaming of such identities in a virtual society will mark a new milestone of human identity constructed through technological mediation.

3 Attachment to AI-generated self-image

It's crucial to recognise the significance of the attachment to AI-generated self-image when discussing digital twinning in the social context. Attachment can be identified as a "*lasting psychological connectedness between human beings* [30]. However, it has been suggested that attachment can also be formed with objects [31, 32]. People tend to develop an attachment to AI-developed chatbots when in distress and lack human companionship [33]. Further, they demonstrate that individuals develop this attachment when they feel that a chatbot offers emotional support, encouragement, and psychological security. Attachment to an AI-generated self-image differs from the chatbot, as a self-image is an extension of an individual's self rather than an external technological artefact that can respond to them. Individuals are attached to digital objects that represent features of themselves and allow them to form different identities [20] and attachment patterns have a significant role in the development of self-image [34]. We define attachment to AI-generated self-image as a *deep and enduring emotional bond that connects a person to his or her digital twin in the digital space to enhance his or her self-image*. The Person who generated the image with the support of AI to enhance his or her image can attach to the twin either subjectively or objectively. Subjective attachment refers to the belief that the AI-generated photo represents the real face of the individual, leading them to actively comment and react to it, assuming that it is me. On the other hand, objective attachment involves users perceiving the digital twin as something that belongs to the individual, leading to passive comments or reactions. Subjective attachment typically results in a higher level of involvement with the digital twin compared to objective attachment.

4 Perceived sense of emptiness as a predictor for attachment to AI-generated self-image

Emptiness can be identified mainly from three components: an inner sense of "hollowness," a generalised feeling of emotional "numbness," and a feeling that part of the self is missing [35]. An empty self is a type of self that appears in contemporary consumer societies due to the influence of sociocultural, psychological, economic, and demographic changes [36]. These factors influence individuals' emptiness, which means a deep sense of lack at the core of our being [37]. In the past, when Cushman introduced the empty self-theory, the digital world as we know it today did not exist, so his focus was solely on the physical world. Even though technologies have changed, it is evident that the current wave of digital technology leads to an increase in the perceived sense of emptiness. Numerous studies have emerged showing that online behaviour, such as heavy Internet usage [38] social media platforms [39–41] can contribute to various psychological issues such as psychological distress, emotional distress, depression and anxiety. Therefore, the empty self-theory is valid in explaining the emptiness in the virtual world. Empty self-theory is somewhat similar to the absorption-addiction model [42] and emphasises that emptiness leads to continuing emotional needs, which individuals attempt to soothe by consuming unnecessary goods or other abnormal behaviours. Cushman [36] highlights that advertising is one of the main professions responsible for healing the empty self. As per the empty self-theory, advertising is filling the gap of emptiness by allowing individuals to consume the perceived substance symbolically. A fragile sense of the self seeks external gratification to overcome internal deficiencies and celebrity worship helps achieve this [42]. Attaching the idealised figures such as celebrities in advertising supports filling the emptiness gap. Empirical studies have identified a negative relationship between emptiness and compulsive buying [43] and a positive relationship between emptiness and problematic smartphone use [44]. With the philosophical foundation of empty self-theory, we argue that when individuals feel a lack of life (emptiness) in the context of social media, they may find solace by, compensating their sense

of emptiness through their digital image often referred to as a "twin". This process closely resembles the attachment to idealised images in advertising, as outlined in the empty self-theory. This indicates that a perceived sense of emptiness can be identified as a determinant of the attachment to AI-generated self-image in the context of social media.

5 Conclusion and directions for future research

In our brief communication, we delved into the concept of digital twinning to gain insights into the dynamics of the public sphere. Our specific focus was on AI-generated images shared across various social media platforms. Furthermore, we elucidated a theoretical basis for exploring the phenomenon of attachment to AI-generated self-images by drawing upon the theoretical foundation of the empty self-theory. The emergence of networks social contexts, driven by enhanced self-images, will have implications for the functioning of the digital public sphere. Attachment to AI-designed self-images may intensify affective bonding between individuals and the near-perfect fantasy selves. This will shape the digital public sphere, especially in terms of the ways in which affective publics form and function.

Future research could focus on identifying additional factors that influence an individual's attachment to the AI-generated self-image beyond just the concept of the perceived sense of emptiness. Perceived sense of emptiness was selected because it was identified as a significant factor in predicting addictive behaviour, such as compulsive buying and problematic smartphone use. Social influence, nostalgia, self-expression, and perceived uniqueness might contribute to the attachment to the AI-generated self-image. Furthermore, it is worth a deep exploration of the difference between subjective and objective attachment. This will help to understand the level of involvement with the twin generated through the perceived sense of emptiness. Additionally, a quantitative study could be developed to empirically evaluate the relationship between the perceived sense of emptiness and attachment to AI-generated self-image and its significance. This type of study will help to justify the proposed relationship in this report empirically.

Acknowledgements We want to extend our gratitude to the social media users who shared the AI-generated images as their profile pictures. Their sharing allowed us to think deeply about this idea.

Author contributions Dr. Tharaka Wijesundara and Dr. Chamil Rathnayake collaborated on developing the concept. Dr Chamil Rathnayake wrote part of the introduction section, and Dr Tharaka Wijesundara wrote the remaining part with the support of Dr Chamil Rathnayake. Both authors approved the final version of the short report for submission.

Funding Not applicable.

Data availability No datasets were generated or analysed during the current study.

Code availability Not applicable.

Declarations

Competing interests The authors declare no competing interests.

References

1. Miller I. The artist in the machine: the world of AI-powered creativity. London: MIT Press; 2019.
2. Uprety D, Zhu D, Jack West H. ChatGPT—A promising generative AI tool and its implications for cancer care. Cancer. 2023;129(15):2284–9. https://doi.org/10.1002/cncr.34827.
3. D'Alfonso S. AI in mental health. Curr Opin Psychol. 2020;36:112–7. https://doi.org/10.1016/j.copsyc.2020.04.005.

4. M William, B-M Nathan, K Amanda, NC Lev, J Smith. The Rise of Generative AI and the Coming Era of Social Media Manipulation 3.0: Next-Generation Chinese Astroturfing and Coping with Ubiquitous AI. 2023. Accessed: Jun 04, 2024. https://apps.dtic.mil/sti/citations/trecms/AD1210283
5. Korenhof P, Giesbers E, Sanderse J. Contextualizing realism: an analysis of acts of seeing and recording in digital twin datafication. Big Data Soc. 2023;10(1):205395172311550. https://doi.org/10.1177/20539517231155061.
6. Sun T, He X, Li Z. Digital twin in healthcare: recent updates and challenges. Digit Health. 2023;9:205520762211496. https://doi.org/10.1177/20552076221149651.
7. Stavropoulos P, Papacharalampopoulos A. Designing a digital twin for micromanufacturing processes. Adv Mech Eng. 2022;14(6):168781322210960. https://doi.org/10.1177/16878132221096004.
8. Lyu Z, Fridenfalk M. Digital twins for building industrial metaverse. J Adv Res. 2023. https://doi.org/10.1016/j.jare.2023.11.019.
9. Agrawal H, Agrawal S. Impact of social media and photo-editing practice on seeking cosmetic dermatology care. Clin Cosmet Investig Dermatol. 2021. https://doi.org/10.2147/CCID.S322859.
10. Ozimek P, Lainas S, Bierhoff H-W, Rohmann E. How photo editing in social media shapes self-perceived attractiveness and self-esteem via self-objectification and physical appearance comparisons. BMC Psychol. 2023;11(1):99. https://doi.org/10.1186/s40359-023-01143-0.
11. Lee M, Lee H-H. Social media photo activity, internalization, appearance comparison, and body satisfaction: the moderating role of photo-editing behavior. Comput Human Behav. 2021;114:106579. https://doi.org/10.1016/j.chb.2020.106579.
12. Madni A, Madni C, Lucero S. Leveraging digital twin technology in model-based systems engineering. Systems. 2019;7(1):7. https://doi.org/10.3390/systems7010007.
13. Woitsch R, Sumereder A, Falcioni D. Model-based data integration along the product & service life cycle supported by digital twinning. Comput Ind. 2022;140:103648. https://doi.org/10.1016/j.compind.2022.103648.
14. Michael G. Digital twins: past, present, and future. In: Noel C, Adam D, Roberto M, editors. The digital twin. Cham: Springer; 2023. p. 97–121.
15. VanDerHorn E, Mahadevan S. Digital twin: generalization, characterization and implementation. Decis Support Syst. 2021;145:113524. https://doi.org/10.1016/j.dss.2021.113524.
16. Lv Z, Xie S, Li Y, Hossain MS, El Saddik A. Building the metaverse using digital twins at all scales, states, and relations. Virtual Real Intell Hardw. 2022;4(6):459–70. https://doi.org/10.1016/j.vrih.2022.06.005.
17. Wu Y-CJ, Chang W-H, Yuan C-H. Do facebook profile pictures reflect user's personality? Comput Human Behav. 2015;51:880–9. https://doi.org/10.1016/j.chb.2014.11.014.
18. Chua THH, Chang L. Follow me and like my beautiful selfies: Singapore teenage girls' engagement in self-presentation and peer comparison on social media. Comput Human Behav. 2016;55:190–7. https://doi.org/10.1016/j.chb.2015.09.011.
19. Schlosser AE. Self-disclosure versus self-presentation on social media. Curr Opin Psychol. 2020;31:1–6. https://doi.org/10.1016/j.copsyc.2019.06.025.
20. Koles B, Nagy P. Digital object attachment. Curr Opin Psychol. 2021;39:60–5. https://doi.org/10.1016/j.copsyc.2020.07.017.
21. Lowe-Calverley E, Grieve R. Self-ie love: predictors of image editing intentions on facebook. Telematics Inform. 2018;35(1):186–94. https://doi.org/10.1016/j.tele.2017.10.011.
22. Wick MR, Keel PK. Posting edited photos of the self: increasing eating disorder risk or harmless behavior? Int J Eat Disord. 2020;53(6):864–72. https://doi.org/10.1002/eat.23263.
23. Vendemia MA, DeAndrea DC. The effects of viewing thin, sexualized selfies on instagram: investigating the role of image source and awareness of photo editing practices. Body Image. 2018;27:118–27. https://doi.org/10.1016/j.bodyim.2018.08.013.
24. Sætra HS. Generative AI: here to stay, but for good? Technol Soc. 2023;75:102372. https://doi.org/10.1016/j.techsoc.2023.102372.
25. Wolff J, Pauling J, Keck A, Baumbach J. Systematic review of economic impact studies of artificial intelligence in health care. J Med Internet Res. 2020;22(2):e16866. https://doi.org/10.2196/16866.
26. Berendt B, Littlejohn A, Blakemore M. AI in education: learner choice and fundamental rights. Learn Media Technol. 2020;45(3):312–24. https://doi.org/10.1080/17439884.2020.1786399.
27. Sudarsanam SK, Neelanarayanan V, Umasankar V, Indranil S. Application of AI based expert evaluation method in an automobile supplier selection problem. Mater Today Proc. 2022;62:4991–5. https://doi.org/10.1016/j.matpr.2022.04.592.
28. Ben Ayed R, Hanana M. Artificial intelligence to improve the food and agriculture sector. J Food Qual. 2021;2021:1–7. https://doi.org/10.1155/2021/5584754.
29. N Fatima. AI in Photography: Scrutinizing Implementation of Super-Resolution Techniques in Photo-Editors. In 2020 35th International Conference on Image and Vision Computing New Zealand (IVCNZ), IEEE. 2020; 1–6. https://doi.org/10.1109/IVCNZ51579.2020.9290737.
30. Bowlby J. Attachment. Attachment and loss, vol. 1. New York: Basic Books; 1969.
31. Park CW, Macinnis DJ, Priester J, Eisingerich AB, Iacobucci D. Brand attachment and brand attitude strength: conceptual and empirical differentiation of two critical brand equity drivers. J Mark. 2010;74(6):1–17. https://doi.org/10.1509/jmkg.74.6.1.
32. Keefer LA, Landau MJ, Rothschild ZK, Sullivan D. Attachment to objects as compensation for close others' perceived unreliability. J Exp Soc Psychol. 2012;48(4):912–7. https://doi.org/10.1016/j.jesp.2012.02.007.
33. Xie Tianling and Pentina Iryna, "Attachment Theory as a Framework to Understand Relationships with Social Chatbots: A Case Study of Replika," in *Proceedings of the 55th Hawaii International Conference on System Sciences*, 2022, pp. 2046–2055. Accessed: Jun 03 2024. http://hdl.handle.net/10125/79590
34. Çuhadaroğlu Çetin F, Tüzün Z, Pehlivantürk B, Ünal F, Gökler B. Attachment styles and self-image in Turkish adolescents. J Res Adolesc. 2010;20(4):840–8. https://doi.org/10.1111/j.1532-7795.2010.00674.x.
35. Clive H. Experienced levels of emptiness and existential concern with different levels of emotional development and profile of values. Psychol Rep. 1984;55(3):967–76.
36. Cushman P. Why the self is empty: toward a historically situated psychology. Am Psychol. 1990;45(5):599–611. https://doi.org/10.1037/0003-066X.45.5.599.
37. Sebastienne G. Addressing the empty self: toward socially-just subjectivities. In: Morris B, Gwin O, Grant S, McDonald S, editors. Subjectivity in psychology in the era of social justice. 1st ed. Milton Park: Routledge; 2020.

38. Zhou J, Friedel M, Rosmarin DH, Pirutinsky S. Internet addiction and the treatment of depression? A prospective naturalistic outcome study. Cyberpsychol Behav Soc Netw. 2023;26(2):121–6. https://doi.org/10.1089/cyber.2022.0184.
39. Seabrook EM, Kern ML, Rickard NS. Social networking sites, depression, and anxiety: a systematic review. JMIR Ment Health. 2016;3(4):e50. https://doi.org/10.2196/mental.5842.
40. Keles B, McCrae N, Grealish A. A systematic review: the influence of social media on depression, anxiety and psychological distress in adolescents. Int J Adolesc Youth. 2020;25(1):79–93. https://doi.org/10.1080/02673843.2019.1590851.
41. Cataldo I, Lepri B, Neoh MJY, Esposito G. Social media usage and development of psychiatric disorders in childhood and adolescence: a review. Front Psychiatry. 2021. https://doi.org/10.3389/fpsyt.2020.508595.
42. Reeves RA, Baker GA, Truluck CS. celebrity worship, materialism, compulsive buying, and the empty self. Psychol Mark. 2012;29(9):674–9. https://doi.org/10.1002/mar.20553.
43. Zerach G. The mediating role of emptiness and materialism in the association between pathological narcissism and compulsive buying. Int J Ment Health Addict. 2016;14(4):424–37. https://doi.org/10.1007/s11469-015-9591-9.
44. Zerach G. Emptiness mediates the association between pathological narcissism and problematic smartphone use. Psychiatr Q. 2021;92(1):363–73. https://doi.org/10.1007/s11126-020-09803-9.