

Demystifying Scientific Creativity: Artificial Intelligence at the Edge of Reason

Ioannis Votsis (Northeastern University London)

Now that we have well and truly entered the age of AI, we are increasingly relying on machines to assist us in scientific tasks, including discovery and justification. Historically, carrying out such tasks has required a good measure of human creativity, which many scholars still consider to be difficult, if not impossible, to reproduce with machines. Their scepticism is motivated by a romanticised view of creativity, according to which creativity is tied to the human condition and is elusive and inscrutable. In this talk, I reject the romantic view for a more grounded approach that sees scientific creativity as a rational process that involves deductive, inductive and heuristic reasoning, with a hefty dose of trial and error (in the spirit of Langley et al. 1987). More concretely, I offer a blueprint for a system that may be able to aid (and at the limit replace) humans in performing the tasks of scientific discovery and justification via a combination of methods that emanate from neural and symbolic AI.¹ Among other things, I discuss automated reasoning as a means of generating as well as testing hypotheses, and investigate how heuristics, particularly analogies (Bartha 2010), can help reduce the search space of plausible hypotheses.

References:

Bartha, P. (2010). *By Analogical Reasoning*. Oxford: Oxford University Press.

Langley, P., Simon, H. A., Bradshaw, G. L., & Zytkow, J. M. (1987). *Scientific discovery*. MIT Press.

Trinh, T. H., Wu, Y., Le, Q. V., He, H., & Luong, T. (2024). Solving olympiad geometry without human demonstrations. *Nature*, 625(7995), 476-482.

¹ Neuro-symbolic methods are on the ascendancy, as demonstrated by the AlphaGeometry (Trinh et al. 2024).