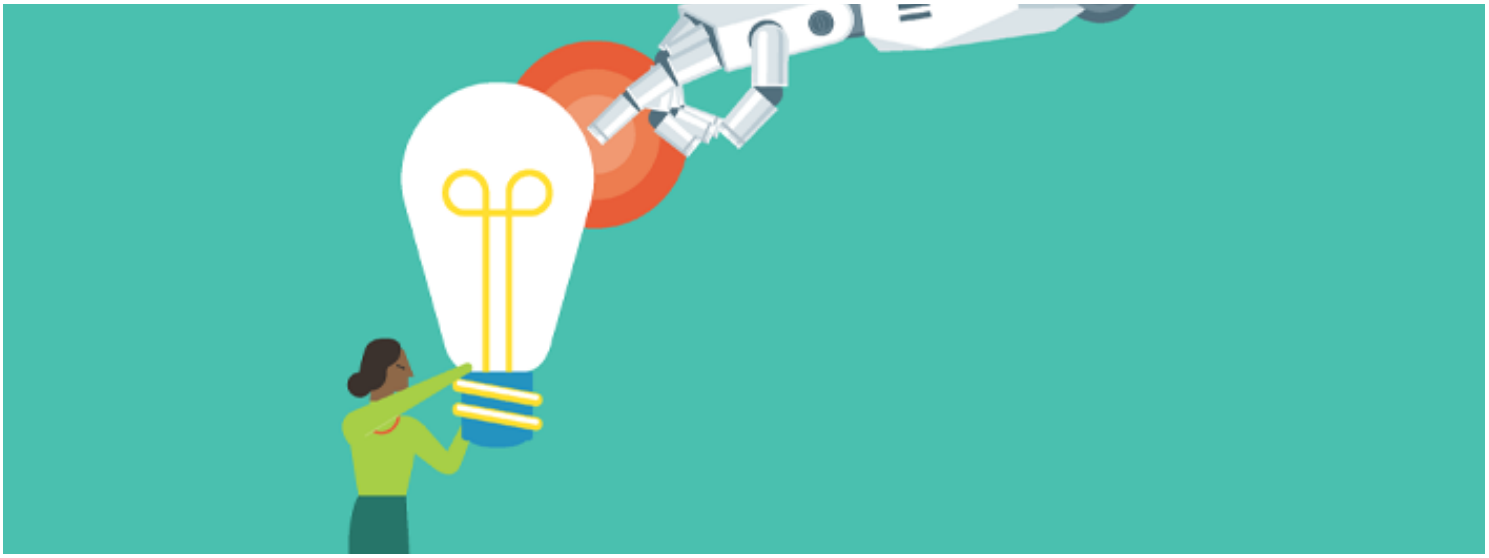

How Can Academics Use GenAI in Their Research?

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By Arun Rai

AI can support researchers by automating routine tasks and augmenting their creativity, yet the use of the technology introduces new risks.

- Academics can use AI tools as aids to challenge assumptions, generate hypotheses, develop ideas, critique research designs, generate synthetic data, discern patterns and

discover anomalies.

- However, AI can return incorrect information, violate privacy standards, perpetuate biases, lead researchers to rely on it too heavily, and present ethical dilemmas.
- In an ongoing project, researchers are using GenAI to develop a chatbot tutor that will provide personalized and affordable support to students at minority-serving institutions.

Generative AI (GenAI) is revolutionizing the landscape for academic researchers. By creating novel avenues for them to tackle complex problems—from ending poverty to mitigating climate change to promoting sustainability—it is expanding what researchers can achieve. At the same time, GenAI introduces new risks that faculty need to understand and manage.

The route to GenAI came straight through big data, which profoundly impacted business and social sciences scholarship. Researchers initially used big data analytics to harness large datasets pertaining to complex business and societal phenomena. By identifying patterns of correlations within the data, researchers could apply predictive analytics to precisely estimate the behaviors and outcomes of individuals, teams, and organizations.

To deepen understanding and extract meaningful insights, researchers combined machine learning and deep learning with causal inference methods. This approach allowed them to assess how various factors affected the behaviors and outcomes of entities and how these effects varied across types of entities in different contexts.

As digital technologies and analytical methods have advanced, GenAI has emerged as a new player. Through conversational prompt-based interactions with GenAI, users can create new humanlike content and derive nuanced insights from existing datasets. Academics have opportunities to make the research process more efficient and innovative by leveraging AI as an automator of routine tasks and an augmenter of creative endeavors.

However, with these opportunities come risks. Content generated by AI is sometimes of low quality and has the potential to breach legal and privacy standards. I believe researchers must carefully manage these risks if they want to realize the benefits of GenAI without suffering adverse consequences.

Automation and Augmentation With GenAI

Researchers can use GenAI to automate routine data collection and preprocessing and to capture and integrate multimodal data such as texts, images, voice recordings, and videos. They also can rely on it to write and debug code, assist in copyediting, and streamline workflows.

In addition, they can use GenAI to augment their capabilities and skills to carry out seven key research tasks:

1. Challenging assumptions. As academics formulate research problems, they can have GenAI take on a role that is critical of their viewpoints. They can invite it to argue against their theoretical lenses and point out blind spots. Researchers often are vulnerable to making "type three errors"—that is, asking questions that might not be relevant or useful. To avoid this trap, they can use GenAI as a partner that can challenge bounded rationality and ensure that they do not fix prematurely on the lenses they use to formulate the problem and develop the research question.

2. Developing hypotheses. Scholars can input a premise for a hypothesis and ask GenAI to generate counterclaims, alternative explanations, reservations, and qualifications. They even can ask it to limit the claims to certain contexts or control the extent to which it offers speculations.

> **GenAI can create synthetic data that mimics the characteristics of real data. This allows researchers to augment training datasets, design test models, and ensure data privacy by using proxy counterfactuals.**

3. Conceiving novel research designs. Researchers can invite GenAI to envision alternative or complementary approaches to their research designs. They can ask it how to improve the discovery of causal mechanisms underlying various effects, perhaps by using natural language processing (NLP) techniques to conduct a large-scale qualitative analysis using computational methods. They can even ask it to integrate the data from different sources and apply machine learning and NLP techniques to illuminate those causal mechanisms.

As an example, say researchers are planning an event study to determine what impact a cybersecurity breach would have on the market value of a firm. They could ask GenAI to probe the heterogeneity of the effect by type of breach and type of firm. From there, they could ask GenAI how to leverage information about the breach in earnings calls and 8-K reports, which track unscheduled events that could impact a company. Additionally, they could ask GenAI to predict how the market would react if they disclosed the breach, apologized to customers, and took action to contain the impact.

4. Generating synthetic data. GenAI can create high-quality, high-volume synthetic data that mimics the characteristics of real data. This allows researchers to augment training datasets, design test models, and ensure data privacy by using proxy counterfactuals. For example, GenAI can generate synthetic medical records to preserve patient privacy or create new imagery for a facial recognition system when real images are limited.

5. Simulating future states of the world. GenAI can forecast future scenarios by using historical and current data. When it does this at scale, it can evaluate a large number of conditions and variables, incorporating elements of uncertainty to produce comprehensive and diverse scenarios.

For example, academics can examine potential threats such as economic downturns, supply chain failures, and new technological or policy developments. Given the highly uncertain nature of business, political, technological, and global environments, such simulations can inform theory, practice, and policy as organizations prepare for exogenous shocks and transitions to different possible states of the world.

6. Discerning patterns. Before researchers move on to confirmatory analysis, they can use the technology to detect any interesting patterns that might be early predictors of something else.

7. Discovering anomalies. Researchers can upload a sales dataset and ask GenAI to identify and explain any anomalies that deviate from theoretical expectations. For instance, after pointing to an unexpected sales spike in a particular region, GenAI might provide contextual insights on promotional campaigns or competitor issues that explain the spike. This knowledge could spark the creative process and cause scholars to pivot to a new theoretical perspective.

Responsible GenAI Practices

Despite its many uses, GenAI presents risks that researchers must carefully manage. Fortunately, governments and professional organizations are beginning to draft useful standards that address these risks. In the U.S., guidance on the responsible and transparent use of AI is expected from bodies such as the President's Council of Advisors in Science and Technology. Increasing numbers of discipline-based societies and academic journals also are developing GenAI policies and requiring researchers to disclose how they have used the technology in their scholarly work. We can expect considerable experimentation to shape these policies in the future.

Overall, I believe researchers face challenges and must learn to mitigate risks in five main areas:

Content quality and legality. While GenAI reduces many of the cognitive demands on researchers, it also dramatically increases the amount of effort academics must make to ensure AI's suggestions are high-quality and ethical. GenAI can go awry in several ways:

- It sometimes "hallucinates," making up answers when it lacks information.
- Unlike human researchers, AI can't use judgment to evaluate the quality of publications, so it indiscriminately includes studies of varying quality and reproducibility.

- GenAI can miss newer publications because the pool of knowledge used to inform its responses might have a cutoff date.
- AI's effectiveness is limited by the biases and gaps in its training datasets.
- GenAI can generate text that closely mirrors copyrighted articles or books, leading to potential legal issues and plagiarism concerns.

The only way for researchers to avoid these problems is to verify the appropriateness of the content obtained from GenAI.

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Privacy. Whether accessing data or interacting with individuals, GenAI has been known to violate privacy standards. These include company confidentiality requirements and governmental regulations enacted by the United States' Family Educational Rights and Privacy Act (FERPA) and the Health Insurance Portability and Accountability Act (HIPAA).

Many individuals do not fully understand how their personal information and social media activity can be mined by AI. Even anonymized data can lead to reidentification when GenAI cross-references multiple datasets, such as academic records and social media posts.

To avoid privacy violations, researchers can implement advanced anonymization methods, ensure informed consent, establish strict data access boundaries, undergo regular audits, generate synthetic data, and participate in ongoing training.

Synthetic data validity. While synthetic data isn't necessarily good or bad, it might oversimplify entities and their relationships to ensure they fit computational models. When individuals and organizations are represented as artificial instances with certain attributes, critical information about them can be lost. To reduce this risk, researchers should consider combining extensive synthetic data with intensive data that digs deep into a phenomenon.

Citation bias. GenAI can perpetuate and reinforce certain popular bodies of work, viewpoints, and scholars through the citations it recommends, which creates cognitive trapping. If researchers prompt GenAI to suggest less popular, atypical combinations of citations, it will generate a broader scope of perspectives that can be used to challenge, replace, or enrich conventional ideas.

Peer reviewing. Peer reviewers are selected on the basis of their individual expertise, and peer critiques require substantial, privileged, and detailed information. If reviewers uploaded an

article into a GenAI tool, they could not be certain where the tool would send, save, or use the article's contents. This would absolutely violate confidentiality expectations for peer review.

Another problem is that GenAI tools are trained on data that exists and has been widely published. If GenAI is reviewing article submissions, it could default to common biases and homogenize original thought. Its critiques also could rise to the level of plagiarism.

To avoid these possibilities, it is best to leave reviewing tasks to humans for now. Journals, professional associations, and scholarly communities will need to carefully conceive, trial, and validate practices for human-AI collaborative reviewing before AI is involved in the reviewing process.

A Firsthand Example

When scholars are aware of and manage risks through responsible practices, they can leverage GenAI to automate tasks and enhance both the creative and analytical aspects of their research. Here's an example from my own work at Georgia State University's Robinson College of Business in Atlanta.

We are partnering with researchers from the Massachusetts Institute of Technology in Cambridge on an ongoing project sponsored by Axim Collaborative, a social enterprise dedicated to expanding access to education. The goal is to design and evaluate a large language model (LLM) tutor that promotes equitable student success in computing courses, specifically Python programming. The tutor will provide at-scale, personalized, and affordable support to students at minority-serving institutions (MSIs) across the learning levels of the revised Bloom's taxonomy: *remembering, understanding, applying, analyzing, evaluating,* and *creating*.

> **Innovation thrives on diverse, original thought. If we rely too heavily on GenAI, we lose the ability to make critical analyses and question information.**

My colleagues and I have utilized GenAI to automate several tasks, including converting audio files from focus groups into text transcripts, summarizing key points from these transcripts, and extracting structured data from unstructured chat logs. Moreover, GenAI helped us identify specific information that was embedded in lengthy paragraphs, such as questions students had posed to the LLM tutor.

GenAI also enabled us to use chat logs to discover patterns and challenges in students' learning pathways. Using ChatGPT-4o, we classified messages between students and the LLM tutor according to the revised Bloom's taxonomy, then we clustered these interactions based on transitions across taxonomy levels. This approach allowed us to visualize how each

student and each group transitioned within their clusters, which helped us identify anomalies for further investigation.

In addition, we used GenAI in a discursive manner to explore how the complementary insights of contemporary learning theories can illuminate the diverse learning pathways of students at MSIs and inform the design of the LLM tutor. We also asked GenAI to provide us with notifications and summaries of relevant research articles and reports from digital libraries such as JSTOR, Google Scholar, and arXiv.

As a final example, we had GenAI suggest ways to formulate and communicate the implications of our findings to audiences in information systems, education, and public policy. In all of our uses of GenAI, we routinely considered its risks, employed responsible practices, and verified the results and recommendations.

An Exciting Future

For scholars, the future of GenAI is promising. It can transform and empower our research processes by augmenting our creative activities while automating our mundane tasks. But we must understand its limits.

Innovation thrives on diverse, original thought. If we rely too heavily on GenAI, we lose the ability to make critical analyses and question information. We risk becoming "research drones" who generate fewer original ideas and breakthroughs. While GenAI can provide us with quick answers, we will acquire deep expertise only through intensive study and extensive experience. If we are to sustain vitality and progress in any business field, we must foster critical thinking and creativity even while we leverage this technology.

We also must ensure that all researchers have access to foundation models, comprehensive datasets, advanced computing power, and training and skill development opportunities. If we don't, we risk significant inequities in the research process. Partnerships among academia, industry, and government will be vital for fostering a more inclusive environment for researchers. They will be able to solve complex problems in innovative ways with the power of their imagination and ideas.

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