RICE | BUSINESS
Jones Graduate School of Business

Google Gemini in Colab

MGMT 675: Generative AI for Finance

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A Different Approach

Code Environment + Chatbot

- ChatGPT and Claude: Chatbots with code execution added
- Google Colab: Code execution environment with chatbot added
- Colab started as Jupyter notebooks in the cloud (2017)
- Gemini was integrated into Colab later (2024)
- Philosophy: Write and run code first, use AI to assist

What is Google Colab?

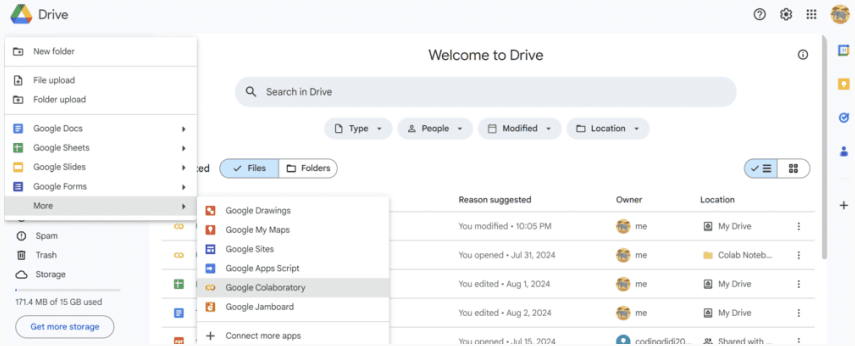
- A free tool from Google for running code in your browser
- No software installation required
- Works on any computer with internet access
- All your work saves automatically to Google Drive

What You Need

- Just two things:
- A Google account (Gmail works)
- A web browser (Chrome recommended)
- That's it!

Accessing Colab: From Google Drive

Click New → More → Google Colaboratory

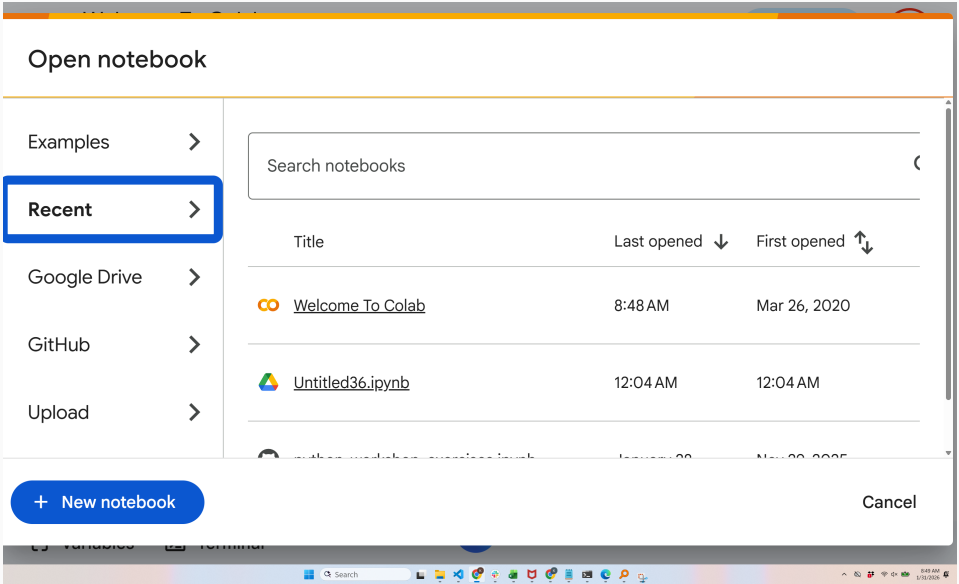


Accessing Colab: Direct

Go directly to:

colab.research.google.com

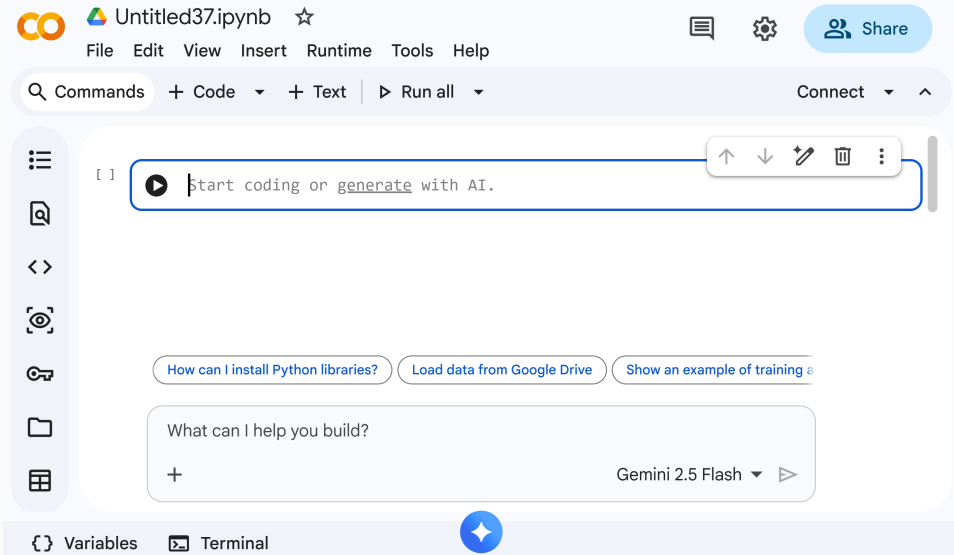
The Open Notebook Dialog



Opening Notebooks

- Examples: Google's tutorial notebooks
- Recent: Your recently opened notebooks
- Google Drive: Notebooks saved in your Drive
- GitHub: Open notebooks from GitHub repos
- Upload: Upload a .ipynb file
- Click + New notebook to start a fresh notebook

The Colab Interface: Notebook + Gemini



How Notebooks Work

- Three elements: notebook, notebook interface (Colab or other), and Python runtime environment
- A notebook (.ipynb file) is just a text file
- The interface renders the file to create what you see and handles communication with the runtime environment
    1. When you run a cell, the code is transmitted to a runtime environment (called a kernel).
    2. The runtime processes and executes your code.
    3. Results flow back to the notebook interface.
    4. The interface renders outputs, visualizations, and any error messages.

Navigating a Notebook

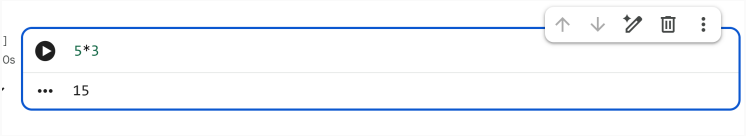
- + Code: Add a new code cell
- + Text: Add a text/markdown cell
- Connect: Connect to Google's servers
- Files (folder icon): View and upload files

What is a Cell?

- A cell is a box where you write code or text.
- Two types:
- Code cells: Run Python code
- Text cells: Write notes and explanations
- You can have as many cells as you need.

Your First Code: Simple Math

Type 5*3 and press Shift + Enter → Result: 15



Your First Code: Hello World

Type print('hello world') and press Shift + Enter

Running Code: Three Ways

- Click the play button (>) on the left of the cell
- Press Shift + Enter (runs and moves to next cell)
- Press Ctrl + Enter (runs and stays in cell)
- Tip: Shift + Enter is the most common method

Understanding the Play Button

- Before running:
- Circle with play icon (>) - Cell is ready
- While running:
- Spinning circle - Code is executing
- After running:
- Checkmark - Output appears below

Cell Numbers

- Notice the [1] or [2] next to cells?
- Shows the order cells were run
- Empty [ ] means not yet run
* means currently running
- Important: Can run cells in any order but top to bottom avoids confusion.

Adding New Cells

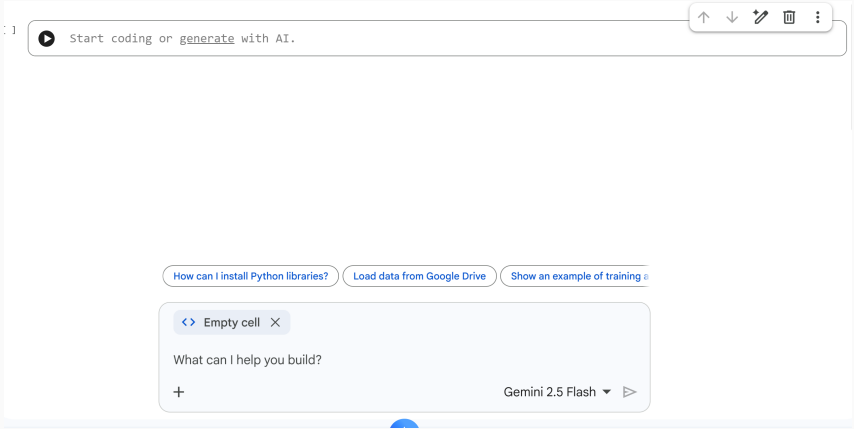
- From the toolbar:
- Click + Code for a code cell
- Click + Text for a text cell
- Using keyboard:
- Ctrl + M, B → Add cell below
- Ctrl + M, A → Add cell above

Deleting and Moving Cells

- To delete a cell:
- Click the trash icon in the cell toolbar
- Or: Ctrl + M, D
- To move a cell:
- Click the up/down arrows in the cell toolbar
- Or drag and drop the cell

Meet Gemini: Your AI Assistant

Gemini is built into Colab to help you write code



What Gemini Can Do

- Generate code from plain English descriptions
- Explain what existing code does
- Fix errors in your code
- Suggest improvements
- Answer Python questions

Runtime: What Powers Your Code

- When you click Connect, Colab gives you a virtual computer:
- CPU (standard processing)
- RAM (memory)
- Disk space
- And optionally: GPU or TPU for machine learning

Restarting the Runtime

If your code isn't working as expected:

Runtime → Restart runtime

This clears all variables and starts fresh.

Note: You'll need to re-run your cells after restarting

Session Limits

- Sessions disconnect after $\sim$90 minutes idle
- Maximum $\sim$12 hours continuous use
- Limited GPU/TPU hours per week

Get Started

1. Ask Gemini to get stock price data from Yahoo Finance and compute daily returns.
2. Ask Gemini to generate a boxplot of the daily returns.
3. Ask Gemini how you can save the boxplot.
4. Ask Gemini how you can save the return data.
5. Ask Gemini how yu can save the notebook

Exercise: Computing Returns

- Download the Excel file containing NOV price and dividend history
- Compute daily returns including dividends
- Calculate annualized mean return and volatility

Download exercise1-returns.xlsx

Exercise: Estimating Betas

- Download the Excel file containing stock and market returns
- Estimate betas for each stock using regression
- Interpret the results

Download exercise4-betas.xlsx

Exercise: Mean-Variance Analysis

- Download the Excel file with expected returns and covariance matrix
- Find the tangency portfolio
- Plot the efficient frontier

Download exercise5-meanvariance.xlsx