Image Search on Mobile Phones made simpler

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1. Introduction

In this Project, we are going to implement Face net to recognize images based on similarity in context, location etc. for low power devices like smartphones. To boost the performance of Convolutional neural network, we plan to use Binary Nets using Tensor flow for smartphones.

2. Existing Work

Some Already existing work[1] have been there for Face Recognition implementations with accuracy as high as 94.6%, but with changes brought in by Facenet[2] and BinaryConnect Networks it has become possible to computation on Mobile system. Even though advanced techniques exists in implementing face verification and recognition there exists serious challenges to current approaches. At present the existing system Face Net[2] learns a mapping from face images to Euclidean space where distances correspond to measure of similarity between the faces. This space has been produced, and tasks like face recognition, verification can be implemented using techniques with Face Net embedding as feature vectors. This uses Convolutional network to optimize the embedding.This approach has much better accuracy. The main challenge in this approach is to implement face net through Tensor flow for low power devices like smartphones.TO improve the performance in mobile phones we implement Binary Nets on top of CNN .There exist two efficient approximations to standard convolutional neural networks: Binary-Weight-Networks[3] and XNOR-Networks[4]. In Binary-Weight Networks, the filters are approximated with binary values, where as in XNOR-Networks, both the filters and the input to convolutional layers are purely binary. XNOR-Networks uses binary operations for approximate convolutions.

3. Approach

expected experiments and direction of analysis and a thorough literature survey with appropriate references.

Our approach is to use a version of FaceNet implemented on Binary CNN using Tensorflow framework for Android. For the current implementation we are aiming to provide tags to photographs based on face recognition and search photographs of family and friends using generated tags and context such as timestamp, event, Geo-spatial context etc. According to current project plan we are going to use images stored in a photo gallery as the training data for the network, which will be trained by creating artificial samples of the user tagged photographs. If time permits we will also implement incremental learning for our model in order to provide dynamic addition of output classes in order to add tags to unknown people in photographs which model hasn't seen before. We decided with this approach in support of the recent development in Binary Networks on low power hardware. We will be using Tensorflow for Android version which is designed on low precision floating point calculations. If the framework is successful then we will try to tackle challenges and constraints posed by a Mobile Computing platform. There are many challenges to projects like computation capability and power and energy budget of a Smartphone which we will try to address in the given time to best of our ability.

4. Work Division

The following table presents the tentative work division

TABLE 1. WORK DIVISION

S.no	Task	Assignee	Deadline
1	Basic Android App Layout	Vishal	10th March
2	Facenet on Tensorflow	Rajagopaalan	15th March
3	Demo test Tensorflow Android	Vishal	17th March
4	Image Feature Extraction	Rajagopaalan	25th March
5	Context based Image tagging	Vishal	04th April
6	Improvements to Model	Rajagopaalan	05th April
7	Search Algorithm	Vishal	15th April
8	Implement on Android Tensorflow	Rajagopaalan	15th April
9	Testing and Validation	Vishal	17th April
10	Artificial dataset generation	Rajagopaalan	20th April
11	Testing with real dataset	Vishal	21st April
12	Incremental Learning	Rajagopaalan	25th April

References

[1] Dave et al., *Face Recognition in Mobile Phones*, Standford University, Jun. 7, 2010.

[2] Dave et al., *FaceNet: A Unified Embedding for Face Recognition and Clustering*, Google Inc, Jun. 17, 2015.

[3] Bengio et al., *BinaryConnect: Training Deep Neural Networks with binary weights during propagations*, arXiv:1602.02830, Mar. 17, 2016.

[4] Rastegari et al., *XNOR-Net: ImageNet Classification Using Binary Convolutional Neural Networks*, Computer Vision ECCV 2016, 2016