Report for the Deep Learning Course Assignment 2

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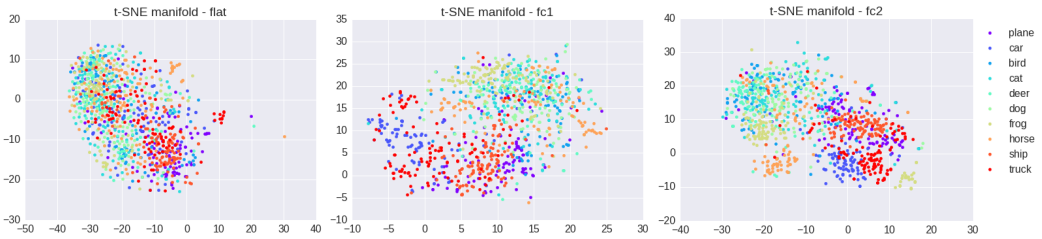
Abstract

In this assignment, we were tasked with implementing various convolutional neural network (CNN) architectures in TensorFlow (TF)...

1 Task 1



(a) Flat (b) FC1 (c) FC2

Figure 1: t-SNE manifolds obtained from extracting linear convnet features from layers Flatten/FC1/FC2

Bkah

Use feature_extraction() in order to compute features for test samples at layer fc2. Use these features to visualize learned space by the help of t-SNE. Include the visualization in your report.

Note: You can download and use the implementation for t-SNE from here. You can also use sklearn implementation of t-SNE.

Train 10 linear one-vs-rest classifiers for each class and report the performances. Can you draw similar conclusions by just looking at the visualization and thinking about separability and how good classes are represented by the model?

Note: You can use any linear classifier implementation available as long as you preserve consistency in experiments. See scikitlearn, libsvm, liblinear, VLFeat and etc.

Repeat the above experiments for flatten and fc1. Discuss the results. What is more suited for classification purposes: flatten, fc1 or fc2?

Can you improve test performance by using regularization techniques? Try L2 weight regularization on the fully-connected layers. You can also try others regularization techniques like dropout and batch normalization. Report your conclusions in your report with experimental support.

2 Task 2

"As clear from the definition of contrastive loss, we can see that this objective is not explicitly designed for classification purpose although it is yet a discriminative one. Identify one or two applications of such loss models."

30th Conference on Neural Information Processing Systems (NIPS 2016), Barcelona, Spain.

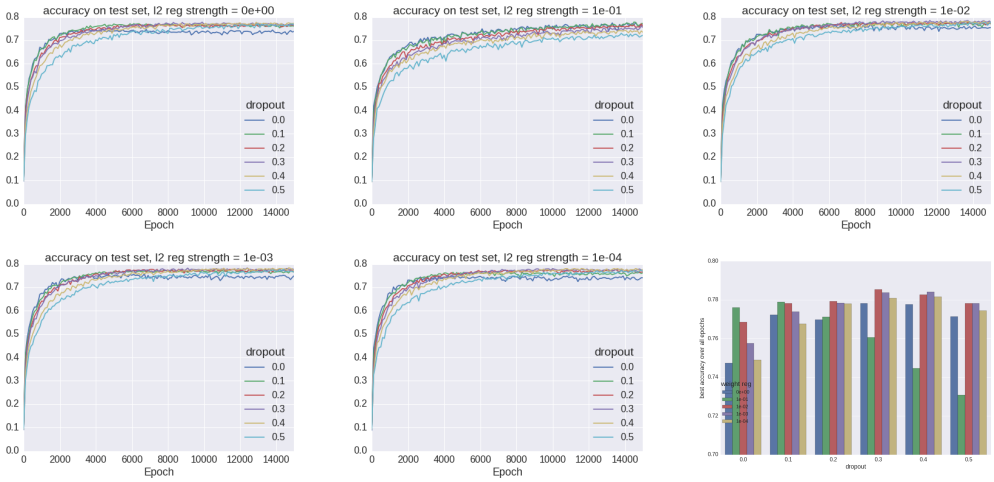


Figure 2: Accuracy on test set over time using various dropout and weight regularisation settings (last figure shows max accuracy over all epochs for each setting)

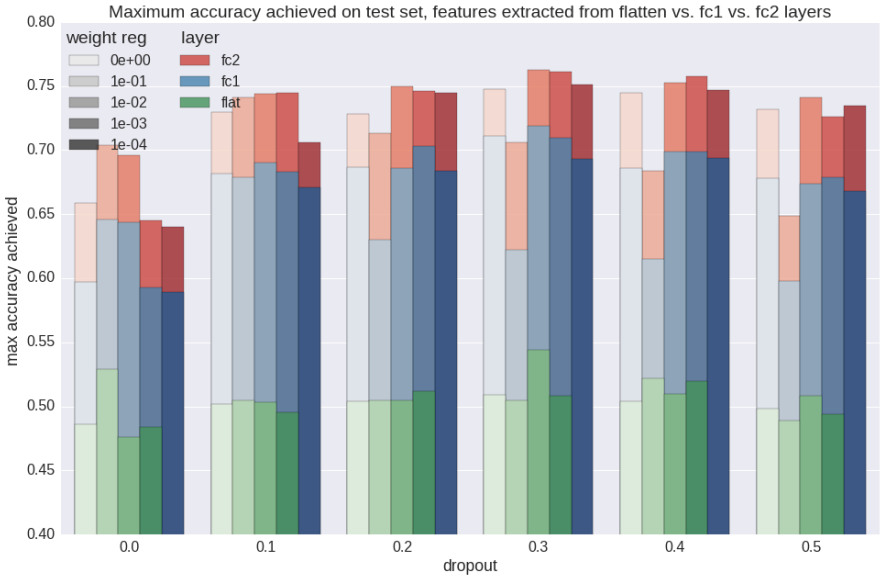


Figure 3: Performance of various dropout and weight regularisation settings on linear 1vsAll classifier model performance using features from flatten/FC1/FC2

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3 Task 3

4 Conclusion

Should contain conclusion of this study.

References

[1] Alexander, J.A. & Mozer, M.C. (1995) Template-based algorithms for connectionist rule extraction. In G. Tesauro, D.S. Touretzky and T.K. Leen (eds.), *Advances in Neural Information Processing Systems 7*, pp. 609–616. Cambridge, MA: MIT Press.

[2] Bower, J.M. & Beeman, D. (1995) *The Book of GENESIS: Exploring Realistic Neural Models with the GEneral NEural SImulation System.* New York: TELOS/Springer–Verlag.

[3] Hasselmo, M.E., Schnell, E. & Barkai, E. (1995) Dynamics of learning and recall at excitatory recurrent synapses and cholinergic modulation in rat hippocampal region CA3. *Journal of Neuroscience* **15**(7):5249-5262.