



Lab1: Warm-up & GitHub

11210IPT 553000

Deep Learning in Biomedical Optical Imaging

2023/09/18



Outlines

- What's Colab?
- How to use Colab?
- Numpy Basic
- GitHub
- Open a Repository and Commit Homework
- Homework 1

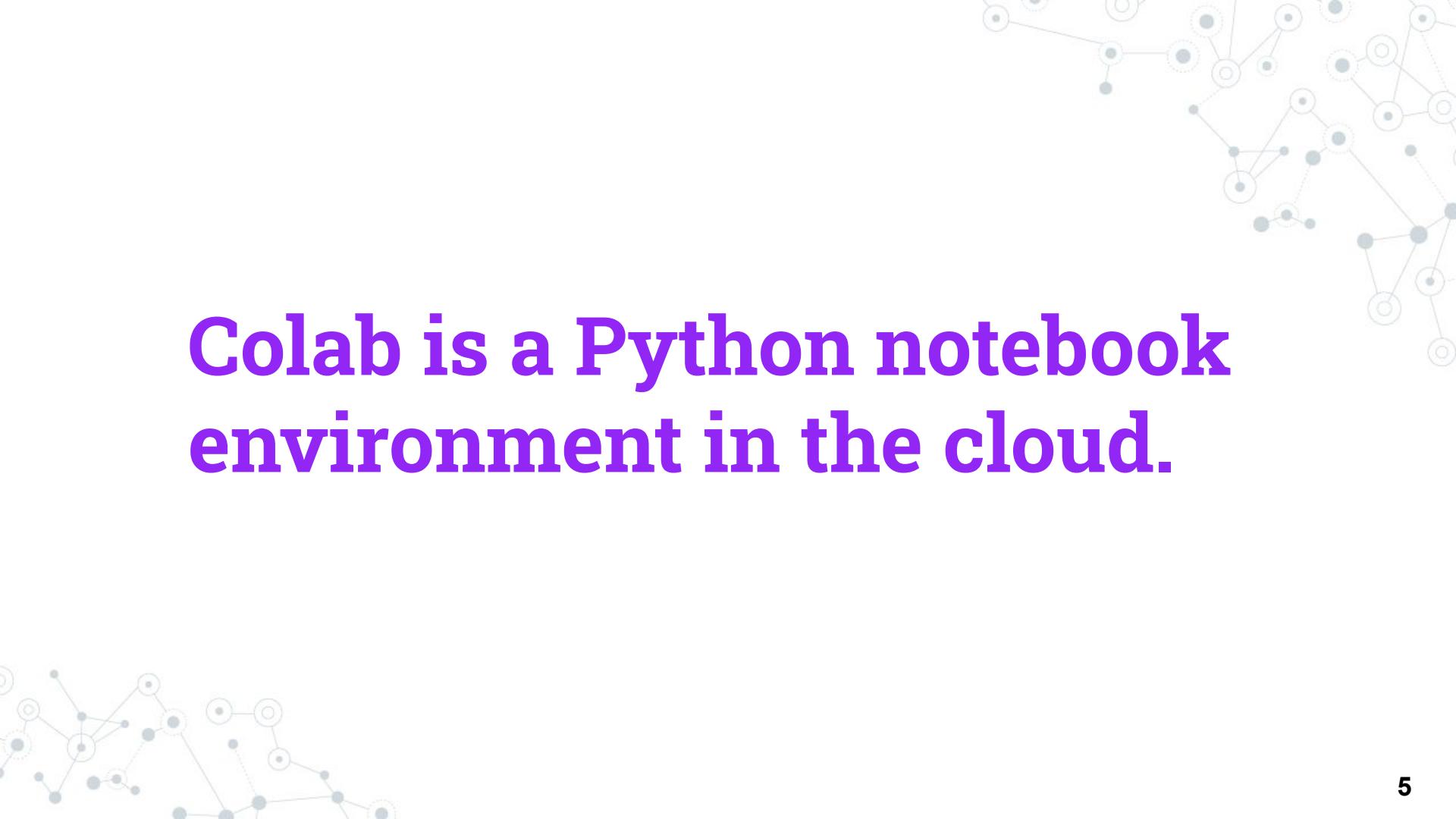
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What's Colab?

1. **Python Environment:** Google Colab provides a Python environment where you can write and execute Python code through your browser. It supports Python 2.7 and 3.6+.
2. **GPU Support:** It offers free access to GPU computing resources, which can be very beneficial when working on deep learning projects.
3. **Integration with Google Drive:** You can save your notebooks directly to your Google Drive, allowing for seamless storage and sharing of your projects.
4. **Collaborative Work:** Like other Google services, Colab allows for collaborative work on notebooks, meaning multiple people can work on a project simultaneously.
5. **Pre-installed Libraries:** It comes with many popular libraries pre-installed, which facilitates setting up your environment for ML and data science projects.
6. **Importing Datasets:** You can easily import datasets from various sources, including GitHub and Google Drive, into your Colab notebooks.

The Colab logo is located in the bottom right corner. It consists of the word "colab" in a lowercase, sans-serif font. The letters are colored in a gradient: 'c' is orange, 'o' is yellow, 'l' is orange, 'a' is yellow, and 'b' is orange. The 'o' has a small black outline.



Colab is a Python notebook environment in the cloud.

Outlines

- What's Colab?
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- Numpy Basic
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How to use Colab?



1. **Accessing Colab:** You can access Google Colab through its [website](#) using a Google account.



2. **Creating/Opening a Notebook:** Once on the Colab interface, you can create a new notebook to start working on your project.



3. **Writing Code:** You can write and execute Python code in code cells. You can also add text cells to document your code and add explanations.



4. **Executing Code:** You can run a code cell by clicking on the play button on the left side of the cell or using the keyboard shortcut Ctrl+Enter.



5. **Saving and Sharing Notebooks:** After working on a notebook, you can save it to your Google Drive and share it with others through a link.

Welcome to Colab

The screenshot shows the Google Colaboratory interface. At the top, there's a navigation bar with icons for file, edit, view, insert, run, help, and settings. Below the bar, there are tabs for '程式碼' (+), '文字' (+), and '複製到雲端硬碟'. On the left, a sidebar titled '目錄' contains links to '開始使用', '數據科學', '機器學習', '其他資源', '主要範例', and '區段'. The main content area features a video player with the title '歡迎使用 Colab!' and a subtitle: '如果你已經熟悉 Colab, 請觀看這部影片瞭解互動式表格、執行過的程式碼歷史紀錄視窗畫面, 以及指令區塊面板。' Below the video, there's a section titled 'Colab 是什麼?' with a list of benefits: '不必進行任何設定', '免付費使用 GPU', and '輕鬆共用'. A note says '無論你是學生、數據科學家或是 AI 研究人員, Colab 都能讓你的工作事半功倍。請觀看 Colab 的簡介影片瞭解詳情, 或是直接瀏覽以下的新手入門說明!' Under the '開始使用' heading, it says '你正在閱讀的文件並非靜態網頁, 而是名為 Colab 筆記本的互動式環境, 可讓你撰寫和執行程式碼。' An example code cell shows Python code calculating the number of seconds in a day:

```
[ ] 1 seconds_in_a_day = 24 * 60 * 60  
2 seconds_in_a_day  
86400
```

At the bottom, a note says: '如要執行上方儲存格中的程式碼, 請按一下進行選取, 再按一下程式碼左側的播放鍵, 或是使用鍵盤快速鍵『Command/Ctrl + Enter 鍵』。按一

<https://colab.research.google.com/>

Upload Notebook to Colab



歡迎使用 Colaboratory

檔案 編輯 檢視畫面 插入 執行階段 工具 說明

新增筆記本 + 程式碼 + 文字 复製到雲端硬碟

開啟筆記本 Ctrl+O

上傳筆記本

重新命名

在雲端硬碟中儲存複本

將副本另存為 GitHub Gist

在 GitHub 中儲存副本

儲存 Ctrl+S

修訂版本記錄

下載

列印 Ctrl+P

歡迎使用 Colab!

如果你已經熟悉 Colab，請觀看這部影片瞭解互動式表格、執行過的程式碼歷史記錄檢視畫面，以及指令區塊面板。

3 Cool Google Colab Features



Colab 是什麼？

Colab (全名為「Colaboratory」) 可讓你在瀏覽器中編寫及執行 Python 程式碼，並具有以下優點：

- 不必進行任何設定
- 免付費使用 GPU
- 輕鬆共用

無論你是學生、數據資料學家或是 AI 研究人員，Colab 都能讓你的工作事半功倍。請觀看 [Colab 的簡介影片](#)瞭解詳情，或是直接瀏覽以下的新手入門說明！

Basic of Colab Notebook

The screenshot shows the 'Cells' section of the 'Overview of Colaboratory Features' in Google Colab. The left sidebar has a 'Cells' section expanded, showing options like 'Code cells', 'Text cells', and 'Adding and moving cells'. The main content area has a heading 'Cells' with a sub-section 'Code cells'. It explains that a notebook is a list of cells containing explanatory text or executable code. It provides instructions for executing code cells, such as clicking the play icon or using keyboard shortcuts like Cmd/Ctrl+Enter or Shift+Enter. Below this, there's a snippet of code:

```
[ ] 1 a = 10  
2 a
```

 followed by the output

```
10
```

. The next section is 'Text cells', which describes how to edit text cells using double-clicking and markdown syntax.

A notebook is a list of cells. Cells contain either explanatory text or executable code and its output. Click a cell to select it.

Below is a **code cell**. Once the toolbar button indicates CONNECTED, click in the cell to select it and execute the contents in the following ways:

- Click the **Play icon** in the left gutter of the cell;
- Type **Cmd/Ctrl+Enter** to run the cell in place;
- Type **Shift+Enter** to run the cell and move focus to the next cell (adding one if none exists); or
- Type **Alt+Enter** to run the cell and insert a new code cell immediately below it.

There are additional options for running some or all cells in the **Runtime** menu.

```
[ ] 1 a = 10  
2 a
```

```
10
```

This is a **text cell**. You can **double-click** to edit this cell. Text cells use markdown syntax. To learn more, see our [markdown guide](#).

You can also add math to text cells using [LaTeX](#) to be rendered by [MathJax](#). Just place the statement within a pair of \$ signs. For example $\sqrt{3x-1} + (1+x)^2$ becomes $\sqrt{3x-1} + (1+x)^2$.

https://colab.research.google.com/notebooks/basic_features_overview.ipynb



Improve development efficiency with a powerful feature



Outlines

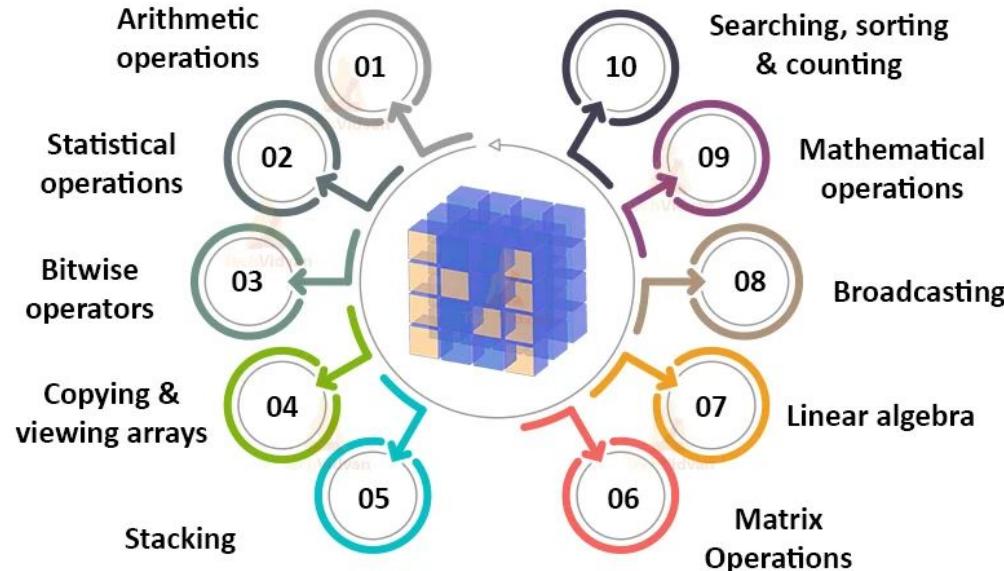
- What's Colab?
- How to use Colab?
- **Numpy Basic**
- GitHub
- Open a Repository and Commit Homework
- Homework 1

What is NumPy?

1. NumPy stands for **Numerical Python**.
2. NumPy is a Python library used for working with **arrays**.
3. It also has functions for working in linear algebra, Fourier transforms, and matrices.
4. NumPy was created in 2005 by Travis Oliphant. It is an **open-source project**, and you can use it freely.



Uses of Numpy



Source:

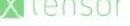
<https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.lccnet.com.tw%2Flccnet%2Farticle%2Fdetails%2F2252&psig=AOvVaw0pqzHbzgoSC41aDlahJw97&ust=1695050797058000&source=images&cd=vfe&opi=89978449&ved=0CBAQjRxqFwoTCMD8gLf6sYEDFQAAAAAdAAAAABAI>

Numpy Ecosystem

Quantum Computing	Statistical Computing	Signal Processing	Image Processing	Graphs and Networks	Astronomy	Cognitive Psychology
						
QuTiP PyQuil Qiskit PennyLane	Pandas statsmodels Xarray Seaborn	SciPy PyWavelets python-control	Scikit-image OpenCV Mahotas	NetworkX graph-tool igraph PyGSP	AstroPy SunPy SpacePy	PsychoPy
Bioinformatics	Bayesian Inference	Mathematical Analysis	Chemistry	Geoscience	Geographic Processing	Architecture & Engineering
						
BioPython Scikit-Bio PyEnsembl ETE	PyStan PyMC3 ArviZ emcee	SciPy SymPy cvxpy FEniCS	Cantera MDAnalysis RDKit PyBaMM	Pangeo Simpeg ObsPy Fatiando a Terra	Shapely GeoPandas Folium	COMPAS City Energy Analyst Sverchok

Source: <https://numpy.org/>

Numpy Ecosystem

Array Library	Capabilities & Application areas
 DASK	Dask Distributed arrays and advanced parallelism for analytics, enabling performance at scale.
 CuPy	CuPy NumPy-compatible array library for GPU-accelerated computing with Python.
 JAX	JAX Composable transformations of NumPy programs: differentiate, vectorize, just-in-time compilation to GPU/TPU.
 xarray	Xarray Labeled, indexed multi-dimensional arrays for advanced analytics and visualization
 Sparse	Sparse NumPy-compatible sparse array library that integrates with Dask and SciPy's sparse linear algebra.
 PyTorch	PyTorch Deep learning framework that accelerates the path from research prototyping to production deployment.
 TensorFlow	TensorFlow An end-to-end platform for machine learning to easily build and deploy ML powered applications.
 MXNet	MXNet Deep learning framework suited for flexible research prototyping and production.
 Arrow	Arrow A cross-language development platform for columnar in-memory data and analytics.
 xtensor	xtensor Multi-dimensional arrays with broadcasting and lazy computing for numerical analysis.
 Awkward Array	Awkward Array Manipulate JSON-like data with NumPy-like idioms.
 uarray	uarray Python backend system that decouples API from implementation; unumpy provides a NumPy API.
 tensorly	tensorly Tensor learning, algebra and backends to seamlessly use NumPy, MXNet, PyTorch, TensorFlow or CuPy.

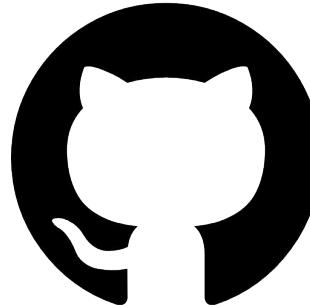
Source: <https://numpy.org/>

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GitHub

GitHub is a platform and cloud-based service for software development and version control using **Git**, allowing developers to **store** and **manage** their code. It provides the distributed version control of Git, access control, bug tracking, software feature requests, task management, continuous integration, and wikis for every project.



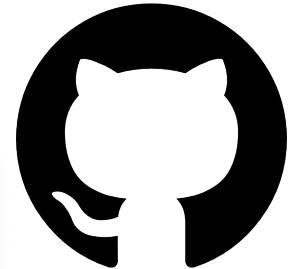
<https://github.com/>

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Github

Create a Repository



A screenshot of a web browser showing the GitHub homepage. The URL in the address bar is `github.com`. The page features a navigation bar with links for `Pull requests`, `Issues`, `Codespaces`, `Marketplace`, and `Explore`. On the left, there's a sidebar with sections for `Top Repositories` (listing repos like `TacoXDD/homeworks`, `yizhouzhao/Tangram`, etc.) and `Recent activity`. The main content area has a heading **The home for all developers — including you.** and a sub-section **Start a new repository**. It includes fields for entering a repository name and choosing between **Public** or **Private** visibility. A prominent green button at the bottom right of this section says **Create a new repository**. To the right of the main content, a sidebar displays **Latest changes** with items from the past few days. A dropdown menu in the top right corner is open, showing options like **New repository**, **Import repository**, **New codespace**, and **New gist**. A **Get started** button is also visible in this menu. At the bottom left of the main content area, there's a link to a documentation page: <https://docs.github.com/en/get-started/quickstart/hello-world>.

github.com

Pull requests Issues Codespaces Marketplace Explore

Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository](#).

Owner * **Repository name ***

TacoXDD / example ✓

Great repository names are short and memorable. Need inspiration? How about [refactored-giggle](#)?

Description (optional)

This is an example repository.

Public
Anyone on the internet can see this repository. You choose who can commit.

Private
You choose who can see and commit to this repository.

Initialize this repository with:

Skip this step if you're importing an existing repository.

Add a README file
This is where you can write a long description for your project. [Learn more](#).

Add .gitignore

Choose which files not to track from a list of templates. [Learn more](#).

.gitignore template: None ▾

Choose a license

A license tells others what they can and can't do with your code. [Learn more](#).

License: None ▾



github.com

Pull requests Issues Codespaces Marketplace Explore

TacoXDD / example

Unwatch 1 Fork 0 Star 0

About

This is an example repository.

Readme 0 stars 1 watching 0 forks

Code

main 1 branch 0 tags Go to file Add file > Code

TacoXDD Initial commit Sacd68d now 1 commit

README.md Initial commit now

README.md

example

This is an example repository.

Releases

No releases published Create a new release

Packages

No packages published Publish your first package

© 2022 GitHub, Inc. Terms Privacy Security Status Docs Contact GitHub Pricing API Training Blog About

Introduction

Change your README.md

Use markdown to write contents.

The screenshot shows a GitHub repository page for 'TacoXDD/example'. The user is editing the 'README.md' file in the 'main' branch. The code editor displays the following Markdown content:

```
1 # I am an example
2
3 > National Tsing Hua University
4 > Fall 2022 11110IPT 5530
5 > Deep Learning in Biomedical Optical Imaging
6
7 ##### tags: `example` `NTHU`
8
9 - **Name:** Taco
10 - **Student ID:** 111003803
11
12 ### This is my cats
13 
14
```

Clone a Project

Git Clone

The screenshot shows a GitHub repository page for 'TacoXDD / example'. The 'Code' tab is selected, displaying a 'Clone' section with options for HTTPS, SSH, and GitHub CLI. The HTTPS URL is shown as <https://github.com/TacoXDD/example.git>. Below the clone section are links for 'Open with GitHub Desktop' and 'Download ZIP'. The repository has 1 branch and 0 tags. The README.md file contains the text 'I am an example' and 'National Tsing Hua University Fall 2022 11110IPT 55'. It also lists tags: example NTHU and contributors: Name: Taco, Student ID: 111003803. A photo of a cat is displayed at the bottom.

TacoXDD / example (Private)

Code Issues Pull requests Actions Projects Security Insights Settings

main 1 branch 0 tags

Go to file Add file ▾ Code ▾ Local Codespaces (New)

Clone

HTTPS SSH GitHub CLI

<https://github.com/TacoXDD/example.git>

Use Git or checkout with SVN using the web URL.

Open with GitHub Desktop

Download ZIP

About

This is an example repository.

Readme 0 stars 1 watching 0 forks

Releases

No releases published Create a new release

Packages

No packages published Publish your first package

I am an example

National Tsing Hua University Fall 2022 11110IPT 55

tags: example NTHU

- Name: Taco
- Student ID: 111003803

This is my cats

Get Token

Personal Access Tokens

This screenshot shows the GitHub Public profile settings page. The user is signed in as 'TacoXDD'. The main area displays the 'Public profile' section, which includes fields for 'Name', 'Profile picture' (a cat's face), 'Email' (with a dropdown menu showing 'Select a verified email to display'), 'Bio' (a text input field), 'URL', 'Twitter username', and 'Company'. On the left, a sidebar lists various account management sections: Public profile, Account, Appearance, Accessibility, Notifications, Access, Billing and plans, Emails, Password and authentication, Sessions, SSH and GPG keys, Organizations, and Moderation. A note at the bottom of the sidebar says 'Open "https://github.com/settings/profile" in a new tab'.

This screenshot shows the GitHub Personal Access Tokens (classic) settings page. The user is signed in as 'TacoXDD'. The main area displays the 'Personal access tokens (classic)' section, which lists tokens generated for the user. One token is shown: 'key' with a value of 'admin:enterprise, admin:gpg_key, admin:org, admin:org_hook, admin:public_key, admin:repo_hook, admin:ssh_signing_key, delete:packages, delete_repo, gist, notifications, project, repo, user, workflow, write:discussion, write:packages'. This token has no expiration date. Below the tokens, a note states: 'Personal access tokens (classic) function like ordinary OAuth access tokens. They can be used instead of a password for Git over HTTPS, or can be used to authenticate to the API over Basic Authentication.' At the bottom, there are links to GitHub's Terms, Privacy, Security, Status, Docs, Contact GitHub, Pricing, API, Training, Blog, and About pages.

Git Commands

How to Update a Repository

- Under a repository folder.
 - *git status* - Show the status of this repository.
 - *git add .* - This command updates the index using the current content found in the working tree, to prepare the content staged for the next commit. (. is the current folder.)
 - *git commit -m “.....”* - Record changes to the repository.
 - *git push* - Update remote refs along with associated objects.

<https://git-scm.com/>

Example

Update a File

```
root@6861f18ca07d:/source/example# git status  
On branch main  
Your branch is up to date with 'origin/main'.  
  
nothing to commit, working tree clean  
root@6861f18ca07d:/source/example# git status  
On branch main  
Your branch is up to date with 'origin/main'.  
  
Untracked files:  
  (use "git add <file>..." to include in what will be committed)  
    Python_Basics_with_Numpy.ipynb  
  
nothing added to commit but untracked files present (use "git add" to track)  
root@6861f18ca07d:/source/example# git add .  
root@6861f18ca07d:/source/example# git status  
On branch main  
Your branch is up to date with 'origin/main'.  
  
Changes to be committed:  
  (use "git restore --staged <file>..." to unstage)  
    new file:   Python_Basics_with_Numpy.ipynb  
  
root@6861f18ca07d:/source/example# git commit -m "Update files"  
[main da24ecd] Update files  
  1 file changed, 1380 insertions(+)  
  create mode 100644 Python_Basics_with_Numpy.ipynb  
root@6861f18ca07d:/source/example# git push  
Username for 'https://github.com': tacoXDD  
Password for 'https://tacoXDD@github.com':  
Enumerating objects: 4, done.  
Counting objects: 100% (4/4), done.  
Delta compression using up to 16 threads  
Compressing objects: 100% (3/3), done.  
Writing objects: 100% (3/3), 11.50 KiB | 11.50 MiB/s, done.  
Total 3 (delta 0), reused 0 (delta 0)  
To https://github.com/TacoXDD/example.git  
  af659ce..da24ecd  main -> main
```

git status

Add files....

git status

Message changed.

git add .

git status

Message changed.

git commit

git push

Enter your username
and personal access tokens

Check Github

The screenshot shows a GitHub repository page for 'TacoXDD/example'. The repository is described as an example repository. It has 1 branch and 0 tags. The most recent commit was made 7 minutes ago by 'TacoXDD' and updated files. A yellow banner highlights 'Your new files!!'. The README.md file contains the text 'I am an example' and information about the course and student. The repository has 0 stars and 1 watching. There are sections for Releases, Packages, and Languages.

TacoXDD/example: This is an example repository.

Search or jump to... Pull requests Issues Codespaces Marketplace Explore

Code Issues Pull requests Actions Projects Security Insights Settings

main 1 branch 0 tags Go to file Add file Code

TacoXDD Update files da24ecd 7 minutes ago 3 commits

Python_Basics_with_Numpy.ipynb Update files 7 minutes ago

README.md Update README.md 36 minutes ago

Your new files!!

I am an example

National Tsing Hua University Fall 2022 11110IPT 5530 Deep Learning in Biomedical Optical Imaging

tags: example NTHU

- Name: Taco
- Student ID: 111003803

This is my cats

About

This is an example repository.

Readme 0 stars 1 watching 0 forks

Releases

No releases published Create a new release

Packages

No packages published Publish your first package

Languages

Push Notebook from Colab to GitHub

The screenshot shows a Google Colab notebook interface with the following content:

File Menu (打开)

- 在云端硬盘中储存
- 以浏览器模式開啟
- 新增筆記本** Ctrl+O
- 開啟筆記本
- 上傳筆記本
- 重新命名
- 移動
- 移至垃圾桶
- 在雲端硬碟中儲存複本
- 將副本另存為 GitHub Gist
- 在 GitHub 中儲存副本** Ctrl+S
- 儲存** Ctrl+S
- 儲存及固定修訂版本 Ctrl+M S
- 修訂版本記錄
- 下載
- 列印 Ctrl+P

National Tsing Hua University
Fall 2023
11210IPT 553000
Deep Learning in Biomedical Optical Imaging
Homework 1

the Homework:

Use your working environment. You can either use [Google Colab](#) or set up your own local Jupyter

it allows you to run Jupyter Notebook in the cloud, eliminating setup time and providing free access to

Instructions:

- Go through the questions provided in the `.ipynb` file and write the necessary code in the designated areas.
- Make sure to test your solutions thoroughly to ensure they work as expected.

3. Submission:

- After you've completed the homework, commit the `.ipynb` file to your GitHub repository.
- Ensure that your repository is publicly accessible so that it can be evaluated.

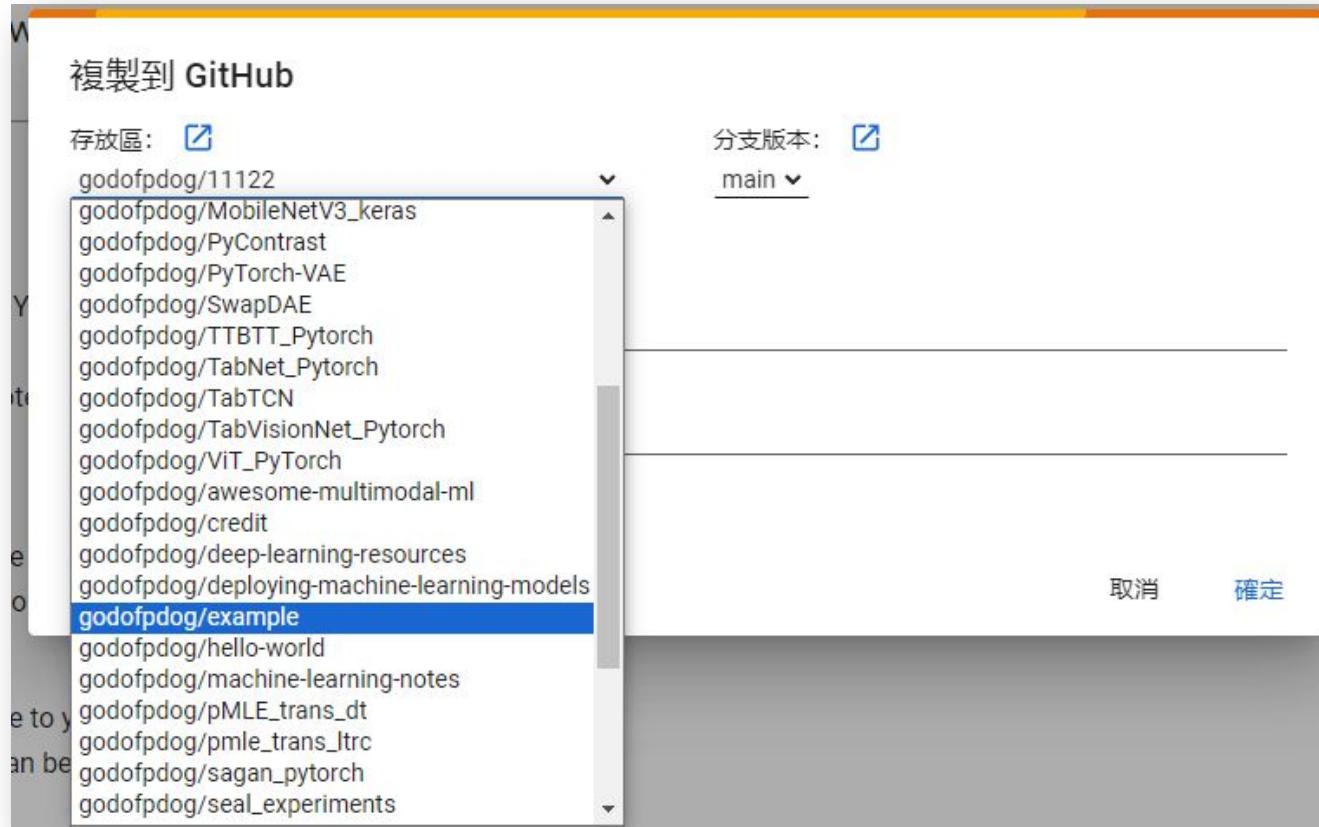
4. Learning More:

- If you need further information or clarification about any `numpy` function, consult [the official numpy documentation](#).
- As a quick hack within this notebook: Create a new cell, type in the function name followed by a `?` (e.g., `np.exp?`), and execute the cell. This will pull up the documentation for the function, giving you a brief overview of its usage and parameters.

Remember, practice is the key to mastering any skill. Make the best use of resources provided and always strive to explore beyond. Good luck!

Decorations at the bottom include three small cat icons.

Select Repository



Edit Commit Message



Check Repository

The screenshot shows a GitHub repository page for a repository named "example" owned by "godofpdog".

Repository Summary:

- Code tab is selected.
- Issues: 0
- Pull requests: 0
- Actions: 0
- Projects: 0
- Wiki: 0
- Security: 0
- Insights: 0
- Settings: 0

Repository Details:

- Owner: godofpdog / example
- Public repository
- Branch: main
- 1 branch
- 0 tags
- 3 commits
- 6c4141c 2 minutes ago
- Update README.md 13 minutes ago
- hw1_answer.ipynb 2 minutes ago

README.md Content:

```
example
This is an example.
National Tsing Hua University 11210IPT 553000 Deep Learning in Biomedical Optical Imaging
tags: example NTHU
• Name: Yi Liu
```

About:

This is an example.

- Readme
- Activity
- 0 stars
- 1 watching
- 0 forks

Releases:

No releases published
Create a new release

Packages:

No packages published
Publish your first package

Homework 1

- **Deadline:** September 25th, 23:59.
- Submission Steps:
 - 1. Ensure your Homework 1 is completed and saved appropriately.
 - 2. Commit your work to your personal GitHub repository.
 - 3. Post the link of your GitHub repository containing your Homework 1 on NTHU EEclass.
-  **Important:** Make sure your commit is timestamped before the deadline. Late submissions

Coding time



People with no idea about AI
saying it will take over the world:



My Neural Network: