

# AI Tools for R

Day 1 - Introduction to Data Analysis with R

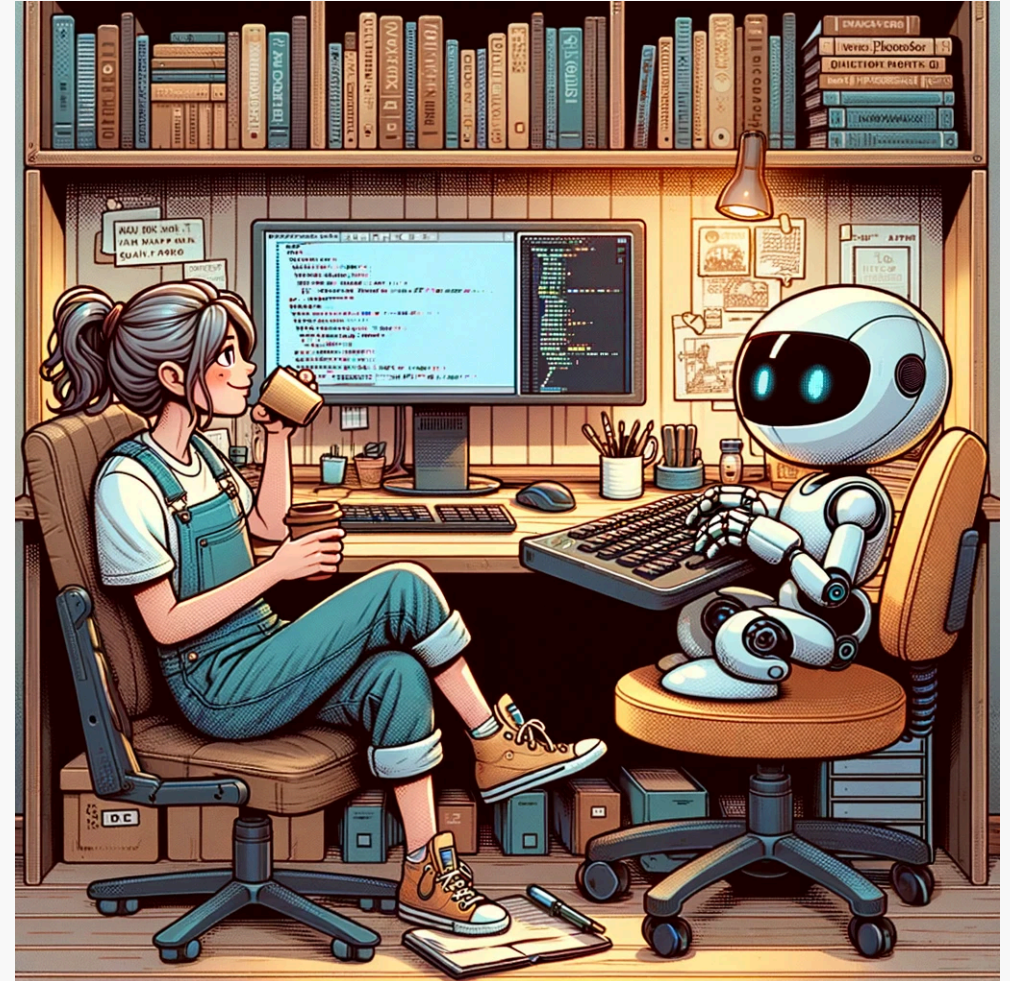
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# Motivation

- 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

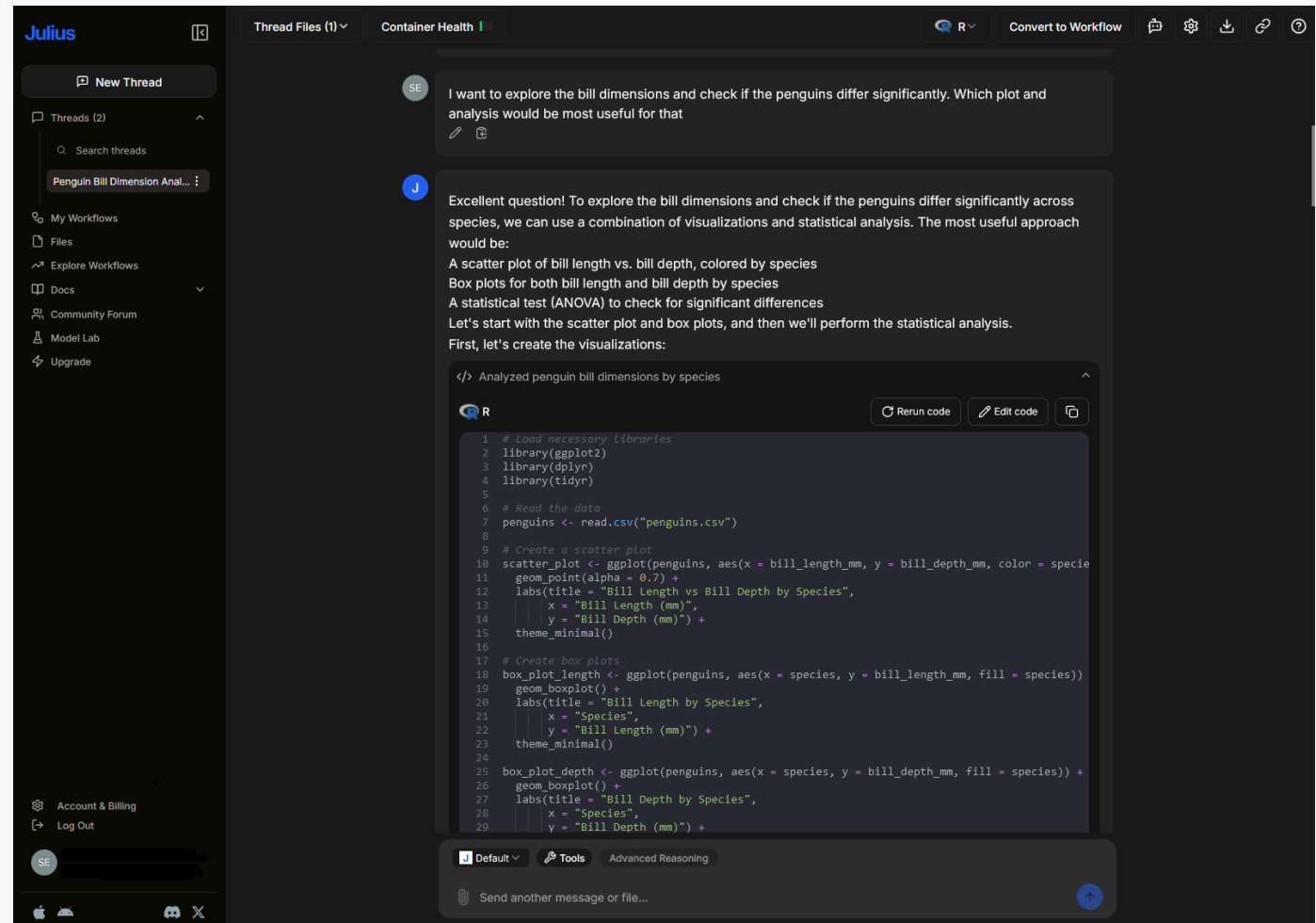
- <https://rtutor.ai/>
- Free browser tool
- Upload data and ask questions about it
- Use the demo data

The screenshot displays the R Tutor web interface. The top navigation bar includes 'RTutor', 'Home', 'EDA', 'Report', and 'More'. The left sidebar contains 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, which includes a 'Quick start' button, the R Tutor logo, and 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 above the table, and a pagination bar at the bottom shows '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!**