

# AI Tools for R

Day 1 - Introduction to Data Analysis with R

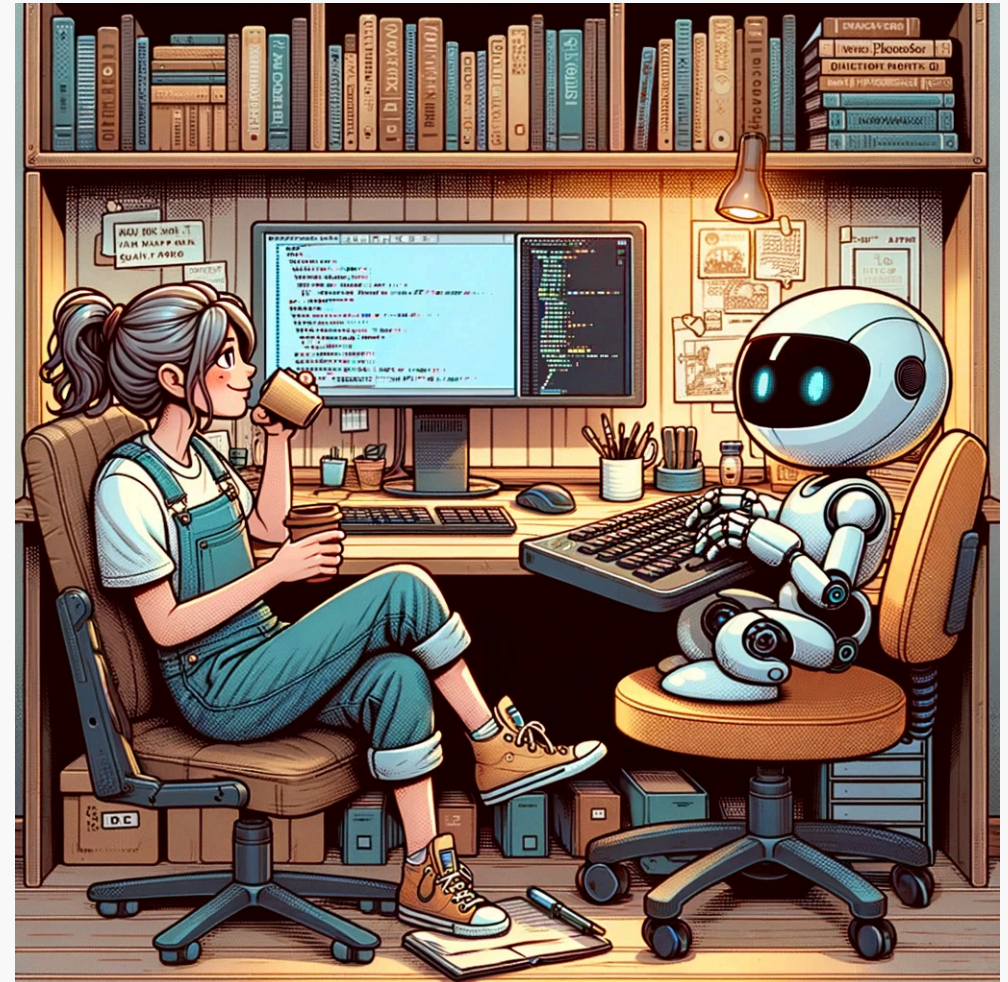
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# Motivation

- AI tools assist programmers with
  - Coding
  - Debugging
  - Learning
  - ...
- Higher productivity and efficiency
- More motivation
- But careful: You still need to understand what's going on!



# Overview of tools

- Browser-based chat bots ([ChatGPT](#), [Bard](#), ...)
  - General-purpose
- Data-analysis tools ([Julius AI](#), [RTutor](#), ...)
  - Upload data and ask questions about it
  - Can also execute code
  - Chat with your data
- Integrated AI tools ([GitHub Copilot](#), [Codium AI](#), ...)
  - Integrated directly in programming environment
  - Real-time suggestions, chat, debugging, ...

Find the tools that best fit your workflow!

# R Tutor

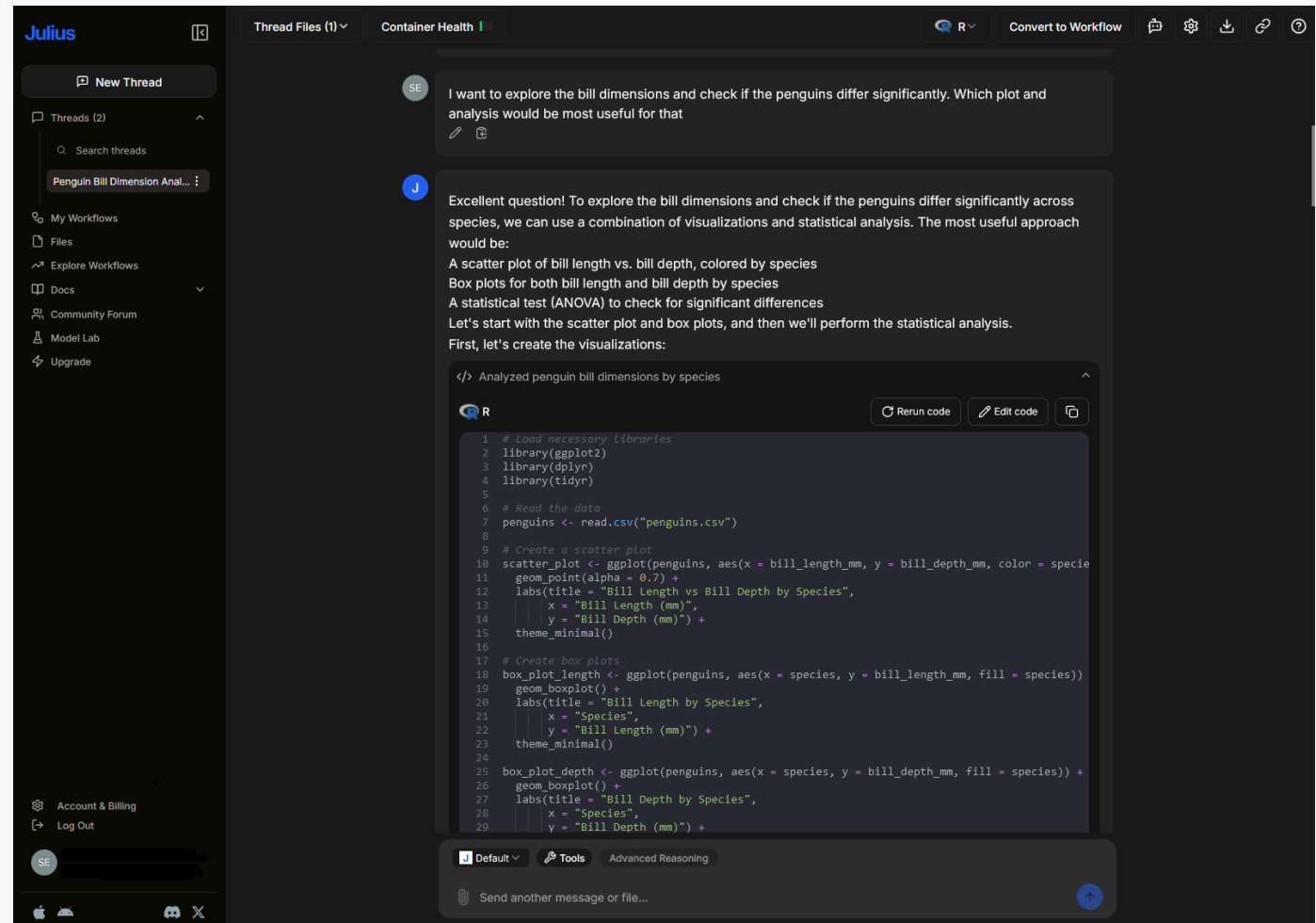
- <https://rtutor.ai/>
- Free browser tool
- Upload data and ask questions about it
- Use the demo data

The screenshot shows the R Tutor web interface. The top navigation bar includes 'RTutor', 'Home', 'EDA', 'Report', and 'More'. The left sidebar has three sections: '1. Select Dataset' with a dropdown menu showing 'mpg (examples)' and a 'Browse...' button; '2. Modify Data Fields' with a 'Data Types' button; and '3. Send Request' with a text area for asking questions and a 'Submit' button. The main content area shows the 'Selected Dataset' section with a table of 234 rows and 11 columns. The table columns are: maker, model, dis, year, cylinder, transmission, drive, city, highway, fuel, and type. The table displays data for Audi A4 and Audi A4 Quattro models from 1999 and 2008. A search bar is located at the top right of the table. The bottom of the table has a pagination control showing 'Previous', '1', '2', '3', '4', '5', '...', '24', and 'Next'.

maker	model	dis	year	cylinder	transmission	drive	city	highway	fuel	type
audi	a4	1.8	1999	4	auto(l5)	f	18	29	p	compact
audi	a4	1.8	1999	4	manual(m5)	f	21	29	p	compact
audi	a4	2	2008	4	manual(m6)	f	20	31	p	compact
audi	a4	2	2008	4	auto(av)	f	21	30	p	compact
audi	a4	2.8	1999	6	auto(l5)	f	16	26	p	compact
audi	a4	2.8	1999	6	manual(m5)	f	18	26	p	compact
audi	a4	3.1	2008	6	auto(av)	f	18	27	p	compact
audi	a4 quattro	1.8	1999	4	manual(m5)	4	18	26	p	compact
audi	a4 quattro	1.8	1999	4	auto(l5)	4	16	25	p	compact
audi	a4 quattro	2	2008	4	manual(m6)	4	20	28	p	compact

# Julius AI

- <https://julius.ai/>
- Try for free
- Basic plan ~20€ per months (-50% academic discount)
- Upload data and ask questions about it



# Github Copilot

- <https://github.com/features/copilot>
- Model based on GPT-4 and OpenAI's Codex
  - Specifically trained on source code
- Basic idea: Integrate directly into R Studio (or other IDEs)
- Works best for well-represented languages (Python, JS, ...)

# How to get GitHub Copilot

See [this website](#) for step-by-step guide and more information.

It's really easy, but you need:

- GitHub Account
- Active GH Copilot subscription (10\$ per month)
  - Get it for free as an academic with an educational account
- IDE that supports Copilot
  - Full support: Visual Studio (Code), Vim, Neovim, JetBrains IDEs (e.g. PyCharm)
  - Limited support: RStudio, ?

# GH Copilot: Inline code suggestions

- Copilot tries to predict what you want to do next
- Suggestions are based on the context
  - Previous code
  - Comments
  - Variable and function names
  - ...

```
fibonacci.R > fibonacci
1  fibonacci <- function(n) {
2    if (n == 0) {
3      return(0)
4    } else if (n == 1) {
5      return(1)
6    } else {
7      return(fibonacci(n - 1) + fibonacci(n - 2))
8    }
9  }
```



# Get better suggestions

- **Provide context**
  - Open other files
  - Add top level comments explaining the purpose of the script
  - Name variables and functions properly
  - Copy-paste sample code and delete it later
- **Be consistent**
  - “Garbage in, garbage out”
  - Have a nice and consistent coding style

Nice side effect of using Copilot: More good-practice coding

# Chat with GH copilot in R Studio

- Available through the <https://ellmer.tidyverse.org/> package
- Chat with LLMs in the sidebar
- Needs an API and some setting up

# Concerns to consider

- Privacy
  - Chose whether your prompts and suggestions will be used by Github ([Github](#) -> [Seetings](#) -> [Copilot](#) -> [Policies](#))
  - Check privacy guidelines before you upload data
- Plagiarism
  - Block suggestions matching public code ([Github](#) -> [Seetings](#) -> [Copilot](#) -> [Policies](#))
- Ethical concerns
  - For-profit tool trained on open-source
- Environmental concerns
  - Water and energy usage

# Usage guidelines

- No definite guidelines, but see examples [listed here](#)
- **Responsibility**
  - You are responsible for your scientific output
  - Stay critical, double-check
- **Transparency**
  - Make clear for which tasks you used which AI
- **Know relevant guidelines**
  - Journals
  - Your university
- **Still understand what is happening!**