EEL6825 Pattern Recognition

Implementation of One-Shot Learning Using Siamese Networks for Face Recognition

OUTLINE

- What is Deep Learning
- Motivation for Siamese Network
- Earlier works
- Research Methodology
- Model architecture
- Result Evaluations
- Conclusion

What is Deep Learning

- Deep Learning is a sub-branch of machine learning which uses Neural Networks.
- Called deep because of the size of the neural nets
- Examples of Deep Nets are Convolutional Neural Networks, Recurrent Neural Networks, LSTMs, GANs

Motivation for Siamese Networks

- Usually CNNs are used for Image classification tasks.
- Traditional CNNs models takes huge amount of data to learn
- Deep Nets models usually do not perform well with less data

- Siamese Networks:
  - Learns with fewer instances of data.
  - Has smaller size than traditional CNNs based classifiers.

Earlier Work

- LeNet used for digit classification
- AlexNet wins ImageNet challenge in 2012.
- DeepFace achieves human level accuracy.
- VGG Nets achieves high accuracy in Image classification task.
- Other nets like InceptionV3 are developed.
- FaceNet is developed.

Research Methodology

- Dissimilarity Score
  - Network can recognize how different two objects are based on their features
  - Higher the difference, higher the dissimilarity score

Research Methodology

Research Methodology

- Classification
  - Once dissimilarity scores are found, use them to distinguish images.
  - Create a dataset consist of pair of images.
  - If the pair has same images, then label it Genuine.
  - If the pair has different images, label it Imposite.

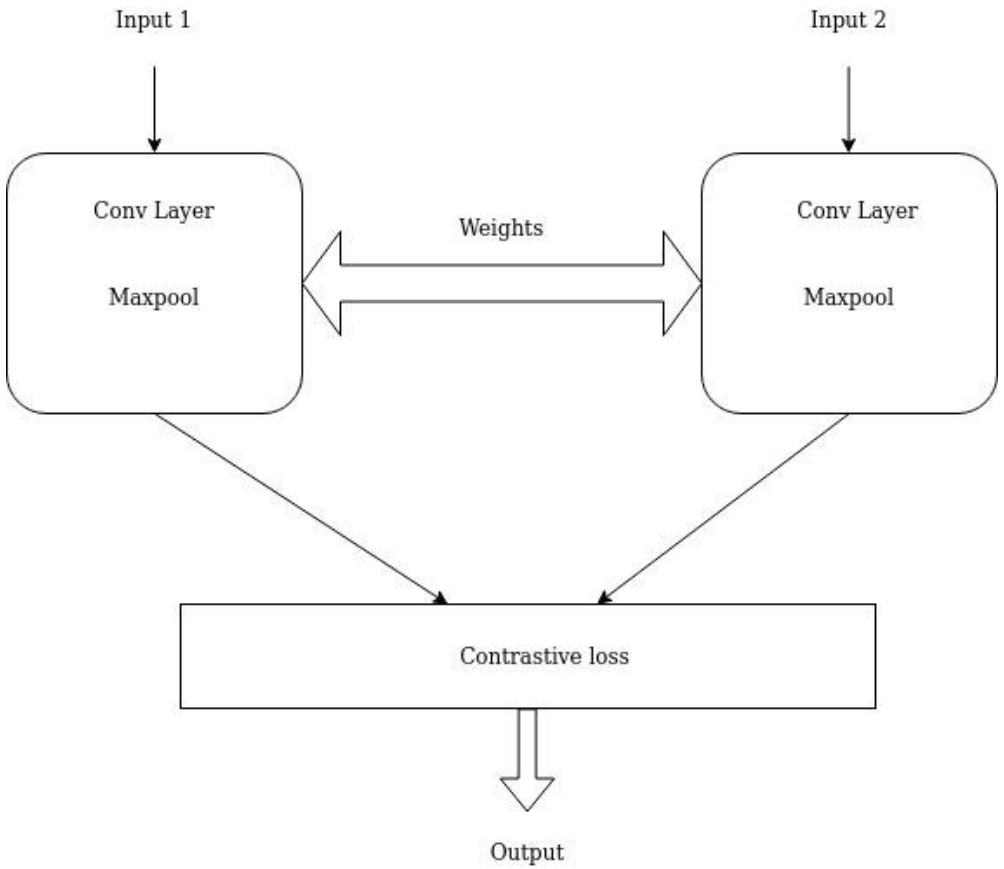
Research Methodology

Genuine

Research Methodology

Imposite

Model Architecture

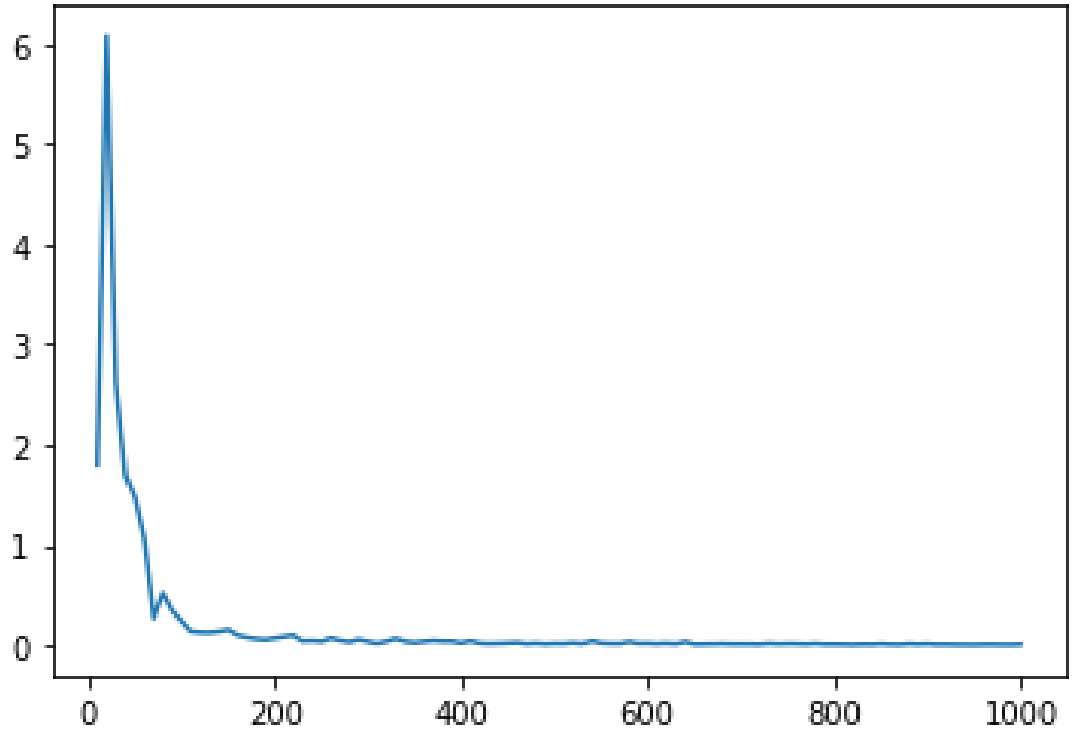


Contrastive Loss:

- $L(W, Y, A_1, A_2) = Y\{\frac{1}{2}(\max(0, m - \ D_w)\}\ ^2 + (1 - Y)(\frac{1}{2})D_w{}^2$
- where Y is the output label, A_1, A_2 are input feature vectors, m is the margin, and D_w is the distance function.

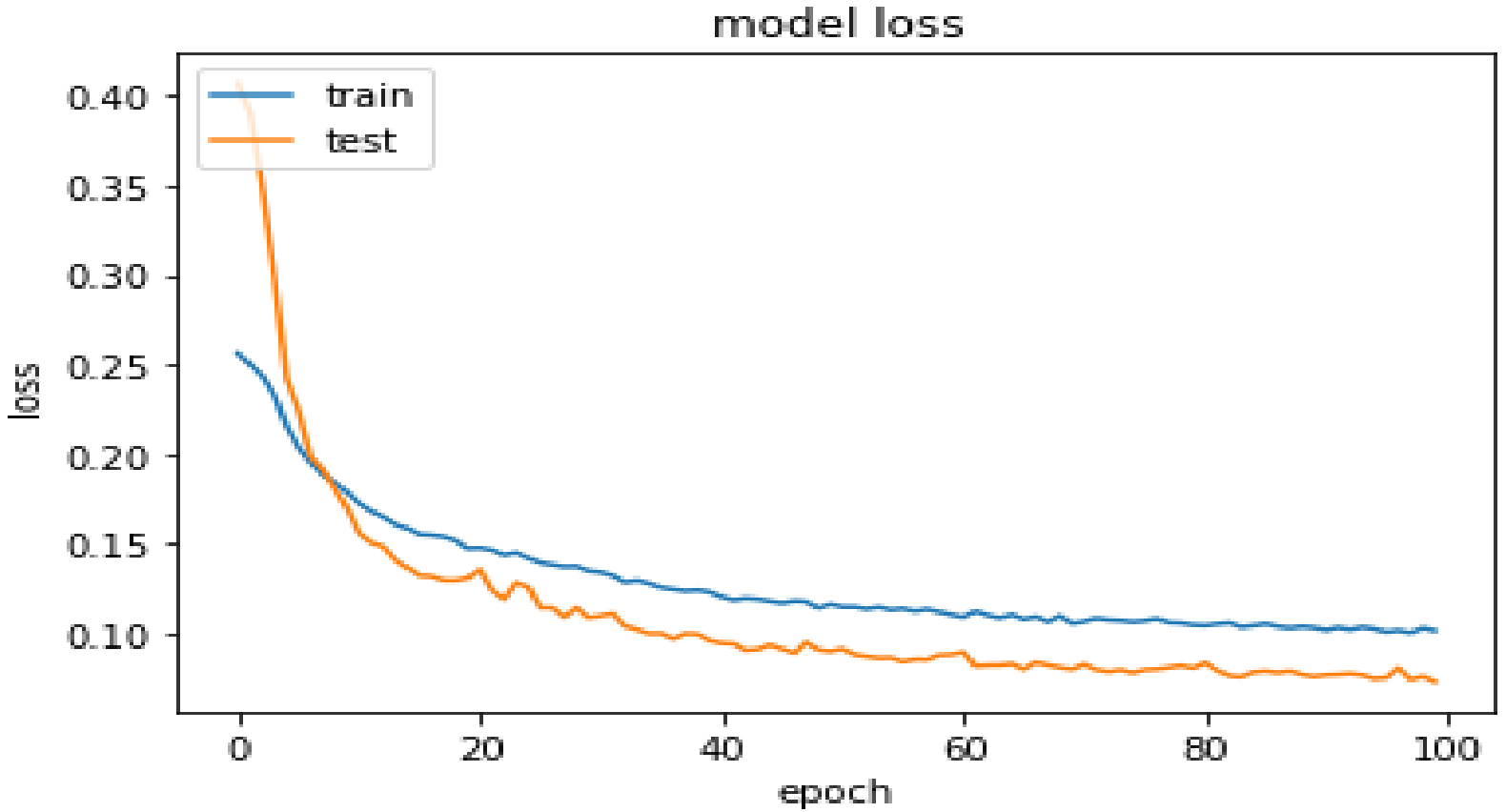
Result Evaluations:

- Loss function change for dissimilarity calculation



Result Evaluation

- Training and Testing loss for classification task:



Results Evaluations:

	Loss	Accuracy
Training	0.093	0.9322
Testing	0.98	0.8939

Results Evaluations

Classifier	Accuracy
Haar Cascade	89%
Viola-Jones	92.1%
Siamese Networks	89%

Conclusion

- Covered basic concepts of deep learning.
- Discussed methods for image classifications.
- Presented New architecture for face Recognition
- Conducted experiments to prove its efficacy
- Evaluated the results with other similar systems.