

AI as Your Research Partner

Ethically Aiding Scientific Paper Writing for Computer Science
and Beyond

The Core Challenge

Scientific writing demands **Originality, Honesty, and Transparency**. How can AI help without compromising these virtues? This presentation explores the "Dos" and "Don'ts."

The Ethical Red Lines: The "Don'ts"



AI is Not an Author

Publisher policies (ACM, Nature, Elsevier) forbid listing AI as a co-author. Authorship implies accountability, which an AI cannot have. You are 100% responsible.



No "Hallucinations"

AI can invent facts, data, and citations. You are responsible for verifying 100% of AI-generated content. Trust, but verify. Then verify again.



Avoiding Plagiarism

AI models can inadvertently plagiarize. All output must be checked, rewritten in your own voice, and properly cited to reflect the original source of the idea.

The Guiding Principles: The "Dos"



AI as an Assistant

Think of it as a spell-checker, a language polisher (especially for non-native speakers), or a brainstorming partner to suggest new keywords or research directions.



Full Transparency

Disclose the use of AI in your acknowledgments or methods section, as per publisher guidelines (e.g., ACM, Elsevier). Transparency builds trust.



You are the Author

You are the intellectual force. The AI is a tool, like a calculator or a code library. You are responsible for the final work's integrity, accuracy, and originality.

AI in the Research Workflow

Let's break down how AI can assist at each stage, from idea to code.

Phase 1: Ideation & Literature Review

How AI helps **before** you write:

- **Identifying Gaps:** Ask an AI to summarize recent abstracts on a topic to quickly spot areas with less research.
- **Finding Connections:** Brainstorm keywords and concepts; ask an LLM or use ResearchRabbit to find thematic links you might have missed.
- **Summarizing Papers:** Quickly understand the gist of a complex paper to see if it's relevant (but you must **always** read the original paper).



Tools for Literature Review

” **Scite.ai:** Shows *how* a paper is cited (supported, mentioned, contrasted).

<https://scite.ai>

✓ **Consensus:** Extracts direct answers to questions from research papers.

<https://consensus.app>

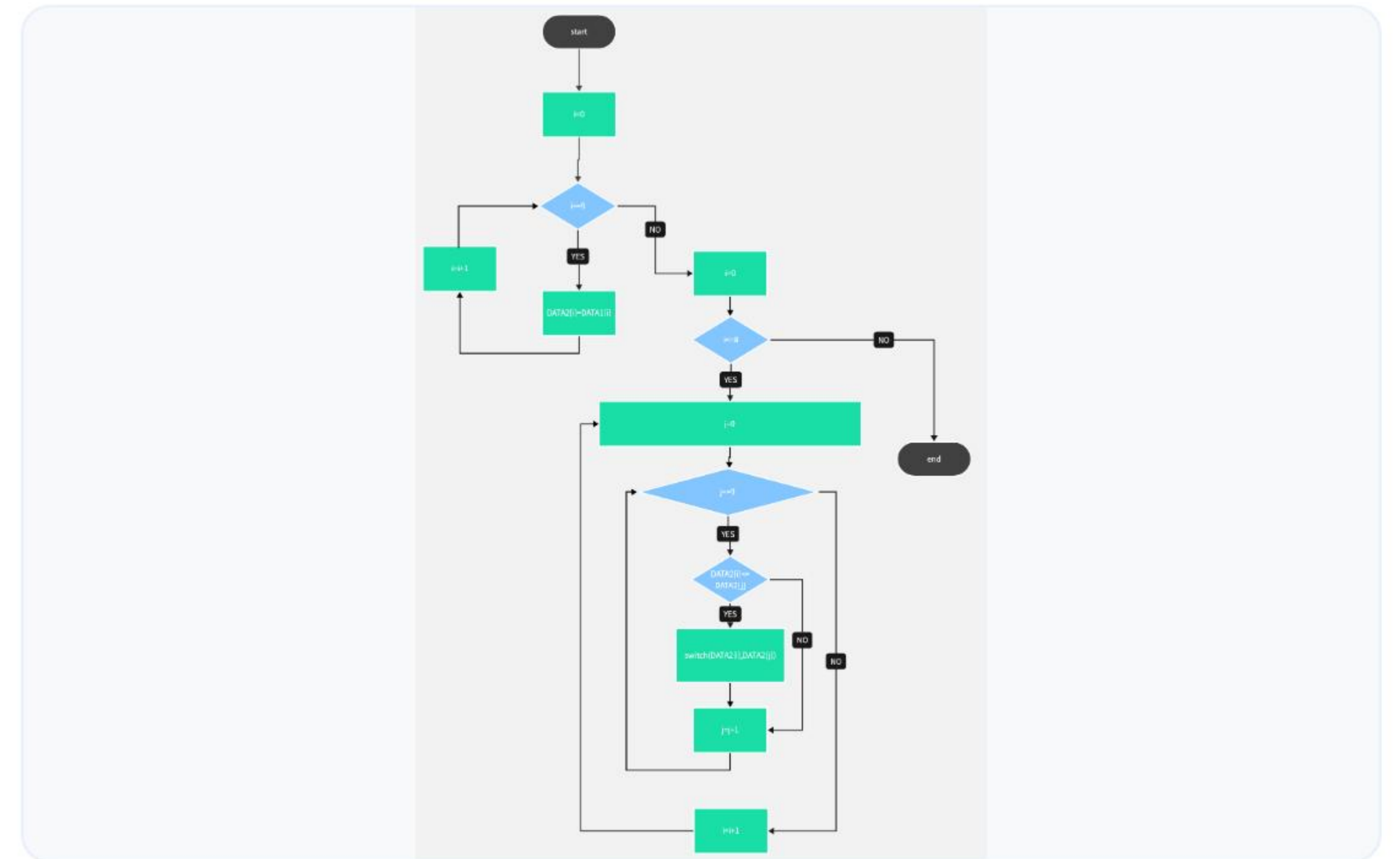
🔍 **Elicit:** Uses semantic search to find papers that answer your question.

<https://elicit.com>

Phase 2: Methodology & Code (CS Focus)

This is key for Computer Science:

- **Code Generation:** Use GitHub Copilot or LLMs to generate boilerplate code, write unit tests, or create data-parsing scripts.
- **Algorithm Explanation:** Paste a complex algorithm and ask for a line-by-line explanation to ensure you understand it.
- **Debugging:** Describe a bug, paste your code (if not sensitive!), and get suggestions for potential fixes.
- **Transparency:** You **must** document the AI's role (per ACM policy) and verify all generated code.



Accelerating Diagram & Figure Creation



Code to Diagram

Generate flowcharts, sequence, and class diagrams from text using tools like Mermaid.js.

mermaid.live



Data to Plot

Generate Python/R code for Matplotlib, Seaborn, or ggplot2 to create your data visualizations.



Concept to Image

Use AI-assisted tools to scaffold block diagrams and system architectures quickly.

lucid.ai

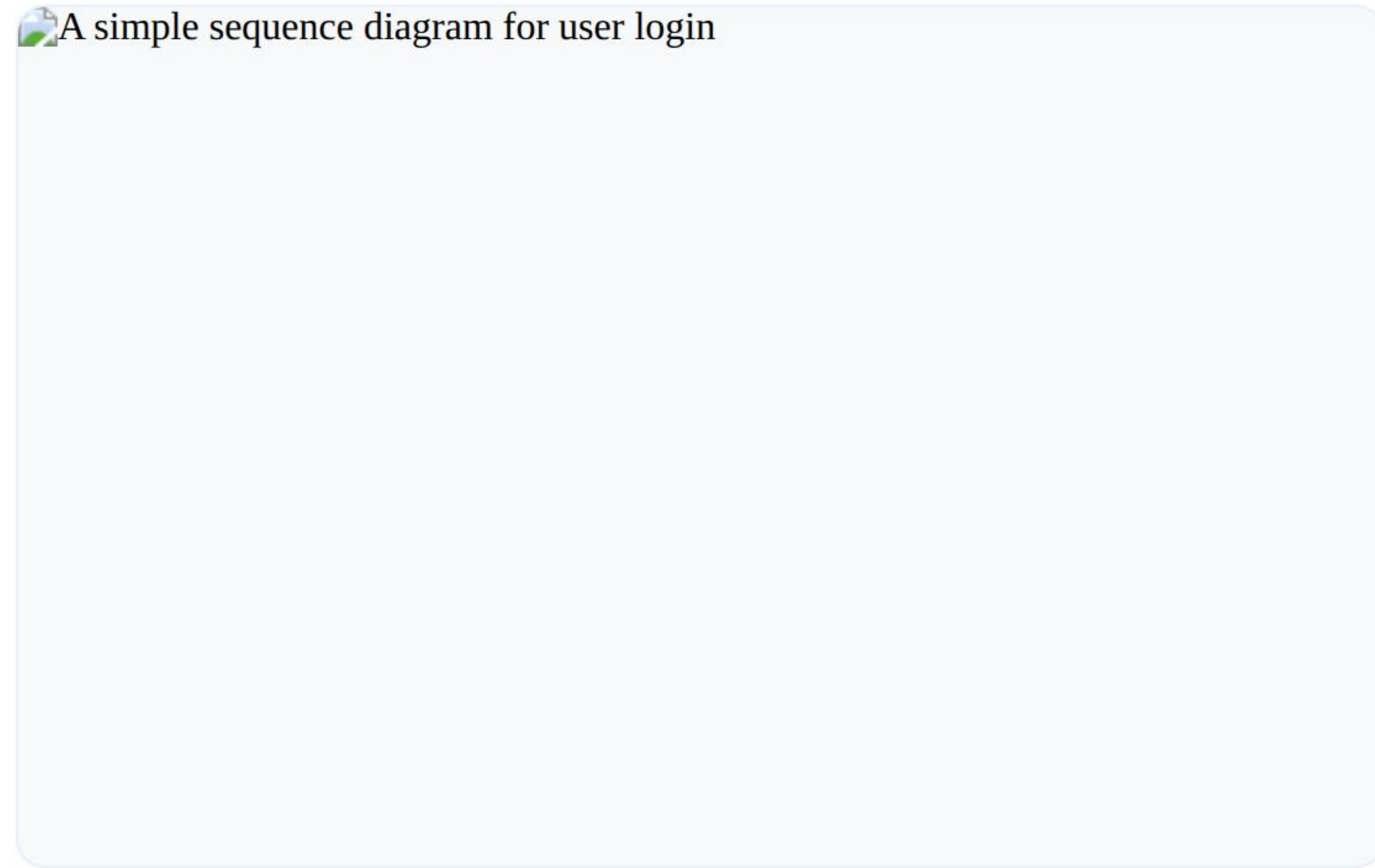
Diagram Showcase: Text to Diagram

From Prompt to Figure:

Instead of drawing, you write code. This is faster, more reproducible, and easier to edit.

Prompt to AI: "Generate Mermaid.js code for a sequence diagram where a User logs into a Web Server, which queries a Database."

Virtue: Saves hours of manual drawing and ensures your diagrams are consistent and editable as code.

A simple sequence diagram for user login

Phase 3: Finding Patterns in Data

Data Visualization

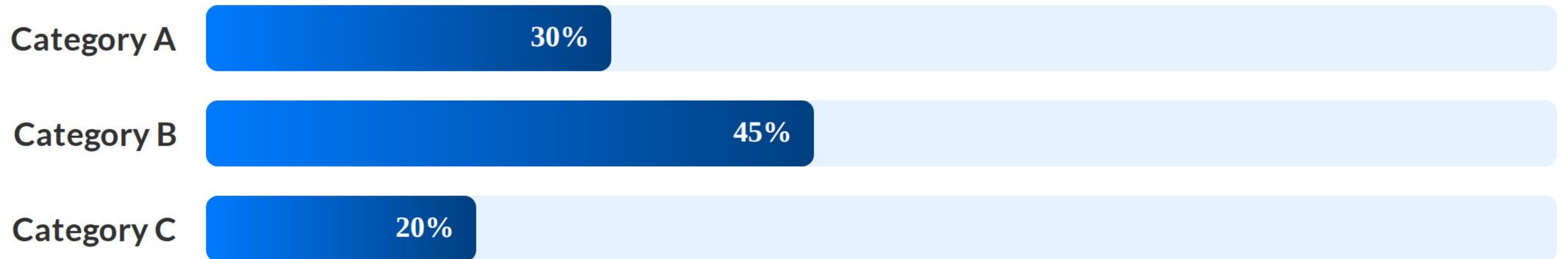
AI can dramatically speed up analysis. You can provide a CSV structure and ask: "Write Python/R code using Matplotlib/ggplot2 to create a bar chart of column A vs. column B."

Statistical Help

Ask for guidance: "What statistical test is most appropriate to compare these two groups?" or "Identify primary clusters or outliers in this data."

Warning: Never feed AI sensitive, private, or non-anonymized data.

From Prompt to Plot: Aiding Analysis



*A simple prompt can generate the code for this chart, saving you time on syntax and letting you focus on the ***interpretation*** of the results.*

AI in the Writing Process

This is where ethics are most critical. Using AI as a partner, not a crutch.

Phase 4: AI as Your Writing Coach

Outlining: "Generate an IMRaD (Introduction, Methods, Results, Discussion) outline for a paper on [your topic]."

Language Polishing: Invaluable for non-native English speakers. Use it to fix grammar, improve flow, and correct idiomatic expressions.

Consistency Check: Ask the AI: "Does this paragraph flow logically from the previous one?" or "Is my terminology consistent?"



The "Paraphrasing" Trap

“

Using AI to change a few words in someone else's sentence is still plagiarism. True paraphrasing is restating the *idea* in your own words and structure, with a clear citation.

”

— A Core Virtue of Academic Integrity

Using AI to **Avoid** Plagiarism

- ✓ **Paraphrasing Tool (with caution):** Use tools like **QuillBot** to rephrase **your own** ideas to find better wording. Never plug in someone else's text.

<https://quillbot.com>

- 🔍 **Originality Checker:** Use your university's official tool (e.g., Turnitin). Tools like **Grammarly Premium** also check against public data.

<https://grammarly.com>

- 💡 **Idea vs. Text:** Ask AI to summarize a paper's idea. Then, close the AI and write **your own** summary from scratch, citing the source.

The Translation Bridge

Expanding Your Sources:

- Tools like **DeepL** or **Google Translate** are powerful for understanding papers in other languages.
- **Virtue:** This expands your literature review, allowing you to include non-English sources.
- **Rule:** Use the translation to **understand** the findings. Then, you must **paraphrase and cite** the original source paper.
- **Pitfall:** Never copy-paste a translation. Nuance is lost and it is not your work.

<https://deepl.com>



Phase 5: AI as "Reviewer #2"

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Key Prompts

Find weaknesses before submission:

1. "Act as a peer reviewer. What are the main weaknesses of this abstract?"
2. "What counterarguments could be made against my discussion section?"
3. "Check my paper for clarity, consistency, and flow."

CRITICAL: Per publisher (e.g., Springer) policy, **NEVER** upload your unpublished manuscript to a *public* AI tool. Use only secure, institutional versions.

Case Study: The Abstract

Bad Practice

Prompt: "Write an abstract for my paper."

This lacks context, risks fabrication, and abdicates your role as the author.

Good Practice

Prompt: "I have written my paper. Here is the Introduction, Methods, and Results. Based **only** on this text, draft an abstract that includes: 1. The problem, 2. Our method, 3. The key finding, 4. The implication."

This is a **scaffolding** approach. You provide the intellect; the AI provides the structure.

The Future & Responsibility

How to use these tools and maintain transparency and
reproducibility.

The Future: AI & Reproducibility

2. AI Output

Keep a record of the raw output from the AI (the code, the text) before you edited it.

4. Documentation

This record becomes part of your research documentation, ensuring your work is transparent and reproducible.



1. Prompt

Save the exact prompts you used to generate code, analyze data, or create figures.



3. Verification

Document the steps you took to verify and refine the AI's output. This is your intellectual contribution.



Summary: Your Ethical AI Toolkit

DO 

Use for brainstorming, language polishing, code generation, and diagram scaffolding.

Disclose your use, **verify** all facts/code, and retain **full accountability**.

DON'T 

Never list as an author, never copy/paste unverified facts, and never use for core intellectual contribution.

Never use "AI Paraphrasing" as a substitute for real writing and citation.

Questions?

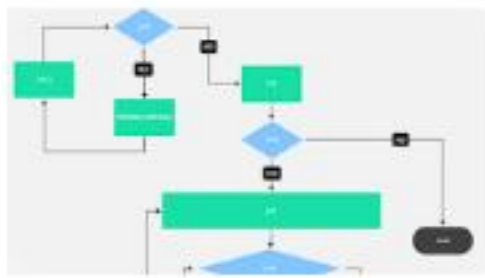
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Image Sources



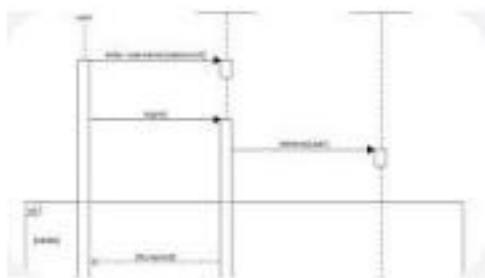
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