6/19
One-shot Recognition

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Project Review

- Learn a linear/non-linear projection to a lower dimension
- “Learn how to learn” by training on multiple subsets of the training data
  - One subset = 1 pseudo training example, 1 pseudo testing example
- Evaluate with one-shot recognition (one training example)
  - Using K-Nearest Neighbors
This Week’s Progress

- Fixed a lot of bugs in implementation
- New corrected results for previous setups
- Optimized code with efficient data structures
- Implemented different baseline systems for comparison
- Further extended system
  - Different distance metrics
  - Multi-layer for nonlinearity
Experimental Setup

- Setup for experiments:
  - 1000 different sets of:
  - Training classes – subset = 1 training example, 10 testing examples
  - Testing classes – subset = 1 training example, 10 testing examples
  - Reduction to 10 dimensions
Corrected Results

- PCA (baseline)
  - ~17.30% mean accuracy

- Linear Projection
  - ~12.85% mean accuracy
  - Not fully optimized

- Logistic Projection
  - ~18.23% mean accuracy
New Extensions

- Additional baseline measurements
  - No dimensionality reduction
  - $A = \text{Identity matrix}$
- Different distance metrics
  - $\log(1 + \text{norm}(O(x) - O(y))^2)$
  - $\text{sum}(\log(1 + (O(x) - O(y)).^2))$
- Higher dimensionality reduction
  - Increase to 50 dimensions
  - Lampert has 85 attributes (dimensions)
- Run on training classes
- Multi-layer dimensionality reduction
  - Provides more non-linearity
Results

- Same experimental setup as before
- \( A = \) Identity matrix (baseline)
  - \( \sim 14.87\% \) mean accuracy
  - PCA: \( \sim 17.30\% \) mean accuracy
- Log distance, logistic projection
  - \( \sim 18.16\% \) mean accuracy
  - Logistic Euclidean: \( \sim 18.23\% \) mean accuracy
- Log distance summed, linear projection
  - \( \sim 19.81\% \) mean accuracy
  - Linear Euclidean: \( \sim 12.85\% \) mean accuracy
More Results

- Higher dimensionality reduction
  - Logistic projection with 50 dimension reduction
  - ~20.22% mean accuracy
  - Best results so far
More Results

- Evaluate on training classes
- Logistic projection (50 dimensions)
  - ~19.94% mean accuracy
  - Chance accuracy: 2.5%
- PCA (50 dimensions) (baseline)
  - ~4.63% mean accuracy
- A = Identity matrix (baseline)
  - ~4.03% mean accuracy
More Results

- Cascaded multiple logistic projections to make multi-layer, more non-linearity
- Not helping, as we are over-fitting
- Training classes accuracy for 5-layer: ~51.41%
Next Steps

- 6 sets of features, right now only using rgsift
  - Incorporate all feature sets together
  - Extend multi-layer idea here

- Implement more sophisticated form of Stochastic Gradient Descent

- Possible extension to fast object recognition

- Obtain actual images from Lampert