Similing Face Recognition: Voting Method in Ensemble Learning

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Introduction and Dataset Description

Idea of the Project: We tried to solve the Happy House problem - people can enter the house if and only if they are smiling. We build a smile detector by using different classification algorithms to classify different

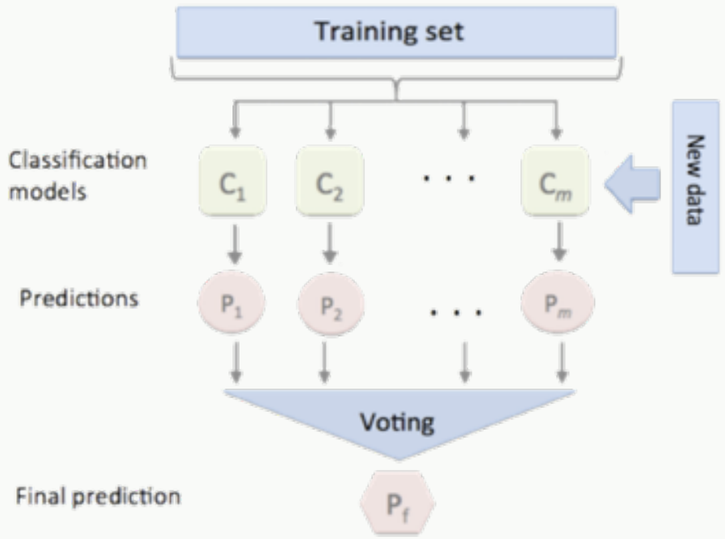
Description of Data Set: Source: Kaggle Site - Deep Learning Specialization - Convolutional Neural Network Course - Week 2 - Happy House Exercise. The train set has 600 examples and the test set has 150 examples. It Contains 2 *.h5 files One is the train dataset One is the test. The dataset contains several faces that may simle or not, for the same person.

Ensemble Learning

We try to use Ensemble Method which combines several base classifiers to one strong classifier in order to improve predictions. There several different type of ensemble method, Bootstrap Aggregation and Voting are typical methods of ensemble. Bootstrap Aggregation tries to turn a weak classifier into a strong classifier by resampling. Voting is turning several weak classifiers to a strong classifier based on voting.

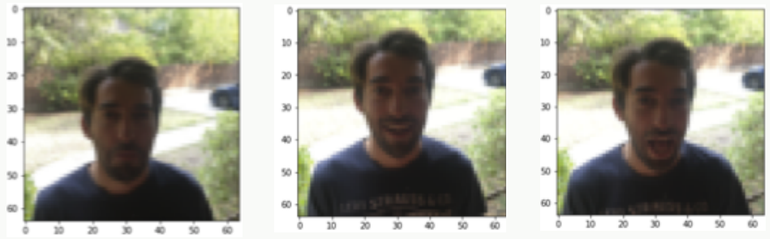
Voting Method

There are two kinds of Voting Ensemble: hard voting and soft voting. Hard voting is where a model is selected from an ensemble to make the final prediction by a simple majority vote for accuracy. Soft voting can only be done when all the classifiers can calculate probabilities for the outcomes. Soft voting arrives at the result by averaging out the probabilities calculated by individual classifier.

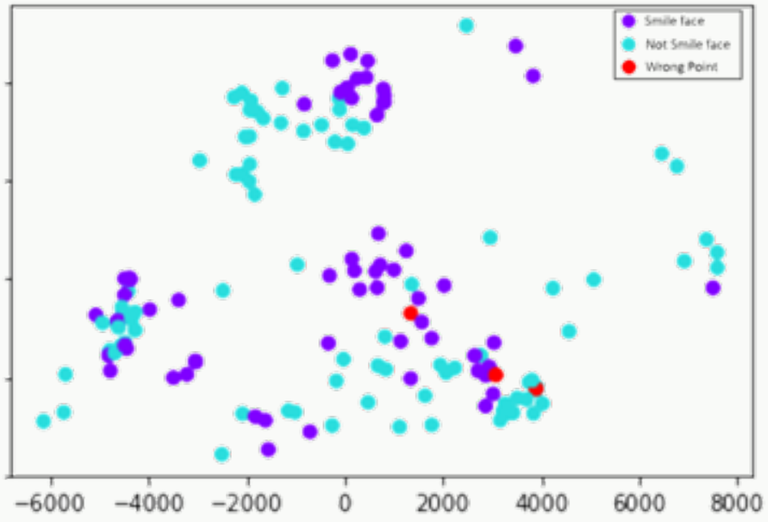


Results and Analysis

We split training set into sub-training and validation set. Using validation set to determine weight for each weak classifier, the final ensembling classifier only gives **three** mislabeled points. What's interesting is all the three faces belong to the same person.



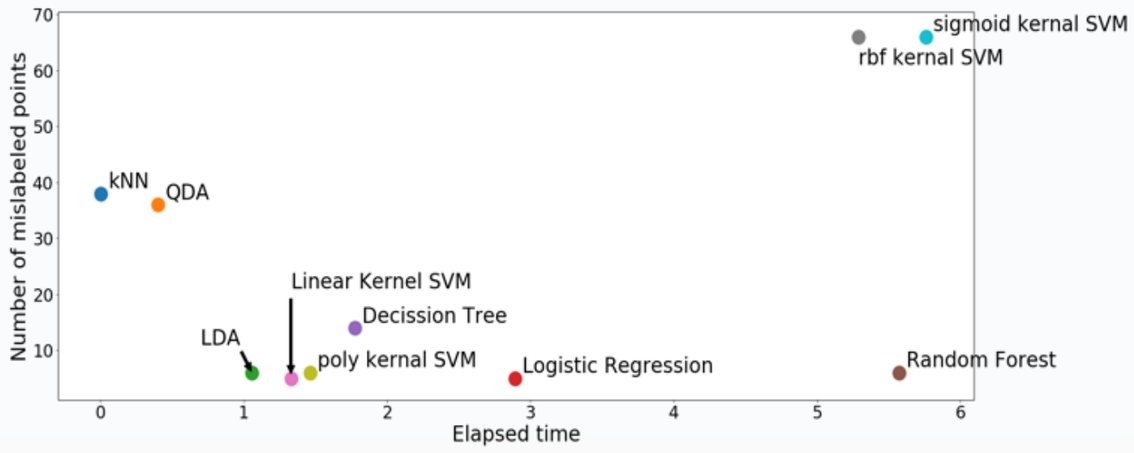
The following is classification results, where purple points mean correctly recognized smiling face and blue points are correctly recognized not smiling face, and red points are wrong recognization.



Comparison Among Different Classification and Ensembling

In order to get a better prediction, we chose 5 weaker classifiers from K-Nearest Neighbors Classification, Quadratic Discriminant Analysis, Linear Discriminant Analysis, Logistic Regression Classification, Decision Tress Classification, Random Forest Classification, Support Vector Machine Classification, Non-linear Kernel SVM and Gradient Boosting Decision Tree Classification.

Classification	Mislabels
KNN	38
QDA	36
LDA	6
SVD	6
DT	14
RF	6
Linear-SVM	5
NL-SVM-RBF	66
NL-SVM-poly	6
NL-SVM-SGD	66
GBDT	7
CNN	5



Conclusion

By using ensemble methods with multiple learning algorithms we got 3 mislabeled points, which obtains better predictive performance than could be obtained from any of the constituent learning algorithms alone.

In the recent years, due to the growing computational power which allows training large ensemble learning in a reasonable time frame, the number of its applications has grown increasingly. The application of ensemble learning has extend to many aspects like: Remote sensing, Computer security and Face recognition.