Project 1.

Is that you? Metric Learning Approaches for Face Identification

Team Ikshana

Ananya Arun (20171019)
Samhita Kanaparthy (2018121005)
Sravani Kaza (20171189)
Thejasvi Konduru (20171134)

Introduction

Paper: *Is that you? Metric Learning Approaches for Face Identification*

By Matthieu Guillaumin, Jakob Verbeek and Cordelia Schmid

The paper, talks about the problem of **face recognition and identification**. That is to determine if two face images depict the same person or not.

Challenges observed: This is difficult due to variations in scale, pose, lighting, background, expression, hairstyle, and glasses

Approach: Proposed two methods for learning robust distance metrics (Mahalanobis distance) that outperform the various state of art techniques in face Identification which are 1) LDML 2) MkNN

$$d_{\mathbf{M}}(\mathbf{x}_i, \mathbf{x}_j) = (\mathbf{x}_i - \mathbf{x}_j)^\top \mathbf{M} (\mathbf{x}_i - \mathbf{x}_j)$$

Logistic discriminant approach (LDML):

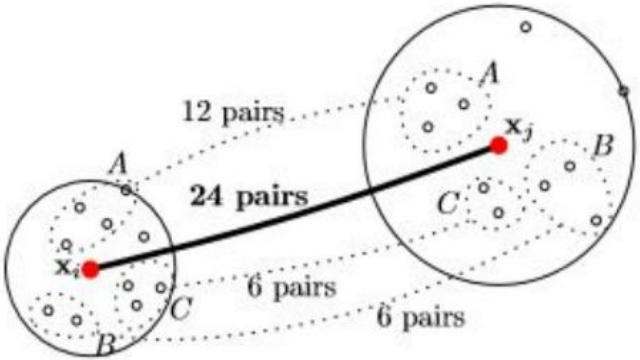
LDML is a logistic discriminant approach which learns the metric from a set of labelled image pairs. Its objective is to make distance between images in positive pairs to be smaller than the distances corresponding to negative pairs.

$$p_n = p(y_i = y_j | \mathbf{x}_i, \mathbf{x}_j; \mathbf{M}, b) = \sigma(b - d_{\mathbf{M}}(\mathbf{x}_i, \mathbf{x}_j)),$$

$$\sigma(z) = (1 + \exp(-z))^{-1}$$

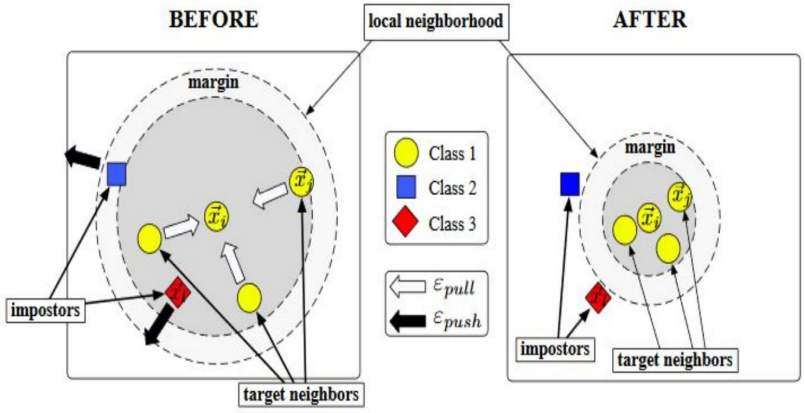
Nearest neighbour approach (MkNN):

Computes the probability for two images to belong to the same class. The score of our Marginalized kNN (MkNN) binary classifier for a pair of images (x_i , x_j) is based on how many positive neighbour pairs we can form from neighbours of x_i and x_j.



State of Art Model:

Large Margin Nearest Neighbour Metrics (LMNN)



The intuition is that for each data point we need a metric which makes the k nearest neighbours of its own class – target neighbours – closer than points from other classes. The objective has two term, one minimises the distances between target neighbours, while the other is a hinge-loss that encourages target neighbours to be at least one distance unit closer than points from other classes.

Objectives:

1. To implement different methods of finding distance metrics like LMNN, LDML, MKNN based Face Classification on unrestricted data of LFW Dataset.
2. We experiment different combinations of these methods for better estimation of results.
3. We also experiment the accuracies of Face Identification with different distance metrics for MKNN.

LFW Dataset


Elisabeth Schumacher, 1 Elisabeth Schumacher, 2


Debra Messing, 1 Debra Messing, 2

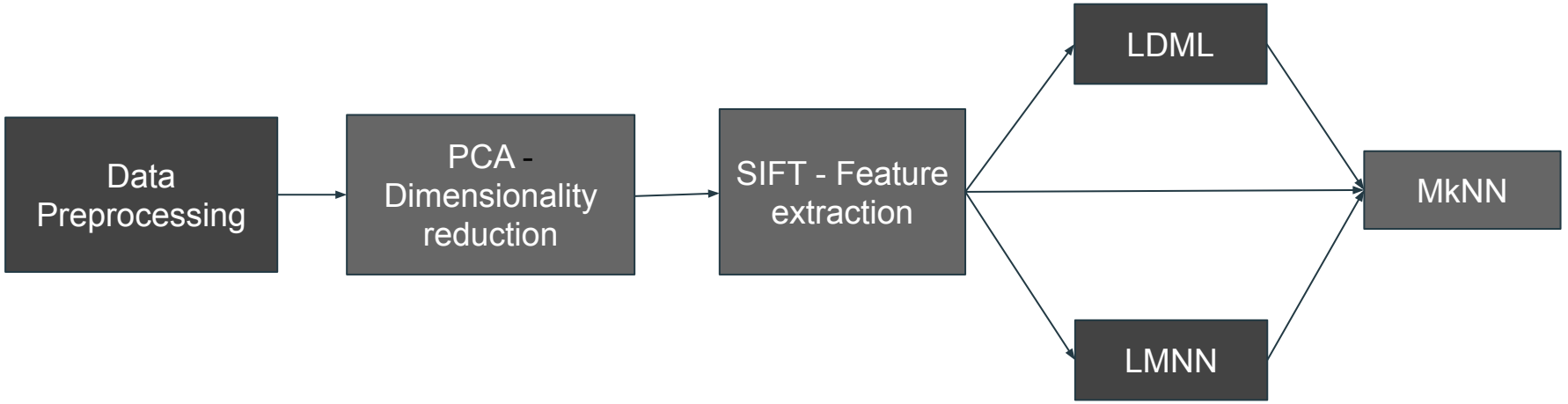
Labeled Faces in the Wild Dataset

- 13233 images
- 5749 people
- 1680 people with two or more images

The paper runs the experiment in two different settings

- Restricted - fixed set of positive and negative image pairs given
- Unrestricted - faces labeled by their identity

Pipeline


Data Preprocessing
PCA - Dimensionality reduction
SIFT - Feature extraction
LDML
LMNN
MkNN

Project Deliverables - Timeline

Mid Evaluation	Feature Extraction from Images using **SIFT**
	LMNN Implementation
End Evaluation	**MkNN** Implementation
	Run different experiments to compare between L2, LMNN and different k values
	LDML (if time permits)