

Licence Plate (Re-)Recognition

Work at Conduent Labs India, Bangalore
(previously Xerox Research Centre India)



Background

- Optical Character Recognition (OCR) - the de facto standard approach used for license plate recognition, but occasionally runs into issues.
- A secondary approach is to re-identify license plates by matching them with previously seen plates.
- Suitable for applications like electronic tolling or parking systems where the same vehicles may be seen repeatedly.

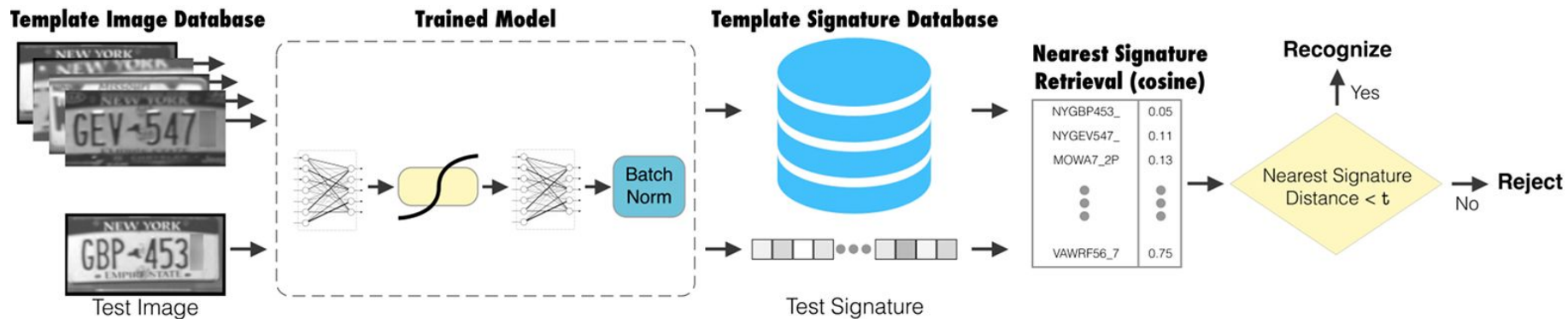
Goals

- Learn a feature representation for licence plate images, such that the following process works:
 - a. Compute feature vector for previously seen plates
 - b. Compute feature vector for incoming vehicle plate
 - c. Perform nearest-neighbour matching
- This should work with high accuracy even if thousands of vehicles have been seen at that tollbooth.
- Some vehicles may be new, so they should not be matched...

Our Contribution: *f2nn*

- Hybrid model with two distinct stages:
 - Fisher vector (an unsupervised statistical model for generating image representations)
 - A 2-layer fully connected neural network, optimized using the triplet loss (used for face recognition)
- Loss function is important; results vary widely with different choices
 - Some models didn't converge with softmax
- Used popular convolutional neural networks (VGG and ResNet-50) for comparison

Benchmarking



Some definitions

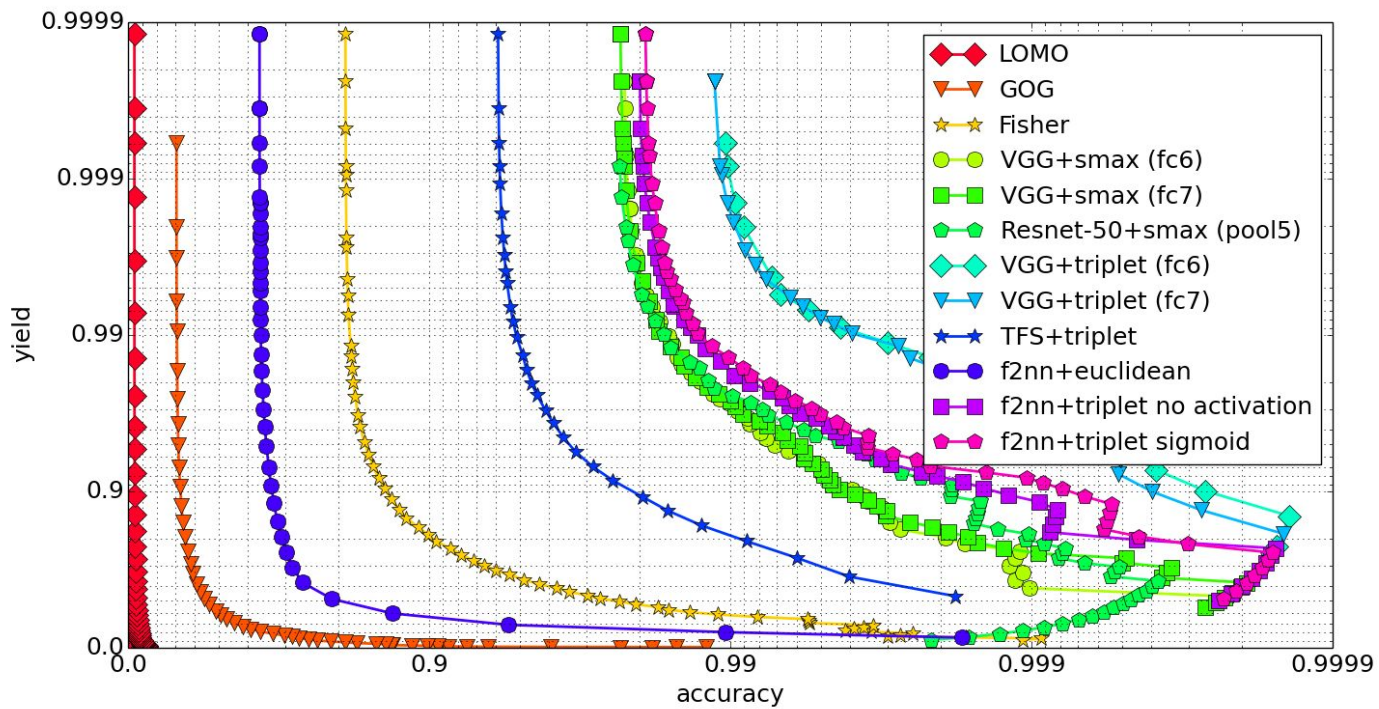
- Yield:

$$\frac{\text{vehicles we have previously seen and which we recognize}}{\text{vehicles we have previously seen and which show up}}$$

- Accuracy:

$$\frac{\text{vehicles which we recognize correctly}}{\text{vehicles we recognize}}$$

Results



What did I do in this work?

- Literature survey on CNNs
- Understanding existing system at Xerox, which used Fisher vectors
- Playing with different pre-processing and augmentation techniques
- Trying different CNN models
- Understand and extend Caffe source code (C++ and CUDA) to be able to use triplet loss
- Use lab server (with GPU), and cloud resources (Microsoft Azure), for experiments