



University of  
Pittsburgh®

Health Sciences  
School of Nursing

# Partnering with AI for Genomic Informatics: Practical Workflows for Data Analysis and Interpretation

International Society of Nurses in Genetics (ISONG)  
November 15, 2025

Lacey W. Heinsberg, PhD, RN (she/her)

# Outline

- 1 Reproducibility Starts with R
- 2 (Even) Better Together: Partnering with AI
- 3 When R Met AI: Responsible Integration
- 4 Practice What We Code: A Practical Example

# Outline

1

Reproducibility Starts with R



(*your fave programming language*)

2

(Even) Better Together: Partnering with AI

3

When R Met AI: Responsible Integration

4

Practice What We Code: A Practical Example

# TRUST

Can I repeat the analysis described?  
= **Reproducibility**

Can I get the same answer in an  
independent (validation) dataset?  
= **Replicability**

# Most studies are not reproducible

nature  
genetics

ANALYSIS

---

## Repeatability of published microarray gene expression analyses

John P A Ioannidis<sup>1–3</sup>, David B Allison<sup>4</sup>, Catherine A Ball<sup>5</sup>, Issa Coulibaly<sup>4</sup>, Xiangqin Cui<sup>4</sup>, Aedín C Culhane<sup>6,7</sup>, Mario Falchi<sup>8,9</sup>, Cesare Furlanello<sup>10</sup>, Laurence Game<sup>11</sup>, Giuseppe Jurman<sup>10</sup>, Jon Mangion<sup>11</sup>, Tapan Mehta<sup>4</sup>, Michael Nitzberg<sup>5</sup>, Grier P Page<sup>4,12</sup>, Enrico Petretto<sup>11,13</sup> & Vera van Noort<sup>14</sup>

# Challenges of reproducibility

Increasingly complex data and methods

Statistics as an art and a science

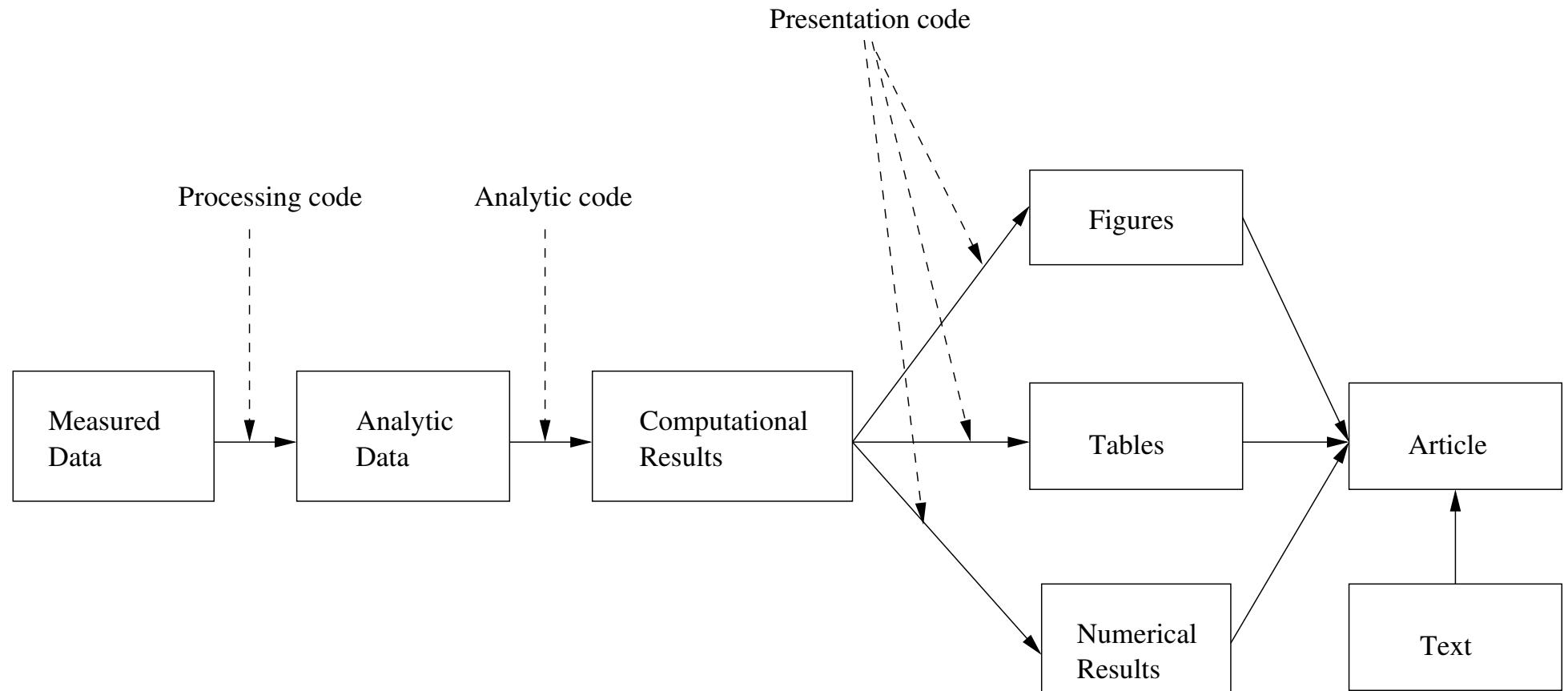
Lack of time / energy / analytical support

Etc.

# What often happens

Point-and-click software, iterative analyses  
poorly tracked, manuscript pieced together

# A better way



(All code as SCRIPTS).



@allison\_horst

# (Sidebar: Examining my biases)

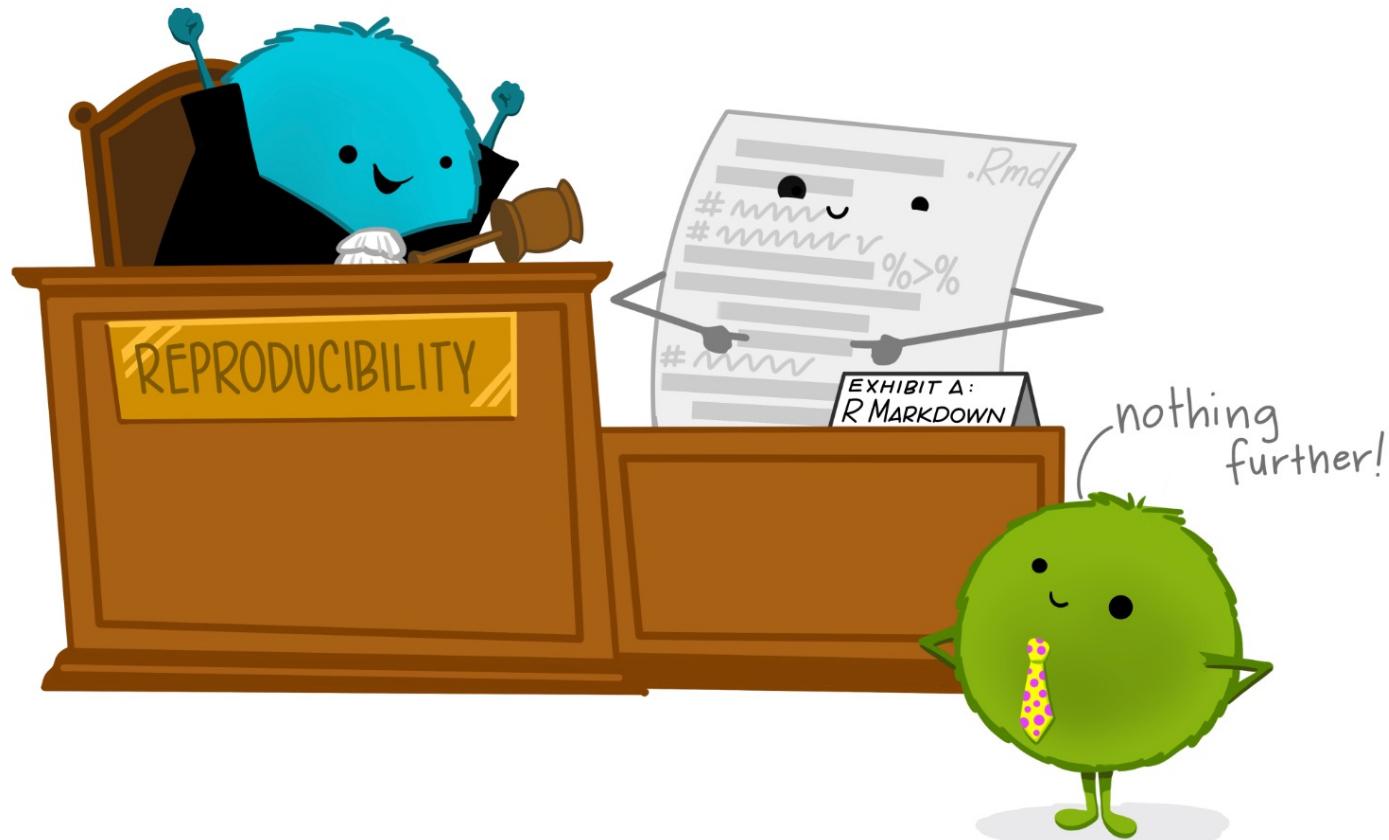
SPSS

SAS

Python

Etc.

# R markdown



# R markdown

Combine code, text, and results in a single document

Explain what you're doing in plain language — like a lab notebook

Automatically render to HTML, PDF, or Word

Makes your work transparent, traceable, and reproducible

RStudio

Heinsberg\_Example.Rmd

Knit on Save ABC Knit Run Outline

Source Visual

```
1 ---  
2 title: "Project/Paper Title"  
3 subtitle: "Workflow X: Brief Description"  
4 author: "Lacey W. Heinsberg"  
5 date: "`r format(Sys.time(), '%B %d, %Y, %R')`"  
6 header-includes:  
7 - \usepackage{pdflscape}  
8 - \newcommand{\blandscape}{\begin{landscape}}  
9 - \newcommand{\elandscape}{\end{landscape}}  
10 - \usepackage{fvextra}  
11 - \DefineVerbatimEnvironment{Highlighting}{Verbatim}{breaklines,commandchars=\\\{\}}  
12 output:  
13   html_document:  
14     df_print: paged  
15     toc: true  
16     number_sections: true  
17     toc_depth: '4'  
18     code_folding: show  
19     #html_preview: false  
20     #toc: true  
21     pdf_document:  
22       toc: true  
23       number_sections: true  
24       toc_depth: 4  
25     #github_document:  
26     # md_extensions: +raw_attribute  
27 ---  
28  
29 ```{r,echo=FALSE,message=FALSE,warning=FALSE}  
30 require(knitr)  
31 # Set so that long lines in R will be wrapped:  
32 opts_chunk$set(tidy.opts=list(width.cutoff=80),tidy=TRUE)  
33 ```  
34  
35 ```{r,echo=FALSE}  
36 # In the event of a crash, save the working space on exit:  
37 save_all <- function() {  
38   save.image("recover.RData")  
39 }  
40 options(error = save_all)  
41 ```
```

1:1 Project/Paper Title R Markdown

Console

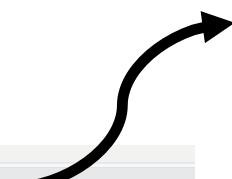
# Project/Paper Title

## Workflow X: Brief Description

Lacey W. Heinsberg

July 18, 2025, 15:02

- 1 Load libraries
- 2 Project notes
  - 2.1 Overview
  - 2.2 Abbreviations
  - 2.3 [Anything useful that you can think of for future you or your team]
- 3 Load data
  - 3.1 Read in data files
  - 3.2 Merge data
  - 3.3 Clean data
- 4 Descriptives
  - 4.1 Table 1: Participant characteristics
  - 4.2 Histograms (DNAm)
    - 4.2.1 [Etc. etc. etc.]
  - 4.3 Bivariate analyses
  - 4.4 Sina with violin plots (DNAm x Outcome)
    - 4.4.1 Figure S1: CV
    - 4.4.2 Figure S2: DCI
- 5 Regression analyses
  - 5.1 Table 2: DNAm ~ Outcome
  - 5.2 Forest plots of results
- 6 Session Information



```

Heinsberg_Example.Rmd
Source Visual Knit on Save Knit
1 +-
2 title: "Project/Paper Title"
3 subtitle: "Workflow X: Brief Description"
4 author: "Lacey W. Heinsberg"
5 date: "July 18, 2025 (Sys.time()), 'NB MD, NY, NR')"
6 header_includes:
7   \usepackage{pdfscope}
8   - \newcommand{\landscape}{\begin{tikzpicture}[remember picture, overlay]
9   - \begin{scope}[xscale=-1, yscale=1, transform shape]
10  - \end{scope}\end{tikzpicture}}
11  - \newcommand{\endlandscape}{\end{tikzpicture}}
12  - \DefineVerbatimEnvironment{Highlighting}{Verbatim}{breaklines,commandchars=\{\}}
13 output:
14   html_document:
15     df_print: paged
16     toc: true
17     number_sections: true
18     toc_depth: 4
19     code_folding: show
20     #html_preview: false
21     #output_file: "index.html"
22     pdf_document:
23       toc: true
24       number_sections: true
25       toc_depth: 4
26       #github_document:
27       # md_extensions: +rm_attribute
28       ...
29       ...
30       # [r_echo=FALSE,message=FALSE,warning=FALSE]
31       require(knitr)
32       # Set so that long lines in R will be wrapped:
33       opts_chunkset(tidy.opts=list(width.cutoff=80),tidy=TRUE)
34       ...
35       ...
36       # In the event of a crash, save the working space on exit:
37       save_all <- function() {
38         save.image("recover.RData")
39       }
40       options(error = save_all)
41       ...
1.1 Project/Paper Title :
Console

```

## 1 Load libraries

My personal preference is to load all libraries in one chunk at the beginning. If you feel like being extra, you can annotate what the packages are used for (examples below).



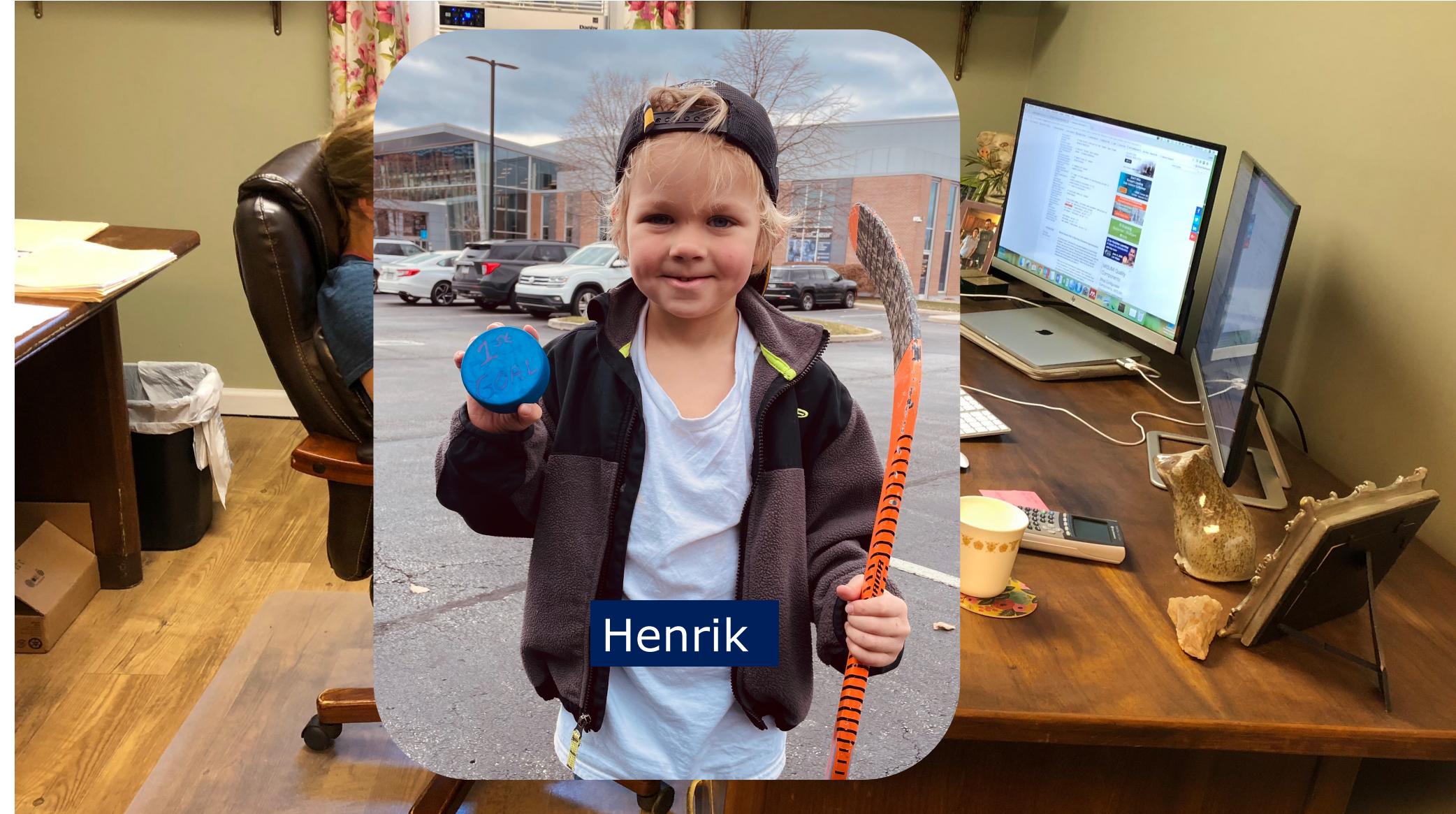
*"The biggest **stumbling block** in **learning R** is thinking that R is hard."*

-Patrick Burns

Me

Henrik

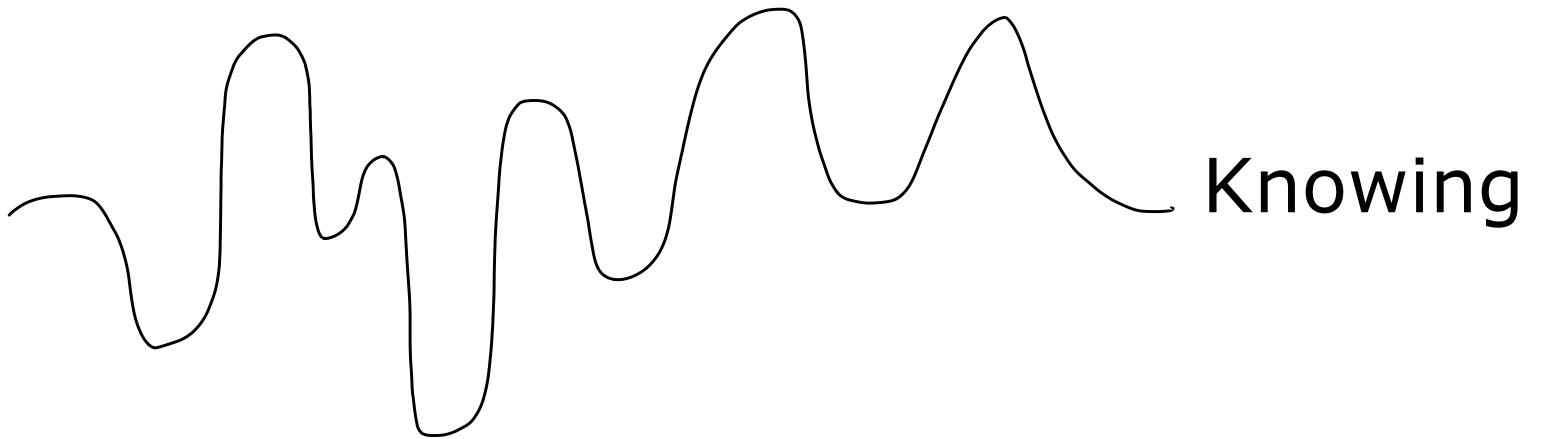




Henrik

## The **learning** space

Not  
knowing



Knowing

(Someone on Instagram)



# Outline

- 1 Reproducibility Starts with R
- 2 (Even) Better Together: Partnering with **AI**
- 3 When **R** Met **AI**: Responsible Integration
- 4 Practice What We Code: A **Practical Example**

# Key terms

AI, artificial intelligence

Generative AI, a category of AI

GPT, generative pretrained transformers

ChatGPT, a generative AI chatbot

# What does a GPT do?

LA You

What does a GPT do?

# What does a GPT do?



## ChatGPT

A GPT (Generative Pre-trained Transformer) is a type of artificial intelligence model developed by OpenAI. Its primary function is to generate human-like text based on input prompts. Here are some key features and capabilities of a GPT:

- 1. Text Generation:** GPT can generate coherent and contextually appropriate text, such as essays, articles, stories, and even poetry.
- 2. Language Understanding:** GPT can comprehend and respond to natural language prompts, making it useful for tasks like chatbots, customer service, and language translation.



# Why should we care about AI?

DIVE BRIEF

**Workers' productivity increases 33% every hour they use generative AI, report finds**

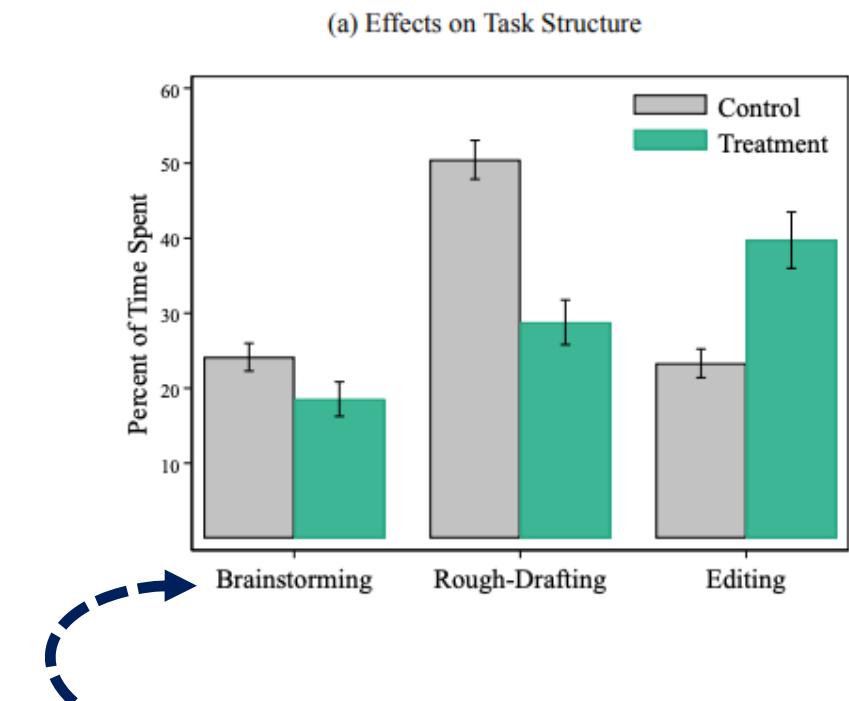
On average, generative AI “is not just an occasional tool for its users, but also an integral part of their work routines,” according to research out of the Federal Reserve Bank of St. Louis.

Published March 6, 2025

---

# Why should we care about AI?

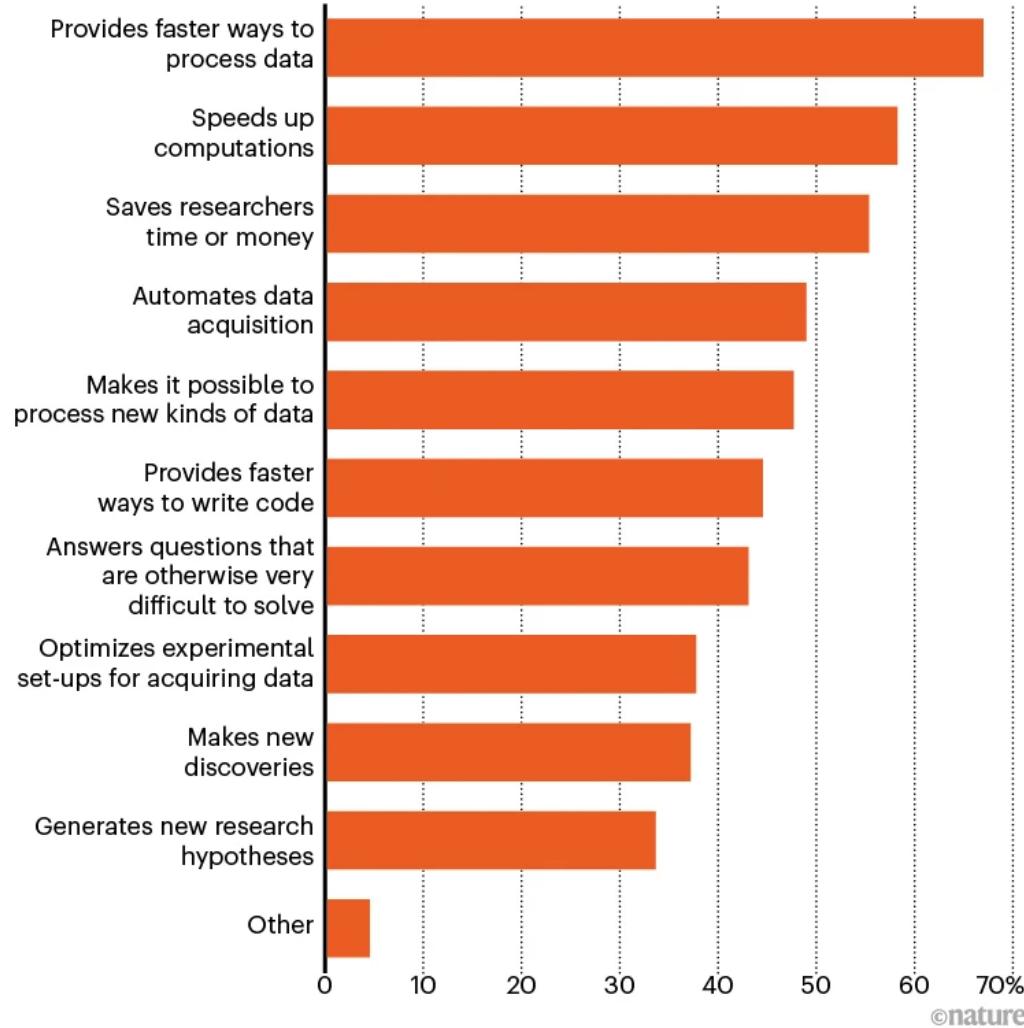
Efficiency  
Productivity  
Quality



Shakked Noy, Whitney Zhang ,Experimental evidence on the productivity effects of generative artificial intelligence. Science381,187-192(2023).DOI:10.1126/science.adh2586

## POSITIVE IMPACTS OF AI

Q: Considering machine-learning methods, what do you think are positive impacts of AI in research? (Choose all that apply.)



AI has massive potential for good

Van Noordeen & Perkel. AI and science: What 1,600 researchers think. *Nature* 621, 672-675 (2023).

**ANNA GREKA**  
Professor, Broad Institute of  
MIT and Harvard

*golden era of  
biomedicine*

PROF\_BENSTOEM

“If you don't use AI tools in academia, you will be left behind. And those who do use such tools will overtake you.”



@PROF\_BENSTOEM

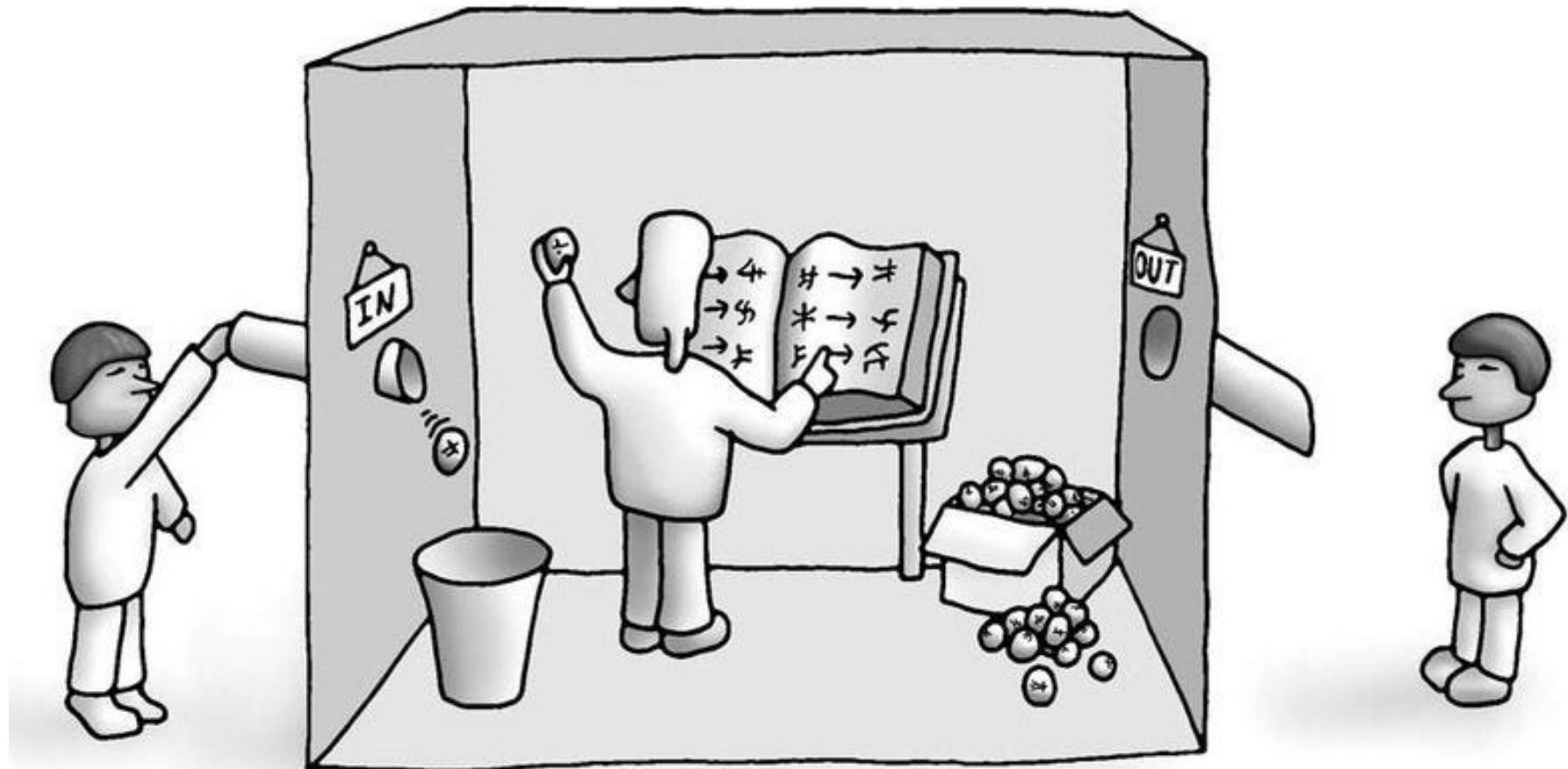


# **Is AI Enhancing Education or Replacing It?**

**Technology should facilitate learning, not substitute for it.**

<https://www.chronicle.com/article/is-ai-enhancing-education-or-replacing-it>

# The illusion of understanding



Source: wikicommons

# Your Brain on ChatGPT: Accumulation of Cognitive Debt when Using an AI Assistant for Essay Writing Task<sup>△</sup>

Nataliya Kosmyna <sup>1</sup>  
MIT Media Lab  
Cambridge, MA

Eugene Hauptmann  
MIT  
Cambridge, MA

Ye Tong Yuan  
Wellesley College  
Wellesley, \*\*\*

Jessica Situ  
MIT  
Cambridge, \*\*\*  
United States

Xian-Hao Liao  
Mass. College of Art  
and Design (MassArt)  
Boston, MA

Ashly Vivian Beresnitzky  
MIT  
Cambridge, MA

Iris Braun  
MIT  
Cambridge

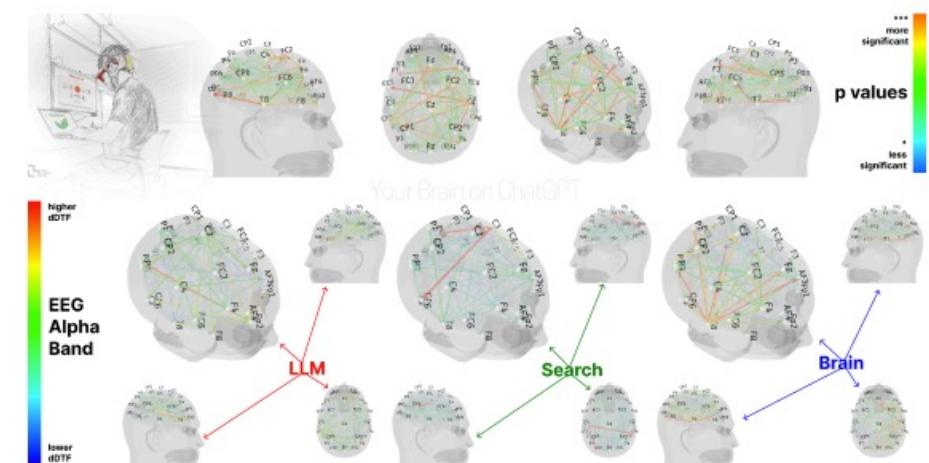


Figure 1. The dynamic Direct Transfer Function (dDTF) EEG analysis of Alpha Band for groups: LLM, Search Engine, Brain-only, including p-values to show significance from moderately significant (\*) to highly significant (\*\*).

A photograph of a stack of three smooth, light-colored stones balanced on a beach. In the background, the ocean is visible under a warm, golden sunset sky.

**The choice to use AI is deeply personal**

# Outline

- 1 Reproducibility Starts with R
- 2 (Even) Better Together: Partnering with AI
- 3 When R Met AI: Responsible Integration
- 4 Practice What We Code: A Practical Example



# AI literacy

Having the knowledge and skills to use AI tools effectively, responsibly, and ethically to accomplish tasks

# AI literacy

Having the knowledge and skills to use AI tools effectively, responsibly, and ethically to accomplish tasks **and, more broadly, navigate an AI-driven world**



(Not just a professional competence)

# AI literacy

Technical understanding (basic principles, capabilities, limitations)

Practical understanding (how to use AI)

Ethical understanding (when to use AI / what to use AI for)

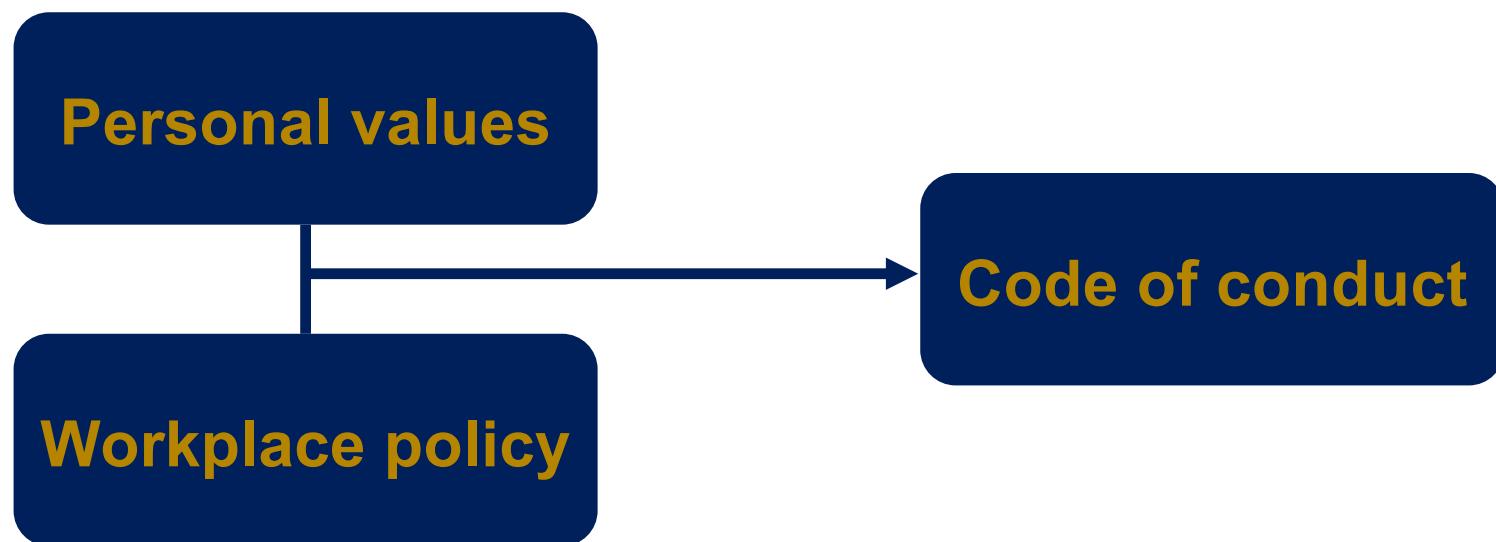
# AI literacy

- Technical understanding (basic principles, capabilities, limitations)
- Practical understanding (how to use AI)
- Ethical understanding (when to use AI / what to use AI for)

Evolving and changing over time



# Develop a personal code of conduct



# **(Some of) my scientific values**

Objectivity

Authenticity

Communication

Stewardship

Transparency / trust

Generosity

## Pitt's policy on it

*"[The] Academic Integrity Code prohibits unacknowledged use of the writing of others, which addresses issues of plagiarism and contract cheating. We believe that the code already implicitly covers the potential use of generative AI, although the policy may be updated soon to explicitly address AI use."*

# **My personal code of conduct**

## **(for stats/coding)**

# My personal code of conduct

## 1. Build competence before reliance

*I prioritize understanding the underlying statistical and programming concepts before using AI-generated code.*

~~Please give me R code to analyze associations between X and Y.~~

**Before we get started, please act as a statistical tutor so I can better understand X analytical method.**

# My personal code of conduct

## 2. Respect data privacy

I **do not** upload human data (even if de-identified) into AI platforms.

!!!!!!

My data look like this  
~~(PASTE)~~ – what should I do next?

Please give me R code to simulate synthetic data with the following structure:  
[...]

# My personal code of conduct

## 3. Maintain objectivity

I critically evaluate AI-generated code and statistical suggestions.

Oh cool thanks – that saved me a lot of time.  
(Moves on)

Hmmm... actually, I think that this loop isn't functioning the way that it should ... let's talk through each step and check the logic.

# My personal code of conduct

## 4. Enhance communication

I use AI to improve the clarity, accessibility, and aesthetic appeal of data visualizations and statistical outputs, particularly in service of scientific communication.

Here's my code and data  
... make this plot prettier.

Help me brainstorm ideas  
to redesign this figure to  
make the main finding  
clearer to a non-technical  
audience.

# My personal code of conduct

## 5. Be transparent

I disclose use of AI in code development, data analysis, and figure generation — especially in manuscripts, presentations, and teaching materials.

(Silently use AI to generate code or figures)

Add a note such as:  
*# ChatGPT-4o used to build  
code in this chunk or  
Figure concept generated  
collaboratively with AI  
assistance (ChatGPT-4o).*

# My personal code of conduct

## 6. Revisit ethics and policy

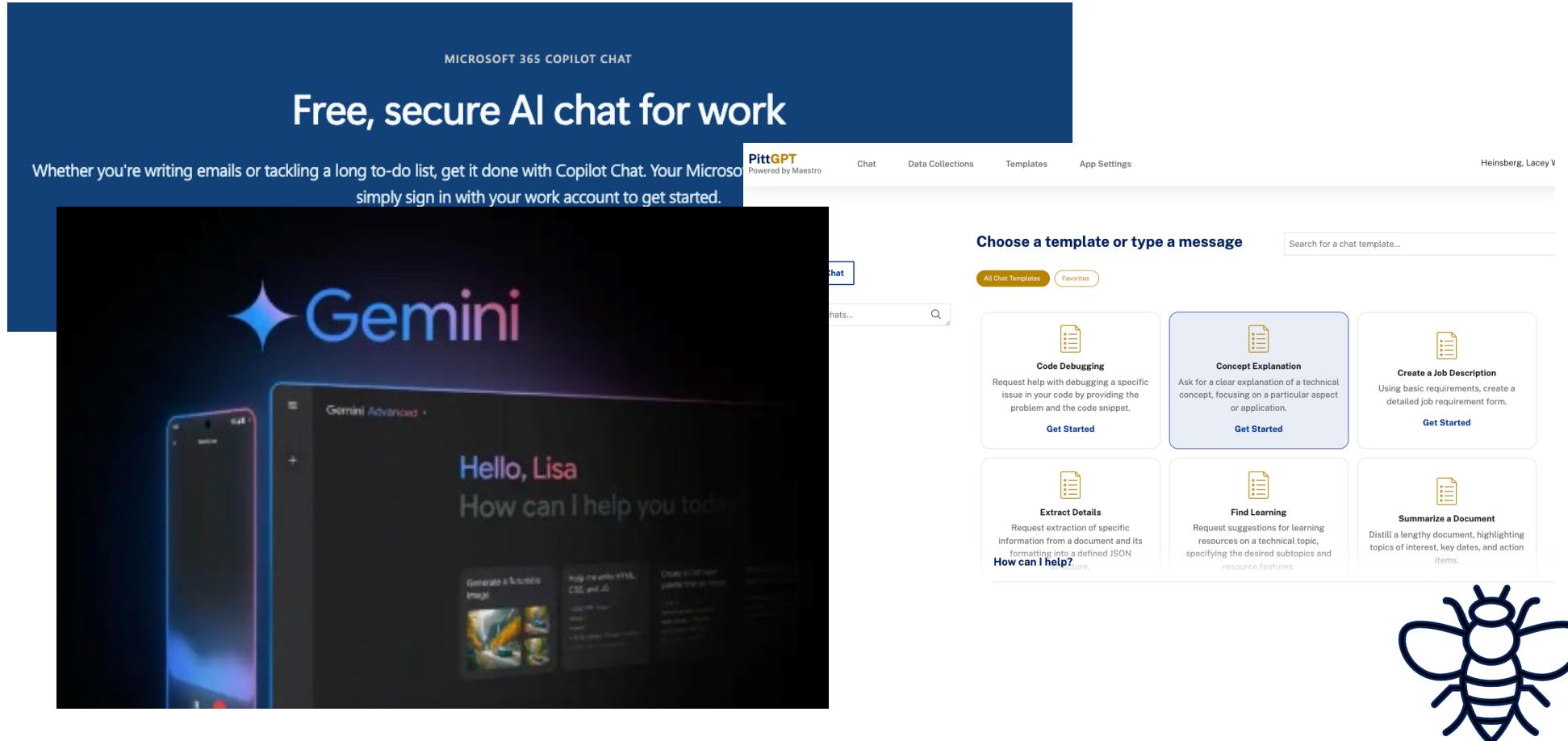
I regularly revisit and refine my AI use in accordance with evolving institutional policies, ethical standards, and my own commitment to responsible science.

I heard some lady say this was OK in a presentation last week so I am going for it.

This doesn't feel right to me ... I am going to check in on the latest AI ethics and reflect on my values before I decide what to do.

# **Other tips / things to know**

# Used closed AI tools



MICROSOFT 365 COPILOT CHAT

## Free, secure AI chat for work

Whether you're writing emails or tackling a long to-do list, get it done with Copilot Chat. Your Microsoft 365 account is included. Simply sign in with your work account to get started.

PittGPT  
Powered by Maestro

Chat Data Collections Templates App Settings

Heinsberg, Lacey V

Choose a template or type a message

All Chat Templates Favorites

Search for a chat template...

**Gemini**

Chat

Chats...

**Gemini Advanced**

Hello, Lisa  
How can I help you today?

Generate a Numeric Image  
Help me write HTML, CSS, and JS  
Create a C# class generator from an interface

**Code Debugging**  
Request help with debugging a specific issue in your code by providing the problem and the code snippet.  
[Get Started](#)

**Concept Explanation**  
Ask for a clear explanation of a technical concept, focusing on a particular aspect or application.  
[Get Started](#)

**Create a Job Description**  
Using basic requirements, create a detailed job requirement form.  
[Get Started](#)

**Extract Details**  
Request extraction of specific information from a document and its formatting into a defined JSON.  
[How can I help?](#)

**Find Learning**  
Request suggestions for learning resources on a technical topic, specifying the desired subtopics and resource features.

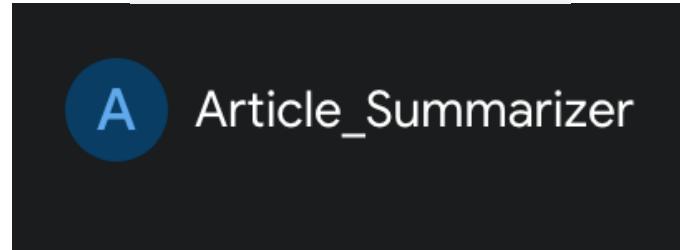
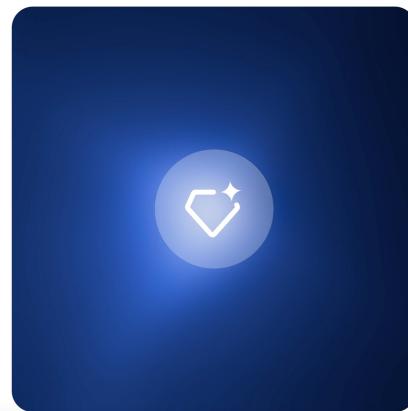
**Summarize a Document**  
Distill a lengthy document, highlighting topics of interest, key dates, and action items.



# BYOB! (Build your own bot!)

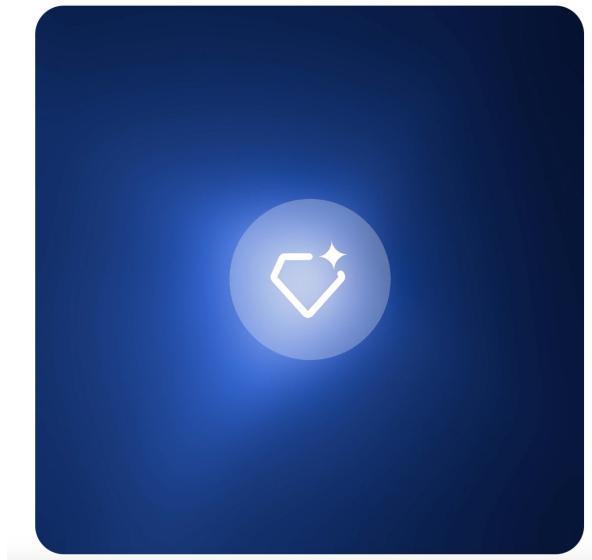


**Dr. Gina Gehling**



# Build custom experts with Gems

Gems are your custom AI experts for help on any topic. Gems can be anything from a career coach or brainstorm partner to a coding helper. Get started with our suite of premade Gems, or build your own custom Gems tailored to your unique needs.





New GPT

• Draft

Create

Configure

Prev

Hi! I'll help you build a new GPT. You can say something like, "make a creative who helps generate visuals for new products" or "make a software engineer who helps format my code."

What would you like to make?



# Synthetic data generator bot

Gemini

2.5 Flash ▾



## Synthetic\_Data

A privacy-first expert that generates complete, runnable R or Python code for synthetic datasets. Describe your variables and correlations, and this Gem will ask for missing details, then produce the script. Strictly forbidden from handling any real human data (PII/PHI).

Give me R code to simulate a data set with 500 people.  
Variables age, sex, race (0=white 1=non-white).

Give me R code to simulate a data set with 500 people.  
Variables age, sex, race (0=white 1=non-white).

S

Synthetic\_Data • Custom Gem

The user's request is incomplete because it is missing the desired statistical relationships and distribution parameters for the variables. I will enter 'Data Elicitation Mode'.

### Data Generation Checklist (Incomplete Request)

To generate a statistically coherent synthetic dataset, the following information is needed:

1. **Language:** (R is implied, but confirmation is helpful)
2. **Sample Size (N): 500** (Provided)
3. **Variable Definitions:**
  - **Age:** Desired distribution (e.g., Normal  $\mu = 45, \sigma = 10$  or Uniform 18 – 80).

Language R; age, normal distribution, sex 55% female  
45% male; 80/20 white to non-white; other variable is  
categorical CREBRF (0=no, yes=1, 45% yes);...



Language R; age, normal distribution, sex 55% female  
45% male; 80/20 white to non-white; other variable is  
categorical CREBRF (0=no, yes=1, 45% yes);...

S

Synthetic\_Data • Custom Gem

The user has provided all necessary parameters for synthetic data generation. I will now proceed with the simulation in R.

## Synthetic Data Protocol Summary

- **Language:** R used for simulation.
- **Total sample size (N):** 500 observations.
- **List of all variables, their type, and their distribution/range:**
  - ID: Integer sequence 1 to 500

R



```
# A Senior Bio-statistician's Synthetic Data Generator
# Language: R

# Set a seed for reproducibility
set.seed(42)

# --- 1. Define Sample Size ---
N <- 500

# --- 2. Generate Independent Variables ---
# ID: Unique identifier
ID <- 1:N

# Age: Continuous, Normal distribution, truncated
# Base normal distribution (mean=45, sd=10)
age_base <- rnorm(N, mean = 45, sd = 10)
# Truncate to a realistic range (18 to 90)
Age <- pmax(18, pmin(90, age_base))

# Sex: Categorical (Factor) - 55% Female (F), 45% Male (M)
```

RStudio

Heinsberg\_Example.Rmd

Knit on Save ABC Knit Run Outline

Source Visual

```
1 ---  
2 title: "Project/Paper Title"  
3 subtitle: "Workflow X: Brief Description"  
4 author: "Lacey W. Heinsberg"  
5 date: "`r format(Sys.time(), '%B %d, %Y, %R')`"  
6 header-includes:  
7 - \usepackage{pdflscape}  
8 - \newcommand{\blandscape}{\begin{landscape}}  
9 - \newcommand{\elandscape}{\end{landscape}}  
10 - \usepackage{fvextra}  
11 - \DefineVerbatimEnvironment{Highlighting}{Verbatim}{breaklines,commandchars=\\\{\}}  
12 output:  
13   html_document:  
14     df_print: paged  
15     toc: true  
16     number_sections: true  
17     toc_depth: '4'  
18     code_folding: show  
19   #html_preview: false  
20   #toc: true  
21   pdf_document:  
22     toc: true  
23     number_sections: true  
24     toc_depth: 4  
25   #github_document:  
26   # md_extensions: +raw_attribute  
27 ---  
28  
29 ```{r,echo=FALSE,message=FALSE,warning=FALSE}  
30 require(knitr)  
31 # Set so that long lines in R will be wrapped:  
32 opts_chunk$set(tidy.opts=list(width.cutoff=80),tidy=TRUE)  
33 ```  
34  
35 ```{r,echo=FALSE}  
36 # In the event of a crash, save the working space on exit:  
37 save_all <- function() {  
38   save.image("recover.RData")  
39 }  
40 options(error = save_all)  
41 ```
```

1:1 Project/Paper Title R Markdown

Console

# Data

	A	B	C	D	E	F	G	H	I
1	ID	Time	Age	Race	Education	rs1	rs2	rs3	Fatigue
2	BRCA0001	0	74	White	12	0	0	2	12.22
3	BRCA0001	1	74	White	12	0	0	2	16.12
4	BRCA0001	2	74	White	12	0	0	2	23.87
5	BRCA0001	3	74	White	12	0	0	2	17.18
6	BRCA0002	0	56	White	14	2	0	1	30.12
7	BRCA0002	1	56	White	14	2	0	1	38.99
8	BRCA0002	2	56	White	14	2	0	1	46.45
9	BRCA0002	3	56	White	14	2	0	1	50.12
10	BRCA0003	0	66	Black	14	1	1	0	30.84
11	BRCA0003	1	66	Black	14	1	1	0	31.22
12	BRCA0003	2	66	Black	14	1	1	0	30.22
13	BRCA0003	3	66	Black	14	1	1	0	29.71

# (Bot) sharing is caring



Lacey Heinsberg via DALL-E



**See GitHub!**

# Outline

- 1 Reproducibility Starts with R
- 2 (Even) Better Together: Partnering with AI
- 3 When R Met AI: Responsible Integration
- 4 Practice What We Code: A **Practical Example**

**So what does this look like in practice?**

 **Iwheinsberg** trying to get md to show up correctly7d07e54 · 16 minutes ago [Preview](#)[Code](#)[Blame](#)

779 lines (614 loc) · 30.7 KB

[Raw](#)

# Partnering with AI for Genomic Informatics

Lacey W. Heinsberg November 07, 2025, 17:33

This document was created in collaboration with ChatGPT 5 to support a 2025 ISONG lecture:

*Heinsberg LW. Partnering with AI for Genomic Informatics: Practical Workflows for Data Analysis and Interpretation. [Expert Lecture, Podium]. International Society of Nurses in Genetics, November 2025, Montreal, Canada.*

The author (Dr. Lacey W. Heinsberg) drafted the scientific content herself and used ChatGPT 5 for language editing, organization, and formatting suggestions only. She reviewed, revised, and edited all content, and takes full responsibility for the final product.

## Scenario

Imagine we are a research team studying individuals with breast cancer. We have collected longitudinal symptom data (fatigue, pain, sleep, cognition) and SNP genotype data for each participant. Our paper's aim is:

Determine whether genetic variation in the ABC gene is associated with fatigue over time.

Our data look like this:

# Scenario

Imagine we are a research team studying individuals with breast cancer.

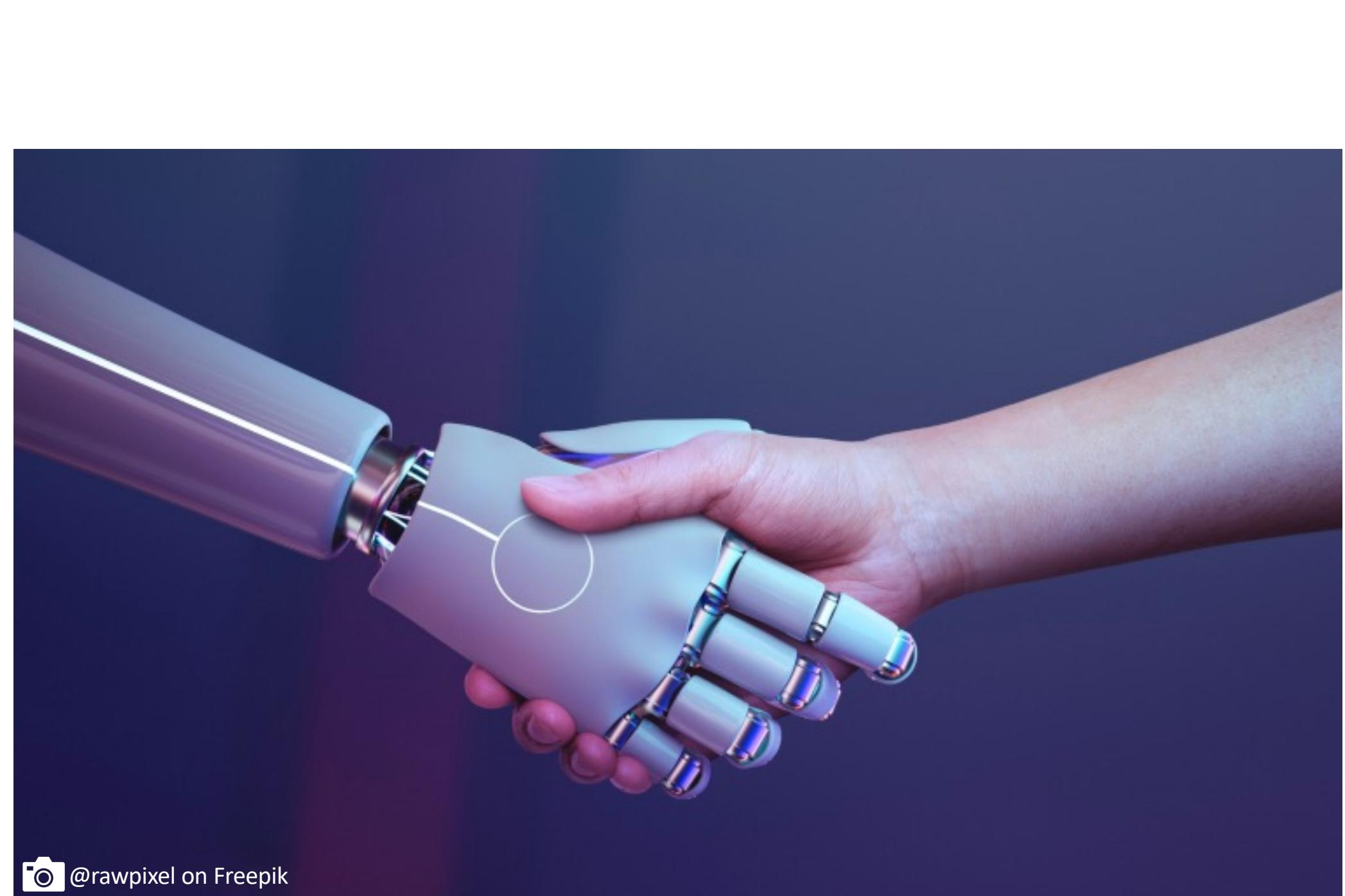
We have collected longitudinal symptom data (fatigue, pain, sleep, cognition) and SNP genotype data from each participant.

# Paper objective

What are the associations between genetic variation in the *ABC* gene and fatigue over time.

# Data

	A	B	C	D	E	F	G	H	I
1	ID	Time	Age	Race	Education	rs1	rs2	rs3	Fatigue
2	BRCA0001	0	74	White	12	0	0	2	12.22
3	BRCA0001	1	74	White	12	0	0	2	16.12
4	BRCA0001	2	74	White	12	0	0	2	23.87
5	BRCA0001	3	74	White	12	0	0	2	17.18
6	BRCA0002	0	56	White	14	2	0	1	30.12
7	BRCA0002	1	56	White	14	2	0	1	38.99
8	BRCA0002	2	56	White	14	2	0	1	46.45
9	BRCA0002	3	56	White	14	2	0	1	50.12
10	BRCA0003	0	66	Black	14	1	1	0	30.84
11	BRCA0003	1	66	Black	14	1	1	0	31.22
12	BRCA0003	2	66	Black	14	1	1	0	30.22
13	BRCA0003	3	66	Black	14	1	1	0	29.71



@rawpixel on Freepik

# Process

Step 1. Planning and discussion

Step 2. Pre-specification of analytical plan

Step 3. Coding process (which is done in collaboration with AI using synthetic data)

Step 4. Extension of code to real data

Step 5. Interpretation

Step 6. Summary, sharing, confirmation

# Bonus material / thoughts

## A note about learning + AI

If your goal is to *truly learn to code* — then you should minimize generative AI use. Tressie McMillan Cottom ([NYT, Aug 12, 2025](#)) warns that if AI automates the messy parts — we lose the foundational learning that comes from wrestling with problems, making mistakes, and figuring out why code fails. [Andrew Heiss](#) similarly notes that LLMs produce plausible code — but not necessarily correct code. And [Dan Weeks](#) emphasizes that relying on AI before you understand the underlying logic hollows out the learning process — because you cannot evaluate whether the output is right, wrong, incomplete, or misleading.

As I mention in my presentation, the decision to use AI is deeply personal. I think it depends on your career stage and your goals:

- If your goal is learning and ...
- If your goal is efficiency or not replace your judgment

This is not "OK for me but not ..."

## Supporting files

File	Purpose
<a href="#">ExampleAnalysisPlan.docx</a>	Template one-page analytic pre-specification plan
<a href="#">SyntheticDataGemInstructions.txt</a>	Instructions to create your own Gemini "Synthetic Data"" Gem
ISONG Slides	Slides from ISONG Talk - Coming Soon
<a href="#">Heinsberg_Example.Rmd</a>	Example R markdown template with annotation
<a href="#">Heinsberg_Template_Plain.Rmd</a>	Example R markdown template, plain

# Partnering with AI

Reproducibility starts with R

Partner with AI thoughtfully

Build competence before reliance

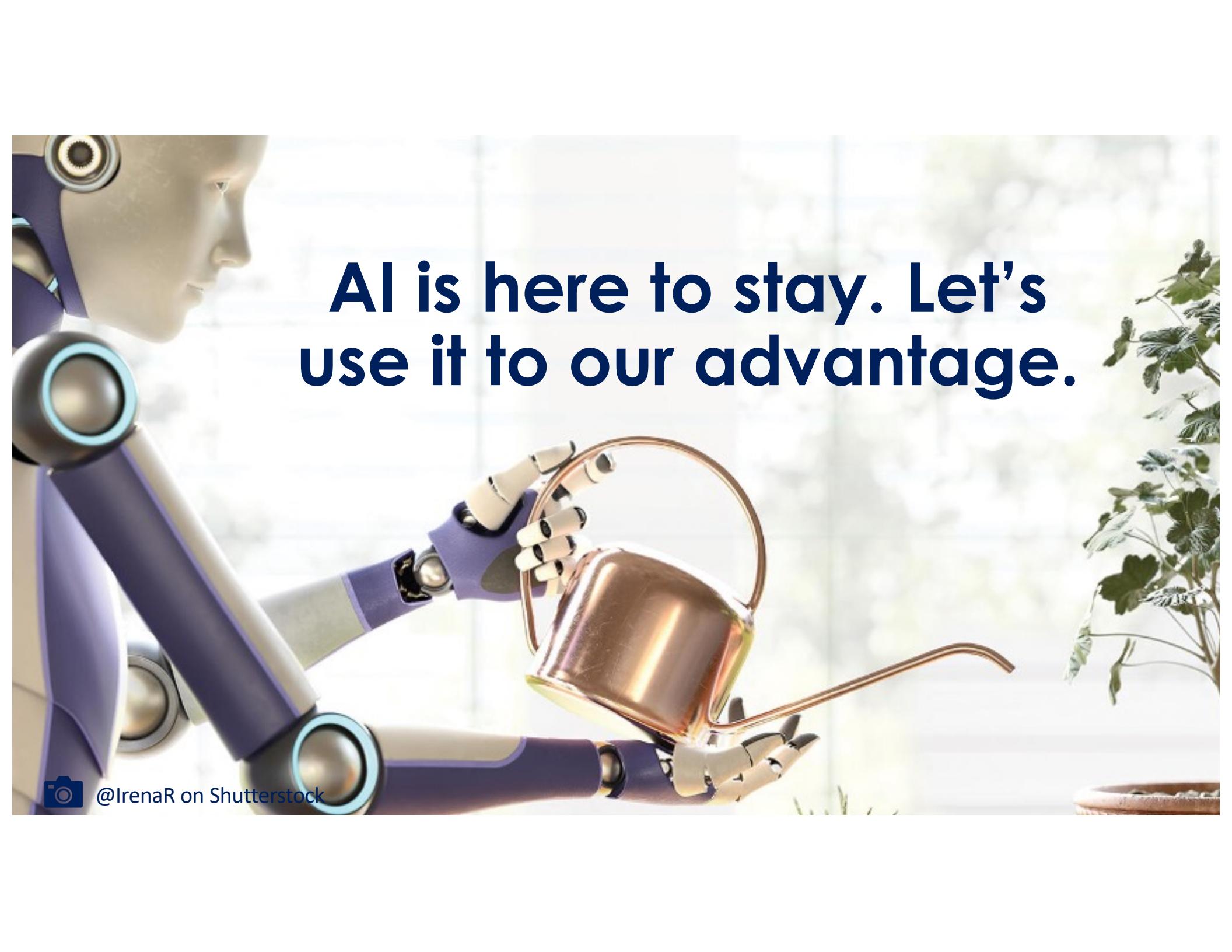
Use synthetic data to learn / code safely

Swap in real data only after approval & QC

# Partnering with AI

Does AI make us less scientific?

Or does it help us spend more time *being scientists*?



**AI is here to stay. Let's  
use it to our advantage.**



@IrenaR on Shutterstock

# Thank you!



University of  
**Pittsburgh.**<sup>®</sup>

---

**Health Sciences**  
School of Nursing



law145@pitt.edu



Lacey W. Heinsberg, PhD, RN