

## How Generative AI Could Help Researchers

A simplified version of the following research paper:

*Use cases for the application of generative artificial intelligence for researchers: A survey.*

Jonas Witte, Samed Bayer, and Ingo Weber. Preprint, February 2026.

<https://hal.science/hal-05463006>

### What problem is this paper trying to solve?

The paper points out that although many articles talk about AI in research, **most are opinion pieces** or focused on a narrow discipline.

There was *no* large, structured, cross-disciplinary overview of generative AI use cases for researchers.

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### What did the authors actually do?

The researchers performed a **Structured Literature Review (SLR)**:

- They searched **Google Scholar** using a specific query string
- Reviewed the **first 1,000 search results**
- After several selection steps, **204 papers** remained
- From these, they extracted, merged, and cleaned use cases
- Final count: **118 distinct use cases**

They also emphasized:

- The focus is on **discipline-agnostic use cases**
- They do *not* evaluate whether GenAI *should* or *should not* be used
- They do *not* assess AI readiness or quality

## What did they find?

The authors categorized the 118 use cases into **seven major categories**, each aligned with stages of the scientific process:

1. **Ideation**
2. **Literature Review**
3. **Methodology**
4. **Data Collection**
5. **Programming**
6. **Data Analysis**
7. **Writing**

Below is a summary of each.

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### 1. Ideation

Examples:

- Generating and refining research ideas
- Formulating or improving research questions
- Creating or evaluating hypotheses
- Developing research agendas

### 2. Literature Review

AI can help with:

- Searching for papers
- Brainstorming keywords
- Screening titles/abstracts
- Summarizing individual or multiple papers
- Extracting structured information (e.g., methods, results)
- Identifying theories and gaps

## 3. Methodology

AI may support:

- Selecting or designing research methods
- Designing experiments, surveys, or interview guides
- Checking formulas
- Running simulations
- Providing methodological critique

## 4. Data Collection

AI can help with:

- Creating or cleaning datasets
- Detecting errors, inconsistencies, duplicates
- Generating synthetic data
- Annotating or labeling data
- Suggesting data sources

## 5. Programming

AI supports:

- Code generation
- Debugging
- Explaining code
- Translating between programming languages
- Selecting algorithms or improving code quality

## 6. Data Analysis

Examples include:

- Planning analyses
- Providing method explanations
- Running calculations
- Identifying trends and patterns
- Applying statistical methods
- Interpreting results
- Evaluating outputs

## 7. Writing

AI can help:

- Drafting text
  - Improving clarity and readability
  - Generating titles and abstracts
  - Managing references and citations
  - Formatting documents
  - Providing pre-submission reviews
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## Why does it matter?

The paper discusses benefits **based on other literature** (not new experiments):

- AI may increase productivity
- AI can help early-career researchers
- AI can help manage overwhelming volume of scientific literature

The authors stress that **humans remain fully responsible** for scientific integrity. This is repeatedly emphasized.

## Risks and Limitations

The authors describe several risks in section 5:

### 1. **Hallucinations / Confabulation**

AI can produce incorrect but plausible content. This is described with examples.

### 2. **Bias and homogenization**

AI may reinforce dominant theories → feedback loop → reduced diversity in science. This is a major concern.

### 3. **Reproducibility issues**

Outputs are probabilistic, not deterministic.

#### 4. Lack of shared norms

The scientific community currently lacks standardized rules for using or reporting AI. The paper stresses the need for a unified rulebook.

### Human–AI Collaboration vs. AI-Only Research

The paper introduces:

- **Two dimensions:**
  - GenAI-led vs. researcher-led
  - Once vs. iterative
- A third category: “**GenAI-Only**” research, where AI handles entire workflow

This is drawn from section 5.1 and Table 2.

They raise open questions:

- Would AI-only research be trustworthy?
- Should humans always remain responsible?
- Will AI speed up discovery or cause integrity risks?

### Key Takeaways

1. There are **118** documented generative AI use cases across **seven** categories.
2. The authors *do not* judge feasibility — they only map possibilities.
3. Human responsibility remains central to scientific integrity.
4. Risks include hallucinations, bias, homogenization, irreproducibility, and missing norms.
5. The scientific community needs clear, shared guidelines for AI use.

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This simplified version was created using an AI agent