Team 9

Comparison between ANN and SVM in Image Classification

Introduction

▶ Goal

  ▶ Comparing basic Artificial Neural Network(ANN) with Support Vector Machine(SVM) in image classification

  ▶ Finding optimal training parameters by experimenting various settings

▶ Motivation

  ▶ Examining how well SVM and basic ANN perform in multi -class data

    ▶ SVM and ANN are deprecated in image classification

    ▶ Figuring out the limitation of these basic classification algorithms

Dataset

► CIFAR-10

  ► 10 Categories

  ► Size : 32*32 pixels with 3 channels

  ► Train set : 10000 samples

  ► Test set : 1000 samples

  ► Preprocessing
    mean normalization

Experiment Settings
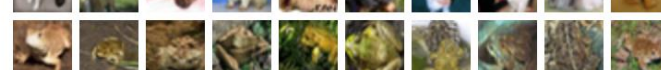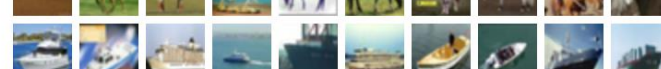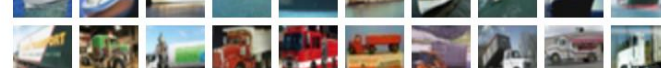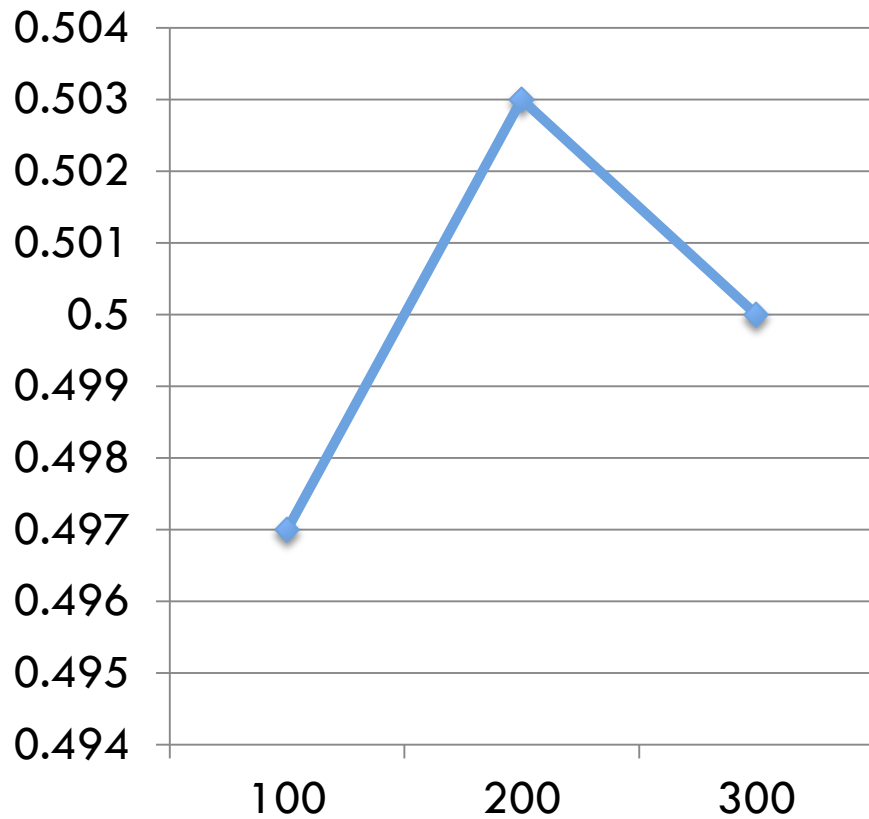
- ANN
  - Single layer
  - Number of hidden units : 100, 200, 300
  - Epoch : 20
  - Minibatch size : 200
  - Learning rate : 0.001
  - Activation function : softmax
  - Loss function : softmax cross-entropy
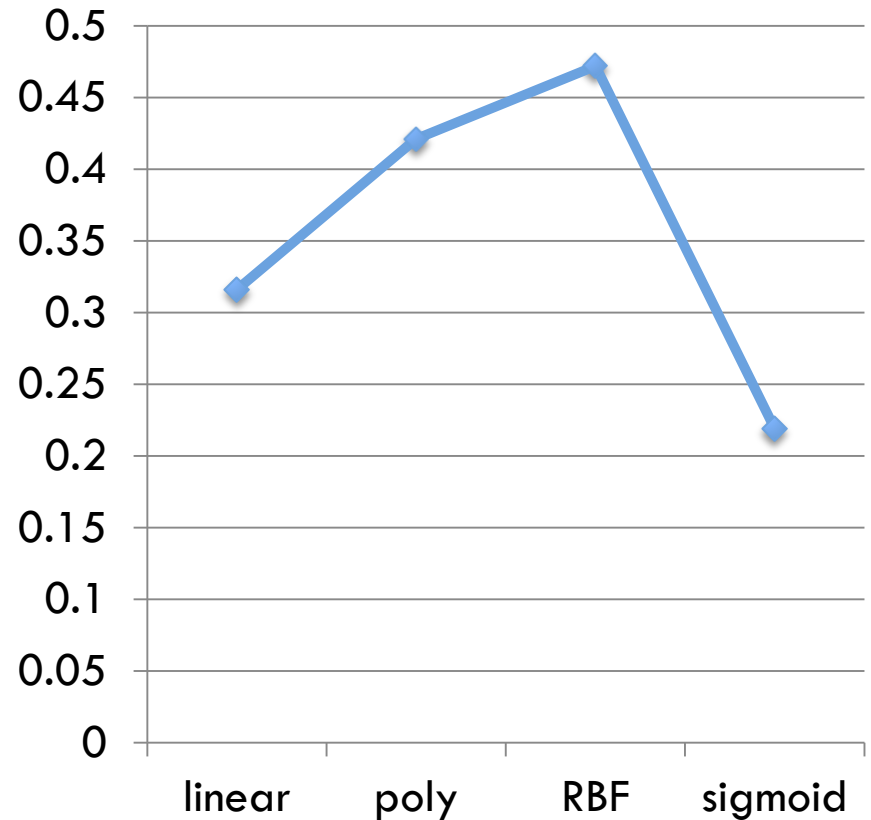
- SVM
  - Different kernel functions : linear, polynomial, RBF, sigmoid
  - C : 1.0
  - gamma : 0.00033, 0.01
  - Preprocessing : mean normalization

Results

ANN

SVM(scikit-learn)

Analysis

ANN	SVM
• best performance with 200 hidden units (no significant difference) • single layer network can get 75% accuracy in cifar-10 classification task : PCA whitening, k-means clustering, ReLU • with batch normalization 60% accuracy is reported • parameter optimization needed	• best performance with RBF kernel • polynomial with degree 3 might show better result when optimized • sigmoid kernel was worse than linear kernel • gamma 0.00033: 1 / feature dimension 0.001: default value

- ANN performs better than SVM

- Needs improvements
  advanced preprocessing techniques, batch normalization, etc.

- CNN with tensorflow: 86.2% accuracy

Reference

- *ANN's vs. SVM's for Image Classification*, Poobalan Govender, ASET 2012

- *An analysis of single-layer networks in unsupervised feature learning*, Coates, A.a, Lee, H.b, Ng, A.Y.a, AISTATS 2011