



Robot Sensor Data Processing

Lab 1. Environment Setting (google colab)

Hyoseok Hwang

Index



- How to use
 - Getting started
 - UI
 - Environment setting
- How to Connect to Google drive
- How to sharing the note

Google colab

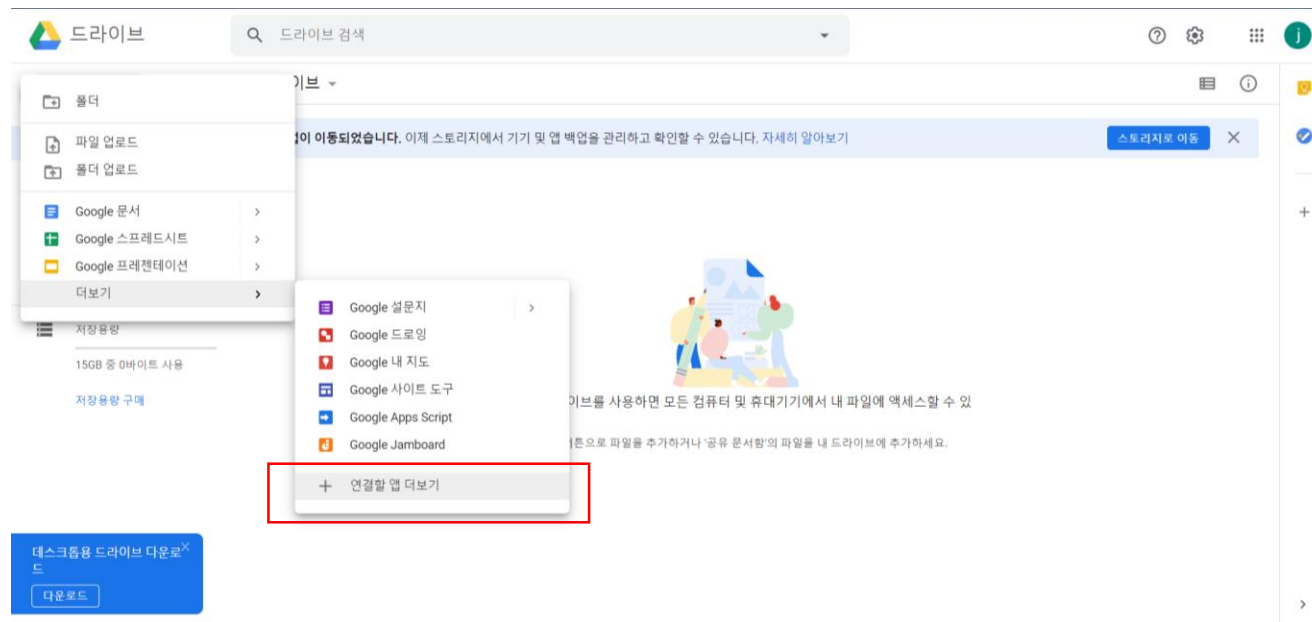


- It's combination of Jupyter notebook and Google Drive
 - Pre-installed libraries : Tensorflow, Scikit-learn, Matplotlib and so on
 - Runs entirely in the cloud as docker
 - Python 2.7 & Python 3.6 support
 - Free GPU acceleration
 - Support bash commands
 - Collaboration features
-
- The maximum session maintain time is 12 hours
 - Also, it will end session if you stay inactively more than 90 minutes
 - <https://bryan7.tistory.com/1077>

How to use – getting started



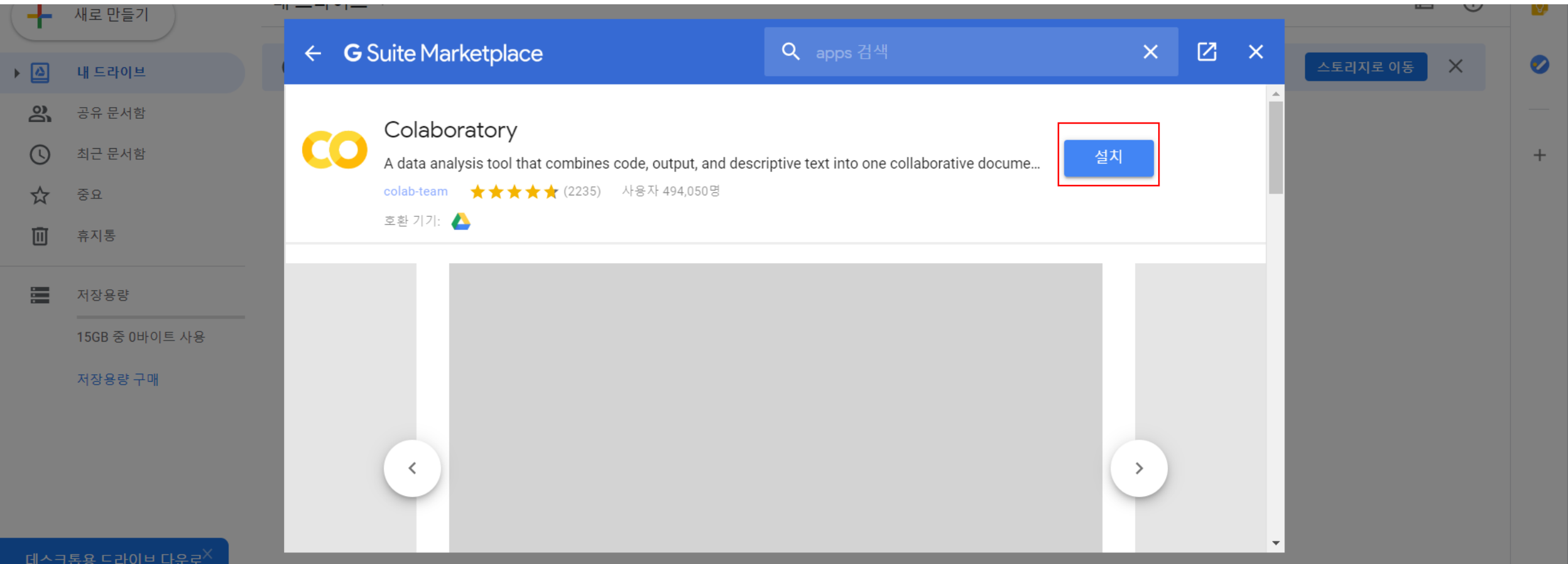
- You need a google account
- Google drive -> 새로 만들기 -> 더보기 -> 연결할 앱 더보기



How to use – getting started



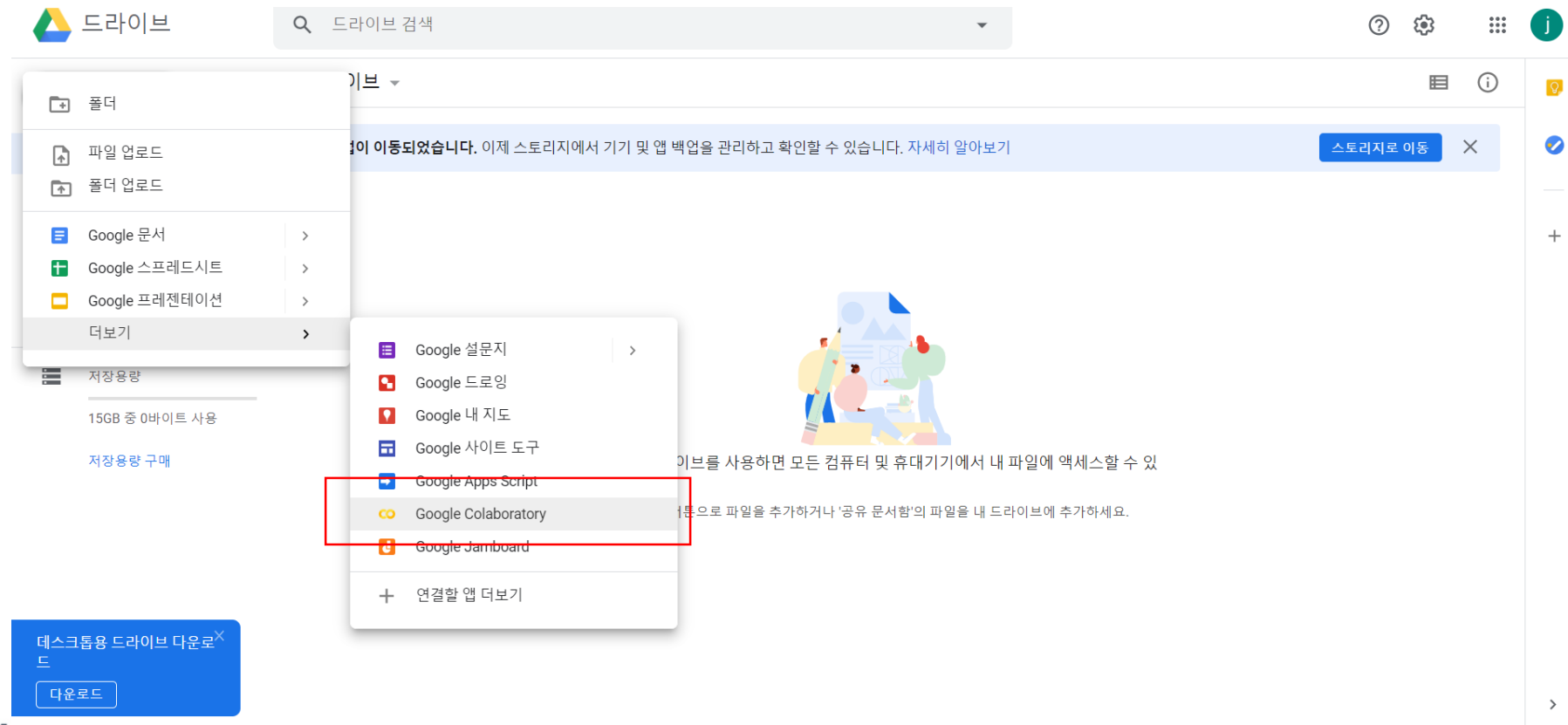
- Search 'Colaboratory' and install

A screenshot of the Google Suite Marketplace interface. The top bar is blue with the text "G Suite Marketplace" and a search bar containing "apps 검색". Below the bar, the "Colaboratory" app is displayed. It features the "CO" logo, the name "Colaboratory", and a description: "A data analysis tool that combines code, output, and descriptive text into one collaborative docume...". The app is by "colab-team" and has a 5-star rating from 2235 reviews, with 494,050 users. A blue button labeled "설치" (Install) is highlighted with a red rectangle. The background shows the Google Drive interface with a sidebar on the left containing options like "새로 만들기" (New), "내 드라이브" (My Drive), "공유 문서함" (Shared with me), "최근 문서함" (Recent), "중요" (Important), "휴지통" (Trash), and "저장용량" (Storage). The storage section indicates "15GB 중 0바이트 사용" (0 bytes used of 15GB) and a link to "저장용량 구매" (Purchase storage). At the bottom left, there is a notification for "데스크톱용 드라이브 다운로드" (Download Drive for desktop).

How to use – getting started




- Create colab project



How to use – getting started



 **Untitled0.ipynb** ☆

파일 수정 보기 삽입 런타임 도구 도움말 오후 6:24에 마지막으로 저장됨

댓글 공유 설정 j

+ 코드 + 텍스트

연결 수정 가능

1 |

hc3bysv51qo-496ff2e9c6d22116-0-colab.googleusercontent.com의 응답을 기다리는 중...

이제 시작합니다

How to use – getting started



- More information : <https://colab.research.google.com/>
- It is similar with Jupyter Notebook
- You can connect to Google drive, Github, Kaggle

How to use – UI



Currently opened note (you can modify name)

Menu bar

Google Colab interface showing a notebook titled "Untitled0.ipynb". The interface includes a left sidebar with a file explorer, a top menu bar, and a main code editor area. A blue callout box points to the notebook title and contains the text "Currently opened note (you can modify name)" and "Menu bar".

The notebook content is as follows:

```
[ ] 1 name = "your name"
    2
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

HELLO COLAB
HELLO your name

```
[ ] 1 print("Type pyramid level")
    2 level = int(input())
```

Type pyramid level
3

```
[ ] 1 k = 2*level-2
    2 for i in range(0, level):
    3     for j in range(0, k):
    4         print(end=" ")
    5     k=k-1
    6
    7     for j in range(0, i+1):
    8         print("* ",end="")
```

How to use – UI

A screenshot of the Google Colab interface. At the top, the file name 'hwang_test.ipynb' is shown with a star icon. Below it is a menu bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help'. A blue arrow points from the 'File' menu to a blue text box that says 'When you save current file using File→ Save, The file will be saved at [Colab Notebooks / file name] in your googld drive'. On the left, there is a 'Table of contents' sidebar with a 'Section' button. On the right, there are 'Comment', 'Share', and 'Settings' icons, along with 'RAM' and 'Disk' usage indicators. Below the main editor, there is a section titled '내 드라이브 > Colab Notebooks' with a table of files. The table has columns for '이름' (Name), '소유자' (Owner), '마지막으로 수정한 날짜' (Last modified date), and '파일 크기' (File size). The table contains one entry: 'Copy of Untitled0.ipynb' owned by '나' (Me), modified on '오후 4:10 나' (4:10 PM Me), with a size of '791바이트' (791 bytes).

hwang_test.ipynb ☆

File Edit View Insert Runtime Tools Help [All changes saved](#)

Table of contents

Section

When you save current file using File→ Save, The file will be saved at [Colab Notebooks / file name] in your googld drive

Comment Share Settings

RAM Disk

Editing

내 드라이브 > Colab Notebooks

이름 ↑	소유자	마지막으로 수정한 날짜	파일 크기
Copy of Untitled0.ipynb	나	오후 4:10 나	791바이트

How to use – UI



Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 3월 2일에 마지막으로 수정됨

댓글

공유



목차



+ 코드 + 텍스트

연결 ▾

수정 가능



HELLO WORLD!

star pyramid



섹션

HELLO WORLD!

```
[ ] 1 name = "your name"
    2
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

```
☞ HELLO COLAB
   HELLO your name
```

star pyramid

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```
☞ Type pyramid level
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    6
    7     for j in range(0, i+1):
    8         print("* ",end="")
```

Add code cell, text cell

How to use – UI



Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 3월 2일에 마지막으로 수정됨



댓글



공유

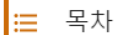


연결 ▼

수정 가능



Current state of note



목차



+ 코드 + 텍스트

<> HELLO WORLD!

star pyramid



+ 섹션

▼ HELLO WORLD!

```
[ ] 1 name = "your name"
    2
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

```
☞ HELLO COLAB
   HELLO your name
```

▼ star pyramid

```
[ ] 1 print("Type pyramid level")
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How to use – UI



Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 3월 2일에 마지막으로 수정됨

댓글

공유



목차



+ 코드 + 텍스트

연결 ▼

수정 가능



HELLO WORLD!

star pyramid



섹션

HELLO WORLD!

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   HELLO your name
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▼ star pyramid

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    4         print(end=" ")
    5     k=k-1
    6
    7     for j in range(0, i+1):
    8         print("* ",end="")
```

Text cell

You can write comment
This cell not executed

Using '#', You can add section

How to use – UI



Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 3월 2일에 마지막으로 수정됨

댓글

공유



목차



+ 코드 + 텍스트

연결

수정 가능



HELLO WORLD!

star pyramid



섹션

HELLO WORLD!

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[ ] 1 name = "your name"
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HELLO your name
```

star pyramid

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    4         print(end=" ")
    5     k=k-1
    6
    7     for j in range(0, i+1):
    8         print("* ",end="")
```

Code cell
You can code that will be executed

How to use – UI



Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 3월 2일에 마지막으로 수정됨

댓글 공유 설정 j

목차

<> HELLO WORLD!

star pyramid



+ 섹션

+ 코드 + 텍스트

연결 수정 가능

HELLO WORLD!

```
[ ] 1 name = "your name"
    2
    3 print("HELLO COLAB")
    4 print("HELLO " + name)
```

```
HELLO COLAB
HELLO your name
```

star pyramid

```
[ ] 1
    2
```

```
Typ
3
```

```
[ ] 1
    2
    3
    4
    5
    6
    7
    8
```

```
print( * ,end= )
```

Result of code cell

Each code cell can be executed separately
Also, It have its own result space

Using play button or 'ctrl+enter', you can execute each code cell
'ctrl+f9' is execute whole code cell of the note

How to use – UI



Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 3월 2일에 마지막으로 수정됨

댓글

공유



목차



+ 코드 + 텍스트

연결

수정 가능



HELLO WORLD!

star pyramid



섹션

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[ ] 1 name = "your name"
    2
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
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☞ HELLO COLAB
   HELLO your name
```

star pyramid

```
[ ] 1 print("Type pyramid level")
    2 level = int(input())
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☞ Type pyramid level
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```
[ ] 1 k = 2*level-2
    2 for i in range(0, level):
    3     for j in range(0, k):
    4         print(end=" ")
    5     k=k-1
    6
    7     for j in range(0, i+1):
    8         print("* ",end="")
```



Control box of cell

Using this, you can move, delete, leave comment and so on!

How to use – UI



CO Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 3월 2일에 마지막으로 수정됨

댓글 공유 설정 j

연결 수정 가능

↑ ↓ ↶ ↷ ↻ ↺ ↻ ↺

목차

- <> HELLO WORLD!
- star pyramid
- + 섹션

HELLO WORLD!

```
[ ] 1 name = "your name"
    2
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

HELLO COLAB
HELLO your name

star pyramid

```
level")
el):
):
6
7 for j in range(0, i+1):
8     print("* ",end="")
```

This is index

As you can see, it might be helpful for exploring code cell

How to use – UI



Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 3월 2일에 마지막으로 수정됨

댓글

공유



코드 스니펫



Google



Mounting Google Drive in your VM →

Open files from Google Drive →

Listing files in Google Drive →

Importing data from Google Sheets →

Saving data to Google Drive →

Mounting Google Drive in your VM [삽입](#)

The example below shows how to mount your Google Drive in your virtual machine using an authorization code, and shows a couple of ways to write & read files there. Once executed, observe the new file (foo.txt) is visible in <https://drive.google.com/>

Note this only supports reading and writing files.

```
1 from google.colab import drive
2 drive.mount('/gdrive')
```

```
1 with open('/gdrive/My Drive/foo.txt',
2         'w') as f:
3     f.write('Hello Google Drive!')
```

+ 코드 + 텍스트

HELLO WORLD!

```
[ ] 1 name = "your name"
2
3 print("HELLO COLAB")
4 print("HELLO " + name)
```

HELLO COLAB
HELLO your name

star pyramid

```
[ ] 1 print("Type pyramid level")
2 level = int(input())
```

Type pyramid level
3

```
[ ] 1 k = 2*level-2
2 for i in range(0, level):
3     for j in range(0, k):
4         print(end=" ")
5     k=k-1
6
7     for j in range(0, i+1):
8         print("* ", end="")
```

This is code snippets

You can search and use code about Google Colab

How to use – UI



The image shows the Google Colab interface. A red rectangle highlights the file explorer on the left, which lists files like README.md, anscombe.json, and various CSV files. A green box highlights the folder icon in the file explorer. A blue box with the text "This is file explorer in your environment." has an arrow pointing to the file explorer. The main area shows two code cells: "HELLO WORLD!" and "star pyramid". The "HELLO WORLD!" cell has a play button icon and shows the output "HELLO COLAB" and "HELLO your name". The "star pyramid" cell shows a loop that prints a pyramid of stars. At the bottom left, a disk usage bar shows "36.65 GB 사용 가능".

CO Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말

파일

업로드 새로고침 드라이브 마운트

sample_data

- README.md
- anscombe.json
- california_housing_test.csv
- california_housing_train.csv
- mnist_test.csv
- mnist_train_small.csv

HELLO WORLD!

```
1 name = "your name"
2
3 print("HELLO COLAB")
4 print("HELLO "+name)
```

HELLO COLAB
HELLO your name

star pyramid

```
[ ] 1 print("Type pyramid level")
    2 level = int(input())

Type pyramid level
3

[ ] 1 k = 2*level-2
    2 for i in range(0, level):
    3     for j in range(0, k):
    4         print(end=" ")
    5     k=k-1
    6
    7     for j in range(0, i+1):
    8         print("* ",end="")
```

RAM 디스크 수정 가능

36.65 GB 사용 가능

How to use – environment setting

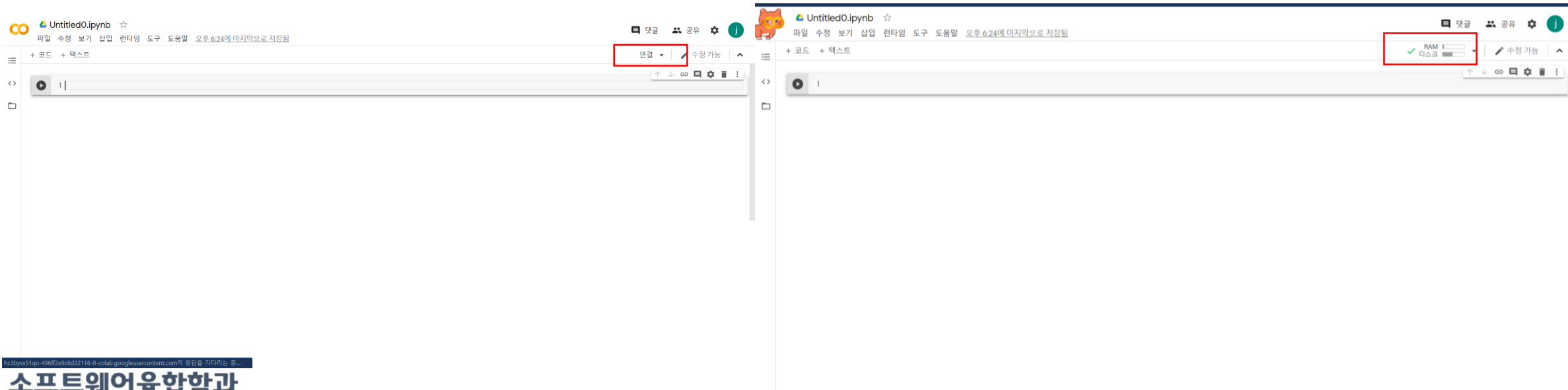


- Runtime setting

- 런타임 -> 런타임 유형 변경 -> 런타임 유형 : python3, 하드웨어 가속기 : GPU

- Check session

- Click 연결
- It will change : 할당중.. > 연결중.. > 초기화중.. and show environment information



How to use – environment check

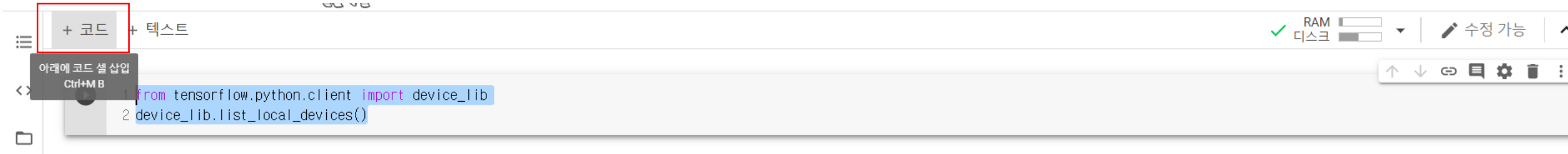


- Now you ready to use colab
- Check your devices
- Type code :
 from tensorflow.python.client import device_lib
 device_lib.list_local_devices()

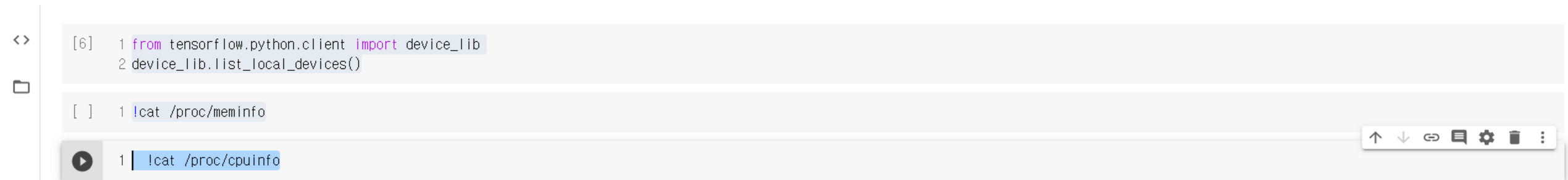
How to use – environment check



- Add code cell



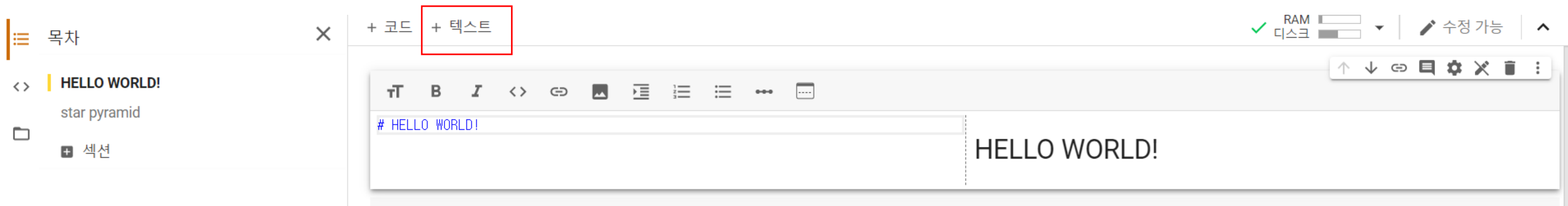
- !cat /proc/meminfo
- !cat /proc/cpuinfo



How to use – environment check



- Check result : run all code cell (ctrl + F9)
- You can see GPU, RAM, CPU information of your device
 - GPU : Tesla P100-PCIE-16GB
 - Memory : 13335180 kB
 - CPU : Intel(R) Xeon(R) CPU @ 2.30GHz
- + 텍스트 : add text cell, Text cell is similar with comment
 - '#' for create section



How to connect google drive



- As google colab is a Docker environment, you have to save the dataset, weights, environment package separately before terminate session
- You can use Google drive to save them, and it may be comfortable
- Of course, the code(note) will save in Google drive as .ipynb

How to connect google drive



The screenshot shows the Google Colab interface. On the left sidebar, under the 'Code snippets' tab, a search filter 'Google' is applied. A list of snippets is shown, with 'Mounting Google Drive in your VM' highlighted by a red box. Below this list, the details for this snippet are shown, including a description and two code blocks. The first code block shows the basic mount command, and the second shows how to write to a file. A blue box with white text is overlaid on the right side of the snippet details, stating: 'You can easily add the mount code form code snippets searching 'Mounting Google Drive in your VM''. A blue arrow points from this text to the 'Mounting Google Drive in your VM' snippet title. The main editor area shows two code cells: 'HELLO WORLD!' and 'star pyramid'. The 'HELLO WORLD!' cell contains a simple print statement and shows its output. The 'star pyramid' cell contains a loop to print a star pattern.

코딩 스니펫

Google

Mounting Google Drive in your VM →

Open files from Google Drive →

Listing files in Google Drive →

Importing data from Google Sheets →

Saving data to Google Drive →

Mounting Google Drive in your VM **삽입**

The example below shows how to mount your Google Drive in your virtual machine using an authorization code, and shows a couple of ways to write & read files there. Once executed, observe the new file (foo.txt) is visible in <https://drive.google.com/>

Note this only supports reading and writing files.

```
1 from google.colab import drive
2 drive.mount('/gdrive')
```

```
1 with open('/gdrive/My Drive/foo.txt',
2 f.write('Hello Google Drive!')
3 !cat '/gdrive/My Drive/foo.txt'
```

HELLO WORLD!

```
1 name = "your name"
2
3 print("HELLO COLAB")
4 print("HELLO "+name)
```

HELLO COLAB
HELLO your name

star pyramid

```
[ ] 1 print("type pyramid level")
    2 level = int(input())

    Type pyramid level
    3

[ ] 1 k = 2*level-2
    2 for i in range(0,level):
    3     for j in range(0,k):
    4         print(end=" ")
    5     k=k-1
    6
    7     for j in range(0, i+1):
    8         print("*",end="")
```

You can easily add the mount code form code snippets searching 'Mounting Google Drive in your VM'

How to connect google drive



댓글 공유



Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 저장



코드 스니펫

Google

- Mounting Google Drive in your VM →
- Open files from Google Drive →
- Listing files in Google Drive →
- Importing data from Google Sheets →
- Saving data to Google Drive →

+ 코드 + 텍스트

HELLO WORLD!

```
[ ] 1 name = "your name"
    2
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

HELLO COLAB
HELLO your name

You can easily move this code cell position using arrow button



```
[ ] 1 from google.colab import drive
    2 drive.mount('/gdrive')
```

```
[ ] 1 with open('/gdrive/My Drive/foo.txt', 'w') as f:
    2     f.write('Hello Google Drive!')
    3 !cat '/gdrive/My Drive/foo.txt'
```

This is the code that you added

Mounting Google Drive in your VM 삽입

The example below shows how to mount your Google Drive in your virtual machine using an authorization code, and shows a couple of ways to write & read files there. Once executed, observe the new file (foo.txt) is visible at <https://drive.google.com/>

Note this only supports reading and

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1 from google.colab import drive
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```
[ ] 1 print("Type pyramid level")
    2 level = int(input())
```

Type pyramid level
3

How to connect google drive



co Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말

+ 코드 + 텍스트

RAM 디스크 수정 가능

```
1 from google.colab import drive
2 drive.mount('/content/gdrive', force_remount=True)
```

... Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6bn6gk8qdgf4n4g3pfee6491hc0brc4i.apps.googleusercontent.com&redirect_uri=urn%3Aietf%3Awg%3Aoauth%3A2.OAuth2

Enter your authorization code:

Run this code cell!

1. Click URL to login google drive that you want mount
2. Permit access
3. Copy access code and paste it in the text box and enter!

*recommend mounted path as '/content/gdrive'

How to connect google drive



댓글 공유

RAM 디스크 수정 가능

Untitled0.ipynb ☆
파일 수정 보기 삽입 런타임 도구 도움말

파일

업로드 새로고침

드라이브 마운트 해제

- bin
- boot
- content
 - gdrive
 - My Drive
 - Colab Notebooks
 - Untitled
 - Untitled0.ipynb
 - sample_data
- datalab
- dev
- etc
- home
- lib
- lib32
- lib64
- media
- mnt
- opt
- proc
- root

+ 코드 + 텍스트

```
1 from google.colab import drive
2 drive.mount('/content/gdrive', force_remount=True)
```

Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6bn6gk8gdgf4n4g3pfee6491hc0brc4l.apps.googleusercontent.com&...

Enter your authorization code:

Mounted at /content/gdrive

```
[ ] 1 !cd /content/gdrive
    2 !ls
    3 !pwd
```

/root

HELLO V

```
[ ] 1 name = "your name"
    2
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

HELLO COLAB
HELLO your name

```
[ ] 1 with open('/gdrive/My Drive/foo.txt', 'w') as f:
    2     f.write('Hello Google Drive!')
```

You can see mounted Google drive!

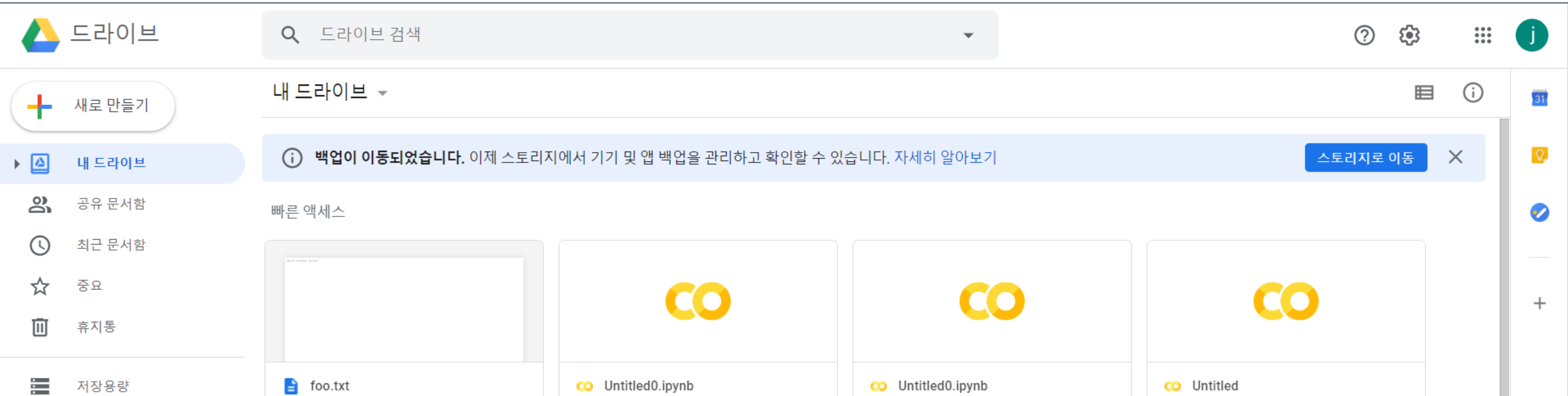
How to connect google drive



- Try this code

```
1 with open('/content/gdrive/My Drive/foo.txt', 'w') as f:  
2     f.write('Hello Google Drive!')  
3 !cat '/content/gdrive/My Drive/foo.txt'
```

- You will get foo.txt file



How to sharing the note



co Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 오후 10:12에 마지막으로 저장됨

댓글 공유

초기화 중

HELLO WORLD!

```
[ ] 1 name = "your name"
    2 name = input()
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

hi
HELLO COLAB
HELLO hi

[] 1

Hello Google Drive!

star pyramid

```
[ ] 1 print("Type pyramid level")
    2 level = int(input())
```

Type pyramid level
1

```
[ ] 1 k = 2*level-2
    2 for i in range(0, level):
    3     for j in range(0, k):
```

How to sharing the note with Google drive



The screenshot shows a Jupyter Notebook titled 'Untitled0.ipynb' with a cat icon. The interface includes a top bar with file management options and a right sidebar with RAM and disk usage indicators. The notebook content is divided into three sections: 'HELLO WORLD!', 'star pyramid', and a third section with a loop. A sharing dialog box is open in the center, titled '다른 사용자와 공유' (Share with other users). It contains a user selection field with 'paransky9577@gmail.com' selected, a text area with 'hi', and a checkbox for '이메일 알림 보내기' (Send email notification) which is checked. The '진송' (Share) button is highlighted with a red rectangle.

Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 오후 10:12에 마지막 기록 저장됨

+ 코드 + 텍스트

HELLO WORLD!

```
[ ] 1 name = "your name"
    2 name = input()
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

hi
HELLO COLAB
HELLO hi

[] 1

Hello Google Drive!

star pyramid

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[ ] 1 print("Type pyramid level")
    2 level = int(input())
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Type pyramid level
1

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[ ] 1 k = 2*level-2
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```

다른 사용자와 공유 공유 가능한 링크 가져오기

사용자

paransky9577@gmail.com x 사용자 추가...

hi

이메일 알림 보내기 ☒

진송 취소 고급

How to sharing the note with link



co Untitled0.ipynb ☆

파일 수정 보기 삽입 런타임 도구 도움말 오후 10:12에 마지막 기록 저장됨

+ 코드 + 텍스트

HELLO WORLD!

```
[ ] 1 name = "your name"
    2 name = input()
    3 print("HELLO COLAB")
    4 print("HELLO "+name)
```

hi
HELLO COLAB
HELLO hi

```
[ ] 1
```

Hello Google Drive!

star pyramid

```
[ ] 1 print("Type pyramid level")
    2 level = int(input())
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Type pyramid level
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[ ] 1 k = 2*level-2
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다른 사용자와 공유

공유 가능한 링크 가져오기

사용자

paransky9577@gmail.com x 사용자 추가...

hi

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How to sharing the note with link



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파일 수정 보기 삽입 런타임 도구 도움말 오후 10:12에 마지막으로 저장됨

+ 코드 + 텍스트

연결 | 수정 가능

```
from google.colab import drive
drive.mount('/content/gdrive', force_remount=True)
```

Go to this URL in a browser: <https://accounts.google.com/...>

Enter your authorization code:
.....

Mounted at /content/gdrive

```
[ ] with open('/content/gdrive/My Drive/foo.txt', 'w') as f:
    f.write('Hello Google Drive!')
!cat '/content/gdrive/My Drive/foo.txt'
```

Hello Google Drive!

HELLO WORLD!

```
[ ] name = "your name"
name = input()
print("HELLO COLAB")
print("HELLO "+name)
```

hi
HELLO COLAB
HELLO hi

[]

다른 사용자와 공유 공유 가능한 링크 가져오기

링크 공유 사용 중 자세히 알아보기

링크가 있는 모든 사용자가 볼 수 있음 링크 복사

<https://colab.research.google.com/drive/1fYePHmcOeLDolBM8AkxreGSJQ5ywo2gc>

사용자 이름 또는 이메일 주 jihu kim와(과) 공유함 이 파일을 보는 사

완료 고급

Copy and paste it!

reference



- <https://zzsza.github.io/data/2018/08/30/google-colab/>
- <https://jisoo-coding.tistory.com/2>
- <https://magenta.tensorflow.org/demos/colab/>
- <https://teddylee777.github.io/machine-learning/Google-colab%EC%9C%BC%EB%A1%9C-GPU-%EB%B6%80%EC%8A%A4%ED%8A%B8%EB%B0%9B%EC%95%84-machine-learning-%ED%95%99%EC%8A%B5%ED%95%98%EA%B8%B0>

Library 설치



- OpenCV
 - 설치되어 있음
 - 현재 버전: 4.6.0
- Open3D
 - !pip install open3d

```
import cv2

cv2.__version__
```

'4.6.0'

```
Successfully uninstalled nbformat-5.7.3
Attempting uninstall: ipywidgets
Found existing installation: ipywidgets 7.7.1
Uninstalling ipywidgets-7.7.1:
Successfully uninstalled ipywidgets-7.7.1
Successfully installed addict-2.4.0 configargparse-1.5.3 dash-2.9.1 dash-core-components-2.0.0 dash-html-components-2.0.0 dash-table-5.0.0 ipywidgets-8.0.4 jedi-0.18
```



THANK YOU

Hyoseok Hwang