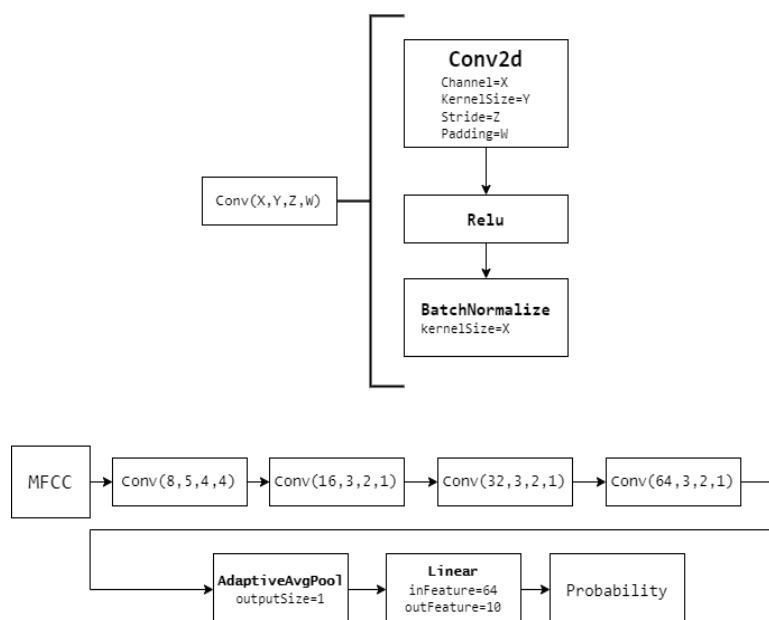# Main Process

Neural Network

During the first 5 days of my training, I attempted to train a neural network whose hidden layers are $12000, 4000, 500, 500$ in size respectively, and all apply `leaky_relu` activation function. For training this model I used the provided dataset in `bof/`, applied SGD optimizer, set 1×10^{-3} as learning rate and 300 as number of epochs. To speed up the training process and facilitate customization, I used `Pytorch` library. One of reasons why I chose this library is that I can customize the model easily and use GPU to speed up training. Another reason is that I have become familiar with this library with the help of UBRTP. This model meets the problem of severe overfitting whatever parameters I used.

RNN

I have also tried training an RNN with the MFCC sequences. But because of unknown mistake, I could not get high enough accuracy. I gave up this model eventually.

CNN

Occasionally, I noticed a blog which says CNN can also be trained to handle the MFCC sequences. But I cannot find the blog again. Then I built up a convolution neural network, which is similar to the ones used for image classification. Then I trained the model using (nearly) the same code of RNN. Overfitting still exists. The **default parameters in `train_cnn.py` are applied for my best model.** The final training results will fluctuate significantly due to the strategy of random data set division. In the end, I chose a model with the highest accuracy on the validation set as the result. The figure shows the structure of the models.

Files and Reproduction

`cnn.py`: model definition and main process of training. This file includes more explanation of my code.

`train_cnn.py`: preparation of training data and parameters.

`test_cnn.py`: generation of prediction for test data.

`model_structure.png`: overview of structure of my model

Command for training and testing:

```
python3 train_cnn.py mfcc/ 39 labels/trainval.csv cnn.model cnn-1
```

```
python3 test_cnn.py cnn.model mfcc/ 39 labels/test_for_student.label mfcc-cnn.csv
```

Screenshot

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