

Use the CIFAR-10 dataset (consisting of 60000 32X32 tiny images) for the below-mentioned assignment. More about the dataset and the data itself is available at - <https://www.cs.toronto.edu/~kriz/cifar.html>

1a. Implement a Fully Connected AutoEncoder in TensorFlow and clearly answer the following during submission -

- What is the size of the bottleneck of your auto-encoder? Did you experiment with different sizes? What is your experience and hence rationale for the best choice?
- What is the objective function you have used?
- Train your model on the CIFAR-10 dataset. Plot the train and test loss. Randomly select 5 images from each class in the test set, encode them and visualize the decoded images. Can you compute the exact loss for each? Are the reconstructed images human recognizable? How did you conduct the experiment? Please comment on the human assessment of the reconstruction versus computed loss. Is there any class that turns out to be more difficult than others?

1b. Repeat the above experiment with a convolutional AutoEncoder (CAE) that uses only the following types of layers: convolution, pooling, upsampling and transpose along with MSE. The encoder and decoder should include one or more layers, with the size and number of filters chosen by you.

- Start with a bottleneck of size 2, train your model on MNIST and plot the train and test loss.
- What is the ideal bottleneck size for this dataset to generate readable images. The bottleneck should be as small as possible for readability, this is part of the grading criteria.

2(a). Use the IMDB Movie Review Dataset¹ to design a sentiment analysis tool. Implement the tool using a standard RNN, LSTM and GRU architecture. You can try fine tuning the models using different hyper-parameter settings. Observe and plot the change in performance w.r.t change in hyperparameters. Report and compare the performance of each of the model architectures in terms of precision, recall and F1-Scores.

2(b). Go to the data-source link [Multidomain Sentiment Analysis Dataset](https://www.cs.jhu.edu/~mdredze/datasets/sentiment/)². Download the entire dataset (unprocessed.tar.gz) and pickup any two domain (it may be books and electronics or any two domains of your choice). Test your best sentiment analysis model that you have developed in 2(a) on these two domain datasets. Observe and explain the performance change (if any).

¹ <http://ai.stanford.edu/~amaas/data/sentiment/>

² <http://www.cs.jhu.edu/~mdredze/datasets/sentiment/>