

Pre-school Reading Materials and Instructions

Neural Network and Deep Learning:

Dr Spyros Chatzivasileiadis suggested reading the following papers to be prepared for the course. All papers are available for free from ARXIV as listed below:

- Physics-Informed Neural Networks for Power Systems - <https://arxiv.org/abs/1911.03737>
- Verification of Neural Network Behaviour: Formal Guarantees for Power System Applications - <https://arxiv.org/abs/1910.01624>
- Deep Learning for Power System Security Assessment - <https://arxiv.org/abs/1904.09029>
- Efficient Creation of Datasets for Data-Driven Power System Applications - <https://arxiv.org/abs/1910.01794>
- Physics Informed Deep Learning (Part I): Data-driven Solutions of Nonlinear Partial Differential Equations - <https://arxiv.org/abs/1711.10561>

Reinforcement Learning:

Dr Zoltan Nagy suggested reading his recent book chapter that is accessible [from this link](#). Please do not share this book chapter with anyone as it is protected by copyright law.

In addition, he suggested reading the Barto & Sutton book (the main reference for RL scientists and users), which is available online for free at <http://incompleteideas.net/book/the-book-2nd.html>

Clustering and Classification:

Dr Archie Chapman suggested reading the textbook “Pattern Recognition and Machine Learning,” by Christopher Bishop. A soft copy of the book is freely available on Prof Bishop’s webpage at <https://www.microsoft.com/en-us/research/people/cmbishop/>

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Python package installation guide on Windows 10

Installing Python 3.7 (Please do not install newer versions as they don't work with TensorFlow)

- 1- Download anaconda graphical installer from <https://www.anaconda.com/distribution/#windows>
- 2- Run the installer
- 3- Run Anaconda prompt
- 4- Run the following commands:
 - a. `pip install torch==1.3.1+cpu torchvision==0.4.2+cpu -f https://download.pytorch.org/whl/torch_stable.html`
 - b. `pip install gym matplotlib pandas numpy pathlib agent`
- 5- Now you're ready to run the main.py file

PS: add the following two lines to line 4 of *main.py* in order to get it to run

```
from agent import RL_Agents  
from reward_function import reward_function
```

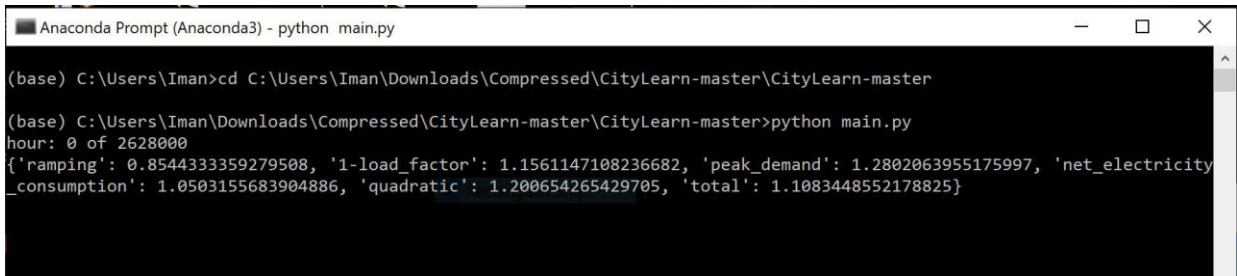
In order to make sure that the packages are installed correctly, and as a part of requirements for "Reinforcement Learning" sessions, please follow the instructions in below:

- 6- Download the repository by clicking on "Clone or download" on the [Github repository](#)
- 7- Uncompress the CityLearn-Master.zip
- 8- Change directory in Anaconda prompt to the uncompressed folder (cd command)
- 9- Run the following command:

```
python main.py
```

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10- The runtime may be different depending on the computer configuration. After code execution is completed, the following lines will be shown up.



```
Anaconda Prompt (Anaconda3) - python main.py
(base) C:\Users\Iman>cd C:\Users\Iman\Downloads\Compressed\CityLearn-master\CityLearn-master
(base) C:\Users\Iman\Downloads\Compressed\CityLearn-master\CityLearn-master>python main.py
hour: 0 of 2628000
{'ramping': 0.8544333359279508, 'l-load_factor': 1.1561147108236682, 'peak_demand': 1.2802063955175997, 'net_electricity_consumption': 1.0503155683904886, 'quadratic': 1.200654265429705, 'total': 1.1083448552178825}
```

* The file takes about 10 mins to be executed on a laptop Core i7 / 16 GB RAM / intel HD graphics 520

Tensorflow package installation guide on Windows 10

System requirements:

Windows 7 or later (64-bit) - Python 3.4-3.7 - pip 19.0 or later

Installing Anaconda:

Skip this stage if you already installed Anaconda

- 1- Download anaconda graphical installer from <https://www.anaconda.com/distribution/#windows>
- 2- Run the installer
- 3- Run Anaconda prompt

Installing pip:

- 1- Run the following command:

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```
conda install pip
```

You can verify that *pip* was installed correctly by opening a command prompt and entering the following command:

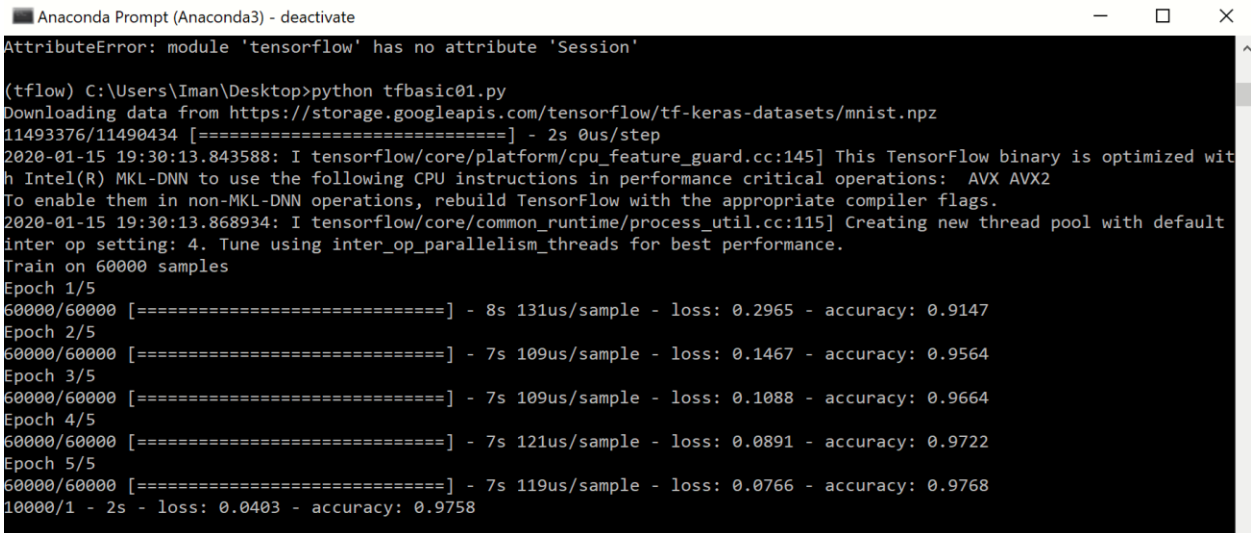
```
pip --version
```

Installing Tensorflow:

Install TensorFlow with Python's *pip* package manager by running the following command:

```
conda create -yn tfenv tensorflow
conda activate tfenv
```

To validate the package installation, please follow a simple example at <https://www.tensorflow.org/tutorials/quickstart/beginner>. This script trains and evaluates a neural network for MNIST dataset using Tensorflow.



```
Anaconda Prompt (Anaconda3) - deactivate
AttributeError: module 'tensorflow' has no attribute 'Session'

(tfenv) C:\Users\Iman\Desktop>python tfbasic01.py
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11493376/11490434 [=====] - 2s 0us/step
2020-01-15 19:30:13.843588: I tensorflow/core/platform/cpu_feature_guard.cc:145] This TensorFlow binary is optimized with
h Intel(R) MKL-DNN to use the following CPU instructions in performance critical operations: AVX AVX2
To enable them in non-MKL-DNN operations, rebuild TensorFlow with the appropriate compiler flags.
2020-01-15 19:30:13.868934: I tensorflow/core/common_runtime/process_util.cc:115] Creating new thread pool with default
inter op setting: 4. Tune using inter_op_parallelism_threads for best performance.
Train on 60000 samples
Epoch 1/5
60000/60000 [=====] - 8s 131us/sample - loss: 0.2965 - accuracy: 0.9147
Epoch 2/5
60000/60000 [=====] - 7s 109us/sample - loss: 0.1467 - accuracy: 0.9564
Epoch 3/5
60000/60000 [=====] - 7s 109us/sample - loss: 0.1088 - accuracy: 0.9664
Epoch 4/5
60000/60000 [=====] - 7s 121us/sample - loss: 0.0891 - accuracy: 0.9722
Epoch 5/5
60000/60000 [=====] - 7s 119us/sample - loss: 0.0766 - accuracy: 0.9768
10000/1 - 2s - loss: 0.0403 - accuracy: 0.9758
```