CS 534 Final Project
Shoes recognition

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It is not enough

• In the real life:

• Shoes

• Balls: basketball, football, ping-pang
Computer vision

https://www.youtube.com/watch?v=3SQiw-X3ko
Improve the algorithm

- Multi-class Classification

1. One vs. rest

2. Pairwise
In our project

We will classify three kinds of shoes:
• boots
• running shoes
• flip-flop
Input

• Training example:
  120 images of each type of shoes (360 totally)

• Testing example:
  50 images of each type of shoes (150 totally)

• $\eta = \{1E^{-3}, 1E^{-2}, 1E^{-1}, 1, 1E^1, 1E^2, 1E^3\}$
Converting Images from Amazon.com within any size

Convert to 50x50 png files

Convert to 
\[x]_{2500x1} = [p(1,1); p(2,1);...p(50,50)]
Batch Gradient Ascent

\[ w = [0 \ 0 \ 0 \ ... \ 0] \]
While not converged, do
\[ d = [0 \ 0 \ 0 \ ... \ 0] \]
for each sample i, do
\[ x_i = \text{(Load a 50x50 gray image)} \]
\[ \hat{y}_i = \frac{1}{1 + \exp(-w \times x_i)} \]
\[ \text{error} = y_i - \hat{y}_i \]
\[ d = d + \text{error} \times X^T \]
\[ w = w + \text{eta} \times d \]
Accuracy (training data, classifier A)

Accuracy = 100%
Accuracy (test data, classifier A)

Accuracy = 93.33%
Accuracy (training data, classifier B)

Accuracy = 100%
Accuracy (test data, classifier B)

Accuracy = 92.67%
Combine the two classifiers
Combine the two classifiers

Accuracy = 86.67%
Application

• Shopping website

• Computer vision
  (e.g. traffic environment recognition)

• CBIR(Content-based image retrieval)
Problems

• Learning cost
  More classes, more learning cost

• Accuracy
  More classes, lower accuracy
Conclusion

• Boots vs. running shoes

• Possible ways to improve

• Forecast
Thanks