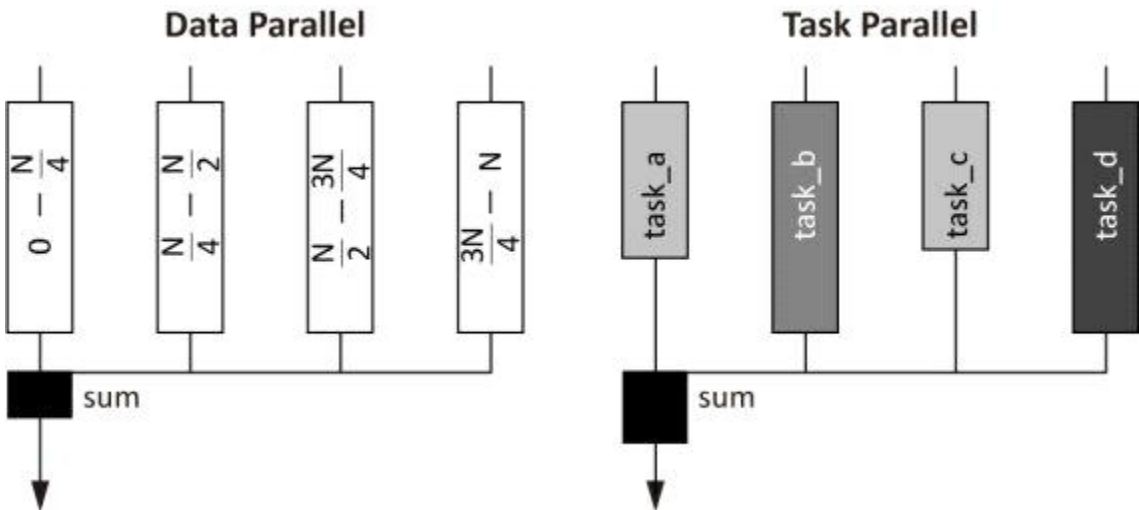# 인공 신경망: 텐서플로우TensorFlow

> 2019년1월30일, 서진택

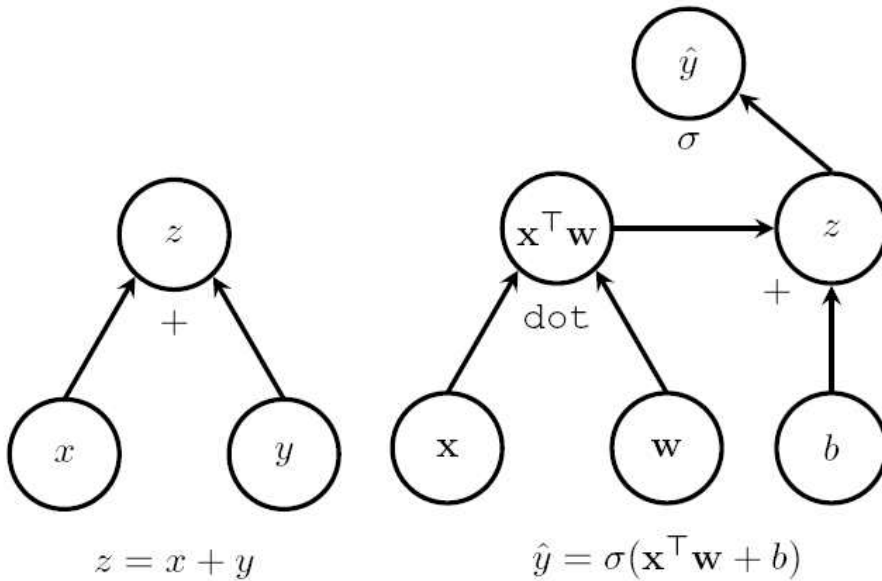## Machine Learning Library

How to implement with multi-thread?

TensorFlow Architecture: Introduction

Computational Graph

$$z = x + y$$

$$\hat{y} = \sigma(\mathbf{x}^\top \mathbf{w} + b)$$

```
#_20180301_jintaeks
import tensorflow
import os

session = tensorflow.Session()

x = tf.constant(10)
y = tf.constant(32)
z = session.run(x + y)
print( z )
#42
```
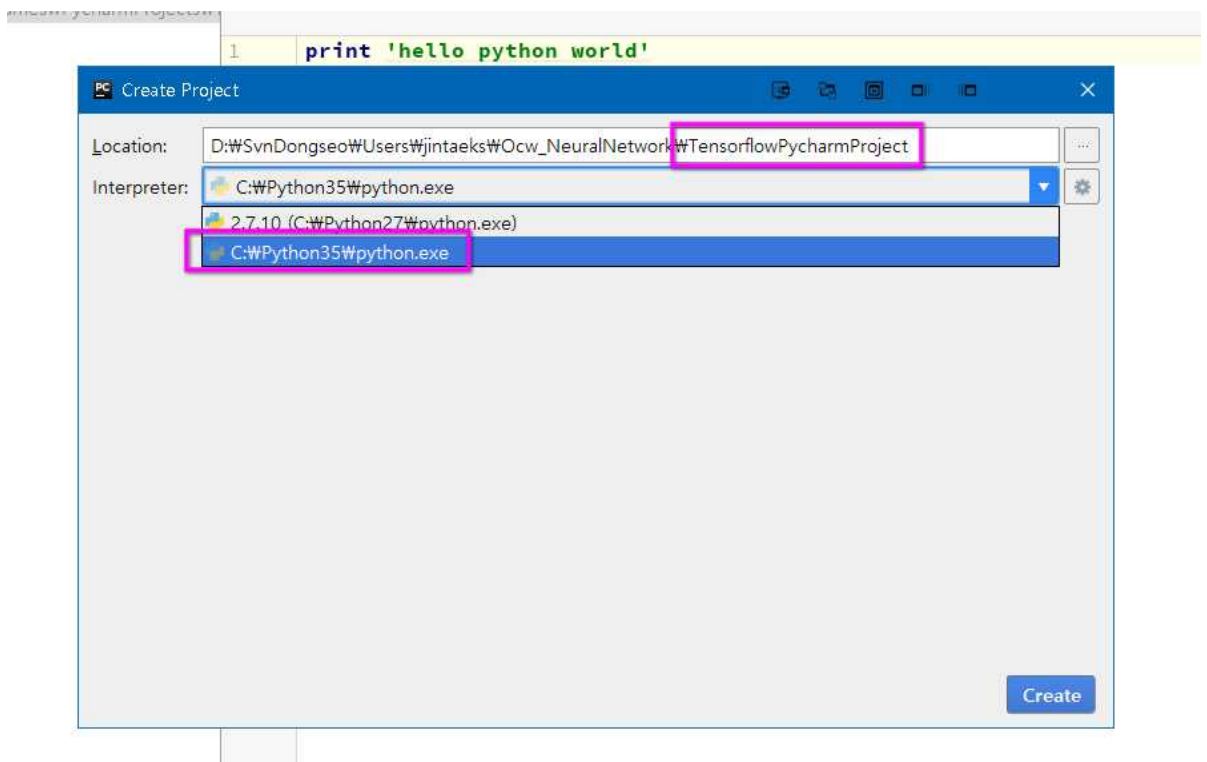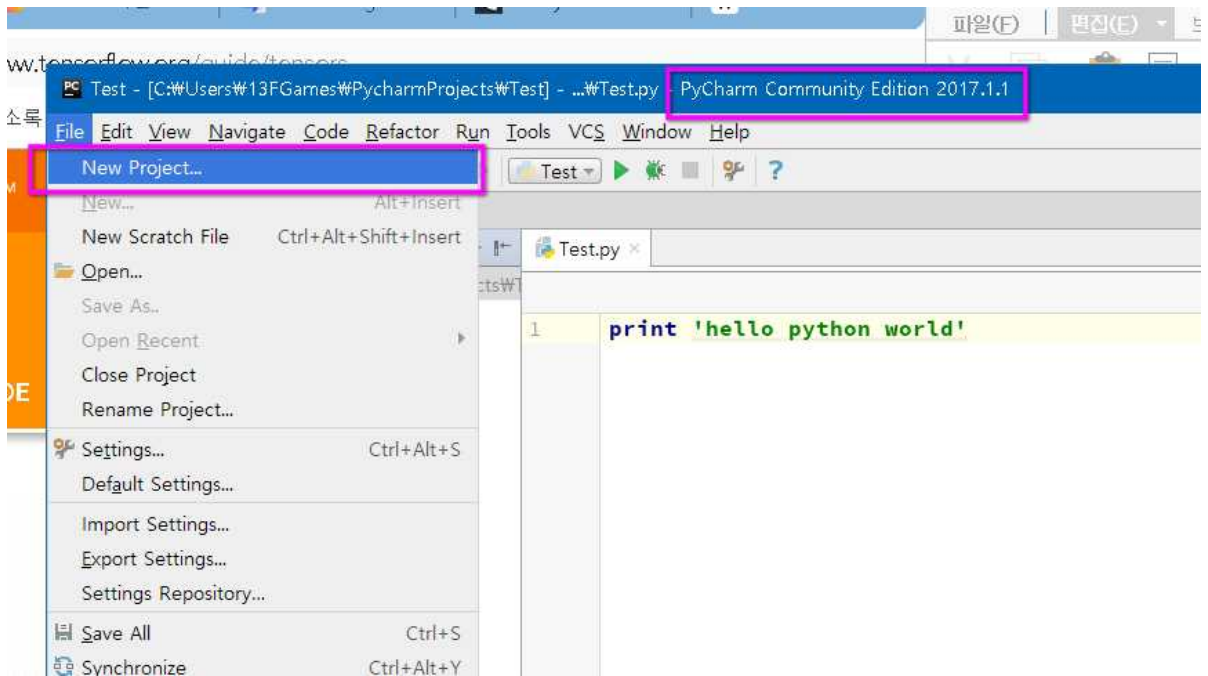
Hello TensorFlow with Python

Install Python 3.x and PyCharm 2017 or above
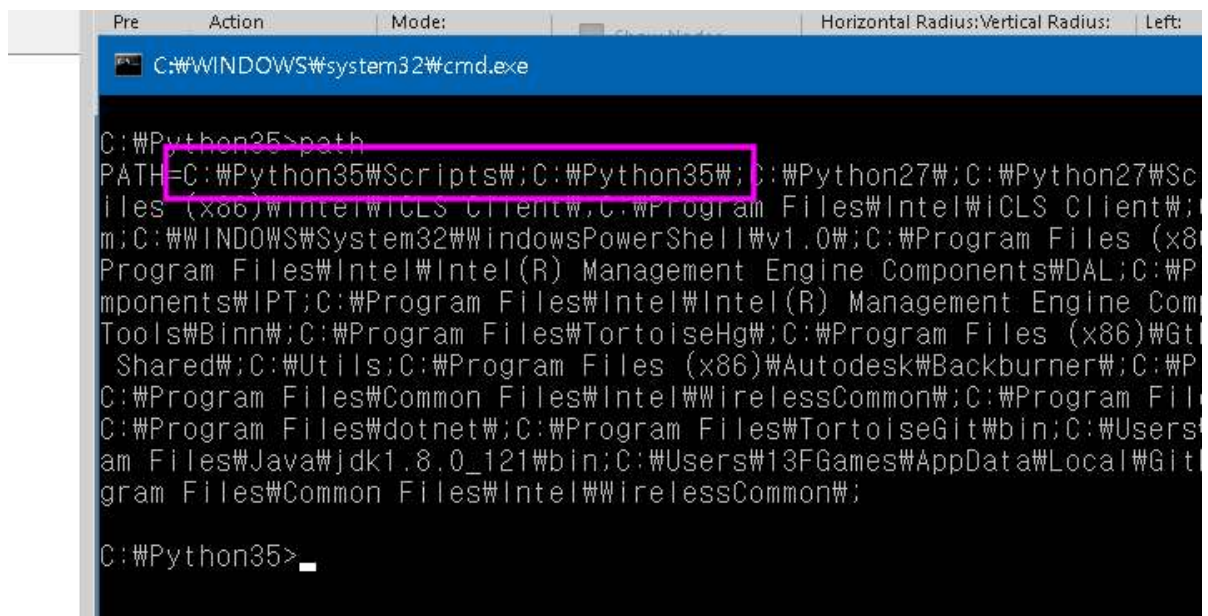
(내용)

Make PyCharm Project

```
1    #_20180301_jintaeks
2    import tensorflow
3    import os
4
5    session = tensorflow.Session()
6
7    x = tensorflow.constant(10)
8    y = tensorflow.constant(32)
9    z = session.run(x + y)
10   print( z )
11   #42
12
```

Install TensorFlow for Python


```
C:\Python35>path
PATH=C:\Python35\Scripts\;C:\Python35\;C:\Python27\;C:\Python27\Sc
iles (x86)\Intel\iCLS Client\;C:\Program Files\Intel\iCLS Client\;
m;C:\WINDOWS\System32\WindowsPowerShell\v1.0\;C:\Program Files (x8
Program Files\Intel\Intel(R) Management Engine Components\DAL;C:\P
mponents\IPT;C:\Program Files\Intel\Intel(R) Management Engine Com
Tools\Binn\;C:\Program Files\TortoiseHg\;C:\Program Files (x86)\Gt
 Shared\;C:\Utils;C:\Program Files (x86)\Autodesk\Backburner\;C:\P
C:\Program Files\Common Files\Intel\WirelessCommon\;C:\Program Fil
C:\Program Files\dotnet\;C:\Program Files\TortoiseGit\bin;C:\Users
am Files\Java\jdk1.8.0_121\bin;C:\Users\13FGames\AppData\Local\Git
gram Files\Common Files\Intel\WirelessCommon\;

C:\Python35>_
```

```
 Shared\;C:\Utils;C:\Program Files (x86)\Autode
C:\Program Files\Common Files\Intel\WirelessCom
C:\Program Files\dotnet\;C:\Program Files\Tortc
am Files\Java\jdk1.8.0_121\bin;C:\Users\13FGame
gram Files\Common Files\Intel\WirelessCommon\;

C:\Python35>pip list
Package    Version
---------- -------
pip        19.0.1
setuptools 28.8.0

C:\Python35>
```

```
C:\Program Files\Common Files\Intel\WirelessCommon\;C:\Progr
C:\Program Files\dotnet\;C:\Program Files\TortoiseGit\bin;C:
am Files\Java\jdk1.8.0_121\bin;C:\Users\13FGames\AppData\Loc
gram Files\Common Files\Intel\WirelessCommon\;

C:\Python35>pip list
Package    Version
---------- -------
pip        19.0.1
setuptools 28.8.0

C:\Python35>pip3 install tensorflow
```

```
print( z )
#42
```

```
Successfully installed absl-py-0.7.0 astor-0.7.1
rocessing-1.0.6 markdown-3.0.1 numpy-1.16.0 proto
.0 werkzeug-0.14.1 wheel-0.32.3

C:\Python35>pip list
Package                Version

absl-py                0.7.0
astor                  0.7.1
gast                   0.2.2
grpcio                 1.18.0
h5py                   2.9.0
Keras-Applications     1.0.7
Keras-Preprocessing    1.0.6
Markdown               3.0.1
numpy                  1.16.0
pip                    19.0.1
protobuf               3.6.1
setuptools             28.8.0
six                    1.12.0
tensorboard            1.12.2
tensorflow             1.12.0
termcolor              1.1.0
Werkzeug               0.14.1
wheel                  0.32.3

C:\Python35>
```

```
Run      Main
    File "C:\Python35\lib\site-packages\tensorflow\python\keras\preprocessing\image.py", line 23, in <module>
      from keras_preprocessing import image
    File "C:\Python35\lib\site-packages\keras_preprocessing\image\__init__.py", line 8, in <module>
      from .dataframe_iterator import DataFrameIterator
    File "C:\Python35\lib\site-packages\keras_preprocessing\image\dataframe_iterator.py", line 11, in <module>
      from pandas.api.types import is_numeric_dtype
ImportError: No module named 'pandas'

Process finished with exit code 1
```
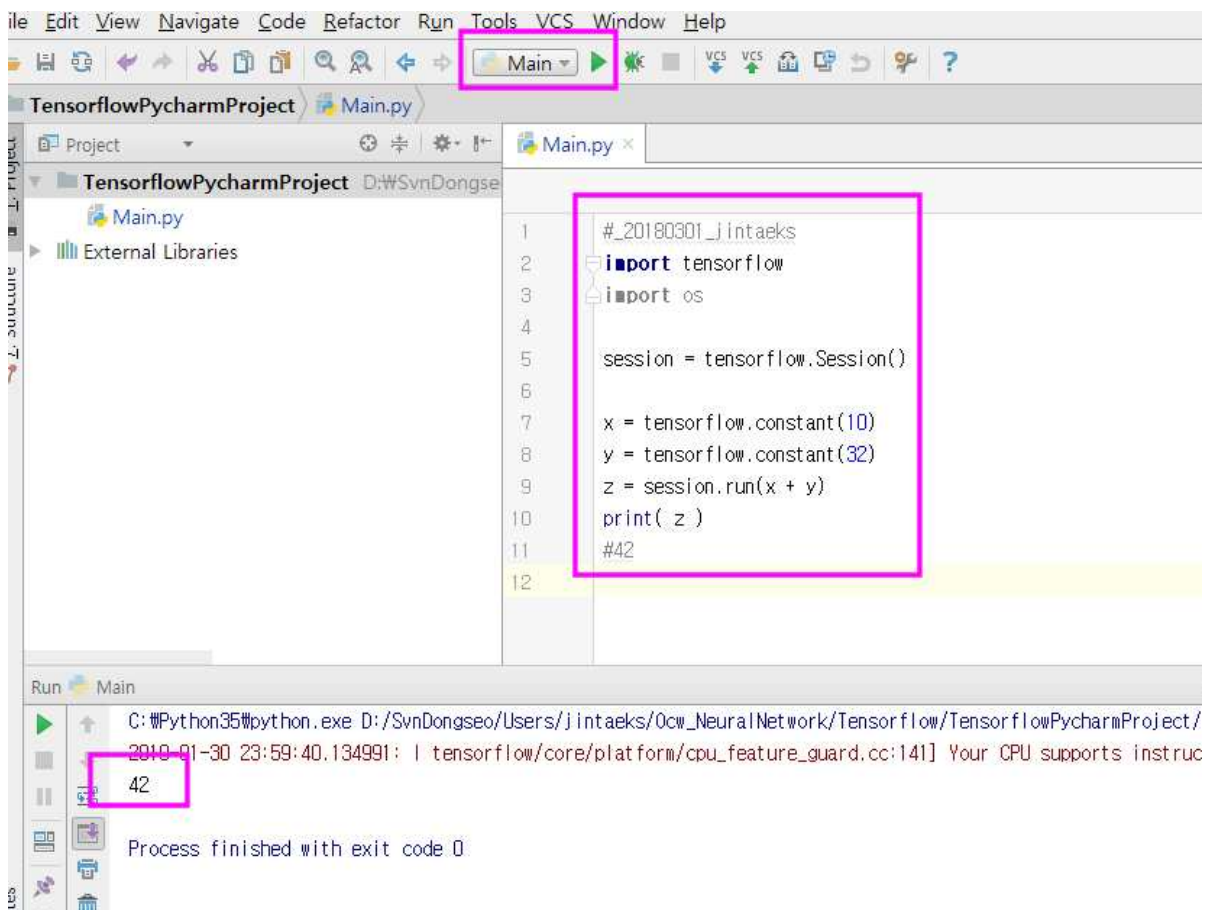
```
wheel                    0.32.3

Job

C:\Python35>pip install pandas
Collecting pandas
  Downloading https://files.pythonhosted.org/packages/9e/da/2dc2c69c4cfc68b37ab9fe800894f1(
/pandas-0.24.0-cp35-cp35m-win_amd64.whl (8.5MB)
    100% |##############################| 8.5MB 1.1MB/s
Requirement already satisfied: numpy>=1.12.0 in c:\python35\lib\site-packages (from pandas)
Collecting pytz>=2011k (from pandas)
  Downloading https://files.pythonhosted.org/packages/61/28/1d3920e4d1d50b19bc5d24398a7cd85
/pytz-2018.9-py2.py3-none-any.whl (510kB)
    100% |##############################| 512kB 802kB/s
Collecting python-dateutil>=2.5.0 (from pandas)
  Downloading https://files.pythonhosted.org/packages/74/68/d87d9b36af36f44254a8d512cbfc483
/python_dateutil-2.7.5-py2.py3-none-any.whl (225kB)
    100% |##############################| 235kB 1.1MB/s
Requirement already satisfied: six>=1.5 in c:\python35\lib\site-packages (from python-dateu
Installing collected packages: pytz, python-dateutil, pandas
Successfully installed pandas-0.24.0 python-dateutil-2.7.5 pytz-2018.9

C:\Python35>
```

from Microsoft.

File Edit View Navigate Code Refactor Run Tools VCS Window Help

Main ▾ ▶ 🗱 ■ ⬇ ⬆ 🔧 📋 ↺ 🔧 ?

TensorflowPycharmProject) 📄 Main.py

🗂 Project ▾   ⊙ ÷ 🔧 ⌐   📄 Main.py ×

▼ **TensorflowPycharmProject** D:\SvnDongse
  📄 Main.py
  ▶ IIII External Libraries

```python
 1    #_20180301_jintaeks
 2    import tensorflow
 3    import os
 4
 5    session = tensorflow.Session()
 6
 7    x = tensorflow.constant(10)
 8    y = tensorflow.constant(32)
 9    z = session.run(x + y)
10    print( z )
11    #42
12
```

Run 🔴 Main

▶ C:\Python35\python.exe D:/SvnDongseo/Users/jintaeks/0cw_NeuralNetwork/Tensorflow/TensorflowPycharmProject/
■ 2010-01-30 23:59:40.134991: I tensorflow/core/platform/cpu_feature_guard.cc:141] Your CPU supports instruc
II 42

   Process finished with exit code 0
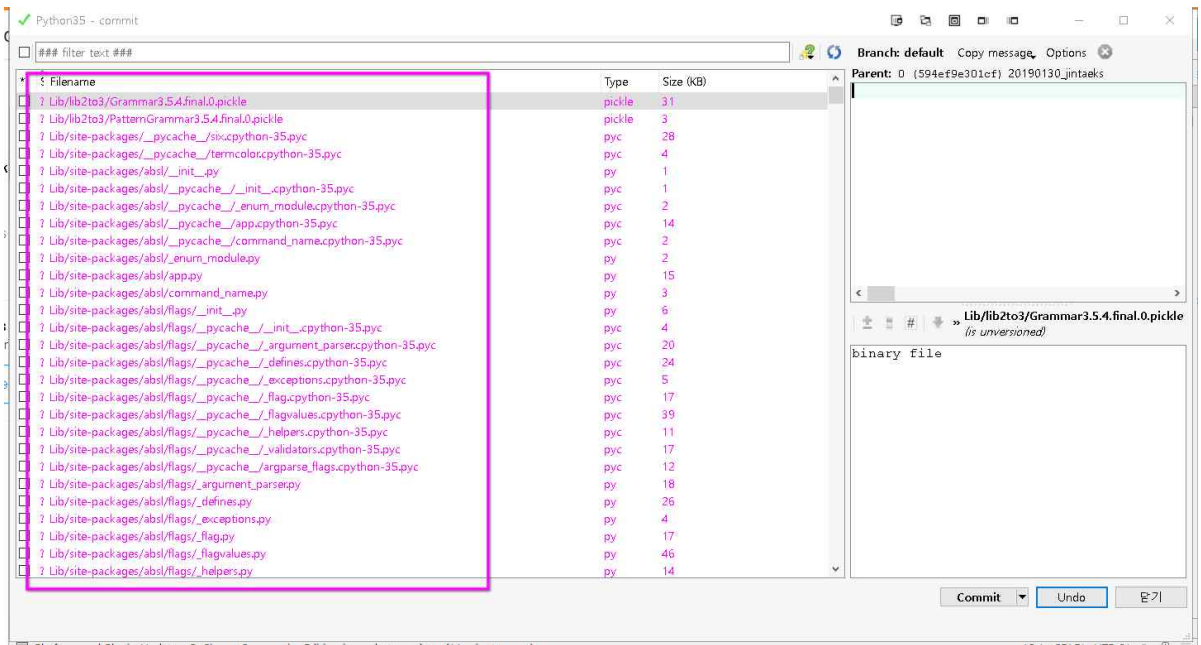
Using matplotlib

```python
# importing the dependencies
import matplotlib.pyplot as plt

plt.plot([1, 2, 3, 4], [1, 4, 9, 16], label='test plot')
plt.legend()
plt.show()
```
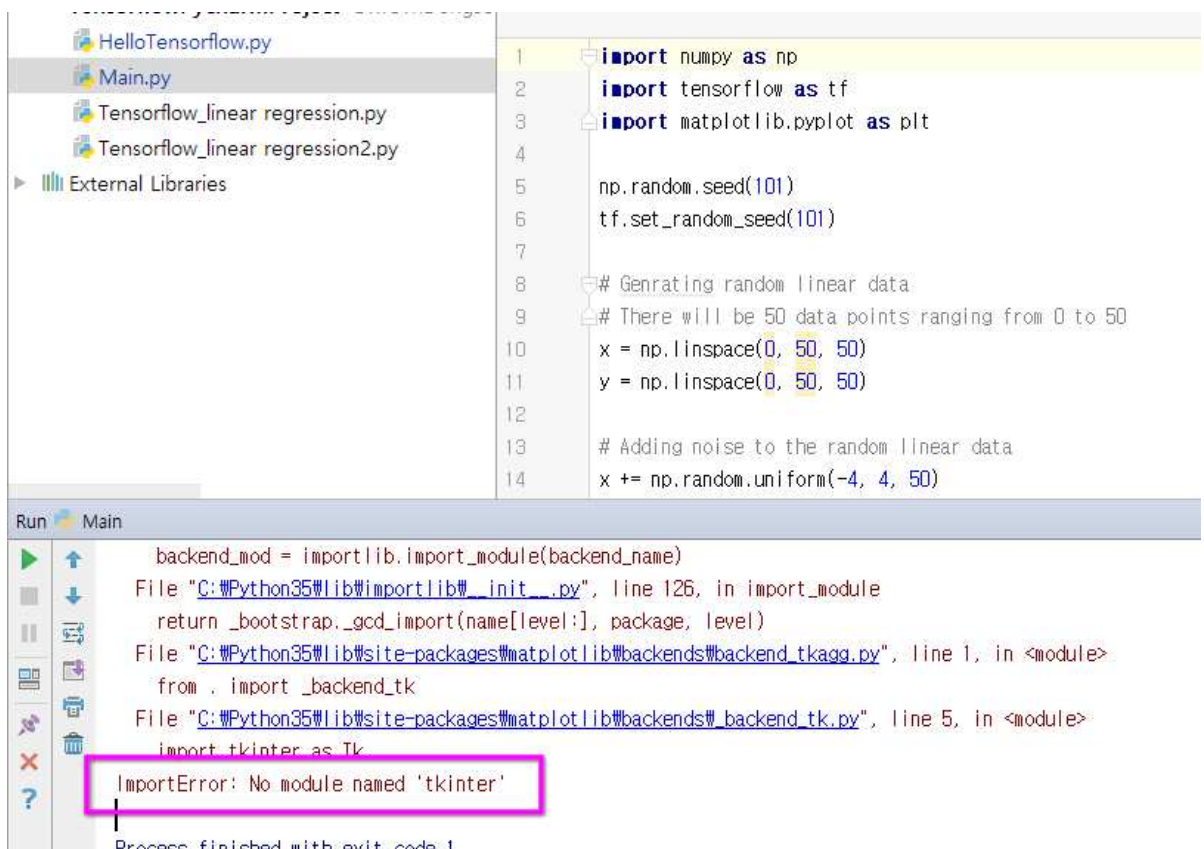
```
C:\WINDOWS\system32\cmd.exe

C:\Python35>pip install matplotlib
Collecting matplotlib
  Downloading https://files.pythonhosted.org/packages/3b/29/b2b657b4cbb306c6cfe82227c6f61d9939b
/matplotlib-3.0.2-cp35-cp35m-win_amd64.whl (8.9MB)
    100% |##############################| 8.9MB 708kB/s
Requirement already satisfied: numpy>=1.10.0 in c:\python35\lib\site-packages (from matplotlib)
Collecting pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/de/0a/001be530836743d8be6c2d85069f46fecf8
/pyparsing-2.3.1-py2.py3-none-any.whl (61kB)
    100% |##############################| 71kB 2.8MB/s
Requirement already satisfied: python-dateutil>=2.1 in c:\python35\lib\site-packages (from matp
Collecting kiwisolver>=1.0.1 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/67/57/834881c80cd1361792a18b467ac8c1638c2
/kiwisolver-1.0.1-cp35-none-win_amd64.whl (57kB)
    100% |##############################| 61kB 3.1MB/s
Collecting cycler>=0.10 (from matplotlib)
  Downloading https://files.pythonhosted.org/packages/f7/d2/e07d3ebb2bd7af696440ce7e754c59dd546
/cycler-0.10.0-py2.py3-none-any.whl
Requirement already satisfied: six>=1.5 in c:\python35\lib\site-packages (from python-dateutil>
)
Requirement already satisfied: setuptools in c:\python35\lib\site-packages (from kiwisolver>=1.

Installing collected packages: pyparsing, kiwisolver, cycler, matplotlib
Successfully installed cycler-0.10.0 kiwisolver-1.0.1 matplotlib-3.0.2 pyparsing-2.3.1

C:\Python35>_
```
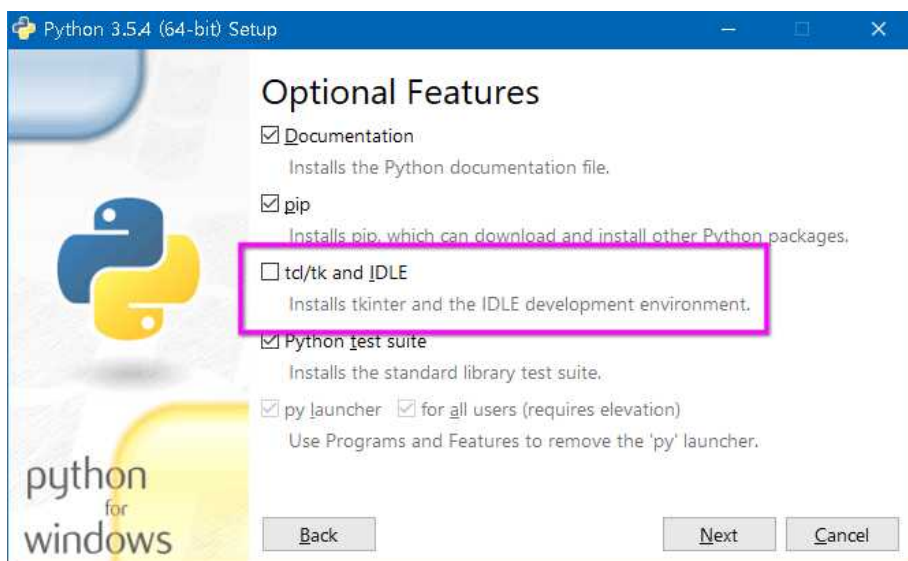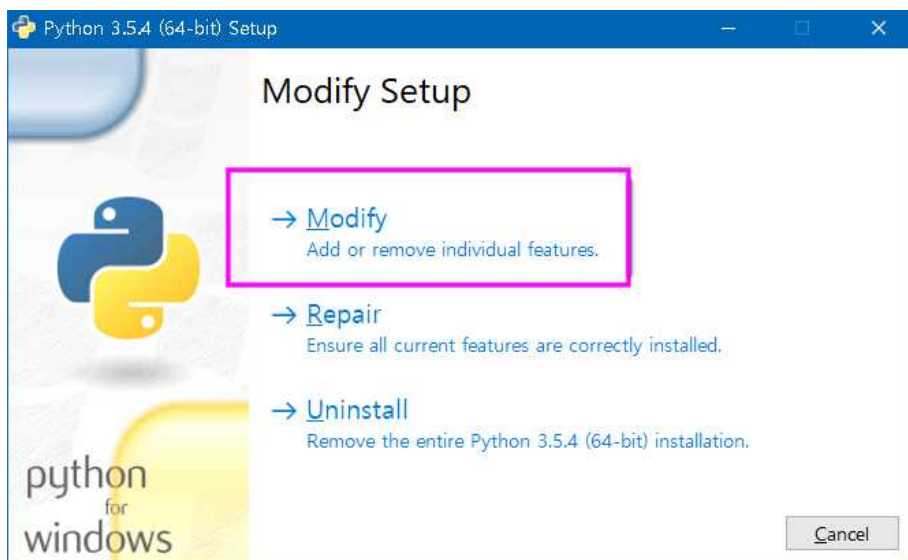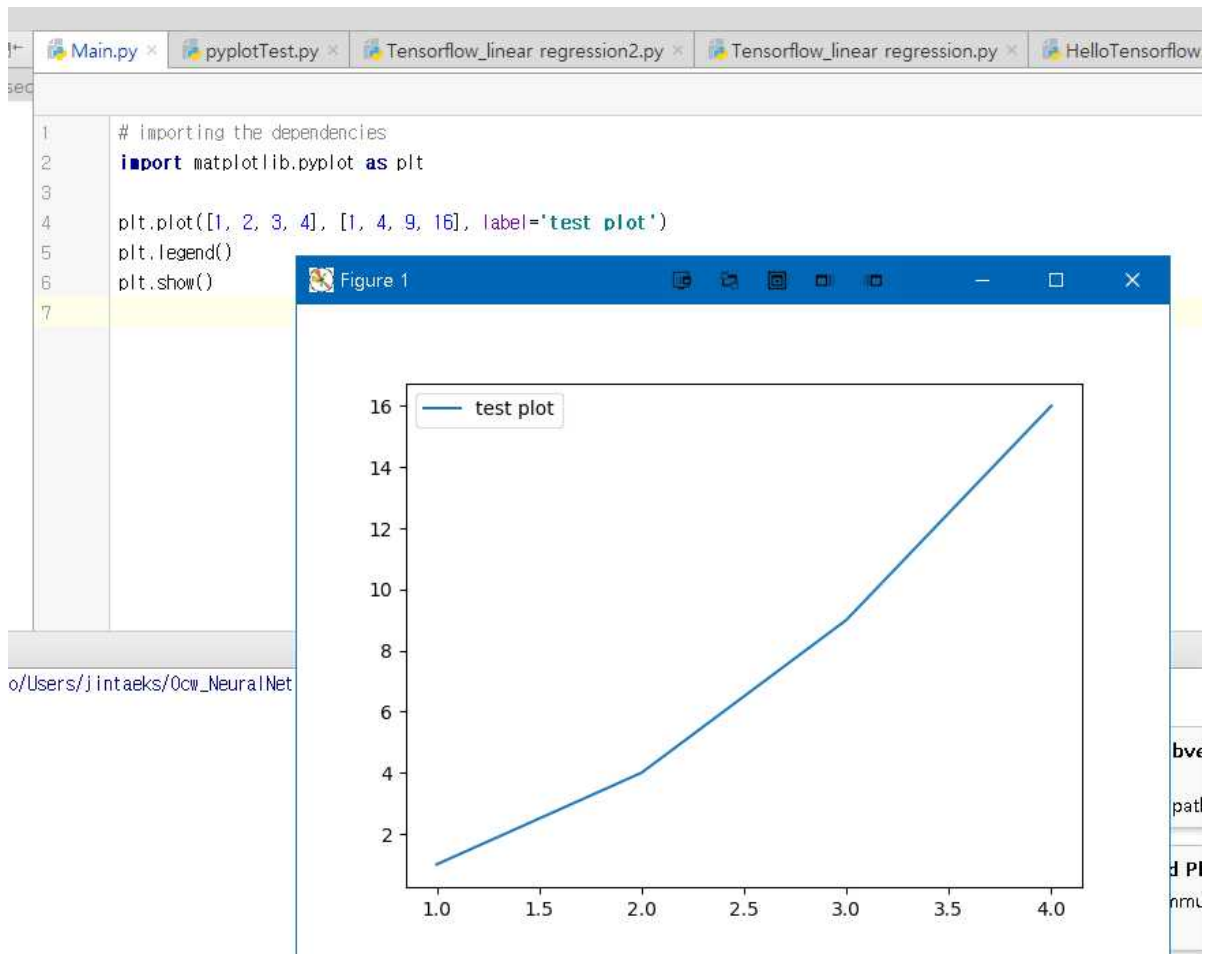


```
HelloTensorflow.py                    1    import numpy as np
Main.py                               2    import tensorflow as tf
Tensorflow_linear regression.py       3    import matplotlib.pyplot as plt
Tensorflow_linear regression2.py      4
External Libraries                    5    np.random.seed(101)
                                      6    tf.set_random_seed(101)
                                      7
                                      8    # Genrating random linear data
                                      9    # There will be 50 data points ranging from 0 to 50
                                     10    x = np.linspace(0, 50, 50)
                                     11    y = np.linspace(0, 50, 50)
                                     12
                                     13    # Adding noise to the random linear data
                                     14    x += np.random.uniform(-4, 4, 50)
```

```
Run  Main

        backend_mod = importlib.import_module(backend_name)
    File "C:\Python35\lib\importlib\__init__.py", line 126, in import_module
        return _bootstrap._gcd_import(name[level:], package, level)
    File "C:\Python35\lib\site-packages\matplotlib\backends\backend_tkagg.py", line 1, in <module>
        from . import _backend_tk
    File "C:\Python35\lib\site-packages\matplotlib\backends\_backend_tk.py", line 5, in <module>
        import tkinter as Tk
ImportError: No module named 'tkinter'

Process finished with exit code 1
```
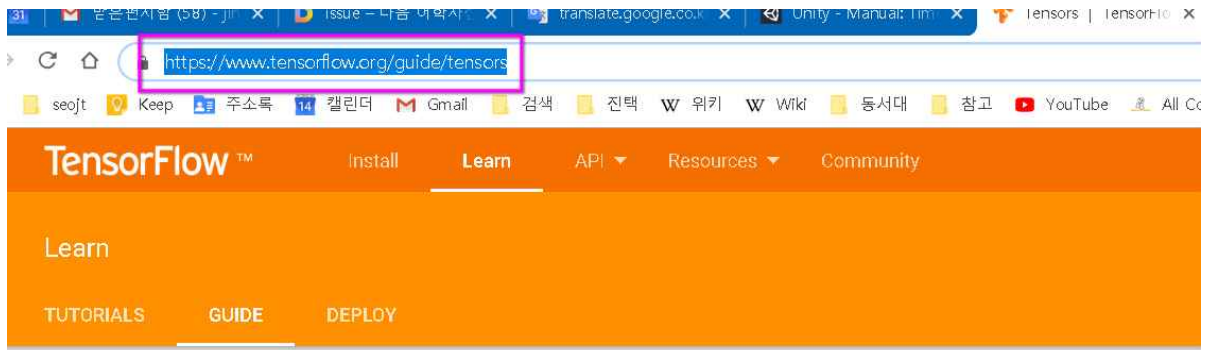

TensorFlow Architecture

https://www.tensorflow.org/guide/tensors

TensorFlow ™

Install   **Learn**   API ▼   Resources ▼   Community

Learn

TUTORIALS   **GUIDE**   DEPLOY

Accelerators
Distribute Strategy
Using GPUs
Using TPUs

Low Level APIs
Introduction
Tensors
Variables
Graphs and Sessions
Save and Restore
Control flow
Ragged Tensors

Tensors

TensorFlow, as the name indicates, is a framework to define and run computation generalization of vectors and matrices to potentially higher dimensions. Internally dimensional arrays of base datatypes.

When writing a TensorFlow program, the main object you manipulate and pass ar object represents a partially defined computation that will eventually produce a v first building a graph of `tf.Tensor` objects, detailing how each tensor is comput tensors and then by running parts of this graph to achieve the desired results.

manipulate : 조종하다, 교.

A `tf.Tensor` has the following properties:

@