

DEEP LEARNING TECHNIQUES

ASSIGNMENT-1

Roll number : **2018103036**

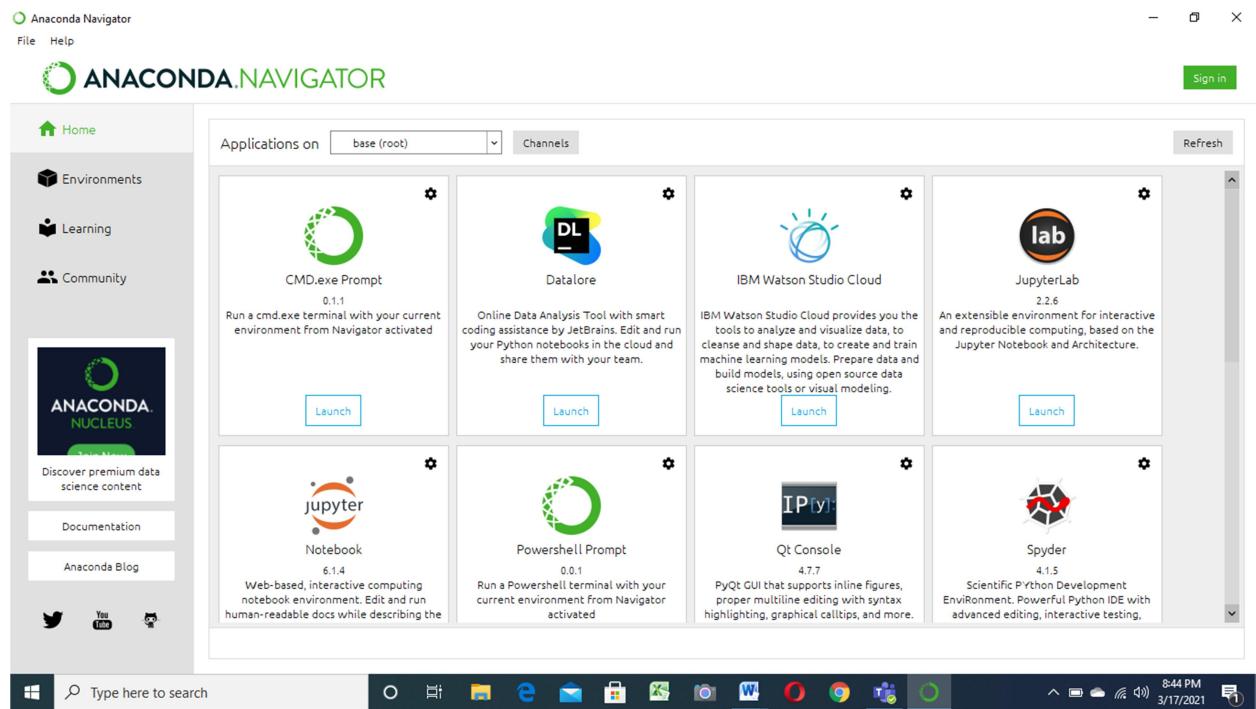
Name : Kavia M

Subject : CS6005 Deep Learning Techniques

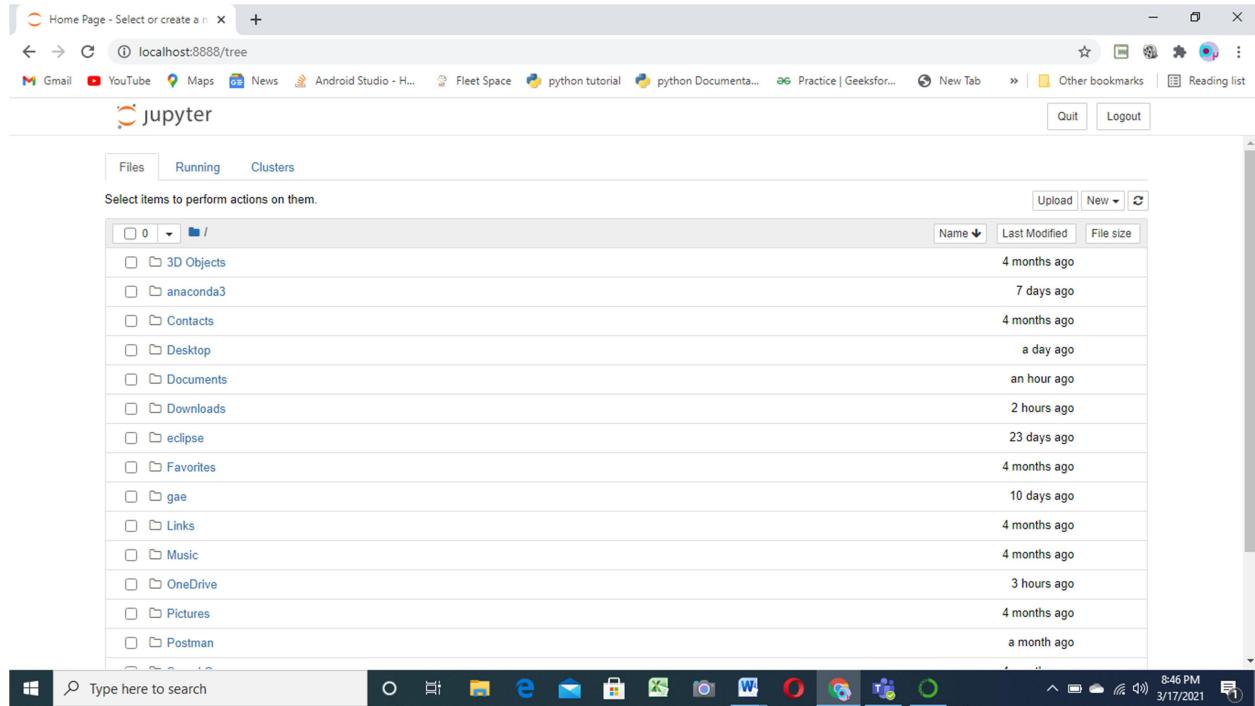
Date : 18.03.2021

Topic : Building Deep Learning Environment on the local System

ANACONDA INSTALLED :



OPENING JUPYTER NOTEBOOK:



UPDATE ANACONDA IN NACONDA PROMPT

Conda update conda

```
Conda Prompt (anaconda3)
(base) C:\Users\USER>conda update conda
Collecting package metadata (current_repodata.json): done
Solving environment: done
## Package Plan ##
environment location: C:\Users\USER\anaconda3
added / updated specs:
- conda

The following packages will be downloaded:
package                               build
backports.functools_lru_cache-1.6.1| pyhd3eb1b0_0      12 KB
backports.tempfile-1.0               | pyhd3eb1b0_1      11 KB
                                         -----
                                         Total:          23 KB

The following packages will be DOWNGRADED:
backports.functoo~                      1.6.1-py_0 --> 1.6.1-pyhd3eb1b0_0
backports.tempfile                       1.0-py_1 --> 1.0-pyhd3eb1b0_1

Proceed ([y]/n)? y

Downloading and Extracting Packages
backports.functools_| 12 KB    | #####| 100%
backports.tempfile-1_| 11 KB    | #####| 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
(base) C:\Users\USER>
```

Conda update --all

```
Conda update --all
(base) C:\Users\USER>conda update --all
Collecting package metadata (current_repodata.json): done
Solving environment: done

## Package Plan ##

environment location: C:\Users\USER\anaconda3

The following packages will be downloaded:

package          | build
-----|-----
_anaconda_depends-2020.07 | py38_0
alabaster-0.7.12 | pyhd3eb1b0_0
anaconda-custom | py38_1
anaconda-project-0.9.1 | pyhd3eb1b0_1
appdirs-1.4.4 | py_0
argon2-cffi-20.1.0 | py38h2bbff1b_1
astroid-2.5 | py38haa95532_1
astropy-4.2 | py38h2bbff1b_0
autotools-1.5.6 | pyhd3eb1b0_0
babel-2.9.0 | pyhd3eb1b0_0
backcall-0.2.0 | pyhd3eb1b0_0
backports-1.0 | pyhd3eb1b0_2
backports.shutil_get_terminal_size-1.0.0 | pyhd3eb1b0_3
beautifulsoup4-4.9.3 | pyha847dfd_0
bitarray-1.7.1 | py38h2bbff1b_1
black-19.10b0 | py_0
bleach-3.3.0 | pyhd3eb1b0_0
blosc-1.21.0 | h19a0ad4_0
bokeh-2.3.0 | py38haa95532_0
brotli-0.7.0 | py38h2bbff1b_1003
ca-certificates-2021.1.19 | ha95532_1
certifi-2020.12.5 | py38haa95532_0
cffi-1.14.5 | py38hcd434a_0
chardet-4.0.0 | py38haa95532_1003
click-7.1.2 | pynd3eb1b0_0
colorama-0.4.4 | pyhd3eb1b0_0
comtypes-1.1.9 | py38haa95532_1002
conda-build-3.21.4 | py38haa95532_0
cryptography-3.4.6 | py38h71e12ea_0
cython-0.29.22 | py38hd77b12b_0
Total: 166.6 MB

The following NEW packages will be INSTALLED:

_anaconda_depends pkgs/main/win-64::anaconda_depends-2020.07-py38_0
appdirs pkgs/main/noarch::appdirs-1.4.4-py_0
black pkgs/main/noarch::black-19.10b0-py_0
gmpy2 pkgs/main/win-64::gmpy2-2.0.8-py38h7edee0f_3
jupyterlab_widgets pkgs/main/noarch::jupyterlab_widgets-1.0.0-pyhd3eb1b0_1
libl1vm9 pkgs/main/win-64::libl1vm9-9.0.1-h21ff451_0
mpc pkgs/main/win-64::mpc-1.1.0-hedee0f_1
mpfr pkgs/main/win-64::mpfr-4.0.2-h62dc0d7_1
mpir pkgs/main/win-64::mpir-3.0.0-hec2e145_1
mypy_extensions pkgs/main/win-64::mypy_extensions-0.4.3-py38_0
pathspec pkgs/main/noarch::pathspec-0.7.0-py_0
ptyprocess pkgs/main/noarch::ptyprocess-0.7.0-pyhd3eb1b0_2
pyerfa pkgs/main/win-64::pyerfa-1.7.2-py38h2bbff1b_0
pyls-black pkgs/main/noarch::pyls-black-0.4.6-hd3eb1b0_0
pyls-spyder pkgs/main/noarch::pyls-spyder-0.4.0-pyhd3eb1b0_0
snappy pkgs/main/win-64::snappy-1.1.8-h33f27b4_0
tbb pkgs/main/win-64::tbb-2020.3-h7aa9793_0
textdistance pkgs/main/noarch::textdistance-4.2.1-pyhd3eb1b0_0
three-merge pkgs/main/noarch::three-merge-0.1.1-pyhd3eb1b0_0
typed-ast pkgs/main/win-64::typed-ast-1.4.2-py38h2bbff1b_1

The following packages will be UPDATED:

anaconda-project          0.8.4-py_0 --> 0.9.1-pyhd3eb1b0_1
astroid                   2.4.2-py38_0 --> 2.5-py38haa95532_1
astropy                  4.0.2-py38he774522_0 --> 4.2-py38h2bbff1b_0
autotools                1.5.4-py_0 --> 1.5.6-pyhd3eb1b0_0
babel                    2.8.1-pyhd3eb1b0_0 --> 2.8.0-pyhd3eb1b0_0
backports.shutil~ pkgs/main/win-64::backports.shutil_ge-->pkgs/main/noarch::backports.shutil_get_terminal_size-1.0.0-pyhd3eb1b0_3
bitarray                 1.6.1-py38h2bbff1b_0 --> 1.7.1-py38h2bbff1b_1
bleach                   3.2.1-py_0 --> 3.3.0-pyhd3eb1b0_0
blosc                    1.20.1-h7bd57a_0 --> 1.21.0-h19a0ad4_0
bokeh                    2.2.3-py38_0 --> 2.3.0-py38haa95532_0
brotli                  0.7.0-py38he774522_1000 --> 0.7.0-py38h2bbff1b_1003
ca-certificates          2020.10.14.0 --> 2021.1.19-haa95532_1
certifi                  pkgs/main/noarch::certifi-2020.6.20-p-->pkgs/main/win-64::certifi-2020.12.5-py38haa95532_0
cffi                     1.14.3-py38h7aidbc1_0 --> 1.14.5-py38hcd434a_0
chardet                 3.0.4-py38_1003 --> 4.0.0-py38haa95532_1003
comtypes                1.1.7-py38_1001 --> 1.1.9-py38haa95532_1002
conda-build              3.20.5-py38_1 --> 3.21.4-py38haa95532_0
```

```
■ Anaconda Prompt (anaconda3)
Proceed ([y]/n)? y

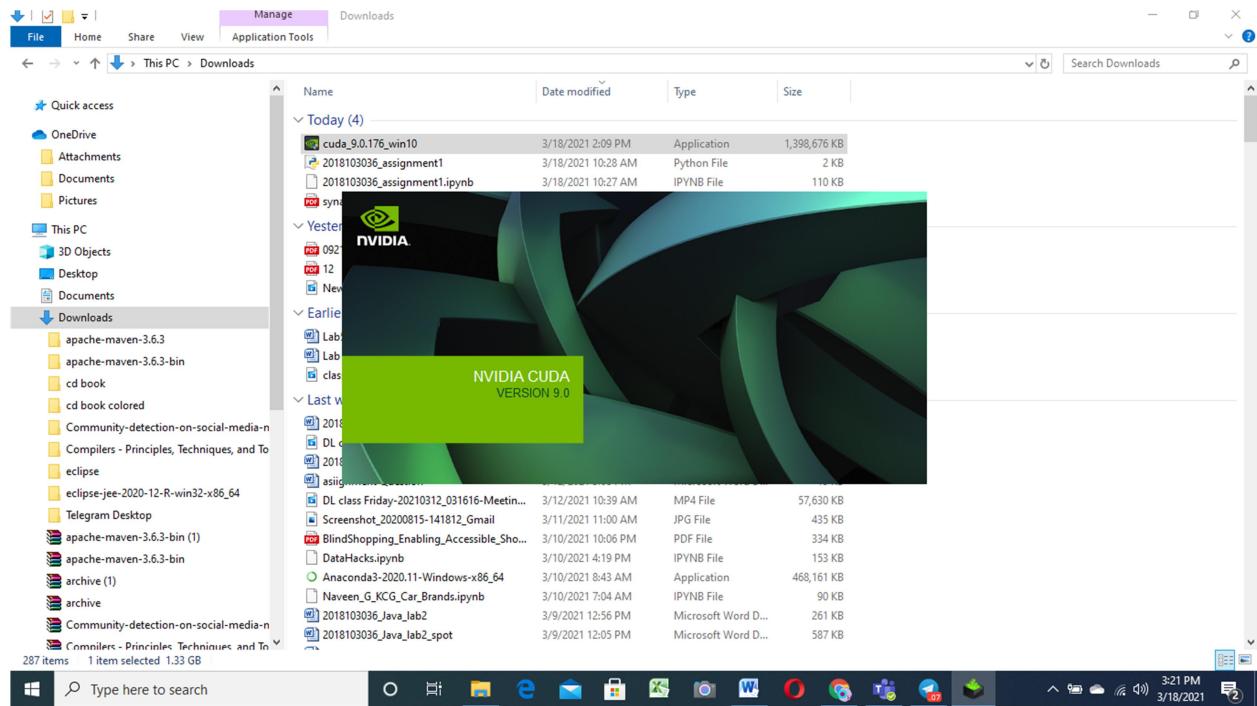
Downloading and Extracting Packages
snowballstemmer-2.1.   62 KB    #####
black-19.10b0           86 KB    #####
spyder-4.2.3            5.4 MB   #####
mkl_fft-1.3.0           134 KB   #####
pickleshare-0.7.5       13 KB    #####
requests-2.25.1          52 KB   #####
mpc-1.1.0                260 KB   #####
locket-0.2.1              10 KB   #####
pkginfo-1.7.0             60 KB   #####
sqlalchemy-1.3.23        1.5 MB   #####
send2trash-1.5.0          14 KB   #####
beautifulsoup4-4.9.3     86 KB    #####
pillow-8.1.2              665 KB   #####
flake8-3.9.0               129 KB   #####
backcall-0.2.0              13 KB   #####
colorama-0.4.4              21 KB   #####
qtawesome-1.0.2            760 KB   #####
sphinx-3.5.2               1.1 MB   #####
werkzeug-1.0.1              239 KB   #####
libtiff-4.2.0                745 KB   #####
psutil-5.8.0                350 KB   #####
sympy-1.7.1                  8.8 MB   #####
regex-2020.11.13            324 KB   #####
jupyterlab-2.2.6              3.4 MB   #####
pycosat-0.6.3                 75 KB   #####
sphinxcontrib-devhel         23 KB    #####
three-merge-0.1.1              10 KB   #####
numexpr-2.7.3                  125 KB   #####
typed-ast-1.4.2                139 KB   #####
ujson-0.4.2                   46 KB    #####
backports-1.0                  210 KB   #####
singledispatch-3.6.1            13 KB    #####
typing_extensions-3.          25 KB    #####
textdistance-4.2.1                29 KB   #####
comtypes-1.1.9                  237 KB   #####
decorator-4.4.2                  12 KB   #####
ptconsole-5.0.2                  97 KB   #####
wheel-0.36.2                     33 KB   #####
prometheus_client-0.          45 KB    #####
dask-2021.3.0                      5 KB    #####

```

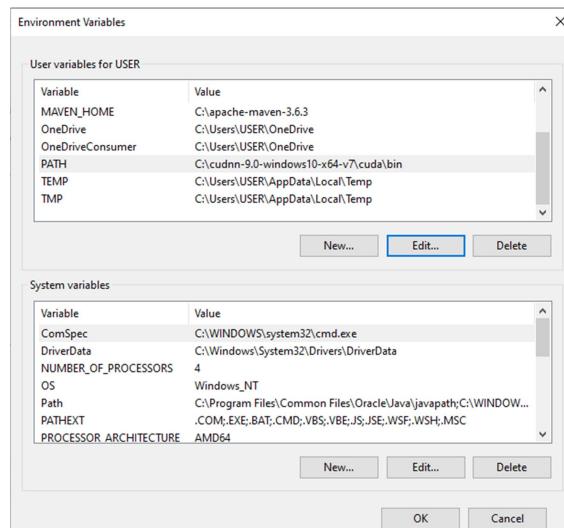
```
[Anaconda Prompt (anaconda3)]  
pandas==1.2.3          | 7.9 MB      | #####| 100%  
Preparing transaction: done  
Verifying transaction: done  
Executing transaction: | DEBUG menuinst_win32:_init_(198): Menu: name: 'Anaconda${PY_VER} ${PLATFORM}', prefix: 'C:\Users\USER\anaconda3', env_name: 'None', mode: 'user', used_mode: 'user'  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\pythonw.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\pythonw.exe', 'C:\Users\USER\anaconda3\Scripts\spyder-script.py']  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\python.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\spyder-script.py', '--reset']  
DEBUG menuinst_win32:_init_(198): Menu: name: 'Anaconda${PY_VER} ${PLATFORM}', prefix: 'C:\Users\USER\anaconda3', env_name: 'None', mode: 'user', used_mode: 'user'  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\pythonw.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\pythonw.exe', 'C:\Users\USER\anaconda3\Scripts\spyder-script.py']  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\python.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\spyder-script.py', '--reset']  
DEBUG menuinst_win32:_init_(198): Menu: name: 'Anaconda${PY_VER} ${PLATFORM}', env_name: 'None', mode: 'user', used_mode: 'user'  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\python.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\jupyter-notebook-script.py', '"%USERPROFILE%"']  
DEBUG menuinst_win32:_init_(198): Menu: name: 'Anaconda${PY_VER} ${PLATFORM}', prefix: 'C:\Users\USER\anaconda3', env_name: 'None', mode: 'user', used_mode: 'user'  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\python.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\jupyter-notebook-script.py', '"%USERPROFILE%"']  
DEBUG menuinst_win32:_init_(198): Menu: name: 'Anaconda${PY_VER} ${PLATFORM}', prefix: 'C:\Users\USER\anaconda3', env_name: 'None', mode: 'user', used_mode: 'user'  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\python.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\jupyter-notebook-script.py', '"%USERPROFILE%"']  
DEBUG menuinst_win32:_init_(198): Menu: name: 'Anaconda${PY_VER} ${PLATFORM}', prefix: 'C:\Users\USER\anaconda3', env_name: 'None', mode: 'user', used_mode: 'user'  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\python.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\jupyter-notebook-script.py', '"%USERPROFILE%"']  
DEBUG menuinst_win32:_init_(198): Menu: name: 'Anaconda${PY_VER} ${PLATFORM}', prefix: 'C:\Users\USER\anaconda3', env_name: 'None', mode: 'user', used_mode: 'user'  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\python.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\jupyter-notebook-script.py', '"%USERPROFILE%"']  
DEBUG menuinst_win32:create(323): Shortcut cmd is C:\Users\USER\anaconda3\python.exe, args are ['C:\Users\USER\anaconda3\cwp.py', 'C:\Users\USER\anaconda3', 'C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\jupyter-notebook-script.py', '"%USERPROFILE%"']  
done
```

The image shows the Windows 10 taskbar at the bottom of the screen. On the left is the Start button. Next to it is a search bar with the placeholder "Type here to search". To the right of the search bar are several pinned icons: File Explorer (a blue folder), Edge (a red and yellow icon), Mail (a blue envelope), Photos (a camera icon), OneDrive (a green cloud icon), and Microsoft Store (a blue square icon). Further to the right are icons for Task View (a grid of squares), File Explorer (blue folder), Edge (red and yellow), Mail (blue envelope), Photos (camera), OneDrive (green cloud), Microsoft Store (blue square), and a system tray with icons for battery, signal, volume, and date/time (9:31 PM, 3/17/2021).

Cuda toolkit installation



Add cuDNN into environment path:



CREATING ANACONDA ENVIRONMENT:

```
■ Anaconda Prompt (anaconda3)
C:\Users\USER\anaconda3\python.exe', 'C:\Users\USER\anaconda3\Scripts\spyder-script.py', '--reset']
done

(base) C:\Users\USER>conda create -n tensorflow pip python=3.6
Collecting package metadata (current_repodata.json): done
Solving environment: done

## Package Plan ##

environment location: C:\Users\USER\anaconda3\envs\tensorflow

added / updated specs:
- pip
- python=3.6

The following packages will be downloaded:
package          build
certifi-2020.12.5 py36haa95532_0      140 KB
pip-21.0.1        py36haa95532_0      1.8 MB
python-3.6.13     h3758d61_0       14.6 MB
setuptools-52.0.0 py36haa95532_0      723 KB
wincertstore-0.2  py36h7fe50ca_0      14 KB
Total:           17.3 MB

The following NEW packages will be INSTALLED:

certifi      pkgs/main/win-64::certifi-2020.12.5-py36haa95532_0
pip          pkgs/main/win-64::pip-21.0.1-py36haa95532_0
python        pkgs/main/win-64::python-3.6.13-h3758d61_0
setuptools    pkgs/main/win-64::setuptools-52.0.0-py36haa95532_0
sqlite        pkgs/main/win-64::sqlite-3.35.1-h2bbff1b_0
vc            pkgs/main/win-64::vc-14.2-h21ff451_1
vs2015_runtime pkgs/main/win-64::vs2015_runtime-14.27.29016-h5e58377_2
wheel         pkgs/main/noarch::wheel-0.36.2-pyhd3eb1b0_0
wincertstore  pkgs/main/win-64::wincertstore-0.2-py36h7fe50ca_0

Proceed ([y]/n)? y
```



```
■ Anaconda Prompt (anaconda3)
The following NEW packages will be INSTALLED:

certifi      pkgs/main/win-64::certifi-2020.12.5-py36haa95532_0
pip          pkgs/main/win-64::pip-21.0.1-py36haa95532_0
python        pkgs/main/win-64::python-3.6.13-h3758d61_0
setuptools    pkgs/main/win-64::setuptools-52.0.0-py36haa95532_0
sqlite        pkgs/main/win-64::sqlite-3.35.1-h2bbff1b_0
vc            pkgs/main/win-64::vc-14.2-h21ff451_1
vs2015_runtime pkgs/main/win-64::vs2015_runtime-14.27.29016-h5e58377_2
wheel         pkgs/main/noarch::wheel-0.36.2-pyhd3eb1b0_0
wincertstore  pkgs/main/win-64::wincertstore-0.2-py36h7fe50ca_0

Proceed ([y]/n)? y

Downloading and Extracting Packages
wincertstore-0.2   14 KB | #####| 100%
python-3.6.13     14.6 MB | #####| 100%
certifi-2020.12.5 140 KB | #####| 100%
pip-21.0.1        1.8 MB | #####| 100%
setuptools-52.0.0 723 KB | #####| 100%
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
#
# To activate this environment, use
# $ conda activate tensorflow
#
# To deactivate an active environment, use
# $ conda deactivate

(base) C:\Users\USER>conda activate tensorflow
(tensorflow) C:\Users\USER>
```



INSTALLING DEEP LEARNING LIBRARIES:

Pip install tensorflow-gpu

```
■ Select Anaconda Prompt (anaconda3)
(tensorflow) C:\Users>cd ..
(tensorflow) C:\>pip install tensorflow-gpu
Collecting tensorflow-gpu
  Downloading tensorflow_gpu-2.4.1-cp36-cp36m-win_amd64.whl (370.7 MB)
    |████████| 370.7 MB 8.6 kB/s
Collecting wrapt==1.12.1
  Downloading wrapt-1.12.1.tar.gz (27 kB)
Collecting typing_extensions==3.7.4
  Downloading typing_extensions-3.7.4.3-py3-none-any.whl (22 kB)
Collecting tensorboard==2.4
  Downloading tensorboard-2.4.1-py3-none-any.whl (10.6 MB)
    |████████| 10.6 MB 288 kB/s
Collecting google-pasta==0.2
  Downloading google_pasta-0.2.0-py3-none-any.whl (57 kB)
    |████████| 57 kB 279 kB/s
Collecting h5py==2.10.0
  Downloading h5py-2.10.0-cp36-cp36m-win_amd64.whl (2.4 MB)
    |████████| 2.4 MB 3.2 MB/s
Collecting flatbuffers==1.12.0
  Downloading flatbuffers-1.12-py3-none-any.whl (15 kB)
Collecting six==1.15.0
  Downloading six-1.15.0-py2.py3-none-any.whl (10 kB)
Collecting grpcio==1.32.0
  Downloading grpcio-1.32.0-cp36-cp36m-win_amd64.whl (2.6 MB)
    |████████| 2.6 MB 3.2 MB/s
Collecting tensorflow-estimator<2.5.0,>=2.4.0
  Downloading tensorflow_estimator-2.4.0-py2.py3-none-any.whl (462 kB)
    |████████| 462 kB 2.2 MB/s
Collecting opt-einsum==3.3.0
  Downloading opt_einsum-3.3.0-py3-none-any.whl (65 kB)
    |████████| 65 kB 541 kB/s
Collecting numpy==1.19.2
  Downloading numpy-1.19.2-cp36-cp36m-win_amd64.whl (13.2 MB)
    |████████| 13.2 MB 262 kB/s
Requirement already satisfied: wheel==0.35 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow-gpu) (0.36.2)
Collecting protobuf>=3.9.2
  Downloading protobuf-3.15.6-cp36-cp36m-win_amd64.whl (904 kB)
    |████████| 904 kB 939 kB/s
Collecting keras-preprocessing==1.1.2
  Downloading keras_Preprocessing-1.1.2-py2.py3-none-any.whl (42 kB)
    |████████| 42 kB 100 kB/s
Collecting termcolor==1.1.0
  Type here to search
```

pip insatl tensorflow

```
■ Anaconda Prompt (anaconda3)
(tensorflow) C:\>pip install tensorflow
Collecting tensorflow
  Downloading tensorflow-2.4.1-cp36-cp36m-win_amd64.whl (370.7 MB)
    |████████| 370.7 MB 5.5 kB/s
Requirement already satisfied: protobuf>=3.9.2 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (3.15.6)
Requirement already satisfied: gast==0.3.3 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (0.3.3)
Requirement already satisfied: wheel==0.35 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (0.36.2)
Requirement already satisfied: grpcio==1.32.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (1.32.0)
Requirement already satisfied: h5py==2.10.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (2.10.0)
Requirement already satisfied: wrapt==1.12.1 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (1.12.1)
Requirement already satisfied: typing_extensions==3.7.4 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (3.7.4.3)
Requirement already satisfied: tensorflow-estimator<2.5.0,>=2.4.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (2.4.0)
Requirement already satisfied: astunparse==1.6.3 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (1.6.3)
Requirement already satisfied: google-pasta==0.2 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (0.2.0)
Requirement already satisfied: opt-einsum==3.3.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (3.3.0)
Requirement already satisfied: six==1.15.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (1.15.0)
Requirement already satisfied: keras-preprocessing==1.1.2 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (1.1.2)
Requirement already satisfied: absl-py==0.10 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (0.12.0)
Requirement already satisfied: numpy==1.19.2 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (1.19.5)
Requirement already satisfied: tensorflow==2.4 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (2.4.1)
Requirement already satisfied: termcolor==1.1.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (1.1.0)
Requirement already satisfied: flatbuffers==1.12.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (1.12)
Requirement already satisfied: setuptools==41.0.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow) (52.0.0.post20210125)
Requirement already satisfied: requests<3,>=2.21.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorflow-estimator<2.4->tensorflow) (2.25.1)
Requirement already satisfied: tensorboard-plugin-wandb==0.16.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorboard<=2.4->tensorflow) (1.8.0)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorboard<=2.4->tensorflow) (0.4.3)
Requirement already satisfied: werkzeug==0.11.15 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorboard<=2.4->tensorflow) (1.0.1)
Requirement already satisfied: google-auth<2,>=1.6.3 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorboard<=2.4->tensorflow) (1.28.0)
Requirement already satisfied: markdown>=2.6.8 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from tensorboard<=2.4->tensorflow) (3.3.4)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from google-auth<2,>1.6.3->tensorboard<=2.4->tensorflow) (4.2.1)
Requirement already satisfied: rsa<5,>=3.1.4 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from google-auth<2,>1.6.3->tensorboard<=2.4->tensorflow) (4.7.2)
Requirement already satisfied: pyasn1-modules==0.2.1 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from google-auth<2,>1.6.3->tensorboard<=2.4->tensorflow) (0.2.8)
Requirement already satisfied: requests-oauthlib==0.7.0 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard<=2.4->tensorflow) (1.3.0)
Requirement already satisfied: importlib-metadata in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from markdown>=2.6.8->tensorboard<=2.4->tensorflow) (3.7.3)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from pyasn1-modules>=0.2.1->google-auth<2,>1.6.3->tensorboard<=2.4->tensorflow) (0.4.8)
Requirement already satisfied: charset<5,>=3.0.2 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from requests<3,>=2.21.0->tensorboard<=2.4->tensorflow) (v
```

pip install keras

```
Anaconda Prompt (anaconda3)

(tensorflow) C:\>pip install keras
Collecting keras
  Downloading Keras-2.4.3-py2.py3-none-any.whl (36 kB)
Collecting scipy>=0.14
  Downloading scipy-1.5.4-cp36-cp36m-win_amd64.whl (31.2 MB)
Requirement already satisfied: numpy>=1.9.1 in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from keras) (1.19.5)
Requirement already satisfied: h5py in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from keras) (2.10.0)
Collecting pyyaml
  Downloading PyYAML-5.4.1-cp36-cp36m-win_amd64.whl (209 kB)
Requirement already satisfied: six in c:\users\user\anaconda3\envs\tensorflow\lib\site-packages (from h5py->keras) (1.15.0)
Installing collected packages: scipy, pyyaml, keras
Successfully installed keras-2.4.3 pyyaml-5.4.1 scipy-1.5.4

(tensorflow) C:\>
```

MNIST DIGIT CLASSIFICATION PYTHON JUPYTER NOTEBOOK

```
In [6]: pip install tensorflow
Collecting tensorflow
  Downloading tensorflow-2.4.1-cp38-cp38-win_amd64.whl (370.7 kB)
Collecting absl-py<=0.18
  Using cached absl_py-0.12.0-py3-none-any.whl (129 kB)
Collecting termcolor<=1.1.0
  Using cached termcolor-1.1.0.tar.gz (3.9 kB)
Requirement already satisfied: wheel<=0.35 in c:\users\user\anaconda3\lib\site-packages (from tensorflow) (0.36.2)
Collecting google-pasta<=0.2
  Using cached google_pasta-0.2.0-py3-none-any.whl (57 kB)
Requirement already satisfied: wrapt<=1.12.1 in c:\users\user\anaconda3\lib\site-packages (from tensorflow) (1.12.1)
Collecting tensorflow-estimator<2.5.0,>2.4.0
  Using cached tensorflow_estimator-2.4.0-py2.py3-none-any.whl (462 kB)
Collecting keras-preprocessing<=1.1.2
  Using cached Keras_Preprocessing-1.1.2-py2.py3-none-any.whl (42 kB)
Collecting protobuf<=3.9.2
  Downloading protobuf-3.15.6-py2.py3-none-any.whl (173 kB)
Collecting gast<=0.3.3
  Using cached gast-0.3.3-py2.py3-none-any.whl (9.7 kB)
Requirement already satisfied: numpy<=1.19.2 in c:\users\user\anaconda3\lib\site-packages (from tensorflow) (1.19.2)
```

IMPORT NECESSARY PACKAGES

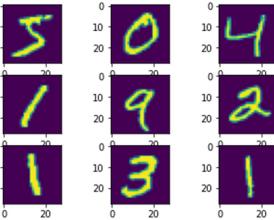
```
In [7]: import tensorflow as tf
```

```
In [7]: import tensorflow as tf
```

```
In [8]: objects = tf.keras.datasets.mnist  
(training_images, training_labels), (test_images, test_labels) = objects.load_data()  
  
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz  
11493376/11498434 [=====] - 2s/step
```

ANALYSING THE DATASET

```
In [9]: for i in range(9):
    # define subplot
    plt.subplot(330 + 1 + i)
    # plot raw pixel data
    plt.imshow(training_images[i])
```



```
In [10]: print(training_images.shape)
          print(training_images[100])
```


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DEFINE COMPILER PARAMETERS LIKE OPTIMIZER AND METRICS

```
In [15]: model.compile(optimizer = 'adam', loss = 'sparse_categorical_crossentropy', metrics=['accuracy'])
```

FEED THE DATA TO OUR NETWORK AND TRAIN

```
In [16]: model.fit(training_images, training_labels, epochs=7)
```

```
Epoch 1/7  
1875/1875 [=====] - 12s 6ms/step - loss: 0.4393 - accuracy: 0.8734  
Epoch 2/7  
1875/1875 [=====] - 11s 6ms/step - loss: 0.1229 - accuracy: 0.9629  
Epoch 3/7  
1875/1875 [=====] - 9s 5ms/step - loss: 0.0850 - accuracy: 0.9740  
Epoch 4/7  
1875/1875 [=====] - 10s 6ms/step - loss: 0.0585 - accuracy: 0.9821  
Epoch 5/7  
1875/1875 [=====] - 10s 5ms/step - loss: 0.0449 - accuracy: 0.9870  
Epoch 6/7  
1875/1875 [=====] - 10s 5ms/step - loss: 0.0341 - accuracy: 0.9901  
Epoch 7/7  
1875/1875 [=====] - 10s 6ms/step - loss: 0.0278 - accuracy: 0.9914
```

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TEST THE PERFORMANCE WITH TEST IMAGE

```
In [17]: print(model.evaluate(test_images,test_labels))
```

```
313/313 [=====] - 2s 4ms/step - loss: 0.0756 - accuracy: 0.9785  
[0.07561788707971573, 0.9785000085830688]
```

```
Accuracy 97.85%
```

Visualizing our prediction using some sample test images

```
In [32]: from matplotlib.pyplot import imshow, show
```

```
In [36]: prediction=model.predict(test_images)  
for i in range(100,110):  
    print(np.argmax(prediction[i]))  
    plt.figure(figsize = (10,1))  
    plt.imshow(test_images[i])  
    show()
```



6
0
20

