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**Parent Item:** Learning a Nonlinear Embedding by Preserving Class Neighbourhood Structure

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# Summary

## Intro

- Having a learned feature representation as well as a learned distance metric can significantly help with KNN problems
- NCA is a linear metric learning algorithm, this work proposes expanding this to nonlinear applications

## Learning Nonlinear NCA

- They lay out the equations for nonlinear NCA
- Can explore much richer class of transformations through nonlinear

## Pretraining

- Describe an unsupervised way to transform input data into feature representation
- Learns a stack of RBMs where feature activations of one RBM are treated as data by the next
- The training can be repeated several times in order to learn a deep model in which each layer of features captures some strong high-order correlations
- Used conjugate gradients on larger mini-batches

## Experimental Results

- Results of class separation are shown to be much better for nonlinear NCA than for LDA, PCA, and Linear NCA

## Regularized Nonlinear NCA

- Can use a setting for semi-supervised learning tasks that they have shown
- regularized nonlinear performs better than non regularized when the number of labeled examples is relatively small
- Can also use this for reconstruction of an image as long as the info for certain aspects are not dimensions in the NCA objective function so you don't have any unwanted effects

## Conclusions

- Have created nonlinear encoder network that learns a similarity metric
- Achieved best reported error rate for reconstruction on MNIST
- comparison to other methods for metric learning remains to be done