Artificial intelligence predicts the future of artificial intelligence research

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An artificial intelligence contemplates the future of science. Credit: Generated by OpenAI's DALL-E3

It has become nearly impossible for human researchers to keep track of the overwhelming abundance of scientific publications in the field of artificial intelligence and to stay up-to-date with advances.

Scientists in an international team led by Mario Krenn from the Max-

Planck Institute for the Science of Light have now developed an AI algorithm that not only assists researchers in orienting themselves systematically but also predictively guides them in the direction in which their own research field is likely to evolve. The work was published in *Nature Machine Intelligence*.

In the field of artificial intelligence (AI) and machine learning (ML), the number of scientific publications is growing exponentially and approximately doubling every 23 months. For human researchers, it is nearly impossible to keep up with progress and maintain a comprehensive overview.

Mario Krenn, research group leader at the Max-Planck Institute for the Science of Light in Erlangen, approaches the solution to this challenge in an unconventional way. He has developed a new graph-based tool, Science4Cast, which allows for posing questions about the future development of AI research.

Prior to this, the international research group had announced the Science4Cast competition with the aim of capturing and predicting the development of scientific concepts in the field of AI research, determining which topics will be the focus of future research. More than 50 contributions with different approaches were submitted.

Krenn, together with the top-ranking teams, has now examined the various methods applied, ranging from purely statistical to purely learning methods, and arrived at surprising results. "The most effective methods use a carefully curated set of network features and not a continuous AI approach," said Mario Krenn. This suggests significant potential that can be unlocked using pure ML approaches without human knowledge.

Science4Cast is a graph-based representation of knowledge which

becomes more complex over time as more scientific articles are published. Each node in the graph represents a concept in AI, and the connections between nodes indicate whether and when two concepts were studied together.

For example, the question "What will happen" can be described as a mathematical question about the further development of the graph. Science4Cast is fed with real data from over 100,000 scientific publications spanning a 30-year period, resulting in a total of 64,000 nodes.

However, predicting what researchers will work on in the future is just a first step. In their work the researchers describe how further development of Science4Cast could soon provide personalized suggestions for individual scientists regarding their future research projects.

"Our ambition is to develop a method that serves as an inspiration source for scientists—almost like an artificial muse. This could potentially accelerate the progress of science in the future," explains Krenn.

More information: Mario Krenn et al, Forecasting the future of artificial intelligence with machine learning-based link prediction in an exponentially growing knowledge network, *Nature Machine Intelligence* (2023). DOI: 10.1038/s42256-023-00735-0

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