International Cartographic Association
Association Cartographique Internationale

AI and Map Use: Can AI Understand Maps?

Amy L. Griffin [a,*], Anthony C. Robinson [b]

[a] *School of Science, RMIT University, amy.griffin@rmit.edu.au*
[b] *GeoGraphics Lab, Department of Geography, The Pennyslvania State University, arobinson@psu.edu*

* Corresponding author

Keywords: map use, artificial intelligence, thinking, cognition

Abstract:

Artificial Intelligence (AI) technologies are having impacts on all kinds of human activities. In the longer term, these technologies will make significant changes to the way we undertake everyday tasks and the way we work. Although there has been growing attention paid in the cartographic community to how AI can be used to build maps (see the ICA Commission on GeoAI's webpage [https://geoai.icaci.org/] for examples or Kang et al. 2024 for a recent review), there has been much less thinking done about the degree to which and how AI technologies understand maps. That is, can they use the information contained within maps to reason and take action as humans can and do?

Our aim in this research is to explore the current limitations of AI technologies in understanding maps. In this presentation, we use several cartographic theoretical frameworks such as the map communication model (Board, 1967; Koláčný, 1969), the map propositional model (Wood et al., 2010), the cognitive-semiotic model of maps (MacEachren, 1995), the map as knowledge base model (Varanka and Usery, 2018), and post-representational perspectives on mapping (Kitchin and Dodge, 2007) to think through what it means to understand a map. Then, using practical examples derived from existing AI tools, we examine the evidence that existing AI tools can understand a map as it is conceptualised with these frameworks to understand the limits of existing technologies. Finally, we explore scenarios in which AI tools could be further developed so that they understand maps well enough to work effectively in partnership with human map users. A fuller exploration of the ideas in this presentation can be found in Griffin and Robinson (2025).

References

Board, C. (1967). Maps as Models. In Chorley, R. J., & Haggett, P. (Eds). *Models in Geography*, p. 671-725. London: Methuen.

Griffin, A. L., & Robinson, A. C. (2025). How do people understand maps and will AI ever understand them? *The International Journal of Cartography*, 11(2), 216-223.

Kang, Y., Gao, S., & Roth, R. E. (2024). Artificial intelligence studies in cartography: a review and synthesis of methods, applications, and ethics. *Cartography and Geographic Information Science*, 51(4), 599-630.

Kitchin, R., & Dodge, M. (2007). Rethinking maps. *Progress in Human Geography*, *31*(3), 331–344.

Koláčný, A. (1969) Cartographic Information—a Fundamental Concept and Term in Modern Cartography, *The Cartographic Journal*, 6(1), 47-49.

MacEachren, A. M. (1995). *How Maps Work: Representation, Visualization and Design*. New York: Guildford Press.

Varanka, D. E., & Usery, E. L. (2018). The map as knowledge base. *International Journal of Cartography*, *4*(2), 201-223.

Wood, D., Fels, J., & Krygier, J. (2010). *Rethinking the Power of Maps*. New York: Guildford Press.