

# CSE 398/498: Deep Learning

## Programming Assignment 3

Due on Thursday November 9, by midnight

In this assignment, you will practice the application of convolutional neural nets and recurrent neural nets. You can use one of the deep learning libraries (TensorFlow, PyTorch, or Caffe2) to assist with your implementation.

### Requirements

In your completed work, you should implement at least two out of the following five tasks. Extra credits will be given if you implement more than two.

**Task 1.** Convolutional Neural Network (ConvNet), for image recognition

- Datasets to use: you can use CIFAR-10, CIFAR-100, or ImageNet-1000 dataset.
- ConvNet architecture to use: You can choose among AlexNet, VGG net, or ResNet. You should tune the hyper parameters to achieve the best performance possible.

**Task 2.** Fully Convolutional Neural Network (FCN), for image segmentation and classification.

- Datasets to choose from:
  - The Cancer Imaging Archive (TCIA) data:  
<http://www.cancerimagingarchive.net/>
  - International Skin Imaging Collaboration (ISIC) data:  
<https://isic-archive.com/>  
<https://isic-archive.com/#images>
  - Microsoft COCO dataset  
<http://cocodataset.org/#home>  
<http://cocodataset.org/#stuff-challenge2017>
- FCN architectures to use: you can choose the implementation proposed by the original FCN paper (Long et al. 2014), or the U-net implementation (Ronneberge et al. 2015).

**Task 3.** Recurrent Neural Network (RNN), or Long Short-Term Memory (LSTM), for music generation

- Datasets to use:
  - Email Prof. Tom Collins at [toc215@lehigh.edu](mailto:toc215@lehigh.edu) for access to musnet repo, reference papers, etc.
- RNN or LSTM architectures to use: Zhu et al. 2015 (S-LSTMs); Johnson et al. 2017; Hadjeres et al., 2017

**Task 4.** Recurrent Neural Network, or Long Short-Term Memory, for sentiment analysis

- Datasets to choose from:

- Deep sentiment dataset  
<http://www.cs.rochester.edu/u/qyou/DeepSent/deepsentiment.html>
- Sentiment analysis on tweets  
<https://github.com/umass-semeval/semEval16>
- References
  - <http://www.ifp.illinois.edu/~jyang29/papers/AAAI15-sentiment.pdf>
  - [https://nlp.stanford.edu/~socherr/EMNLP2013\\_RNTN.pdf](https://nlp.stanford.edu/~socherr/EMNLP2013_RNTN.pdf)
  - <http://www.yuefly.com/Public/Files/2017-03-07/58beb0822faef.pdf>
  - <http://crowdsourcing-class.org/assignments/downloads/pak-paroubek.pdf>

**Task 5.** ConvNet, RNN, or LSTM for another application. Examples include image captioning, language modeling and generation, machine translation, video classification.

## What to hand in

1. Your source code implementing 2+ tasks.
2. A README file to give detailed instructions on how to run and test your source code. Please include installation instructions on any software packages that your implementation requires. There is no need to submit the external (i.e. third-party) software packages; please only submit the source code that you wrote by yourself.
3. A brief REPORT file to summarize which tasks you have implemented. For each task, describe the specific goals of your deep neural network, the architecture (i.e. construct) of the network, dataset used to train and test the network, and evaluation results. Please include snapshots of running your code and getting the final results on test data.