# wz2037_lab3

## Link to Github

```
├── data
    └── cl
        └── valid.h5 // this is clean validation data used to design the defense
        └── test.h5  // this is clean test data used to evaluate the BadNet
    └── bd
        └── bd_valid.h5 // this is sunglasses poisoned validation data
        └── bd_test.h5  // this is sunglasses poisoned test data
├── models
    └── bd_net.h5
    └── bd_weights.h5
    └── B_pi_net_0.1.h5
    └── B_pi_net_0.04.h5
    └── B_pi_net_0.02.h5
├── architecture.py
├── repair.py
├── Geval.py // custom evaluation script
└── eval.py // this is the evaluation script
```

# I. Dependencies

1. Python 3.6.9
2. Keras 2.3.1
3. Numpy 1.16.3
4. Matplotlib 2.2.2
5. H5py 2.9.0
6. TensorFlow-gpu 2.7.0

# II. Data

1. Download the validation and test datasets from here and store them under `data/` directory.
2. The dataset contains images from YouTube Aligned Face Dataset. We retrieve 1283 individuals and split into validation and test datasets.
3. bd_valid.h5 and bd_test.h5 contains validation and test images with sunglasses trigger respectively, that activates the backdoor for bd_net.h5.

# III. Evaluating the Backdoored Model

1. The DNN architecture used to train the face recognition model is the state-of-the-art DeepID network.
2. To evaluate the backdoored model, execute `eval.py` by running:
   `python3 eval.py <clean validation data directory> <poisoned validation data directory> <model directory>` .
   E.g., `python3 eval.py data/cl/valid.h5 data/bd/bd_valid.h5 models/bd_net.h5` . This will output:
   Clean Classification accuracy: 98.64 %
   Attack Success Rate: 100 %

# IV. Important Notes

Please use only clean validation data (valid.h5) to design the pruning defense. And use test data (test.h5 and bd_test.h5) to evaluate the models.

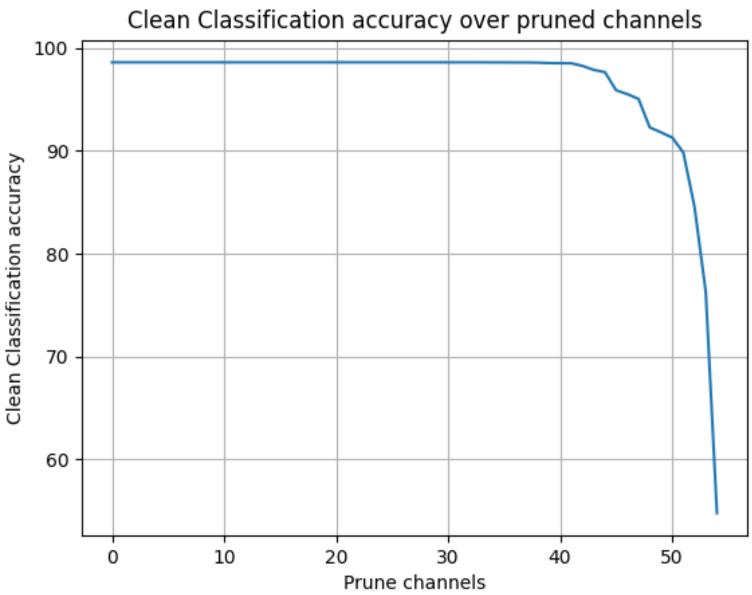
# V. Repair Network

1. Repaired network for X={2%, 4%, 10%, 30%} is created by script *`repair.py`*, and output models are stored in
   *`models/B_pi_net_0.02.h5 models/B_pi_net_0.04.h5 models/B_pi_net_0.1.h5`*
2. To evaluate the goodnet *G*, excute *`Geval.py`* by running:
   `python3 eval.py <clean validation data directory> <poisoned validation data directory> <B model directory> <B' model dirctory>`
   .
   For each repaired network, corresponding commands are:
   `python3 Geval.py data/test.h5 data/bd_test.h5 models/bd_net.h5 models/B_pi_net_0.02.h5` .
   `python3 Geval.py data/test.h5 data/bd_test.h5 models/bd_net.h5 models/B_pi_net_0.04.h5` .

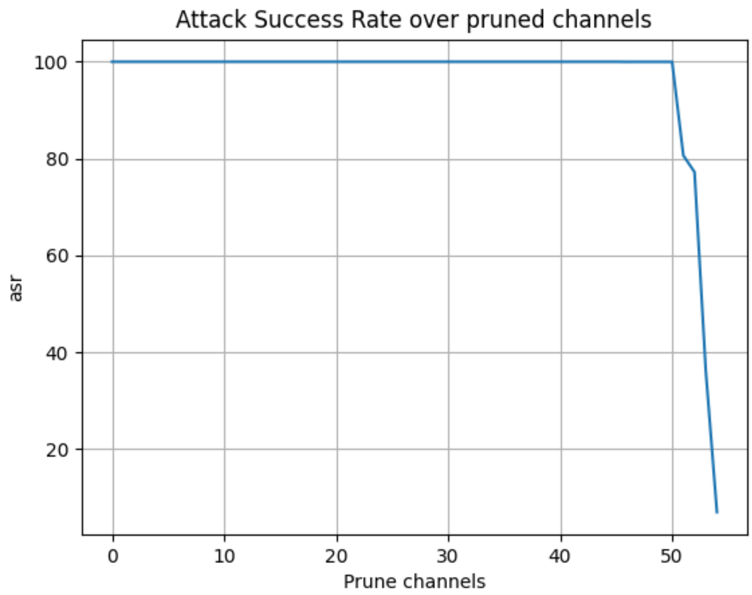
`python3 Geval.py data/test.h5 data/bd_test.h5 models/bd_net.h5 models/B_pi_net_0.1.h5` .

`python3 Geval.py data/test.h5 data/bd_test.h5 models/bd_net.h5 models/B_pi_net_0.3.h5` .

3. Evaluation results are:
    - `B_pi_net_0.02.h5 : Clean Classification accuracy` : 95.90023382696803
      `Attack Success Rate` : 100.0
    - `B_pi_net_0.04.h5 : Clean Classification accuracy` : 92.29150428682775
      `Attack Success Rate` : 99.98441153546376
    - `B_pi_net_0.1.h5 : Clean Classification accuracy` : 84.54403741231489
      `Attack Success Rate` : 77.20966484801247
    - `B_pi_net_0.3.h5 : Clean Classification accuracy` : 54.762275915822286
      `Attack Success Rate` : 6.96024941543258
4. Plot:
    - Clean accuracy:




    - Attack success rate:




5. Comment:
   Pruning defense does not work for this model. For the defensive part, the attack success rate drop to a very low point. However, the clean classification accuracy also drop significantly. When attack success rate drop to a acceptable rate, the clean classification accuracy is too low to consider the model as a usable model. Therefore pruning defense dose not work for this model.