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# Sum up the science, then prompt new ways of thinking

Labs in academia and industry have been digitalizing for more than 30 years, but a new raft of AI-based tools is transforming research capabilities.

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Wading through research takes time and energy, but AI-based tools can reduce this burden. *Credit: Amanda Carden/Shutterstock*

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Researchers have always needed to deeply understand literature, both past and present. They study what other scientists and groups are doing to ideate their own projects, and explore new methods and approaches to enhance the quality of their results.

Not so long ago, researchers would keep abreast of the most recent literature through journal clubs to evaluate studies and share expertise and insights. Over time, these in-person meetings with hard-copy papers morphed into virtual meetings with digital articles. So, what's the next evolution? AI-based tools are already streamlining the discovery process and allowing researchers to find the critical material they need amongst a rapidly growing body of scientific literature.

Adopting AI can be challenging for researchers who are used to a manual process that works, but AI is already enhancing research capabilities: performing complex calculations and carrying out advanced pattern matching tasks, such as detecting cancerous cells. And AI's evolution continues to help more basic research, including the question of how to find what's most relevant. "It's like journal club in a box," says bioinformatics expert, Brian Gilman.

### **More than just search**

Search engines have been a vital part of the researcher's discovery toolbox for years. "You'd find many potentially relevant articles, which then need to be read, but with so much to read there is a chance that you miss the key result," says Daniel Hook, chief executive officer of data solutions company Digital Science. But with seven million new articles, patents and grants being published in 2023 alone, it has become harder to find and process all the relevant material.

AI-powered search tools can provide a solution, not just by finding the right articles, but also by providing insights into many papers by providing targeted, AI-generated summaries as part of the discovery process. The right kind of generative AI can quickly summarize an article and allow people to ask questions about the research, providing answers that are tailored for different levels of understanding. This allows someone to "get a quick insight into what a paper is about", says Christian Herzog, senior vice president of innovations at Digital Science.

The AI could, for instance, help experts gain deeper, more specialized, as well as help non-experts get a basic understanding. "The researchers you might encounter in a hallway have a fundamental understanding of the literature," says Gilman. "As a novice, you can talk to a virtual researcher with that same knowledge. Now, you can expedite your learning in an area where you're not an expert."

The time saved is an obvious benefit. "What used to take hours and hours you can now do with the click of a button," says Gilman. But these AI powered tools can also decrease the amount of mental energy needed

for the discovery process. "AI enables humans to lower their cognitive burden and focus on actual research problems," he adds.

In order to realise these benefits, care must be taken about what type of AI is used and how it is vetted. Generative AI sometimes has a hard time giving accurate answers. For instance, some tools have been unable to correctly answer how many times the letter R appears in the word strawberry. More pertinently, AI models have referenced studies, data or software libraries that do not exist. These so-called hallucinations are a challenge to spot. "Standard generative AI chatbots tend to give answers that sound authoritative, even to experts" says Hook. "It's a little bit dangerous."

Getting a handle on hallucinations is one of the top priorities of AI developers. Hook says that Digital Science's approach is to only include results that are supported by relevant literature. "Lots of research is going into how best to handle hallucinations in a way that makes the tool usable," he says.

### **Enhancing, not replacing**

Ultimately, generative AI should speed up discovery, but not take humans out of the picture. Much like the tools used for calculations and pattern matching, generative AI complements human capabilities. "We want to deploy AI that supports and enhances the intellect of users, not one that replaces it," says Herzog. "These tools allow researchers to quickly decide if they want to work with an article any further."

Beyond generative summary tools, it might not be too long before AI can help researchers in other ways. Gilman sees AI tools acting as a sort of virtual co-researcher that can help with study design. "You could ask the AI if an experiment design will have enough power to have valid conclusions," he speculates. "Or it could help you set up an experiment so it doesn't introduce bias."

AI is starting to cause a shift in how researchers use technology, but there's still a mismatch between humans who have questions, and computers that need things asked a certain way. It's still common for users to have to design prompts in a certain way to get the results they're looking for – little improvement from the early search engines that required use of Boolean terms. Natural language queries are one evolution, but Hook sees room for more. Future AI tools could be even more generative by, for instance, responding to human queries in a way that encourages more questions. "We want to change interactions so that the technology prompts you to think in different ways," says Hook. "You're a smarter engine than AI."

AI developers are working towards reducing researcher cognitive burden, but human intuition is still crucial to research. "People might ask if these tools are taking away human intuition, but the answer is no," says Gilman. "AI doesn't help with intuition, but it can help researchers get a broader understanding."

Hook is certain that AI tools will not remove the lure of the scientific challenge. “There’s a worry that if you give people answers to their questions, they may stop asking questions,” he says. “But these tools give an opportunity to connect to curiosity.”

*Disclosure: Brian Gilman was a consultant for Digital Science at the time of interview.*

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