# Colaboratory
## Frequently Asked Questions
### The Basics
#### What is Colaboratory?link
Colaboratory, or “Colab” for short, is a product from Google Research. Colab allows anybody to write and execute arbitrary python code through the browser, and is especially well suited to machine learning, data analysis and education. More technically, Colab is a hosted Jupyter notebook service that requires no setup to use, while providing access free of charge to computing resources including GPUs.

#### Is it really free of charge to use?link
Yes. Colab is free of charge to use.

#### Seems too good to be true. What are the limitations?link
Colab resources are not guaranteed and not unlimited, and the usage limits sometimes fluctuate. This is necessary for Colab to be able to provide resources free of charge. For more details, see Resource Limits

Users who are interested in more reliable access to better resources may be interested in Colab Pro.

Resources in Colab are prioritized for interactive use cases. We prohibit actions associated with bulk compute, actions that negatively impact others, as well as actions associated with bypassing our policies. The following are disallowed from Colab runtimes:

file hosting, media serving, or other web service offerings not related to interactive compute with Colab
downloading torrents or engaging in peer-to-peer file-sharing
remote control such as SSH shells, remote desktops, remote UIs
connecting to remote proxies
mining cryptocurrency
running denial-of-service attacks
password cracking
using multiple accounts to work around access or resource usage restrictions
creating deepfakes
Additional restrictions exist for paid users here.

#### What is the difference between Jupyter and Colab?link
Jupyter is the open source project on which Colab is based. Colab allows you to use and share Jupyter notebooks with others without having to download, install, or run anything.

### Using Colab
#### Where are my notebooks stored, and can I share them?link
Colab notebooks are stored in Google Drive, or can be loaded from GitHub. Colab notebooks can be shared just as you would with Google Docs or Sheets. Simply click the Share button at the top right of any Colab notebook, or follow these Google Drive file sharing instructions.

#### If I share my notebook, what will be shared?link
If you choose to share a notebook, the full contents of your notebook (text, code, output, and comments) will be shared. You can omit code cell output from being saved or shared by using Edit > Notebook settings > Omit code cell output when saving this notebook. The virtual machine you’re using, including any custom files and libraries that you’ve setup, will not be shared. So it’s a good idea to include cells which install and load any custom libraries or files that your notebook needs.

#### Can I import an existing Jupyter/IPython notebook into Colab?link
Yes. Choose "Upload notebook" from the File menu.

#### How can I search Colab notebooks?link
You can search Colab notebooks using Google Drive. Clicking on the Colab logo at the top left of the notebook view will show all notebooks in Drive. You can also search for notebooks that you have opened recently using File > Open notebook.

#### Where is my code executed? What happens to my execution state if I close the browser window?link
Code is executed in a virtual machine private to your account. Virtual machines are deleted when

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How can I reset the virtual machine(s) my code runs on, and why is this sometimes unavailable? link
Selecting Runtime > Disconnect and delete runtime to return all managed virtual machines assigned to you to their original state. This can be helpful in cases where a virtual machine has become unhealthy e.g. due to accidental overwrite of system files, or installation of incompatible software. Colab limits how often this can be done to prevent undue resource consumption. If an attempt fails, please try again later.

Why does drive.mount() sometimes fail saying "timed out", and why do I/O operations in drive.mount()-mounted folders sometimes fail?link
Google Drive operations can time out when the number of files or subfolders in a folder grows too large. If thousands of items are directly contained in the top-level "My Drive" folder then mounting the drive will likely time out. Repeated attempts may eventually succeed as failed attempts cache partial state locally before timing out. If you encounter this problem, try moving files and folders directly contained in "My Drive" into sub-folders. A similar problem can occur when reading from other folders after a successful drive.mount(). Accessing items in any folder containing many items can cause errors like OSError: [Errno 5] Input/output error. Again, you can fix this problem by moving directly contained items into sub-folders.
Note that "deleting" files or subfolders by moving them to the Trash may not be enough; if that doesn't seem to help, make sure to also Empty your Trash.

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In some cases, we only require Google Drive authorization once, and automatically re-mount Google Drive during future sessions. To protect your files, we only allow this when a notebook passes multiple checks. For example, any notebooks which have been edited by another user do not automatically mount Google Drive.

Why do Drive operations sometimes fail due to quota?link
Google Drive enforces various limits, including per-user and per-file operation count and bandwidth quotas. Exceeding these limits will trigger Input/output error as above, and show a notification in the Colab UI. A typical cause is accessing a popular shared file, or accessing too many distinct files too quickly. Workarounds include:

Copy the file using drive.google.com and don't share it widely so that other users don't use up its limits.
Avoid making many small I/O reads, instead opting to copy data from Drive to the Colab VM in an archive format (e.g. .zip or.tar.gz files) and unarchive the data locally on the VM instead of in the mounted Drive directory.
Wait a day for quota limits to reset.
Why do Drive operations sometimes fail due to storage quota?link
Google Drive imposes a limit on how much data can be stored in it by each user. If Drive operations are failing withInput/output error and a notification says storage quota has been exceeded, delete some files using drive.google.com and Empty your Trash to reclaim the space. It might take a little while for the reclaimed space to be available in Colab.

If you'd like to purchase more Drive space, visit Google Drive. Note that purchasing more space on Drive will not increase the amount of disk available on Colab VMs. Subscribing to Colab Pro will.

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You can purchase guaranteed resources via GCP Marketplace to use with Colab.

What are the usage limits of Colab?link
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In general, notebooks can run for at most 12 hours, depending on availability and your usage patterns. You can expect to experience backend termination if you exhaust your available compute units on a Pro, Pro+, or Pay As You Go plan.

Colab Pro+ supports continuous code execution for up to 24 hours if you have sufficient compute units. Idle timeouts only apply if code execution terminates.

You can fully relax any runtime limits and idle timeouts by purchasing a dedicated VM at GCP Marketplace.

How much memory is available in Colab?link
In the version of Colab that is free of charge you are able to access VMs with a standard system memory profile.

In paid versions of Colab you are able to access machines with a high memory system profile subject to availability and your compute unit balance.

Note that memory refers to system memory. All GPU chips have the same memory profile.

How can I get the most out of Colab?link
Consider closing your Colab tabs when you are done with your work, and avoid opting for GPUs or extra memory when it is not needed for your work. This will make it less likely that you will run into usage limits within Colab. You can always purchase more compute via Pay As You Go should you hit limits.

For more information on getting the most out of the paid version of Colab, see Making the Most of your Colab Subscription.

I saw a message saying my GPU is not being utilized. What should I do?link
Colab offers optional accelerated compute environments, including GPU and TPU. Executing code in a GPU or TPU runtime does not automatically mean that the GPU or TPU is being utilized. To avoid hitting your GPU usage limits, we recommend switching to a standard runtime if you are not utilizing the GPU. Choose Runtime > Change Runtime Type and set Hardware Accelerator to None.

For examples of how to utilize GPU and TPU runtimes in Colab, see the Tensorflow With GPU and TPUs In Colab example notebooks.

## AI Coding

### How do I get access to AI coding in Colab?link

We are slowly rolling out AI coding features like AI-enabled autocompletions, natural language to code, and a chatbot all based on Codey, Google's most advanced family of code-tuned models based on PaLM 2.

Pro+ subscribers in the United States have access to these features now. Pro subscribers in the United States will be enabled next. We will expand access to new countries and to our free of charge tier as soon as capacity and approvals allow.

Sadly, we do not support Google Workspace accounts at this time. We're working on enabling the features for those account types soon.

### I'm a paid subscriber and I don't see AI coding features, what's going on?link

Only paid subscribers in the United States (starting with Pro+) have access to AI coding features. To get access to AI coding features:

Ensure you are located in the United States
Confirm you are not accessing Colab with a Google Workspace account (an account that does not end in "@gmail.com")
AI-enabled autocompletions will appear as you type. Natural language to code and the chatbot both have visible buttons ('generate' and 'Colab AI'). If you see neither of those, and you've confirmed you should have access, please report feedback in product ("Help > Send feedback"). If you want a response via email, you must select the box titled 'We may email you for more information or updates'.

### Can I rely on AI coding features in Colab for production quality work?link

Colab can help with coding and topics about coding, but AI coding in Colab is still experimental and you are responsible for your use of code or coding explanations. You should use discretion and carefully test and review all code for errors, bugs, and vulnerabilities before relying on it.

If any generated code is subject to an open source license, Colab will cite it.

### What can I ask the Colab AI chatbot?link

Please only use the Colab AI chatbot to ask questions related to Colab or coding in Colab. If you want to ask a chatbot about another subject, we recommend Bard for general queries (and questions about other languages like Java!)

### What languages can Colab help me with?link

AI coding in Colab works best and is optimized for Python.

### Does Colab give accurate and safe responses?link

AI coding in Colab is experimental and some of the responses may be inaccurate, so double-check Colab's responses. With your feedback, AI coding in Colab is getting better every day.

Accelerating people's ideas with generative AI is truly exciting, but it's still early days, and AI coding is an experiment. While Colab has built-in safety controls and clear mechanisms for feedback in line with our AI Principles, be aware that it may display inaccurate information, links or offensive statements.

### How can I give feedback about a specific AI response?link

If you get an AI response that you feel is unsafe, not helpful, inaccurate, or bad for any other reason, you can let us know by submitting feedback.

At the bottom right of the response, click the thumbs up or thumbs down icons.

### How can I turn off AI coding in Colab?link

If you wish to disable AI coding in Colab, from the Tools menu select Settings, then Colab AI.

In that space you'll be able to revoke consent and hide AI coding features.

### How and when does Colab cite sources in its responses?link

AI coding in Colab, like some other standalone LLM experiences, is intended to generate original content and not replicate existing content at length. We've designed our systems to limit the chances of this occurring, and we will continue to improve how these systems function. If Colab does directly quote at length from a source, it cites that source.

What data is collected? How is it used?link
When you use generative AI features in Colab, Google collects prompts, related code, generated output, related feature usage information, and your feedback. Google uses this data to provide, improve, and develop Google products and services and machine learning technologies, including Google's enterprise products such as Google Cloud.

To help with quality and improve our products, human reviewers may read, annotate, and process your prompts, generated output, related feature usage information, and your feedback. Please do not include sensitive (e.g., confidential) or personal information that can be used to identify you or others in your prompts or feedback. Your data will be stored in a way where Google cannot tell who provided it and can no longer fulfill any deletion requests and will be retained for up to 18 months.

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The Colab AI chatbot does not have any notebook context, and provides an explanation along with code snippets.

Additional Questions
What browsers are supported?link
Colab works with most major browsers, and is most thoroughly tested with the latest versions of Chrome, Firefox and Safari.

How is this related to colaboratory.jupyter.org?link
In 2014 we worked with the Jupyter development team to release an early version of the tool. Since then Colab has continued to evolve, guided by internal usage.

What about other programming languages?link
Colab focuses on supporting Python and its ecosystem of third-party tools. We're aware that users are interested in support for other Jupyter kernels (eg R or Scala). We would like to support these, but don't yet have any ETA.

I found a bug or have a question, who do I contact?link
Open any Colab notebook. Then go to the Help menu and select ”Send feedback...”.

Why prompt to enable third-party cookies?link
Colab uses HTML iframes and service workers hosted on separate origins in order to display rich outputs securely. Browsers require enabling third-party cookies to use the service workers within iframes. An alternative to enabling third-party cookies for all sites is to allow the following hostname in your browser settings: googleusercontent.com.

How do I change the editor font?link
Colab uses a generic monospace font for the editor. You can configure what font family is used for monospace in most modern browsers. Here's a few common ones:

In Firefox, follow the steps provided in the Firefox support documents to configure the "Monospace" font.
In Chrome, navigate to "chrome://settings/fonts" and modify the section labeled "Fixed-width font".
Does Colab support Python 2?link
Python 2 is no longer supported in Colab. For information on migrating your code from Python 2 to Python 3, see Porting Python 2 Code to Python 3.

Where can I learn more about the paid versions of Colab?link
There is an FAQ on the sign-up page.

How does billing work for the paid versions of Colab?link
Information for Colab Pro, Pro+, and Pay As You Go, including pricing and how upgrades are

handled, can be found at the sign-up page.

How do I access Colab with a Workspace account?link
Access to Colab for Workspace users is controlled by the Workspace on/off control accessible to your organization's administrator.

Workspace for Education organizations are required to obtain parental consent for students' (under the age of 18) use of Additional Services with their Google Workspace for Education account. This can be achieved with this notice template. Please be sure to include Colab in the list of additional services.

For more information, please read our Help Center article “Communicating with Parents and Guardians about Google Workspace for Education”.

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To help with quality and improve our products, human reviewers may read, annotate, and process your prompts, generated output, related feature usage information, and your feedback. Please do not include sensitive (e.g., confidential) or personal information that can be used to identify you or others in your prompts or feedback. Your data will be stored in a way where Google cannot tell who provided it and can no longer fulfill any deletion requests and will be retained for up to 18 months.

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What about other programming languages?link
Colab focuses on supporting Python and its ecosystem of third-party tools. We're aware that users are interested in support for other Jupyter kernels (eg R or Scala). We would like to support these, but don't yet have any ETA.

I found a bug or have a question, who do I contact?link
Open any Colab notebook. Then go to the Help menu and select ”Send feedback...”.

Why prompt to enable third-party cookies?link
Colab uses HTML iframes and service workers hosted on separate origins in order to display rich outputs securely. Browsers require enabling third-party cookies to use the service workers within iframes. An alternative to enabling third-party cookies for all sites is to allow the following hostname in your browser settings: googleusercontent.com.

How do I change the editor font?link
Colab uses a generic monospace font for the editor. You can configure what font family is used for monospace in most modern browsers. Here's a few common ones:

In Firefox, follow the steps provided in the Firefox support documents to configure the "Monospace" font.
In Chrome, navigate to "chrome://settings/fonts" and modify the section labeled "Fixed-width font".
Does Colab support Python 2?link
Python 2 is no longer supported in Colab. For information on migrating your code from Python 2 to Python 3, see Porting Python 2 Code to Python 3.

Where can I learn more about the paid versions of Colab?link
There is an FAQ on the sign-up page.

How does billing work for the paid versions of Colab?link
Information for Colab Pro, Pro+, and Pay As You Go, including pricing and how upgrades are

handled, can be found at the sign-up page.

How do I access Colab with a Workspace account?link
Access to Colab for Workspace users is controlled by the Workspace on/off control accessible to your organization's administrator.

Workspace for Education organizations are required to obtain parental consent for students' (under the age of 18) use of Additional Services with their Google Workspace for Education account. This can be achieved with this notice template. Please be sure to include Colab in the list of additional services.

For more information, please read our Help Center article “Communicating with Parents and Guardians about Google Workspace for Education”.