

Skills for AIO 2024

(All You Need to Prepare)

Vinh Dinh Nguyen
PhD in Computer Science

Outline



- How to Find Documents/Papers
- How to Read Documents/Papers
- Where to Implement Your Code
- Coding Assistant: Colab and ChatGPT
- How to Document Your Results
- Quadratic Equation Problem: Gemini Support

How to Find Documents

❖ Google Scholar: <https://scholar.google.com/>

The screenshot shows the Google Scholar interface with a search query of "generative artificial intelligence". The results page displays several academic papers, including one by T van der Zant, M Kouw, and L Schomaker from Springer, and another by D Baidoo-Anu and LO Ansah from dergipark.org.tr.

Filter / Option	Result Title	Source / PDF Link
Articles	About 1,290,000 results (0.06 sec)	
Any time	[BOOK] Generative artificial intelligence	[PDF] ethernet.edu.et
Since 2024	T van der Zant, M Kouw, L Schomaker - 2013 - Springer	
Since 2023	The closed systems of contemporary Artificial Intelligence do not seem to lead to intelligent machines in the near future. What is needed are open-ended systems with non-linear ...	
Since 2020	☆ Save 99 Cite Cited by 56 Related articles All 9 versions	
Custom range...		
Sort by relevance	Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning	[PDF] dergipark.org.tr
Sort by date	D Baidoo-Anu, LO Ansah - Journal of AI, 2023 - dergipark.org.tr	
Any type	... like generative artificial intelligence (AI) (Hu, 2022). Generative modeling artificial intelligence (GAI) is an unsupervised or partially supervised machine learning framework, which ...	
Review articles	☆ Save 99 Cite Cited by 1137 Related articles All 5 versions >>	
<input type="checkbox"/> include patents	Experimental evidence on the productivity effects of generative artificial intelligence	[PDF] research.university
<input checked="" type="checkbox"/> include citations	S Noy, W Zhang - Science, 2023 - science.org	



How to Find Documents

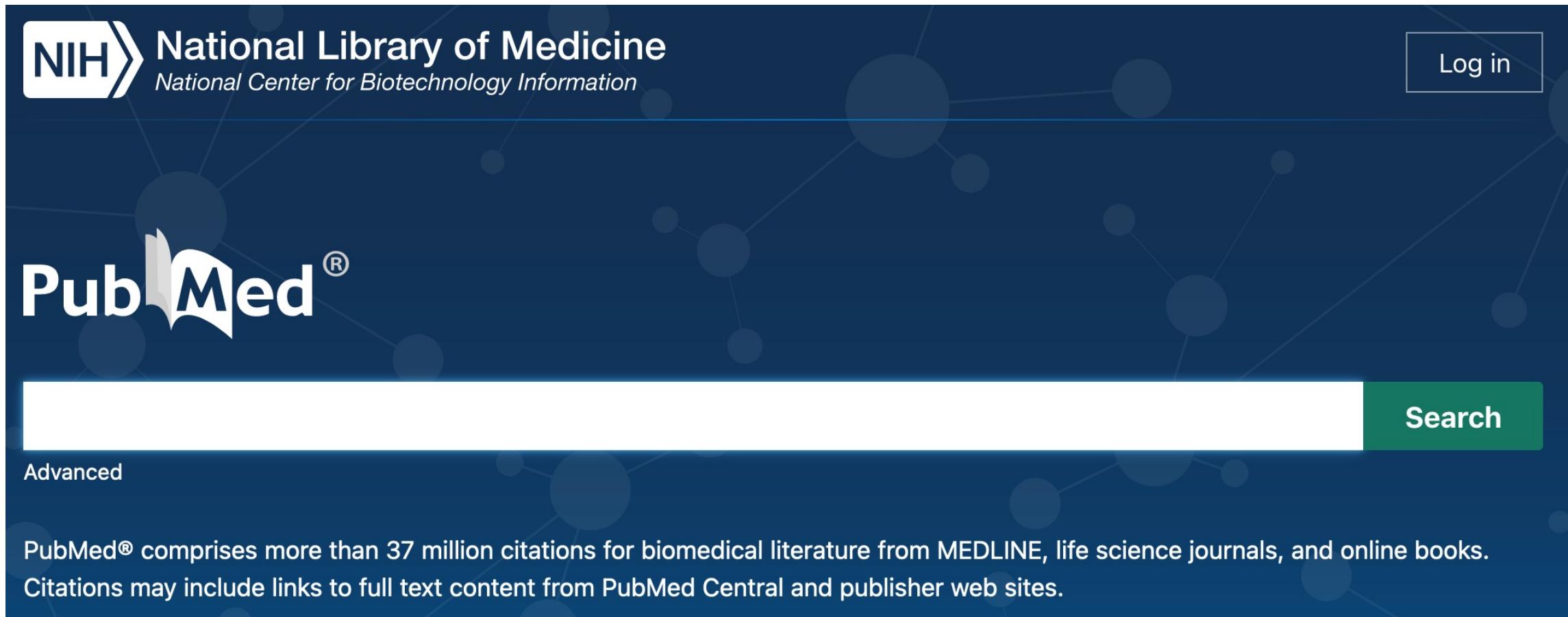
❖ IEEE: <https://ieeexplore.ieee.org/>

The screenshot shows the IEEE Xplore digital library homepage. At the top, there is a dark blue header bar with the "IEEE Xplore®" logo, "Browse", "My Settings", "Help", and "Institutional Sign In" buttons. To the right is the IEEE logo. The main title "Advancing Technology for Humanity" is displayed prominently in gold text. Below it, a search bar shows "SEARCH 6,325,279 ITEMS". The search interface includes a dropdown menu set to "All", a search input field, and a magnifying glass icon. Below the search bar are "ADVANCED SEARCH" and "TOP SEARCHES" buttons. A green banner at the bottom left promotes the "IEEE Climate Change Collection". The banner text reads: "As the world's largest organization of technical professionals, IEEE is uniquely positioned to help organize the world's engineers, scientists, and technical professionals in addressing the causes, mitigating impacts, and adapting to climate change." It includes a "Go to the Collection" button and an image of hands holding a globe.

A digital library for research papers in electrical engineering, computer science, and electronics.

How to Find Documents

❖ PubMed: <https://pubmed.ncbi.nlm.nih.gov/>



A free database of biomedical and life sciences literature



How to Find Documents

❖ Springer, ScienceDirect, or Other Resources:

SPRINGER LINK

Find a journal Publish with us Track your research Search Log in Cart

Search for research articles, academic books and more

200 million monthly downloads 24 million monthly readers 3 million authors submit annually

ScienceDirect®

Find articles with these terms

[Advanced search](#)

13,178 results

Refine by: Years

- 2025 (2)
- 2024 (3,340)
- 2023 (3,018)

Show more ▾

Research article
MOD-YOLO: Multispectral object detection based on transformer dual-stream YOLO
Pattern Recognition Letters, July 2024
Yanhua Shao, Qimeng Huang, ... hongyu Chu

Research article
RoMP-transformer: Rotational bounding box with multi-level feature pyramid transformer for object detection
Pattern Recognition, March 2024
Joonhyeok Moon, Munsu Jeon, ... Ki-Yong Oh

Other Resources

How to Find Documents

❖ Preprint Repositories: <https://arxiv.org/>

The screenshot shows the arXiv homepage. At the top, there's a black header with the Cornell University logo and the word "arXiv". Below it is a red header with the "arXiv" logo. The main content area has a white background. On the left, there's a sidebar with a "Subject search and browse" section. Under "Physics", "Mathematics", "Quantitative Biology", "Computer Science", "Quantitative Finance", "Statistics", "Electrical Engineering and Systems Science", and "Economics" are listed. A dropdown menu is open over "Physics", showing sub-categories: "Astrophysics", "Cosmology and Nongalactic Astrophysics", "Earth and Planetary Astrophysics", "Solar and Stellar Astrophysics", "Disordered Systems and Neural Networks", "Materials Science", "Mesoscale and Nanoscale", "Strongly Correlated Electrons", and "Superconductivity". On the right, there's a "arXiv News" sidebar with a "Latest news" section containing the text "Stay up to date with what is happening at arXiv".

arXiv is a free distribution service and an open-access archive for nearly 2.4 million scholarly articles in the fields of physics, mathematics, computer science, quantitative biology, quantitative finance, statistics, electrical engineering and systems science, and economics. Materials on this site are not peer-reviewed by arXiv.

Subject search and browse:

- ✓ Physics
- Mathematics
- Quantitative Biology
- Computer Science
- Quantitative Finance
- Statistics
- Electrical Engineering and Systems Science
- Economics
- General Relativity and Quantum Cosmology (gr-qc new, recent, search)

arXiv News

Stay up to date with what is happening at arXiv

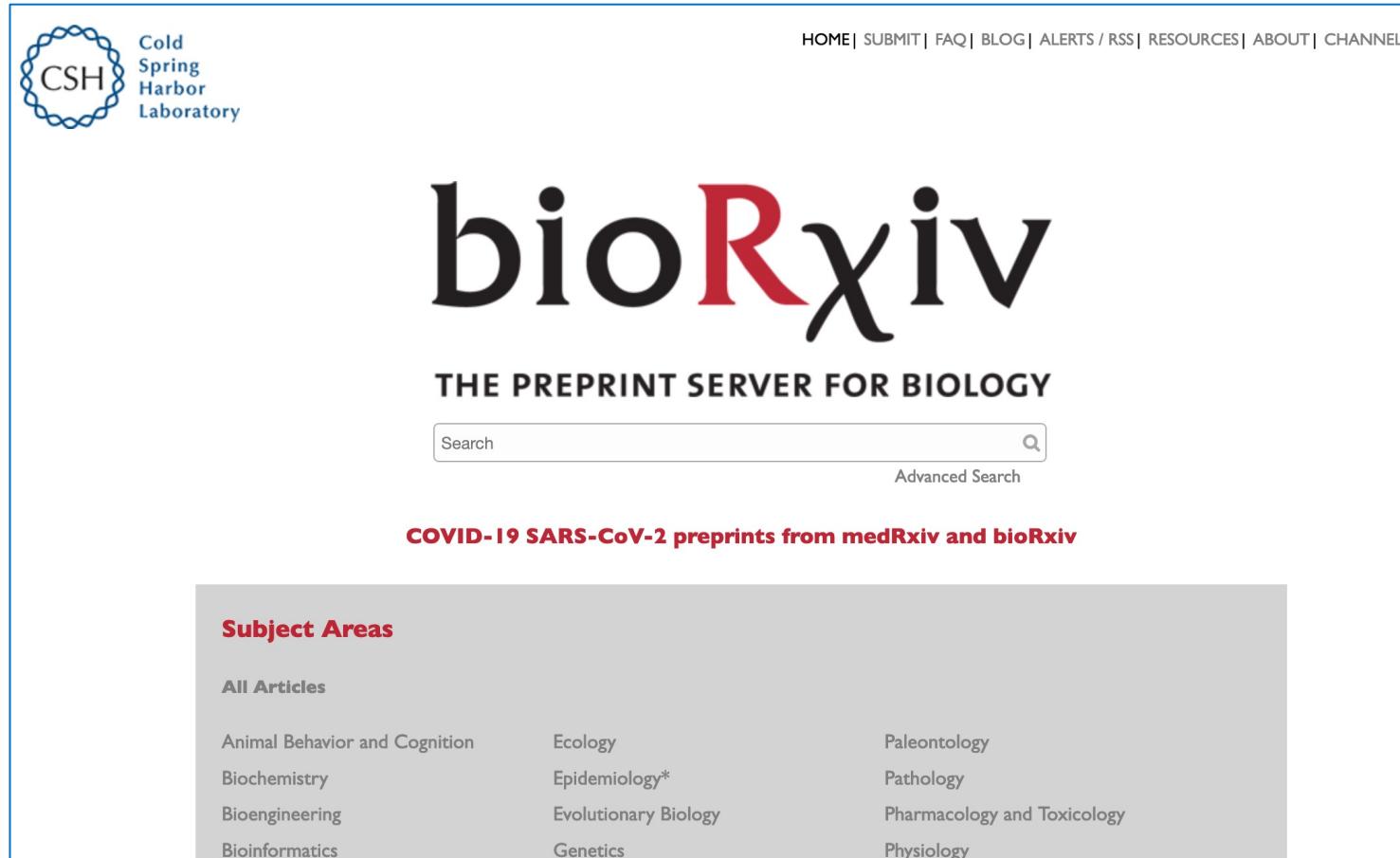
Latest news

A preprint repository for physics, mathematics, computer science, quantitative biology, quantitative finance, and statistics.



How to Find Documents

❖ bioRxiv: <https://arxiv.org/>



The screenshot shows the homepage of bioRxiv. At the top left is the CSHL logo (Cold Spring Harbor Laboratory). At the top right are links for HOME, SUBMIT, FAQ, BLOG, ALERTS / RSS, RESOURCES, ABOUT, and CHANNELS. The main title "bioRxiv" is prominently displayed in large, bold letters, with "bio" in black and "Rxiv" in red. Below it is the subtitle "THE PREPRINT SERVER FOR BIOLOGY". There is a search bar with a magnifying glass icon and a link to "Advanced Search". A red banner at the bottom of the page reads "COVID-19 SARS-CoV-2 preprints from medRxiv and bioRxiv". On the left side, there is a sidebar titled "Subject Areas" with sections for "All Articles" and a grid of subject categories.

Animal Behavior and Cognition	Ecology	Paleontology
Biochemistry	Epidemiology*	Pathology
Bioengineering	Evolutionary Biology	Pharmacology and Toxicology
Bioinformatics	Genetics	Physiology

A free online archive and distribution service for unpublished preprints in the life sciences.

How to Find Documents

❖ **PapersWithCode:** <https://paperswithcode.com/>

The screenshot shows a search interface at the top with fields for 'Search' and 'Browse State-of-the-Art', and links for 'Datasets', 'Methods', and 'More'. Below the search bar is the title of a paper: 'ChatGPT Asks, BLIP-2 Answers: Automatic Questioning Towards Enriched Visual Descriptions'. The title is in large bold black font. Below the title is the date '12 Mar 2023' and a list of authors: Deyao Zhu, Jun Chen, Kilichbek Haydarov, Xiaoqian Shen, Wenxuan Zhang, Mohamed Elhoseiny. There is also a link to 'Edit social preview'. The main text of the paper discusses the development of ChatCaptioner, a method that asks questions to a visual question-answering model like BLIP-2 to generate more enriched image descriptions. It compares the results with ground truth and other models like COCO and WikiArt. At the bottom, there are two buttons: 'PDF' and 'Abstract'.

ChatGPT Asks, BLIP-2 Answers: Automatic Questioning Towards Enriched Visual Descriptions

12 Mar 2023 · Deyao Zhu, Jun Chen, Kilichbek Haydarov, Xiaoqian Shen, Wenxuan Zhang, Mohamed Elhoseiny · [Edit social preview](#)

Asking insightful questions is crucial for acquiring knowledge and expanding our understanding of the world. However, the importance of questioning has been largely overlooked in AI research, where models have been primarily developed to answer questions. With the recent advancements of large language models (LLMs) like ChatGPT, we discover their capability to ask high-quality questions when provided with a suitable prompt. This discovery presents a new opportunity to develop an automatic questioning system. In this paper, we introduce ChatCaptioner, a novel automatic-questioning method deployed in image captioning. Here, ChatGPT is prompted to ask a series of informative questions about images to BLIP-2, a strong vision question-answering model. By keeping acquiring new visual information from BLIP-2's answers, ChatCaptioner is able to generate more enriched image descriptions. We conduct human-subject evaluations on common image caption datasets such as COCO, Conceptual Caption, and WikiArt, and compare ChatCaptioner with BLIP-2 as well as ground truth. Our results demonstrate that ChatCaptioner's captions are significantly more informative, receiving three times as many votes from human evaluators for providing the most image information. Besides, ChatCaptioner identifies 53% more objects within the image than BLIP-2 alone measured by WordNet synset matching. Code is available at <https://github.com/Vision-CAIR/ChatCaptioner>

[PDF](#) [Abstract](#)

How to Find Documents

❖ AIO Question and Answer: <https://www.facebook.com/groups/aio.competition>

AIO Question / Answer and Competition
Private group · 1.2K members

More chats in this group

- [AIO] Tìm đồng đội Click to join
- Competitions/conferences Click to join

GIÚP ĐỠ - PHÁT TRIỂN

AIO Question / Answer and Competition
Private group · 1.2K members

+ Invite Share Joined ▾

Discussion Featured Members Events Media Files

Write something...

Anonymous Post Photo/video Poll

Featured ⓘ

Most relevant

Anonymous member 1h · ...
Mọi người có thể cho đánh giá 2 chương trình tốt nhất hiện nay về AI tại Việt Nam là FPT Residency và Vin AI Residency k ạ?
Nam Nguyễn and 29 others 7 comments

About

Tạo môi trường hỏi / giải đáp, kết nối giúp đỡ giữa các thế hệ AIO. Các member cùng dấn dát nhau học tập và cùng tiến. Các member trong team A... See more

Private Only members can see who's in the group and what they post.

Visible Anyone can find this group.

Learn more

Chats

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How to Read Documents/Papers

❖ Research Papers vs Essays

Research Papers:

- **Abstract:** Provides a concise summary of the research, including the problem, methods, results, and conclusions.
- **Introduction:** Sets up the context, significance, and objectives of the research. It often includes a literature review.
- **Methods:** Describes the experimental or analytical procedures used to conduct the research in detail.
- **Results:** Presents the findings of the research, often with tables, figures, and statistical analyses.
- **Discussion:** Interprets the results, explains their implications, and situates them within the broader context of the field.
- **Conclusion:** Summarizes the key findings and suggests future research directions.
- **References:** Lists all the sources cited in the paper.

Aim to contribute new knowledge to the field.

Focus on empirical evidence, methodologies, and data analysis.

Targeted at a scholarly audience, including researchers and professionals.

Essays:

- **Introduction:** Introduces the topic, provides background information, and presents the thesis statement or main argument.
- **Body Paragraphs:** Develop the argument or narrative with supporting evidence, analysis, and examples. Each paragraph usually focuses on a single point.
- **Conclusion:** Summarizes the main points and restates the thesis in light of the evidence presented.
- **References:** May include a list of sources, though this depends on the essay type.

Aim to argue a point, explore a topic, or reflect on an issue.

Emphasize critical thinking, analysis, and the author's perspective.

Intended for a general audience or specific readers, such as teachers or peers

How to Read Documents/Papers

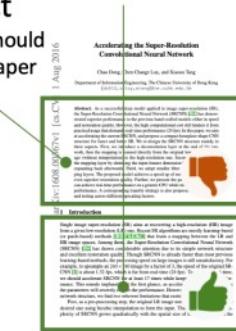
❖Reading Skills

② Introduction

High-level overview of the algorithm

① Abstract

Why you should read this paper



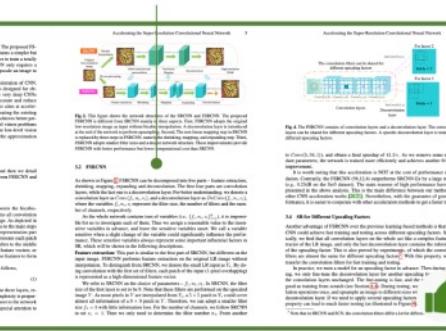
③ Related Work

What other researchers did in this field



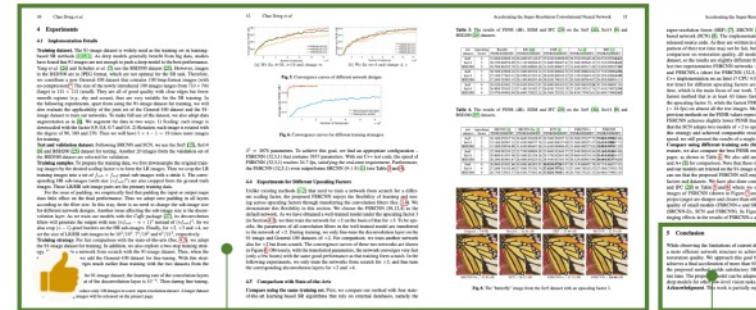
④ Approach

Detailed description of the algorithm



⑤ Experiments

Training, evaluation, visualization, comparisons with other papers



⑥ Conclusion

Sometimes it's about next research topics

⑦ References

Links to all papers that ideas were used

Read thoughtfully, maybe several times

Look through, read only parts you are interested in

Feel free to skip completely

ChatGPT guidelines

how to read scientific research paper

Reading a scientific research paper can be challenging especially if you are new to the field. Here are some steps and tips to help you read and understand scientific research papers more effectively:

1. **Skim:** Get a general idea of the paper.
2. **Read the Abstract and Introduction:** Understand the research question and background.
3. **Read the Methods and Results:** Understand how the study was conducted and what was found.
4. **Analyze Figures and Tables:** Examine the data presented.
5. **Read the Discussion and Conclusion:** Understand the implications and context of the findings.
6. **Take Notes and Summarize:** Write down key points and summaries.
7. **Clarify Doubts:** Use additional resources to understand complex concepts.
8. **Discuss and Re-read:** Engage with peers and revisit the paper to solidify your understanding.

How to Read Documents/Papers

❖Reading Skills

Research Paper 1

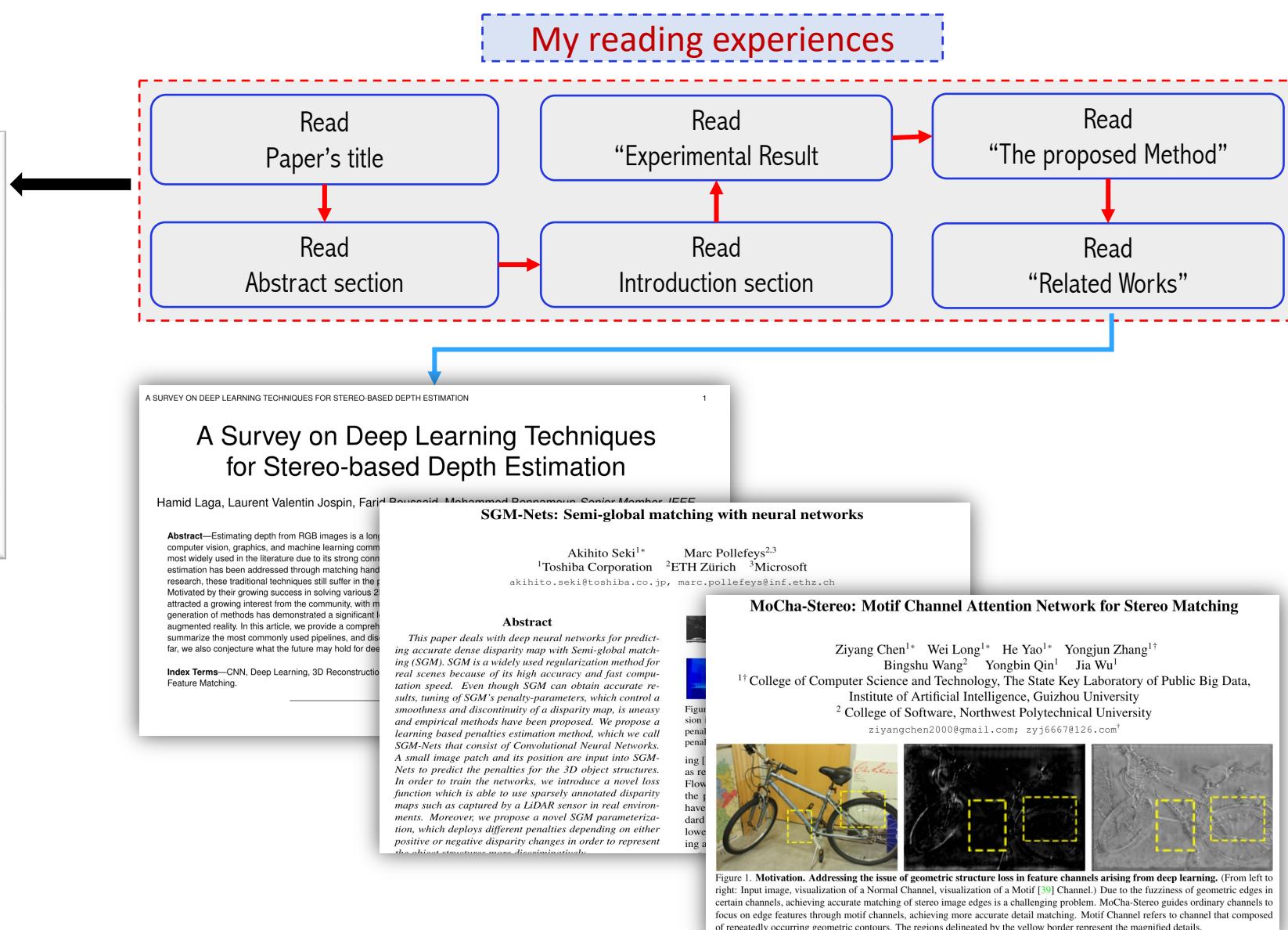
Feature Engineering and Deep Learning for Stereo Matching Under Adverse Driving Conditions

Vinh Quang Dinh[●], Phuc Hong Nguyen, and Vinh Dinh Nguyen[●]

Abstract—Stereo matching is a challenging research topic in driving assistance systems. Existing stereo matching methods work well under normal day-light conditions. However, they fail to operate under adverse driving conditions, such as at night and during snowfall. This paper proposes a robust stereo matching framework using both deep-learning-based features and feature engineering. The proposed method investigates the benefits of features based on feature engineering and deep learning for solving stereo matching problems. Robust feature engineering is proposed for handling specific driving under adverse weather conditions, and a robust feature based on deep learning is considered for handling unspecific driving under extreme weather conditions. The proposed study has shown significantly improved accuracy by 8.31% for the state-of-the-art census based on semi-global matching under the reflection regions using the KITTI Stereo 2012 benchmark. Moreover, the experimental results demonstrate that the proposed system obtains more stable results than existing stereo methods based on deep learning on various stereo datasets, such as the Middlebury, EISAT, HCI, and CCD datasets.

Index Terms—Robust stereo matching, feature engineering, deep learning feature, adverse driving condition, feature data

disparity refinement. Among these steps, the data cost is an important step affecting the final accuracy of the stereo matching algorithm. Traditional stereo methods assume the left and right images are captured under the same lighting conditions. Therefore, a task that computes the data cost is simple. However, noise factors often affect the data cost under real driving conditions, such as illumination changes due to shadows, night time, and rainfall. Many stereo methods have been proposed to overcome these limitations, including the adaptive normalized cross-correlation (ANCC) [2], census rank transforms [3], local density encoding (LDE) [4] and guided image filtering [5]. The main purpose of the existing stereo data costs is to find a robust matching feature in a local region. Finding a robust stereo matching cost that can work well under various driving conditions is still challenging. For example, ANCC was originally designed to handle radiometric variations between the left and right images. However, ANCC cannot work well under multiple illumination conditions and for non-Lambertian reflectance objects. Moreover, the cen



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Where to Implement Your Code

❖ Jupyter NoteBook

The screenshot shows the Jupyter Notebook interface. At the top, there's a navigation bar with tabs for 'Files', 'Running' (which is selected), and 'Clusters'. On the right side of the header, there are 'Quit' and 'Logout' buttons. Below the header, a sidebar on the left lists directory contents: '0' (with a dropdown arrow), a folder icon, and paths like '/AndroidStudioProjects', '/Applications', '/Desktop', and '/Documents'. On the right, there's a file upload section with 'Upload' and 'New' buttons, and a dropdown menu for 'Notebook' (set to 'Python 3 (ipykernel)'), 'Other' (Text File, Folder, Terminal), and a 'Name' dropdown. The main workspace shows a code cell with the input:

```
In [1]: 1 print("Welcome to AIO 2024 class!")
```

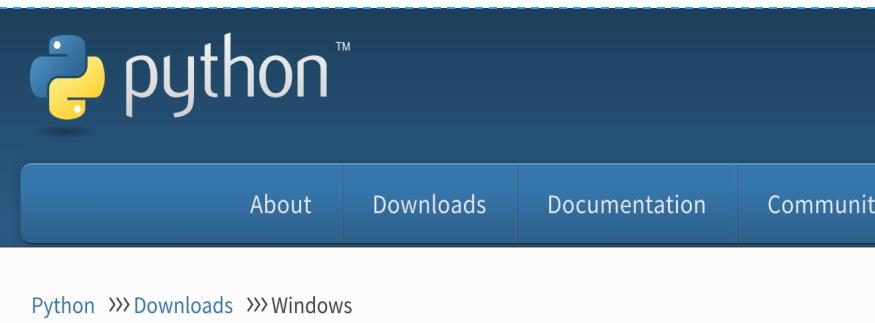
Below the input, the output is displayed:

Welcome to AIO 2024 class!

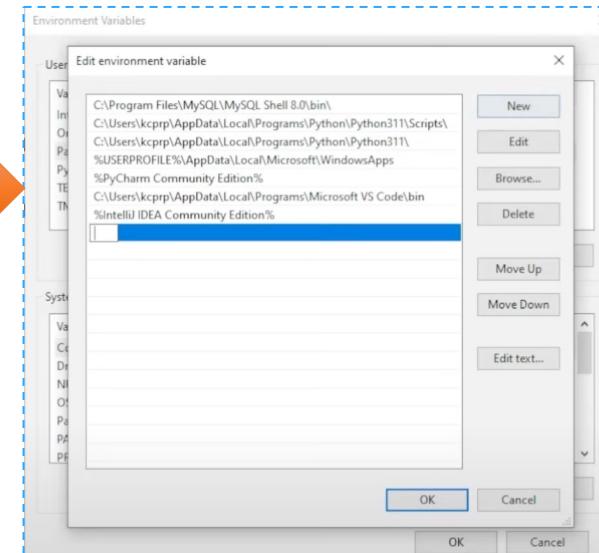
Where to Implement Your Code

❖ How to install Jupyter NoteBook (Method 1)

Download and install Python



Environment Path Configuration



Open Terminal

The screenshot shows a Command Prompt window with the following command being run:

```
cmd: Command Prompt - pip install jupyter
Python 3.11.4
C:\Users\kcprp>pip --version
pip 23.1.2 from C:\Users\kcprp\AppData\Loc...
```

Below the command prompt, the output shows:

```
C:\Users\kcprp>pip install jupyter
```

Python Releases for Windows

- Latest Python 3 Release - Python 3.12.3

<https://www.python.org/downloads/>

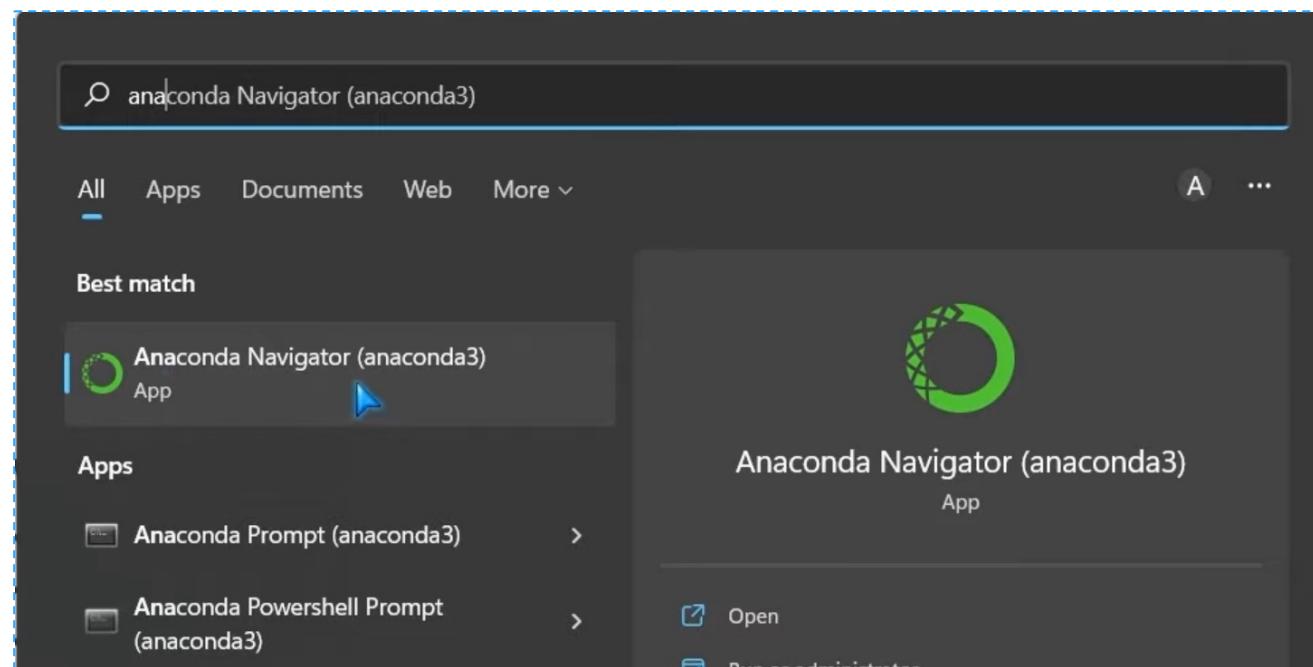
C:\Users\kcprp\AppData\Local\Programs\Python\Python311

C:\Users\kcprp\AppData\Local\Programs\Python\Python311\Scripts

Where to Implement Your Code

❖ How to install Jupyter NoteBook (Method 2)

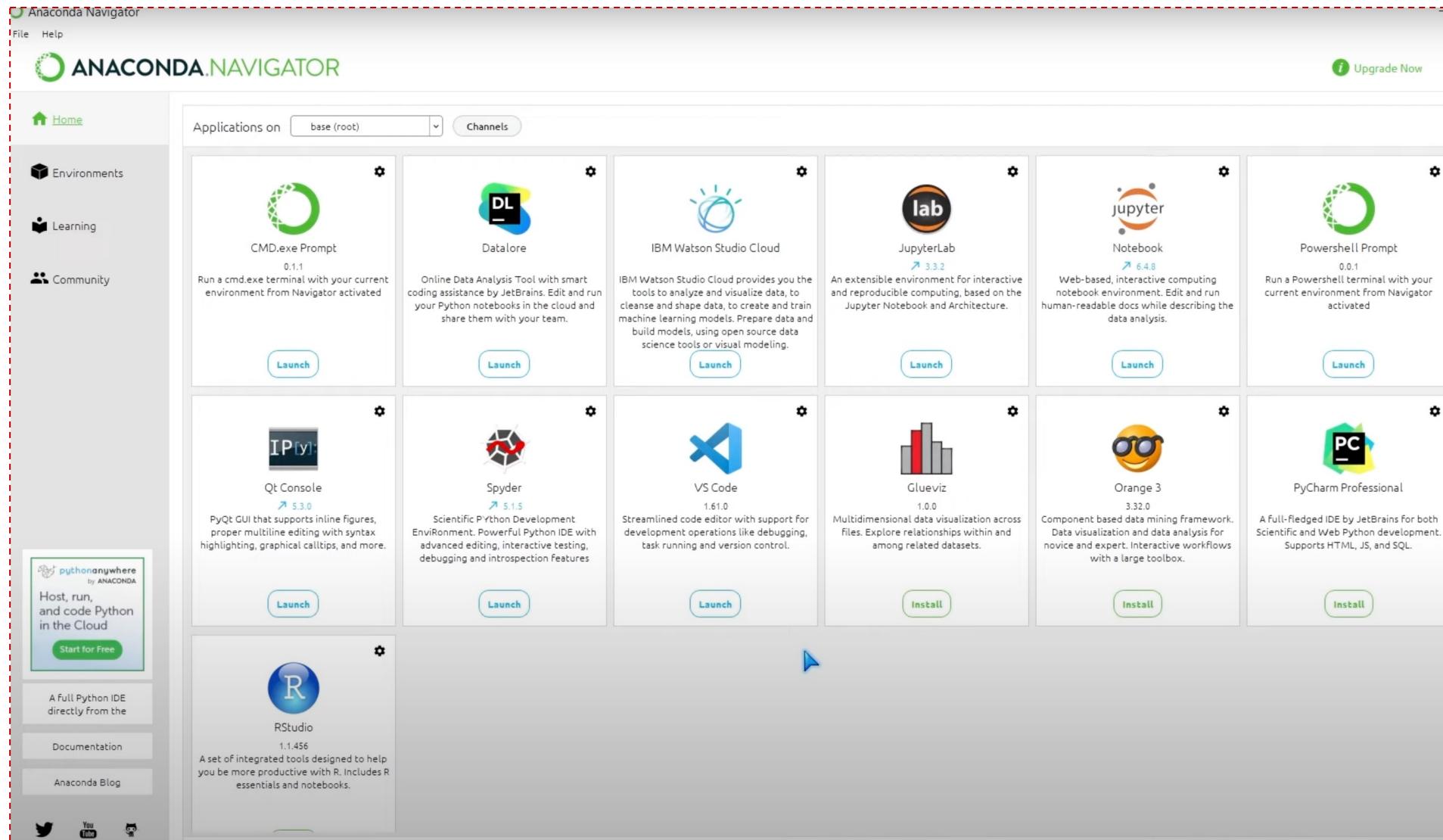
The screenshot shows the official Anaconda website. At the top, there's a navigation bar with links for Products, Solutions, Resources, Partners, and Company. A "Free Download" button is also present. The main heading is "The Operating System for AI", followed by a subtext: "The world's most trusted open ecosystem for sourcing, building, and deploying data science and AI initiatives". Below this is a green "Explore Anaconda Hub >" button. The section "Anaconda Installers" contains three cards: one for Windows (Windows logo, Python 3.11, 64-Bit Graphical Installer (904.4M)), one for Mac (Apple logo, Python 3.11, 64-Bit Graphical Installer (728.7M), 64-Bit Command Line Installer (731.2M), 64-Bit (M1) Graphical Installer (697.4M), 64-Bit (M1) Command Line Installer (700 M)), and one for Linux (Linux logo, Python 3.11, 64-Bit (x86) Installer (997.2M), 64-Bit (AWS Graviton2 / ARM64) Installer (798.5M), 64-bit (Linux on IBM Z & LinuxONE) Installer (91.8M)).



<https://www.anaconda.com/download/success>

Where to Implement Your Code

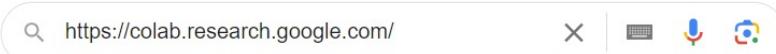
❖ How to install Jupyter NoteBook



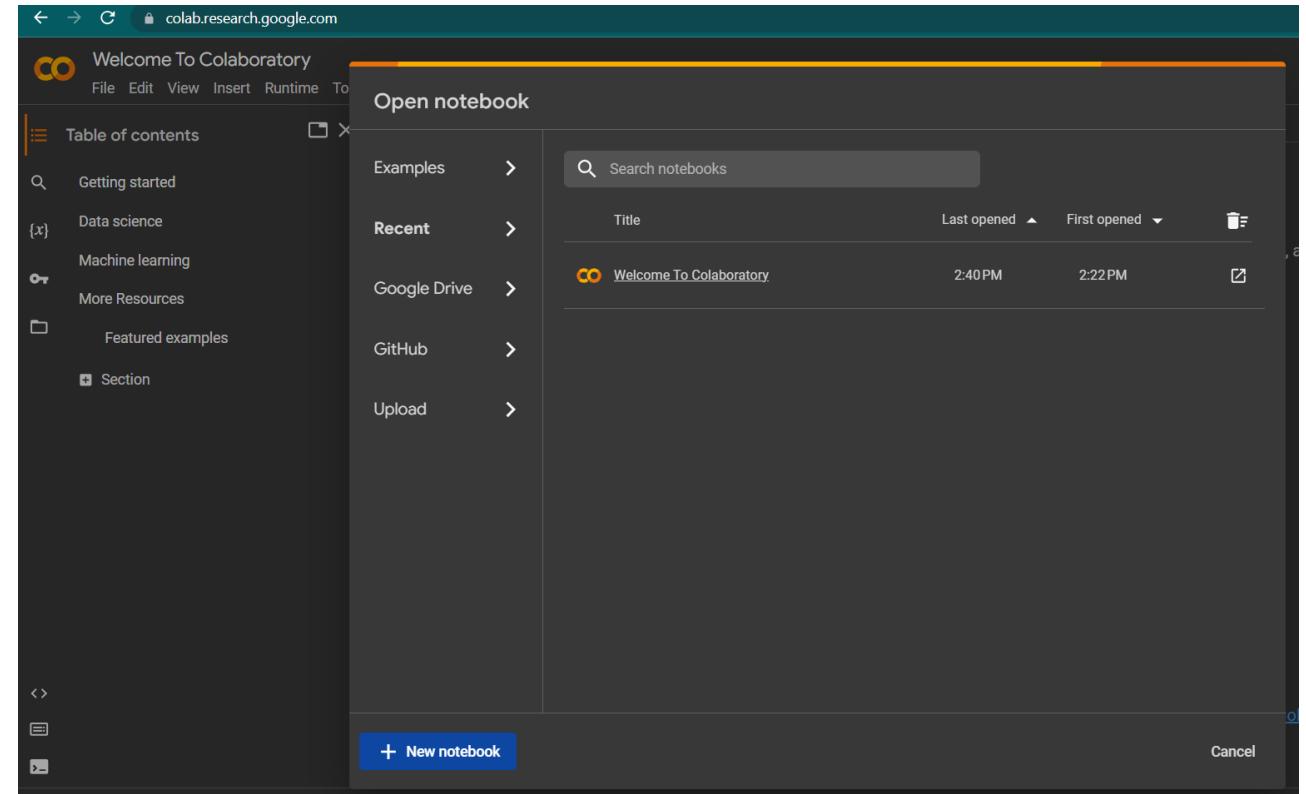
Where to Implement Your Code

❖ How to use Google Colab

Google

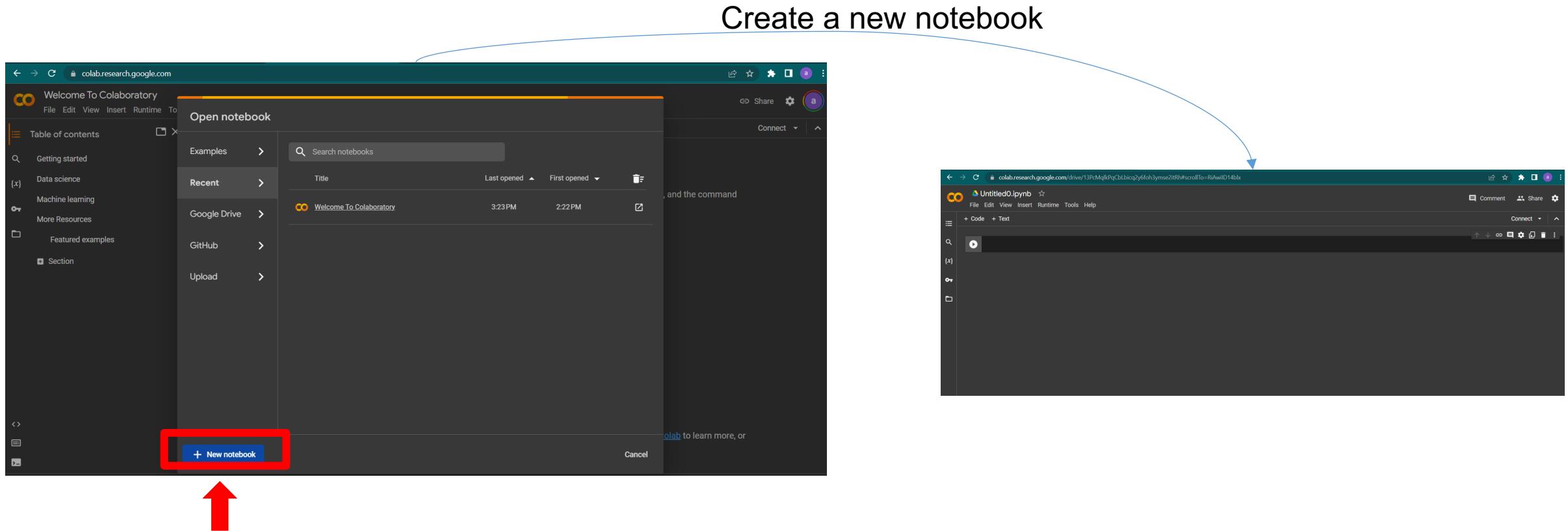


❑ Acess: <https://colab.research.google.com/>



Where to Implement Your Code

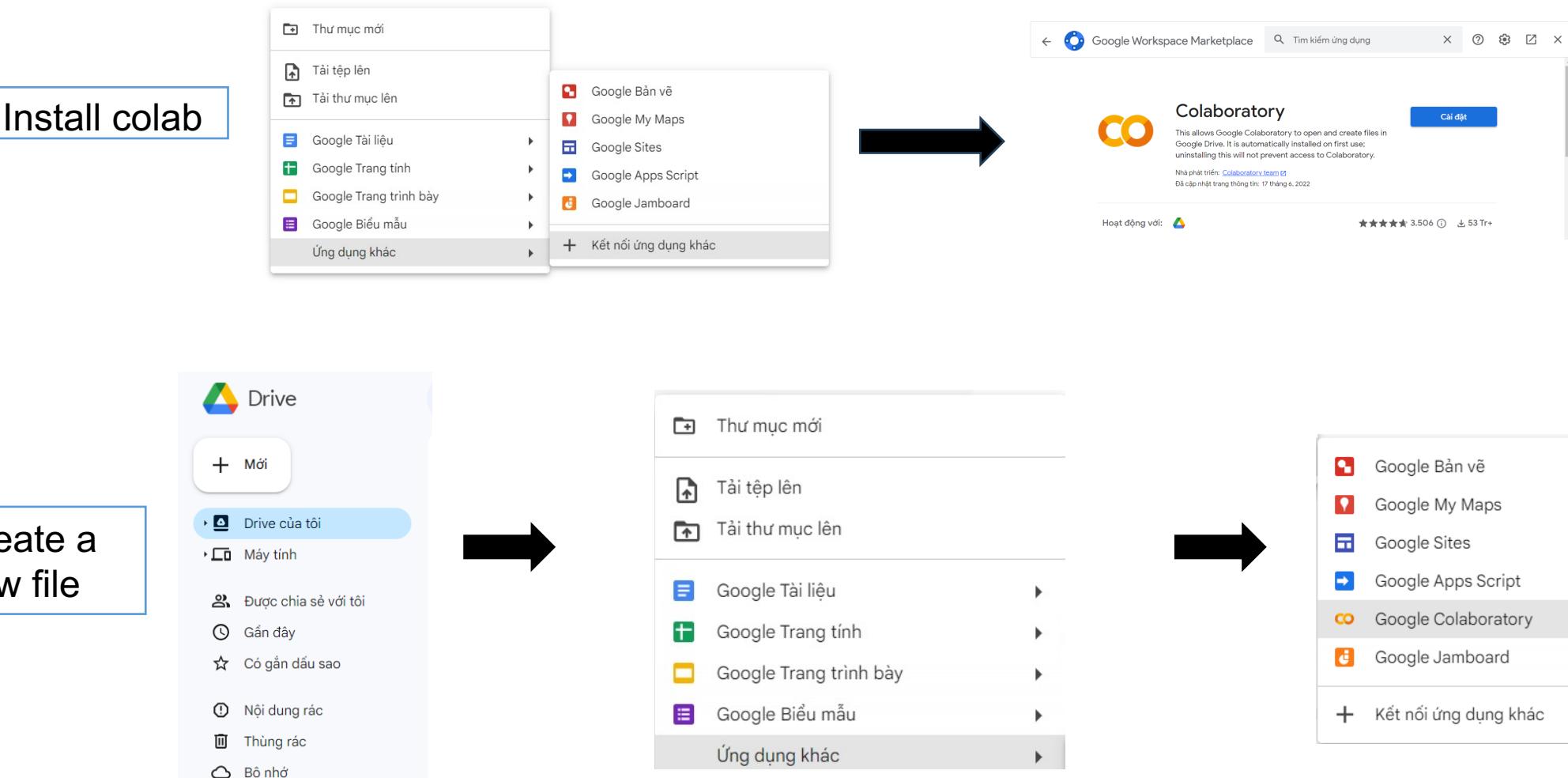
❖ Method 1: Create a notebook from google colab



Click here to create a notebook

Where to Implement Your Code

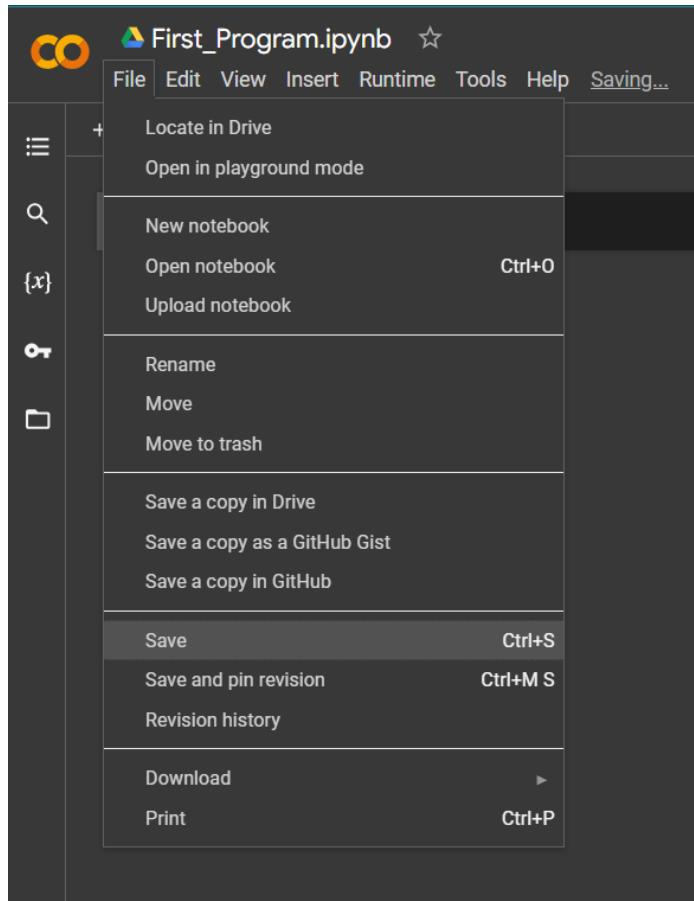
❖ Method 2: Create a notebook from google drive



Where to Implement Your Code

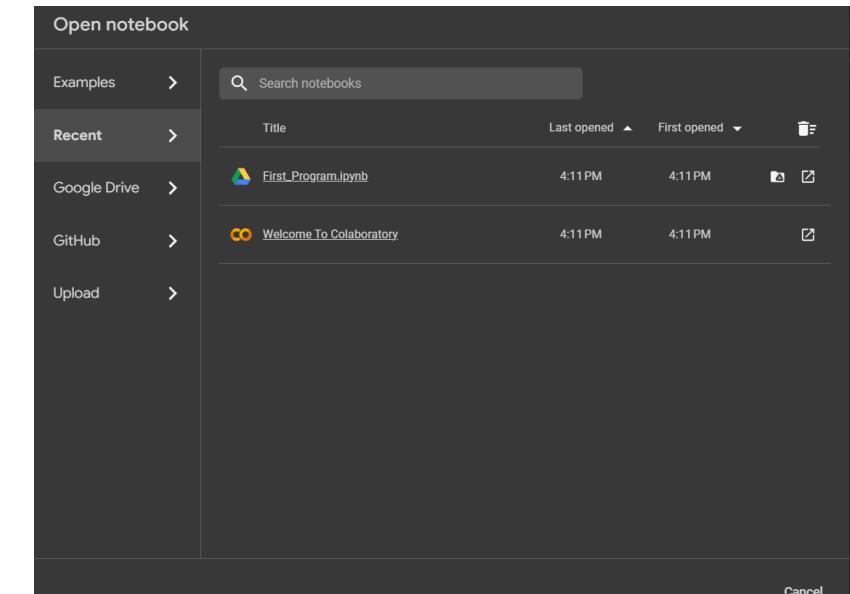
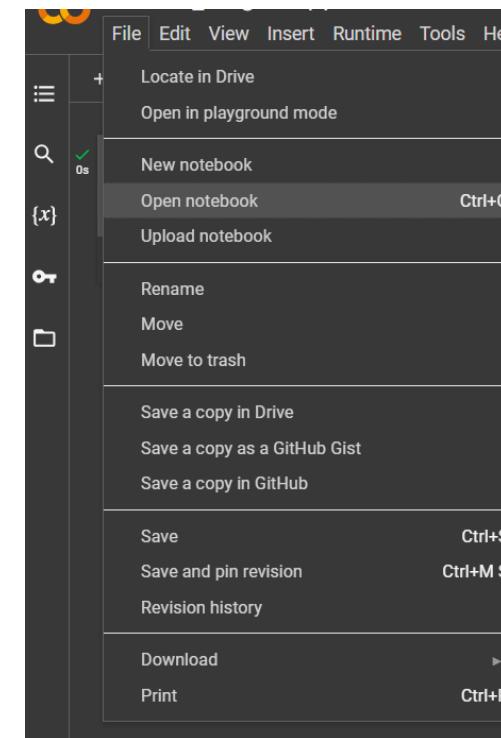
❖ Save a notebook

Click “File” → Select “Save” or Ctr + S



❖ ReOpen a notebook

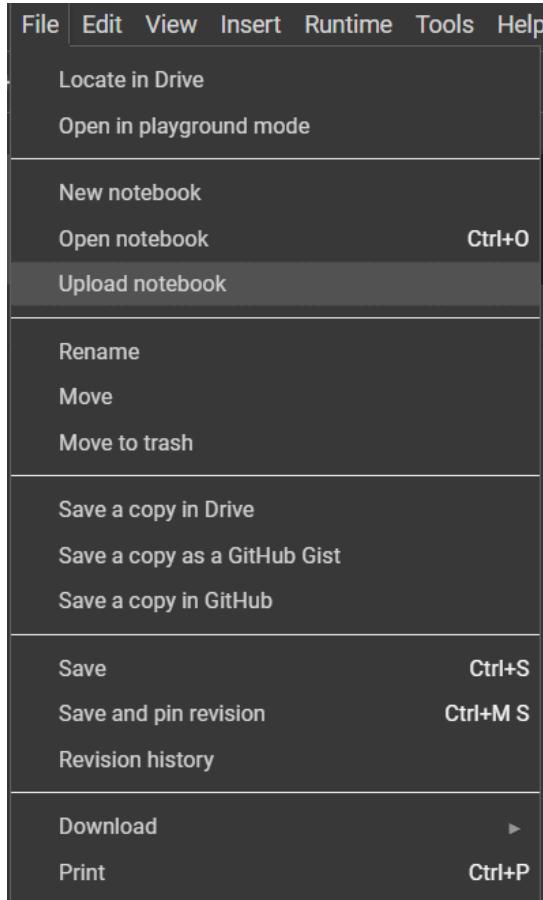
Click “File” → Select “Open Notebook” → Select your notebook



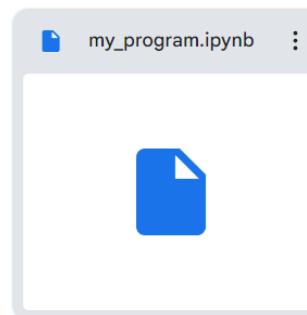
Where to Implement Your Code

❖ Method 1: Upload to Colab

Click “File” → Select “Upload Notebook”

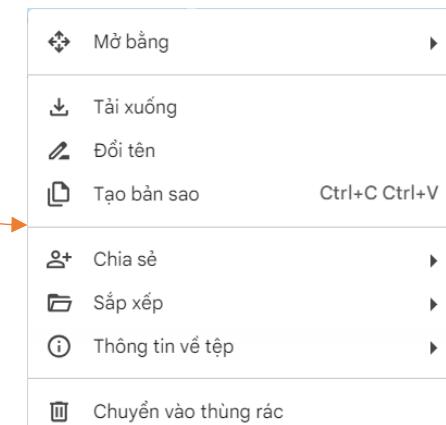


❖ Method 2: Upload to drive



Step 2: Open file by
google colab

Step 1: Upload your local jupyter notebook file to drive



Xem trước

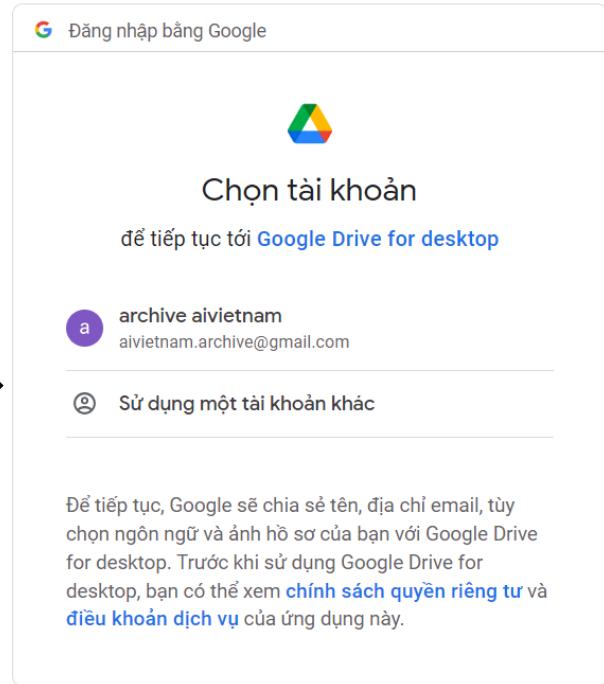
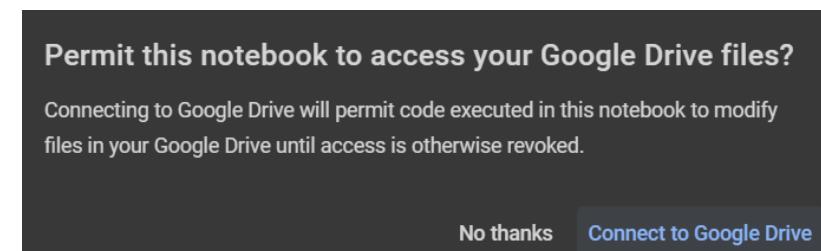
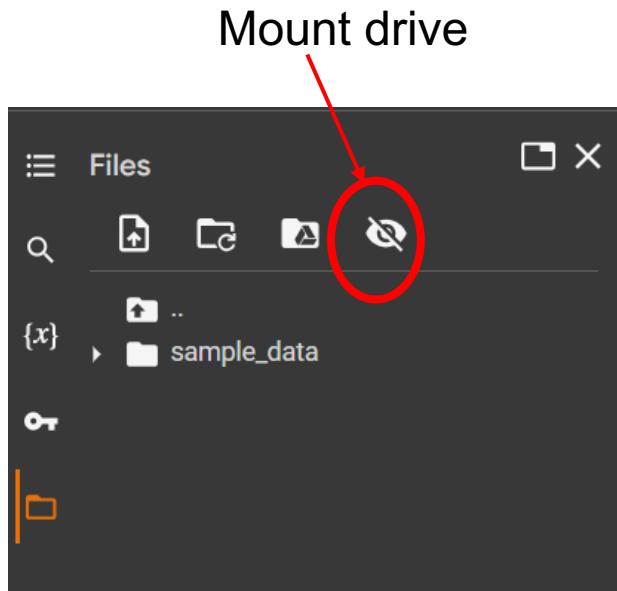
Google Colaboratory

Kết nối ứng dụng khác

Các ứng dụng trên máy tính của bạn

Where to Implement Your Code

❖ Connect colab to Drive



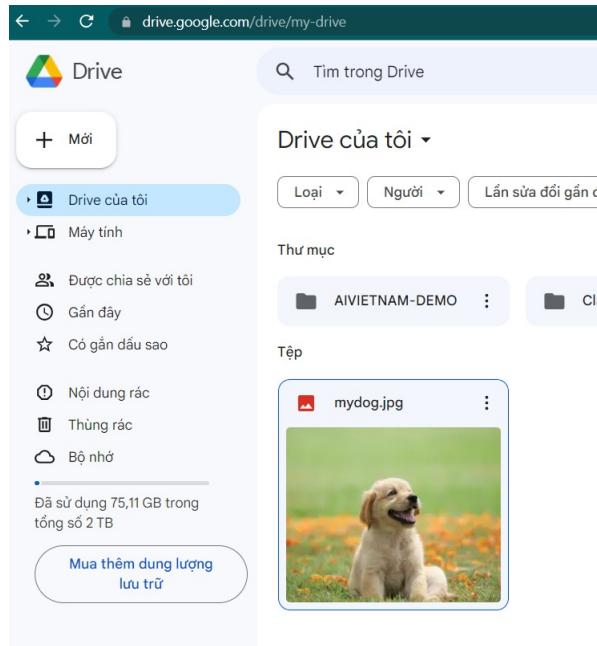
Step 1: From Files select “Mount drive” icon

Step 2: Select “Connect to Google Drive”

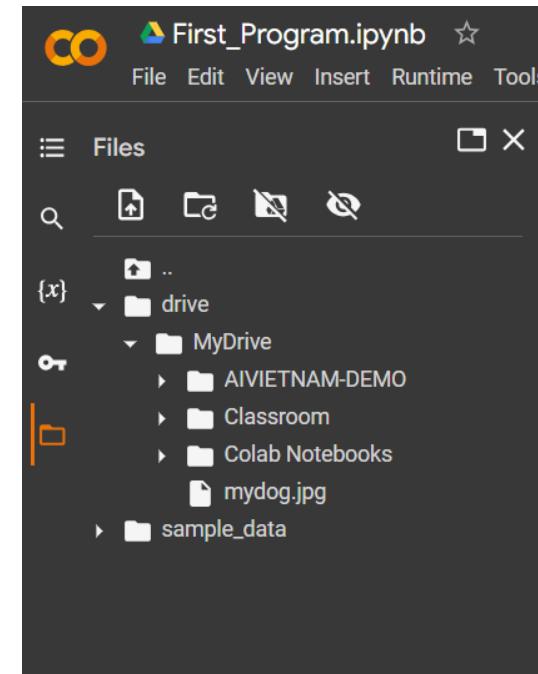
Step 3: Choose your google account

Where to Implement Your Code

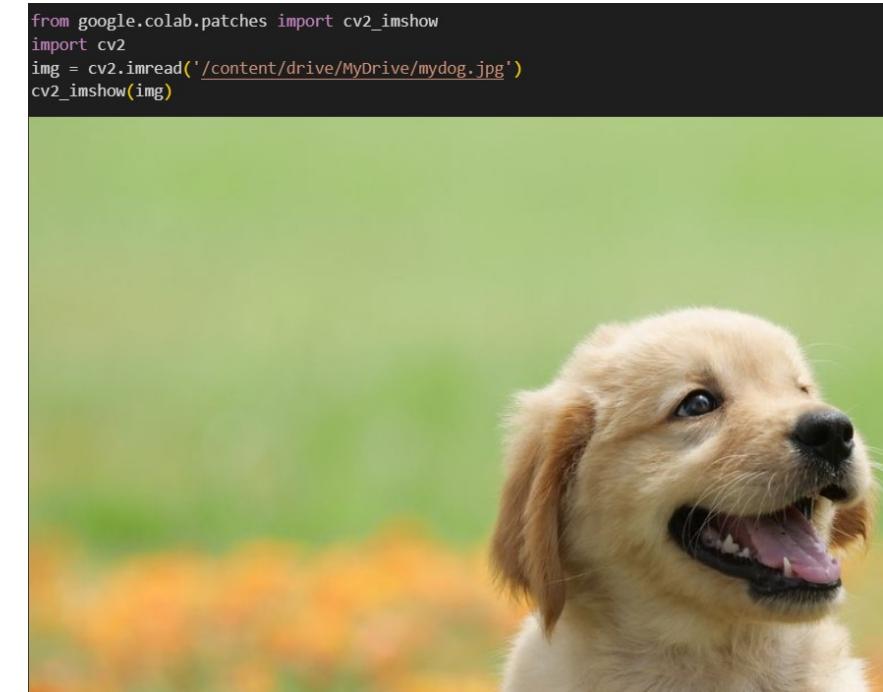
Load and display image



Step 1: Upload file to drive



Step 2: Connect colab to drive



Step 3: Read and show image

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Coding Assistant in Colab



```
x = 10
y = 0
result = x / y
print(result)
```



```
ZeroDivisionError
<ipython-input-1-5ea814e8101d> in <cell line: 3>()
      1 x = 10
      2 y = 0
----> 3 result = x / y
      4 print(result)
```

ZeroDivisionError: division by zero

Traceback (most recent call last)

ZeroDivisionError X

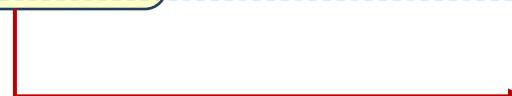
The error is caused by the division by zero. The user has set the value of `y` to 0, and then tried to divide `x` by `y`. This results in a division by zero error.

Suggested Changes

To fix this error, the user should either change the value of `y` to a non-zero value, or use a conditional statement to check if `y` is zero before performing the division.

Next steps:

Explain error



Option 1: Change the value of `y`

```
x = 10
y = 1
result = x / y
print(result)
```

Option 2: Use a conditional statement

```
x = 10
y = 0
if y != 0:
```

❖ Solution Suggestion

Coding Assistant in Colab

❖ Text to Code Generation

+ Code + Text

Start coding or **generate** with AI.

Generate write code to load and display image using opencv

< 1 of 4 > [Use code with caution](#)

```
# prompt: write code to load and display image using opencv

import cv2
import matplotlib.pyplot as plt

# Load the image
image = cv2.imread('image.jpg')

# Convert the image to RGB color space
image_rgb = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)

# Display the image
plt.imshow(image_rgb)
plt.show()
```

Coding Assistant in Colab

❖ Explain Concept/Theory in AI

The screenshot shows a Google Colab interface. At the top, there's a navigation bar with a cat icon, 'Comment', 'Share', a gear icon, and a purple circle with the letter 'A'. Below the bar, there are green checkmarks for 'RAM' and 'Disk'. A dropdown menu is open, showing 'Gemini' highlighted with a yellow box and a star icon. A blue arrow points from this dropdown to a red-bordered box containing the generated text.

Gemini X

AIVN Research Group

What is generative AI?

Gemini

Generative AI is a type of artificial intelligence that can create new data or media from scratch. used for tasks such as:

- **Image generation:** Creating new images from scratch, or modifying existing images.
- **Text generation:** Creating new text, such as articles, stories, or poems.
- **Music generation:** Creating new music, or modifying existing music.
- **Code generation:** Creating new code, or modifying existing code.

ChatGPT for Coders

❖ Skill 1: Generate a python example that uses the for loop

python

```
for i in range(1, 11):  
    print(i)
```



```
for i in range(1, 11):  
    print(i)
```



1
2
3
4
5
6
7
8
9
10

AI

Please help me to generate a python example that uses the for loop



copy and run
on Colab

Google
colab

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

ChatGPT for Coders

❖ Skill 1: Generate a more complicated example

AI

Please help me generate a Python example that uses the for loop and computes factorial for a number

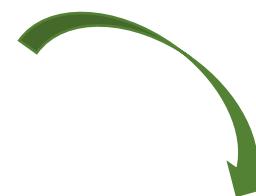
python

```
def factorial(n):
    result = 1
    for i in range(1, n + 1):
        result *= i
    return result

# Test the function
num = int(input("Enter a number to compute its factorial: "))
if num < 0:
    print("Please enter a non-negative number.")
else:
    print(f"The factorial of {num} is {factorial(num)}")
```

 Copy code

Please help me generate a Python example that uses the for loop and computes factorial for a number



copy and run on Colab

```
[2] def factorial(n):
    result = 1
    for i in range(1, n + 1):
        result *= i
    return result

# Test the function
num = int(input("Enter a number to compute its factorial: "))
if num < 0:
    print("Please enter a non-negative number.")
else:
    print(f"The factorial of {num} is {factorial(num)}")
```

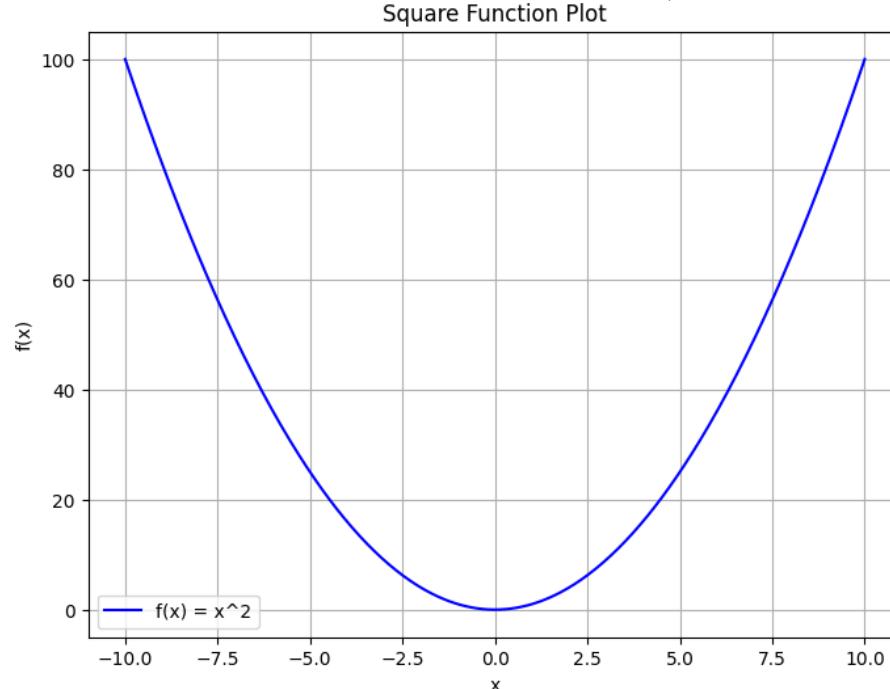
Enter a number to compute its factorial: 3
The factorial of 3 is 6

ChatGPT for Coders

❖ Skill 1: Another example

“please help me generate a Python example that uses Matplotlib and plots a square function from -10 to 10”

copy and run on Colab



python

```
import numpy as np
import matplotlib.pyplot as plt

# Generate x values from -10 to 10
x = np.linspace(-10, 10, 400)

# Compute the square of each x value
y = x**2

# Plotting
plt.figure(figsize=(8, 6))
plt.plot(x, y, label="f(x) = x^2", color='blue')
plt.title("Square Function Plot")
plt.xlabel("x")
plt.ylabel("f(x)")
plt.legend()
plt.grid(True)
plt.show()
```

Copy code

ChatGPT for Coders

❖ Skill 2

Explain an existing code

```
def factorial(n):
    result = 1
    for i in range(1, n + 1):
        result *= i
    return result
```

1. Function Definition:

python

Copy code

```
def factorial(n):
```

This line defines a function named `'factorial'` that takes a single argument, `'n'`.

2. Initialize Result:

python

Copy code

```
result = 1
```

Inside the function, a variable named `'result'` is initialized with the value of 1. This variable will be used to store the cumulative product as the function computes the factorial.

3. For Loop:

python

Copy code

```
for i in range(1, n + 1):
    result *= i
```

A `'for'` loop is used to iterate over numbers from 1 to `'n'` inclusive.

- `'range(1, n + 1)'` produces a sequence of numbers from 1 up to and including `'n'`.
- In each iteration, the loop multiplies the current value of `'result'` by the current loop counter `'i'`. This is equivalent to saying `'result = result * i'`. As the loop progresses, `'result'` accumulates the product of all integers from 1 to `'n'`.

4. Return the Result:

python

Copy code

```
return result
```

After the loop completes, the `'factorial'` function returns the computed factorial value stored in the `'result'` variable.

ChatGPT for

```
def factorial(n):
    result = 1
    for i in range(1, n + 1):
        result *= i
    return result
```

❖ Skill 3: Add comments to an existing code

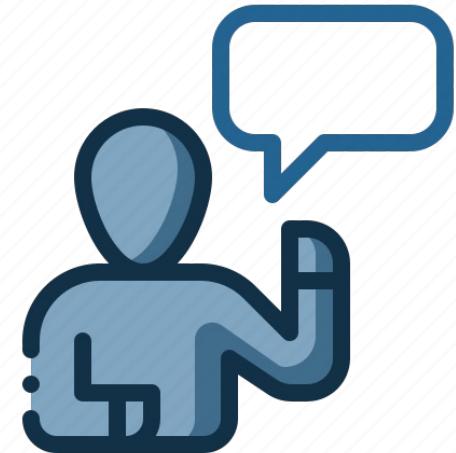
python

 Copy code

```
# Define a function named 'factorial' that computes the factorial of a given
# number.
def factorial(n):
    # Initialize the 'result' variable to 1. This will be used to store the
    # final factorial value.
    result = 1

    # Iterate over numbers from 1 to 'n' inclusive using a for loop.
    for i in range(1, n + 1):
        # Multiply the current value of 'result' by the loop counter 'i'.
        # This accumulates the product for the factorial calculation.
        result *= i

    # Return the computed factorial value.
    return result
```


 Add comments


ChatGPT for Coders

❖ Skill 4: Debugging

Implementing a program on Colab

```
def factorial(n):
    result = 0
    for i in range(1, n + 1):
        result *= i
    return result
```

```
print(factorial(3))
```



This program had an unexpected result. Please find it out.



2

The initial value for the variable `result` is set to `0`. Thus, when you enter the loop and try to multiply `result` with any number from the range, the result will always remain `0` because multiplying any number by `0` is `0`.

1

To calculate the factorial correctly, you should initialize the `result` to `1`, as the factorial of any number starts with multiplying numbers from 1 up to that number.

Here's the corrected code:

python

Copy code

```
def factorial(n):
    result = 1 # Initialize result to 1 instead of 0
    for i in range(1, n + 1):
        result *= i
    return result

print(factorial(3))
```

Now, running this corrected code should yield the output `6`, since $3! = 3 \times 2 \times 1 = 6$.

ChatGPT for Coders

❖ Skill 5: Design a solution for a program



ChatGPT

I have a 1D array of numbers. I want to get the maximum number.
Please design an algorithm and give me a pseudo-code using Pythonic style.

Algorithm:

1. Initialize the `max_value` to the first value in the array.
2. Iterate over each value in the array.
3. Compare each value with `max_value`.
4. If the current value is greater than `max_value`, update `max_value`.
5. Once all elements have been checked, `max_value` will contain the largest number.

python

```
def find_maximum(numbers):
    # Check if the list is empty
    if not numbers:
        return None

    # Initialize max_value with the first number in the list
    max_value = numbers[0]

    # Iterate over each number in the list
    for num in numbers:
        if num > max_value:
            max_value = num

    return max_value
```

Use with Built-in Functions:

Lambda functions are often used in conjunction with built-in functions like `map()`, `filter()`, and `sorted()`.

- Using `map()`:

python

Copy c

```
nums = [1, 2, 3, 4]
squared = list(map(lambda x: x**2, nums))
print(squared) # Outputs: [1, 4, 9, 16]
```

- Using `filter()`:

python

Copy c

```
nums = [1, 2, 3, 4, 5]
evens = list(filter(lambda x: x % 2 == 0, nums))
print(evens) # Outputs: [2, 4]
```

- Using `sorted()`:

python

Copy c

```
pairs = [(1, 2), (3, 1), (4, 5), (0, 4)]
sorted_pairs = sorted(pairs, key=lambda x: x[1])
print(sorted_pairs) # Outputs: [(3, 1), (1, 2), (0, 4), (4, 5)]
```

❖ Skill 6: Explain concepts

What is the Lambda function in Python?

The general syntax for a lambda function is:

python



```
lambda arguments: expression
```

Here are some key points and examples regarding lambda functions:

Basic Usage:

python



```
# A simple lambda function that adds two numbers
f = lambda x, y: x + y
print(f(1, 2)) # Outputs: 3
```

ChatGPT for Coders

❖ Skill 7: Summary idea/key points

Abstract—Stereo matching is a challenging research topic in driving assistance systems. Existing stereo matching methods work well under normal day-light conditions. However, they fail to operate under adverse driving conditions, such as at night and during snowfall. This paper proposes a robust stereo matching framework using both deep-learning-based features and feature engineering. The proposed method investigates the benefits of features based on feature engineering and deep learning for solving stereo matching problems. Robust feature engineering is proposed for handling specific driving under adverse weather conditions, and a robust feature based on deep learning is considered for handling unspecific driving under extreme weather conditions. The proposed study has shown significantly improved accuracy by 8.31% for the state-of-the-art census based on semi-global matching under the reflection regions using the KITTI Stereo 2012 benchmark. Moreover, the experimental results demonstrate that the proposed system obtains more stable results than existing stereo methods based on deep learning on various stereo datasets, such as the Middlebury, EISAT, HCI, and CCD datasets.

Image

<https://arxiv.org/abs/2405.14458>



The paper focuses on improving stereo matching in driving assistance systems, particularly under adverse conditions such as nighttime and snowfall. Traditional stereo matching methods struggle in these scenarios. The proposed approach combines deep learning and feature engineering to create a robust framework. By leveraging feature engineering for specific adverse weather conditions and deep learning for extreme weather, the method significantly enhances accuracy, showing an 8.31% improvement on the KITTI Stereo 2012 benchmark. The system outperforms existing methods, providing stable results across various stereo datasets including Middlebury, EISAT, HCI, and CCD.



Message ChatGPT



ChatGPT

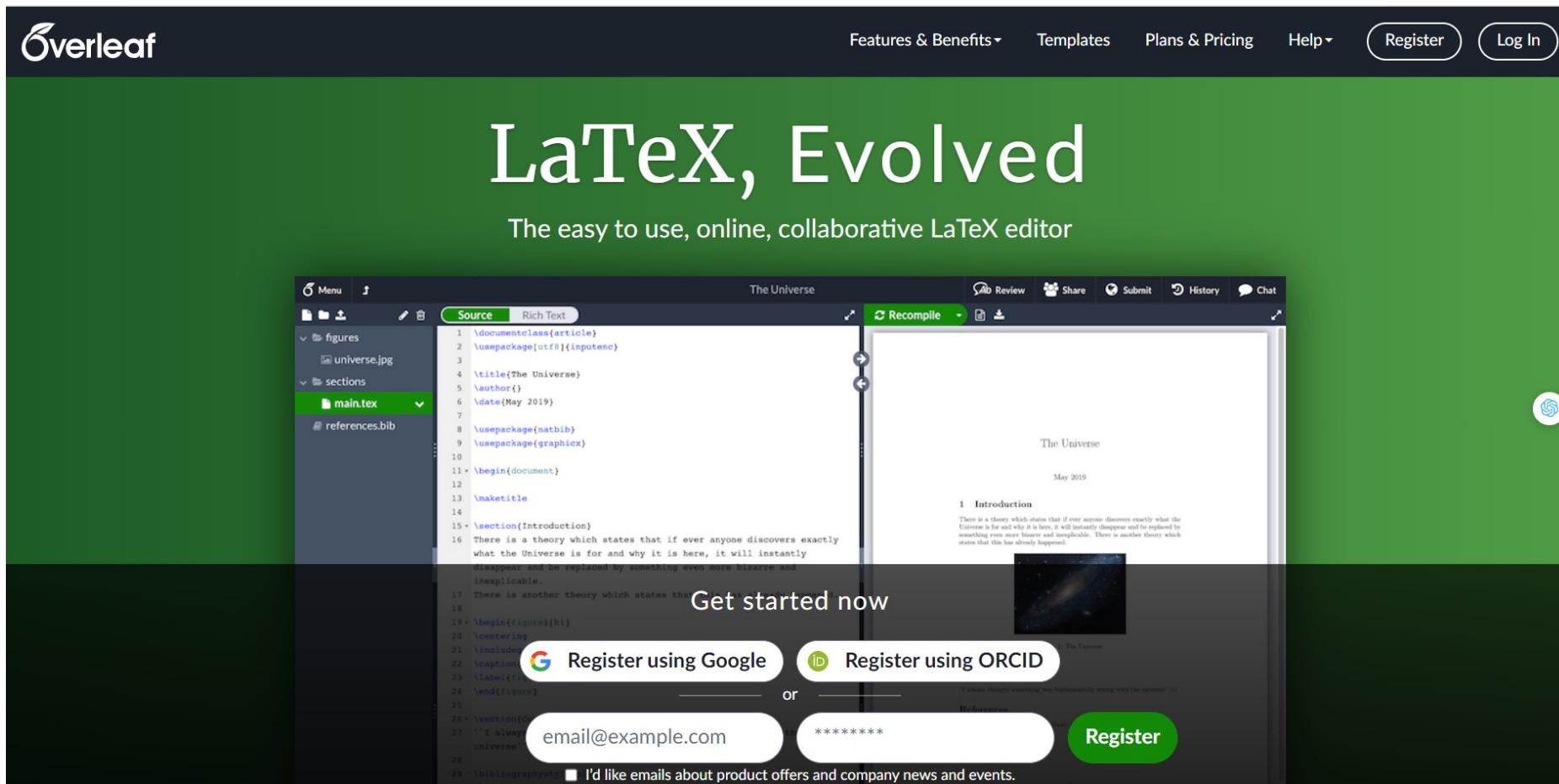
Outline

- How to Find Documents/Papers
- How to Read Documents/Papers
- Where to Implement Your Code
- Coding Assistant: Colab and ChatGPT
- How to Document Your Results
- Quadratic Equation Problem: Gemini Support



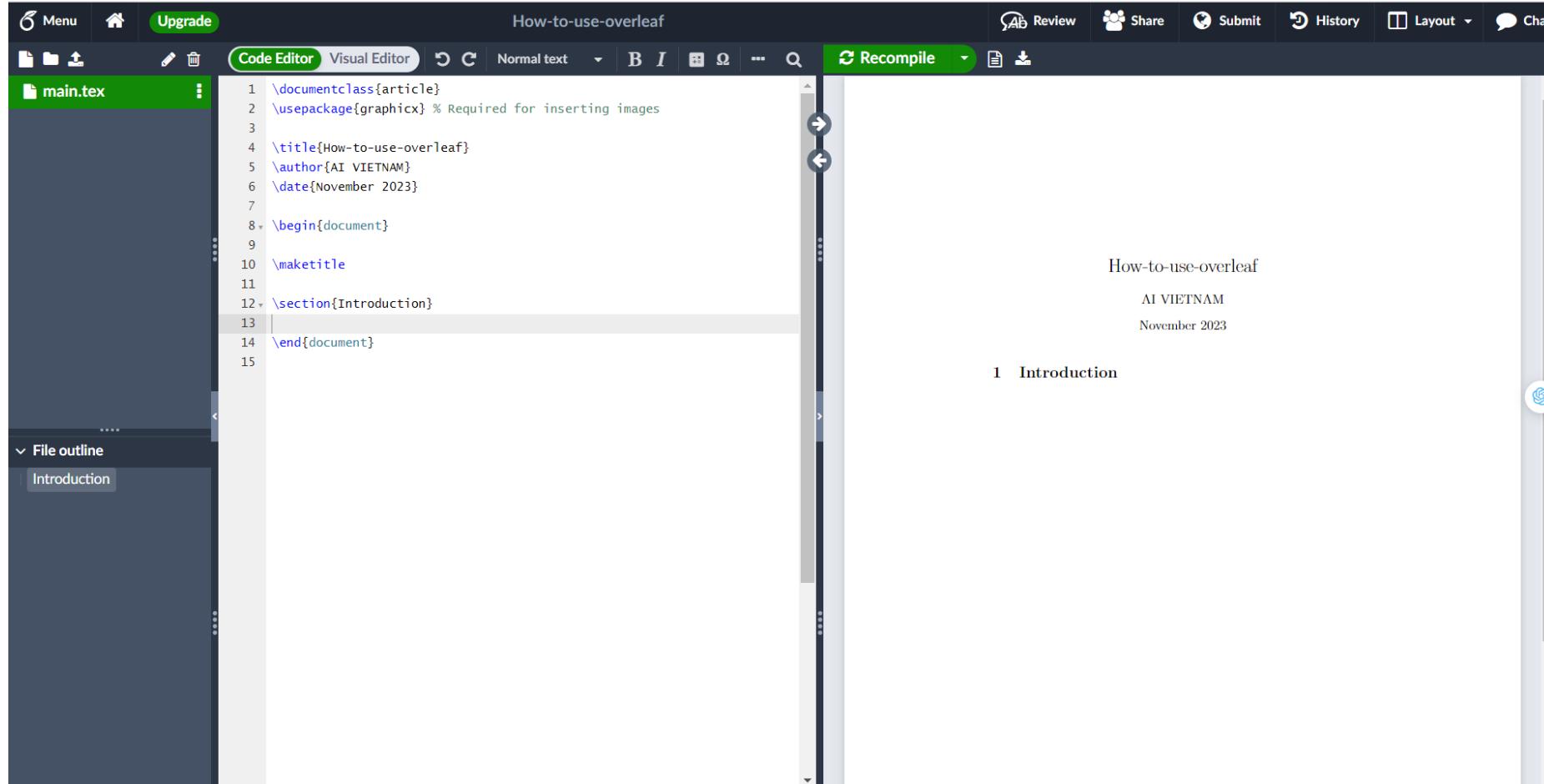
How to Document Your Results

- ❖ **Overleaf**: It is an online LaTeX editing system that helps users conveniently create scientific and technical documents...



How to Document Your Results

❖ Create a project on Overleaf



Overleaf Interface

How to Document Your Results

❖ A minimal LaTeX document

```
\documentclass{article}  
\begin{document}  
Hello World! % your content goes here...  
\end{document}
```

Hello World!

❖ Writing Vietnamese in Latex

```
\documentclass{article}  
\usepackage[utf8]{vietnam}  
\begin{document}  
Xin chào Việt Nam! % your content goes here...  
\end{document}
```

Xin chào Việt Nam!

How to Document Your Results

- **Title:** Use `\title`, `\author`, and `\date` commands to define the title, author, and date.

```
\title{How-to-use-overleaf}
\author{AI VIETNAM}
\date{November 2023}
```

How-to-use-overleaf
AI VIETNAM
November 2023

- **Sections and Subsections:** Utilize `\section`, `\subsection`, and `\subsubsection` to create sections and subsections.

```
\section{Introduction}
\subsection{Subsection 1.1}
\subsubsection{Subsubsection 1.1.1}
```

1 Introduction
1.1 Subsection 1.1
1.1.1 Subsubsection 1.1.1

How to Document Your Results

- Lists: Use **itemize** for bullet-point lists and **enumerate** for numbered lists.

```
\begin{itemize}
    \item Item 1
    \item Item 2
\end{itemize}
```

- Item 1
- Item 2

```
\begin{enumerate}
    \item Item A
    \item Item B
\end{enumerate}
```

1. Item A
2. Item B

How to Document Your Results

❖ Basic Syntax

- **Inserting Images:** Use `\includegraphics` to insert images..

```
\begin{figure}
    \centering
    \includegraphics[width=0.5\linewidth]{whale.jpg}
    \caption{whale}
    \label{fig:whale}
\end{figure}
```



Figure 1: whale

How to Document Your Results

- **Creating Tables:** Use **tabular** environment to create table

```
\begin{table}
  \centering
  \begin{tabular}{|c|c|}
    \hline
    Item 1 & Item 2 \\
    \hline
    Value 1 & Value 2 \\
    Value 3 & Value 4 \\
    \hline
  \end{tabular}
  \caption{Table caption}
  \label{tab:table}
\end{table}
```

Item 1	Item 2
Value 1	Value 2
Value 3	Value 4

Table 1: Table caption

How to Document Your Results

❖ Basic Syntax

Syntax	Explain
\\\	Use \\\ for a manual line break within a paragraph.
\textbf{}, \textit{}	Utilize commands like \textbf{} for bold and \textit{} for italic text.
```, ''	Use ```` and " for opening and closing double quotation marks.
\href{URL}{text}	\href{https://www.overleaf.com}{Visit Overleaf}
\newpage	Use the \newpage command to switch to a new page, and \pageref to number the pages.

# How to Document Your Results

## ❖ Writing Mathematical Formulas

- **Basic formulas:** Use \$ ... \$ to write formulas inline with text.

```
$a^2 + b^2 = c^2$
```

$$a^2 + b^2 = c^2$$

# How to Document Your Results

## ❖ Writing Mathematical Formulas

- Using Tool:

The screenshot shows a LaTeX editor interface. At the top, there's a toolbar with icons for zoom, refresh, clear, colors, functions, and help. Below the toolbar is a large palette containing various mathematical symbols and operators. In the main workspace, there's a code editor with the following LaTeX code:

```
\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}
```

Below the code editor, there are several dropdown menus and checkboxes for settings like font, size, and compression. The final output is a rendered matrix:

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

Click here to Download Image (GIF)

# How to Document Your Results

and can realize accurate object detection and classification. In addition, YOLOv5s has reasonable memory and energy consumption levels because it was designed with 7.5M parameters, fewer than those involved in YOLOv4. Therefore, in this study, the YOLOv5s scheme is used because of its high accuracy and suitability for implementation over limited-resource devices. The proposed robust feature is input to the deep learning model YOLOv5s for detecting vehicles, traffic signs, and traffic lights, as shown in Fig. 3.

## C. Robust Lane Detection

To ensure that the Raspberry Pi car accurately follows the lane, a lane detection algorithm [33] is used. The algorithm involves the following five steps. (1) The input image from the camera system is used to determine the region of interest in which the lane is typically located. (2) Perspective transformation techniques are used to obtain the bird's eye view. (3) The perspective image is transformed into a grayscale image, and

$$\begin{aligned} \gamma(Z_{x,y}^c) &= \sum_{i \in \Omega_n, \Omega_n = \{Z_0, Z_1, \dots, Z_n\}} \delta(Z_{x,y}^c, Z_i^c, \lambda_c(Z_{x,y}, Z_i, Z_{i+1}, n)) \times 2^i \\ \lambda_c(Z_{x,y}, Z_i, Z_j, n) &= \begin{cases} \frac{|I(Z_i) - I(Z_{x,y})| + |I(Z_j) - I(Z_{x,y})|}{3}, & \text{if } j < n \\ \frac{|I(Z_i) - I(Z_{x,y})| + |I(Z_{i-1}) - I(Z_{x,y})| + |I(Z_i) - I(Z_{i-1})|}{3}, & \text{otherwise} \end{cases} \\ \delta(Z_{x,y}, Z_i, \lambda_c) &= \begin{cases} 1 & \text{if } I(Z_i^c) > I(Z_{x,y}^c) + \lambda_c \\ 0 & \text{if } I(Z_i^c) < I(Z_{x,y}^c) + \lambda_c \\ -1 & \text{if } I(Z_i^c) < I(Z_{x,y}^c) - \lambda_c \end{cases} \end{aligned} \quad (2)$$

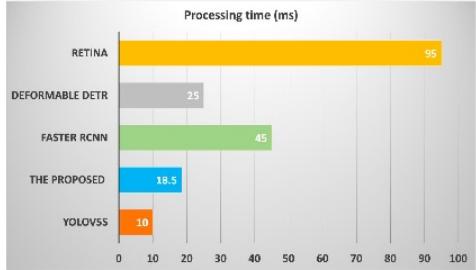


Fig. 10. Processing time of our proposed method and other algorithms on 10 GB Nvidia GTX 3080 GPU.

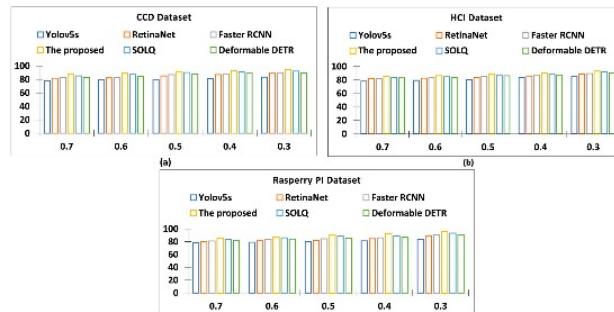
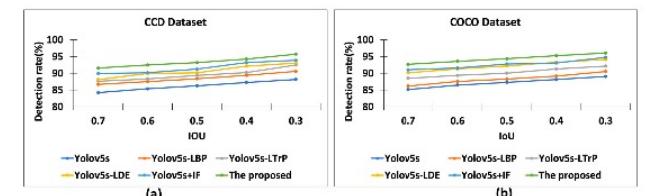


Fig. 11. Vehicle detection results of our proposed system and state-of-the-art object detection methods in difficult driving environments on various datasets: (a) CCD dataset [12]. (b) HCI dataset [37]. (c) the Raspberry Pi dataset.

Canny edge detection algorithms are used to identify the edge of the grayscale image. (4) A histogram is used to determine the positions of the left and right lanes considering the results of Canny edge detection. (5) The Hough transform is used to verify the results of the lane detection system. Fig. 4 shows the lane detection results of the proposed system in day and night conditions.

TABLE I  
IMPLEMENTATION DETAILS

No.	Name	Description
1.	Our proposed method	For YOLOv5s: depth_multiple, width_multiple, anchors, epochs, batch-size, and img-size are set to 0.33, 0.50, and [10,13, 16,30, 33,23], [30,61, 62,45, 59,119], [116,90, 156,198, 373,326], 300, 32, and 416 respectively. For the triangular-pattern-based sigmoid: radius B is set to 1, number of neighbor pixels Zn is set to 8
2.	YOLOv4-tiny	Batch, subdivisions, width, height, momentum, decay, angle, saturation, exposure, hue and learning_rate are set to 64, 24, 416, 416, 0.9, 0.0005, 0, 1.5, 1.5, 1, 0.002, respectively.
3.	YOLOv3-tiny	Width, height, channels, momentum, decay, angle, saturation, exposure, hue, learning_rate, burn_in, max_batches and scales are set to 416, 416, 3, =0.9, 0.0005, 0, 1.5, 1.5, 0.1, 0.001, 1000, 500200, and 0.1, respectively.
4.	Retina	Gamma, alpha, are set to 2 and 0.25, respectively. The focal loss is applied to all 100k anchors in each sampled image.
5.	Faster RCNN	Anchors k, learning rate, momentum, and weight decay are set to 9, 0.001, 0.9, and 0.0005, respectively.
6.	DETR	Learning rate, weight decay, epochs, backbone, number of encoding layers, number of decoding layers and drop out are set to 0.0001, 0.0001, 300, ResNet50, 6, 6, and 0.1, respectively.
7.	Deformable DETR	Backbone, number of heads M, number of key numbers K, loss weight, epochs, learning rate, weight decay, and batch size are set to ResNet50, 8, 4, 2, 50, 0.0001, 0.0001, and 16, respectively.
8.	SOLQ	Number of heads M, number of key numbers K, hidden dim of MLP, $\lambda_{cls}$ , $\lambda_{L1}$ , $\lambda_{iou}$ , epochs, learning rate, weight decay, batch size and backbone are set to 8, 4, 1024, 2, 5, 2, 50, 0.0002, 0.0001, 16, ResNet50, respectively.



QUIZ TIME



# Outline

- How to Find Documents/Papers
- How to Read Documents/Papers
- Where to Implement Your Code
- Coding Assistant: Colab and ChatGPT
- How to Document Your Results
- Quadratic Equation Problem: Gemini Support



# Quadratic Equation Problem: Gemini Support



$$x^2 + 3x - 4 = 0$$

**Input:**  
 $a = 1$   
 $b = 3$   
 $c = -4$

Program

$$x = 1, -4$$

**Output**

Coefficient of  $x$

$$ax^2 + bx + c = 0$$

↑  
Coefficient of  $x^2$       ↑  
Coefficient of  $x$       ↓  
Constant

**Bước 1:** Tính  $\Delta = b^2 - 4ac$

**Bước 2:** So sánh  $\Delta$  với 0

- $\Delta < 0 \Rightarrow$  phương trình (1) vô nghiệm
- $\Delta = 0 \Rightarrow$  phương trình (1) có nghiệm kép  $x_1 = x_2 = -\frac{b}{2a}$
- $\Delta > 0 \Rightarrow$  phương trình (1) có 2 nghiệm phân biệt, ta dùng **công thức** nghiệm sau:

$$x_1 = \frac{-b + \sqrt{\Delta}}{2a} \quad \text{và} \quad x_2 = \frac{-b - \sqrt{\Delta}}{2a}$$

# Quadratic Equation Problem: Gemini Support

## ❖ Step 1: Get input from the user



Suggested code may be subject to a license | Rashbin/Edubridge

```
get input from the user
a = int(input("Enter a: "))
b = int(input("Enter b: "))
c = int(input("Enter c: "))
```

... Enter a: 1

Enter b: 3

Enter c: -4

# Quadratic Equation Problem: Gemini Support

## ❖ Step 2: Calculate Delta



```
calculate delta
delta = b**2 - 4*a*c
print("Delta = ", delta)
```



Delta = 25

# Quadratic Equation Problem: Gemini Support

## ❖ Step 3: Delta Comparison with Zero

- $\Delta < 0 \Rightarrow$  phương trình (1) vô nghiệm
- $\Delta = 0 \Rightarrow$  phương trình (1) có nghiệm kép  $x_1 = x_2 = -\frac{b}{2a}$
- $\Delta > 0 \Rightarrow$  phương trình (1) có 2 nghiệm phân biệt, ta dùng công thức nghiệm sau:

$$x_1 = \frac{-b + \sqrt{\Delta}}{2a} \text{ và } x_2 = \frac{-b - \sqrt{\Delta}}{2a}$$



Conditional Statements in Programming

# Conditional Statements in Programming

## ❖ Comparison operators

TOÁN TỬ SO SÁNH	
TOÁN TỬ	Ý NGHĨA
==	Bằng
!=	Khác
>	Lớn hơn
<	Nhỏ hơn
>=	Lớn hơn hoặc bằng
<=	Nhỏ hơn hoặc bằng

```

1 a = 5
2 b = 8
3
4 # hỏi biến a có bằng biến b hay không?
5 print(a == b)
6
7 # hỏi biến a có khác biến b hay không?
8 print(a != b)
9
10 # hỏi biến a có lớn hơn biến b hay không?
11 print(a > b)
12
13 # hỏi biến a có lớn hơn hoặc bằng biến b hay không?
14 print(a >= b)
15
16 # hỏi biến a có nhỏ hơn biến b hay không?
17 print(a < b)
18
19 # hỏi biến a có lớn hơn hoặc bằng biến b hay không?
20 print(a <= b)

```

False

True

False

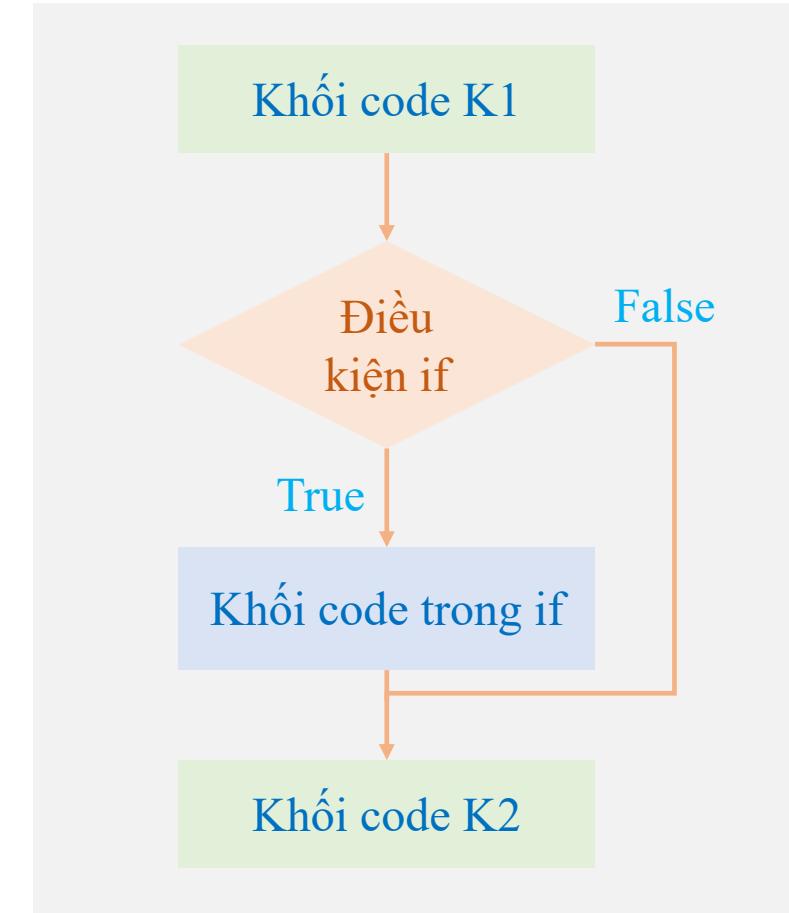
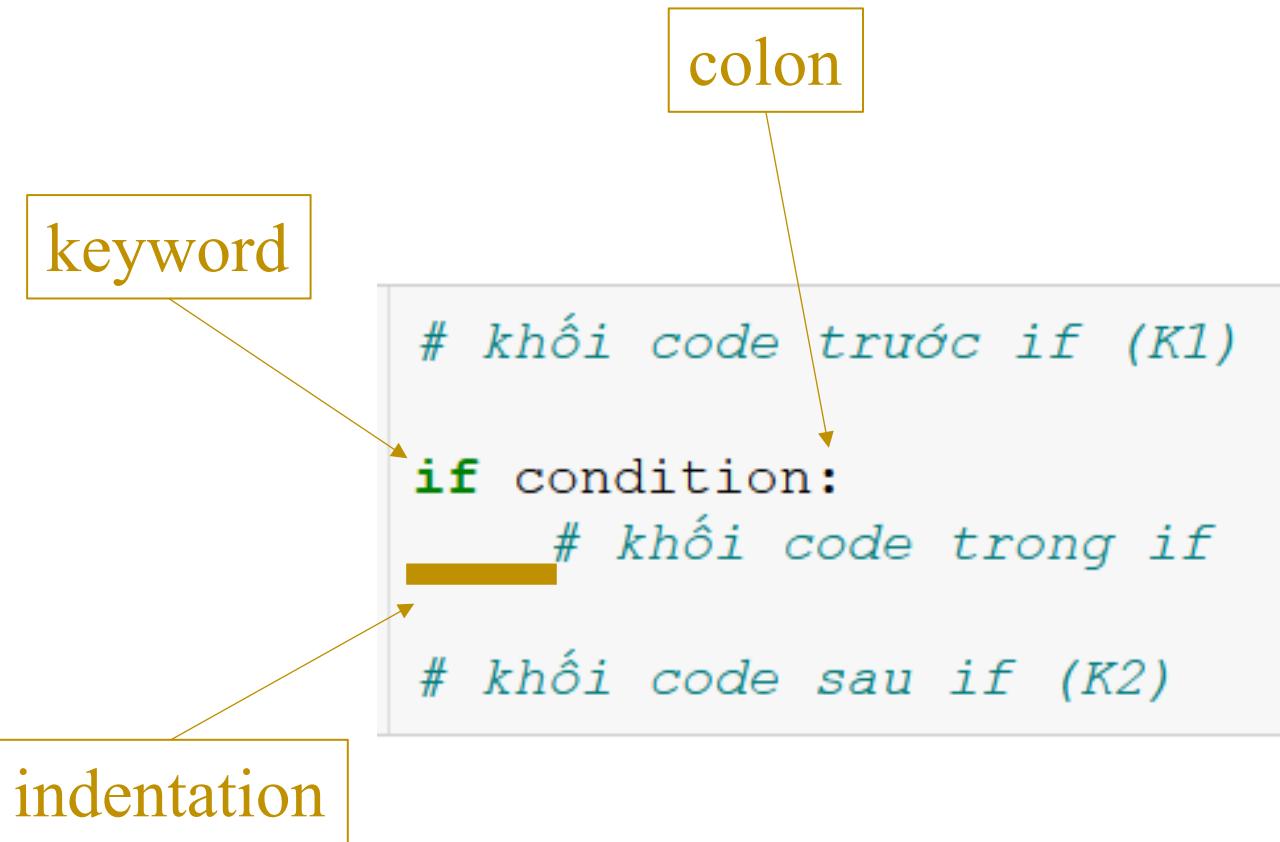
False

True

True

# Conditional Statements in Programming

## ❖ if condition



# Conditional Statements in Programming

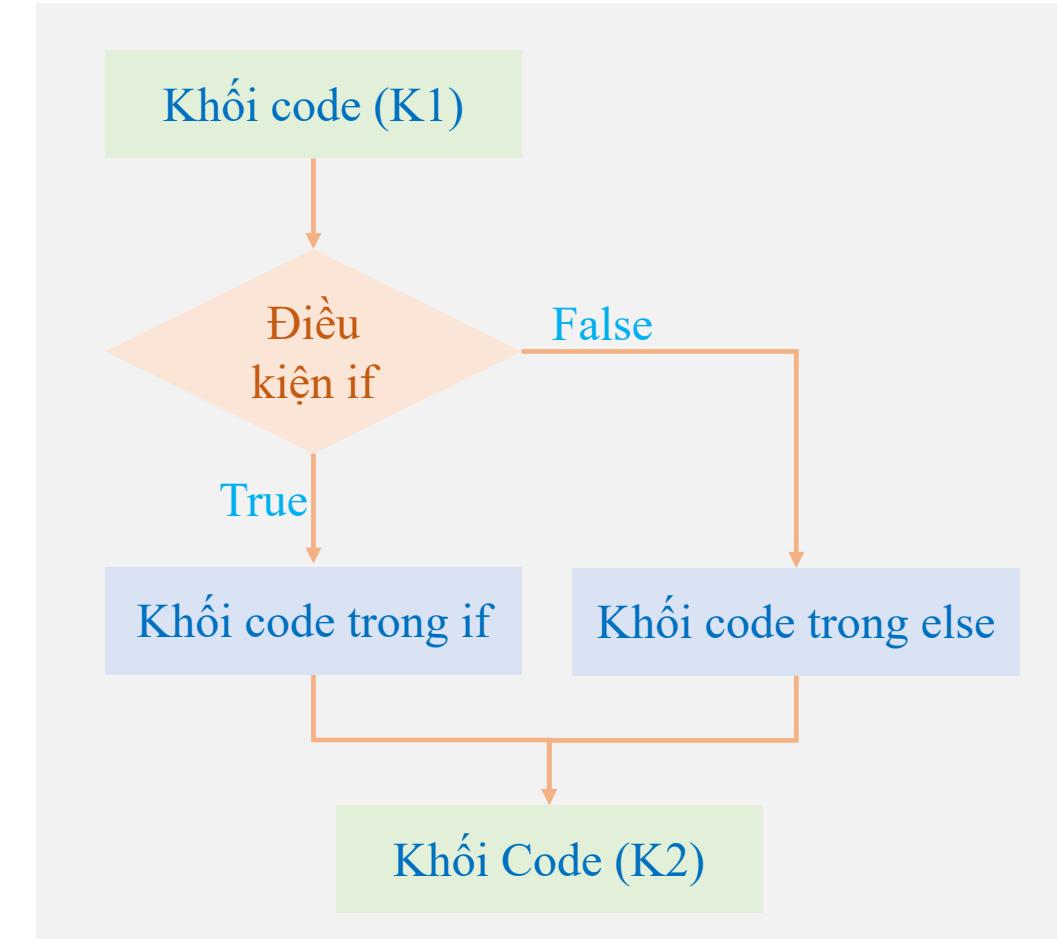
## ❖ if-else condition

```
khối code trước if (K1)
if condition:
 # khối code trong if
else:
 # khối code trong else
khối code sau if (K2)
```

**keyword**

**colon**

**indentation**



# Conditional Statements in Programming

## ❖ if-elif-else condition

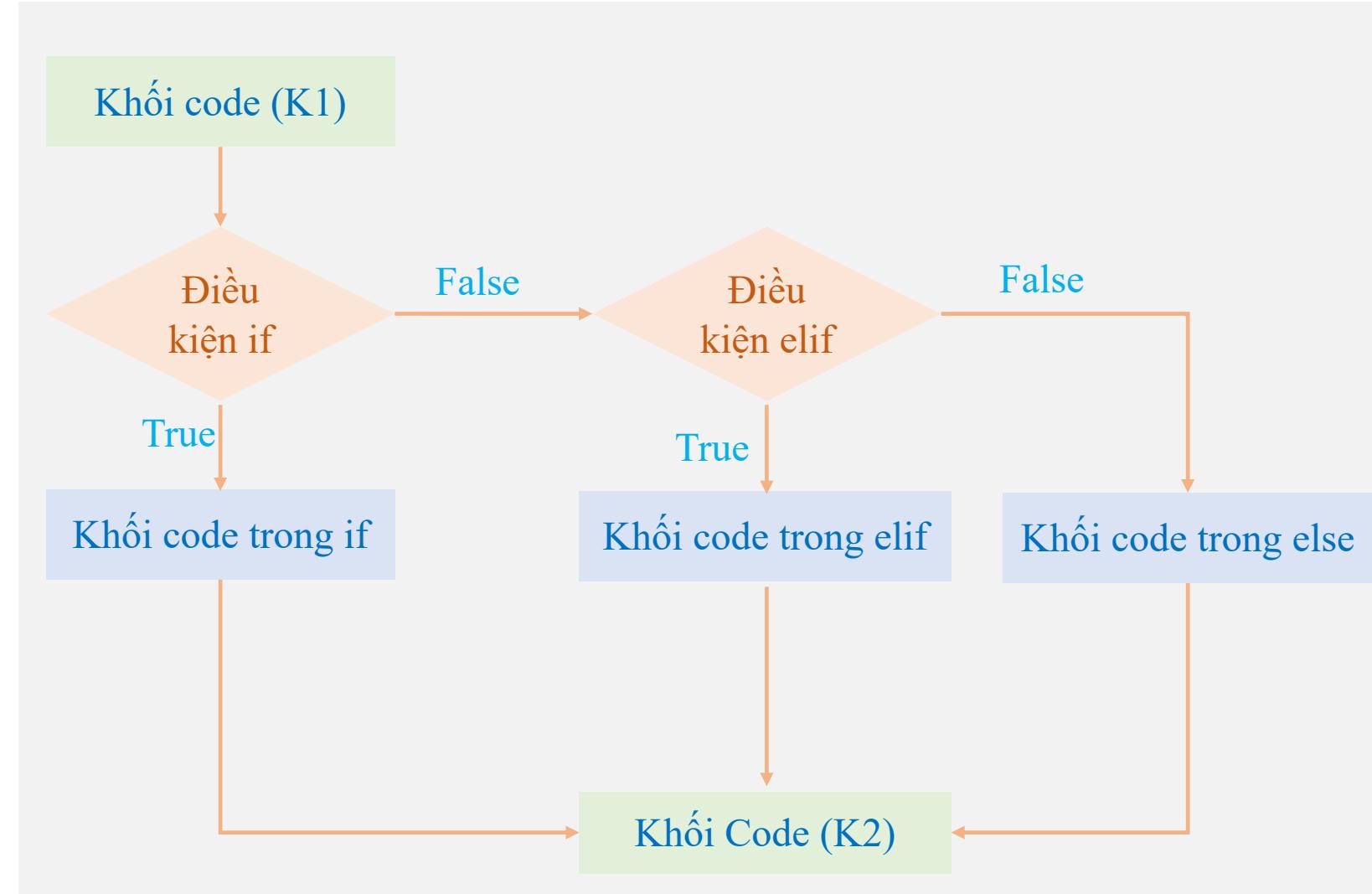
```

1 # khόi code trước if-else (K1)
2
3 if condition1:
4 # khόi code trong if
5 elif condition2:
6 # khόi code trong elif
7 else:
8 # khόi code trong else
9
10 # khόi code sau if-else (K2)

```

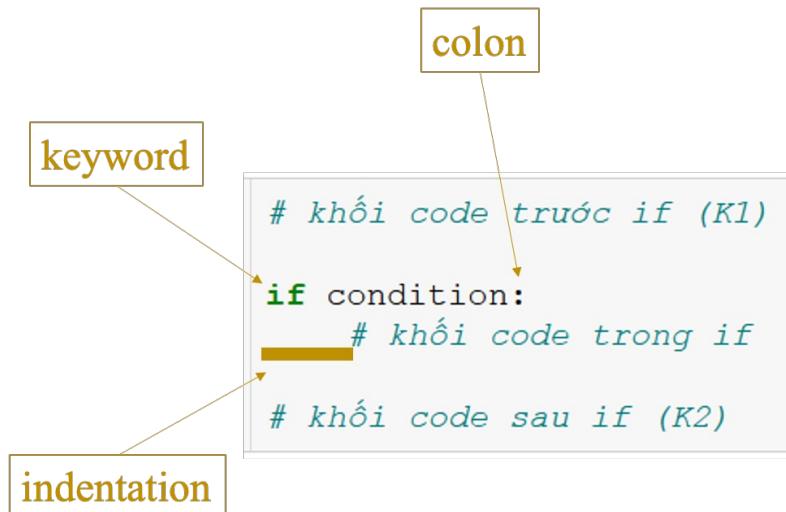
colon

indentation



# Quadratic Equation Problem: Gemini Support

## ❖ Step 3: Delta Comparison with Zero



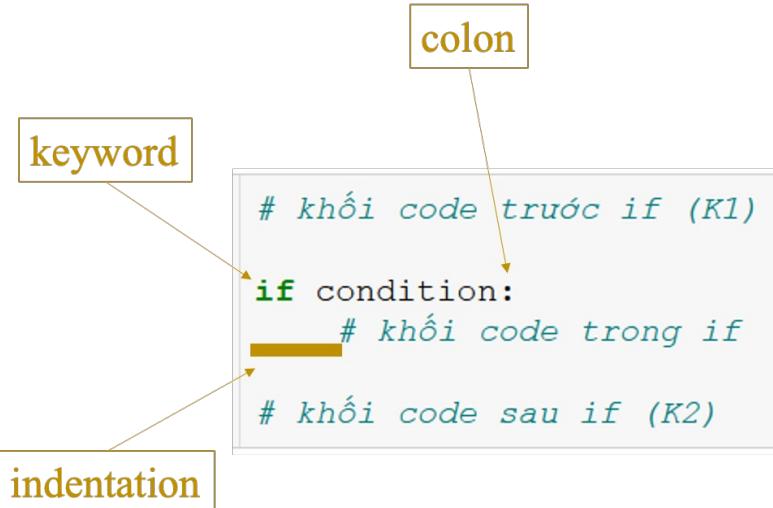
▶ # Compare Delta with Zero

```

if delta > 0:
 print("The roots are real and different.")
elif delta == 0:
 print("The roots are real and same.")
else:
 print("The roots are imaginary.")
```

# Quadratic Equation Problem: Gemini Support

## ❖ Step 3: Delta Comparison with Zero



**Import Library**

**Built-in/Library function**

```

import math
Compare Delta with Zero
if delta > 0:
 x1 = (-b + math.sqrt(delta))/(2*a)
 x2 = (-b - math.sqrt(delta))/(2*a)
 print("The roots are real and different", "(x1 = ", x1, " x2 = ", x2 , ")")
elif delta == 0:
 x1 = -b/(2*a)
 x2 = -b/(2*a)
 print("The roots are real and same. x1 = x2 = ", x1)
else:
 print("The roots are imaginary.")

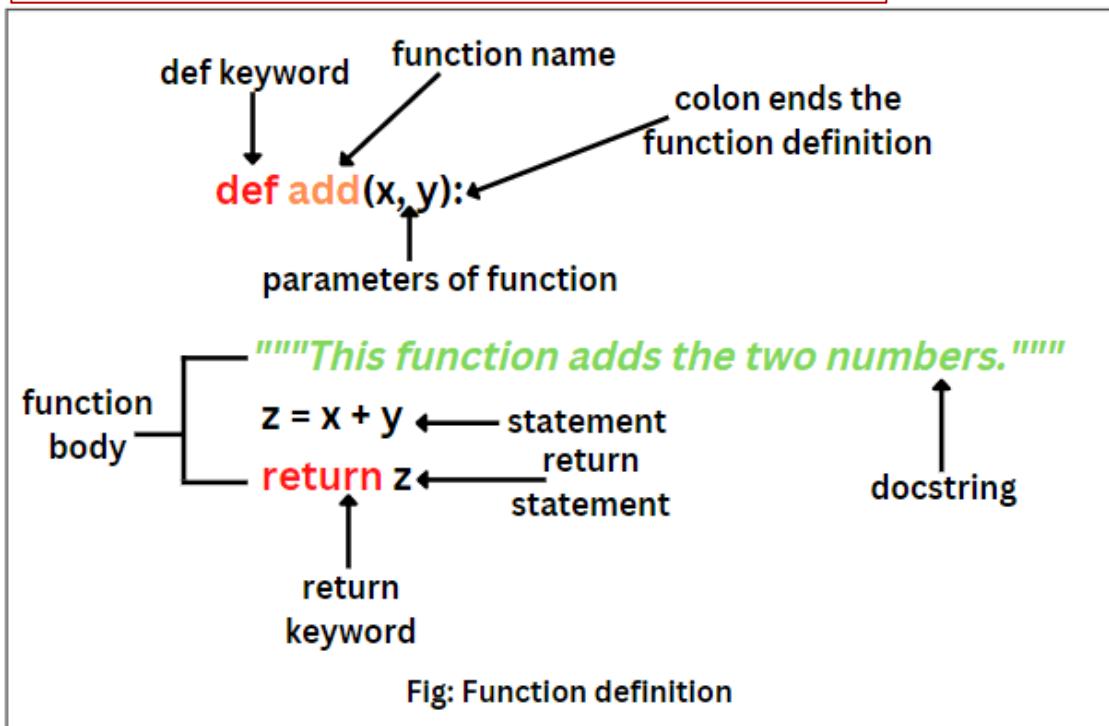
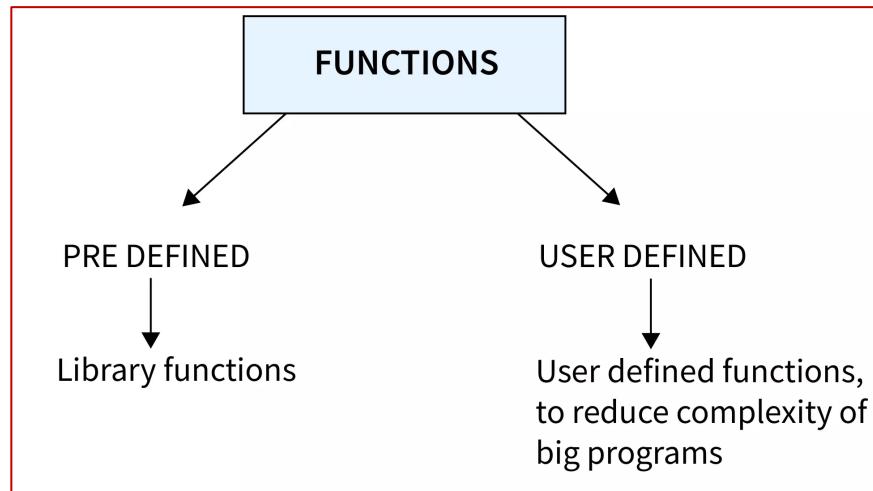
```

The code block shows the implementation of the quadratic equation solver. It imports the 'math' library to use the square root function. It then compares the 'delta' value with zero. If 'delta' is greater than zero, it calculates two real roots using the quadratic formula and prints them. If 'delta' is equal to zero, it calculates one real root and prints it. If 'delta' is less than zero, it prints a message stating that the roots are imaginary.

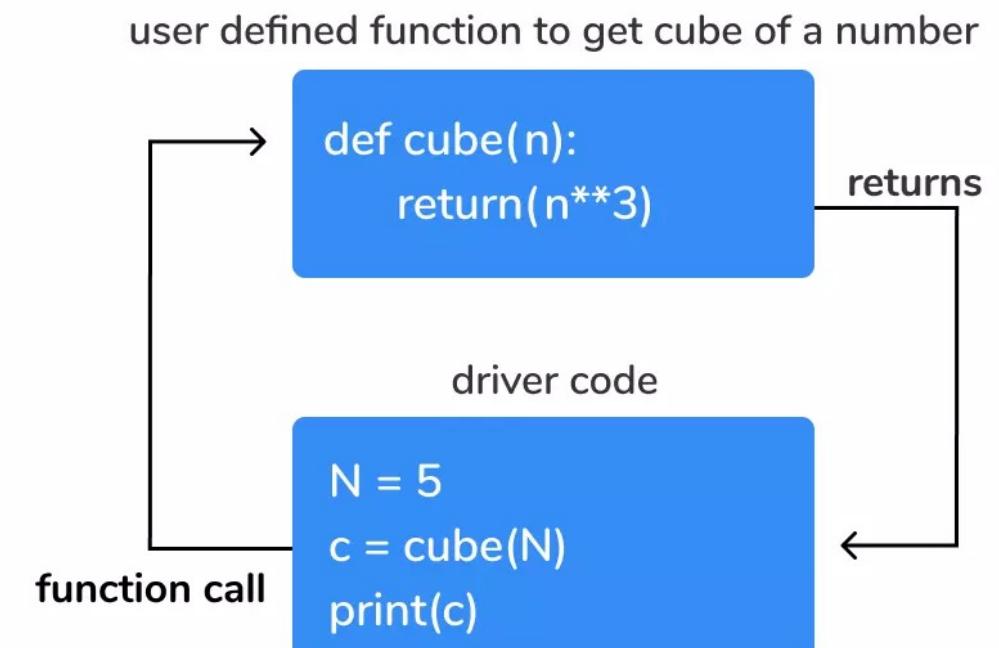


What is User-Defined Function?

# Quadratic Equation Problem: Gemini Support



## ❖ User-defined Function



# User-defined Functions

## Notes for function construction

Define function name

Lowercase with underscores  
and begin with a verb

Indentation

Use 4 spaces for indentation

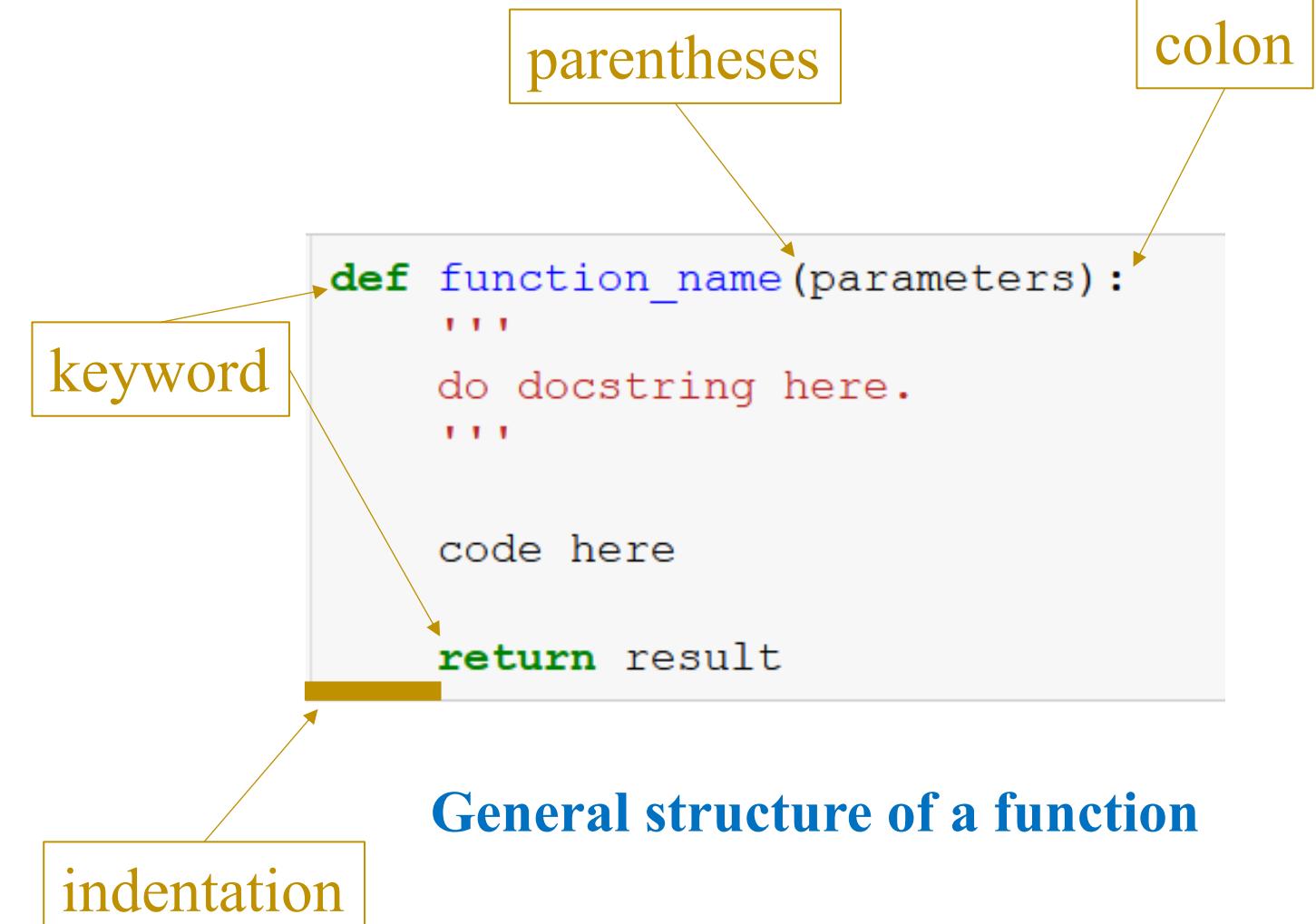
Determine function parameters

Input data help the function done

Do docstring

Explain and describe the function

Output of the function



# User-defined Functions

```
def function_name(parameters):
 """
 do docstring here.
 """

 code here

 return result
```

Define function name  
Lowercase with underscores,  
usually begin with a verb

Determine function parameters  
Input data help the function done

Do docstring  
Explain and describe the function

Output of the function

TÊN	HÌNH DẠNG	DIỆN TÍCH	CHU VI
HÌNH CHỮ NHẬT		$A = L \times w$	$P = L+w+L+w$ $P=2L+2w$

Name	compute_rectangle_area
Parameter	height, width
Output	area

```
def compute_rectangle_area(height, width):
 """
 This function aims to compute area for a rectangle.

 height -- the height of the rectangle
 width -- the width of the rectangle

 This function returns the area of the rectangle
 """

 area = height*width

 return area
```

# User-defined Functions

## ❖ Default values

### Default values



```

1 def compute_rectangle_area(height=0, width=0):
2 """
3 This function aims to compute area for a rectangle.
4
5 height -- the height of the rectangle
6 width -- the width of the rectangle
7
8 This function returns the area of the rectangle
9 """
10
11 area = height*width
12
13 return area

```

```

1 areal = compute_rectangle_area(5, 6)
2 print('area 1: ', areal)
3
4 area2 = compute_rectangle_area(height=5, width=6)
5 print('area 2: ', area2)
6
7 area3 = compute_rectangle_area(width=6, height=5)
8 print('area 3: ', area3)
9
10 area4 = compute_rectangle_area(width=6,
11 height=5)
12 print('area 4: ', area4)
13
14 area5 = compute_rectangle_area()
15 print('area 5: ', area5)

```

```

area 1: 30
area 2: 30
area 3: 30
area 4: 30
area 5: 0

```

# User-defined Functions

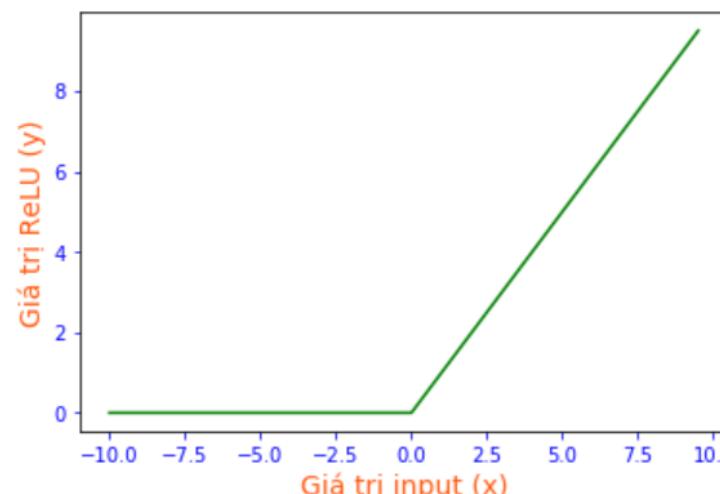
## ❖ ReLU Activation Function:

$$\text{ReLU}(x) = \begin{cases} 0 & \text{if } x \leq 0 \\ x & \text{if } x > 0 \end{cases}$$

`data = [1, 5, -4, 3, -2]`

`data_a = ReLU(data)`

`data_a = [1, 5, 0, 3, 0]`



```

1 def ReLU(x):
2 """
3 This function aims to compute ReLU for a value x.
4
5 x -- an input value
6
7 This function returns the ReLU of x
8 ...
9
10 result = 0
11
12 if x > 0:
13 result = x
14
15 return result

```

```

1 value1 = ReLU(x=5)
2 value2 = ReLU(x=-2)
3
4 print(value1)
5 print(value2)

```

5  
0

# Quadratic Equation Problem: Gemini Support

## ❖ User-defined Function: solve_quadratic

```
▶ # Calculate Delta
delta = b**2 - 4*a*c
print("Delta = ", delta)
```

```
▶ import math
Compare Delta with Zero
if delta > 0:
 x1 = (-b + math.sqrt(delta))/(2*a)
 x2 = (-b - math.sqrt(delta))/(2*a)
 print("The roots are real and different",)
elif delta == 0:
 x1 = -b/(2*a)
 x2 = -b/(2*a)
 print("The roots are real and same. x1 = x2 = ", x1)
else:
 print("The roots are imaginary.")
```



```
[43] # Compare Delta with Zero
def solve_quadratic(a, b, c):
 delta = b**2 - 4*a*c
 if delta > 0:
 x1 = (-b + math.sqrt(delta))/(2*a)
 x2 = (-b - math.sqrt(delta))/(2*a)
 print("The roots are real and different", "(x1 = ", x1, " x2 = ", x2 , ")")
 elif delta == 0:
 x1 = -b/(2*a)
 x2 = -b/(2*a)
 print("The roots are real and same. x1 = x2 = ", x1)
 else:
 print("The roots are imaginary.")
```

▶ solve_quadratic(a=1, b=3, c = -4)

→ The roots are real and different (x1 = 1.0 x2 = -4.0 )

