Facial Emotion Recognition

Group 9 Members

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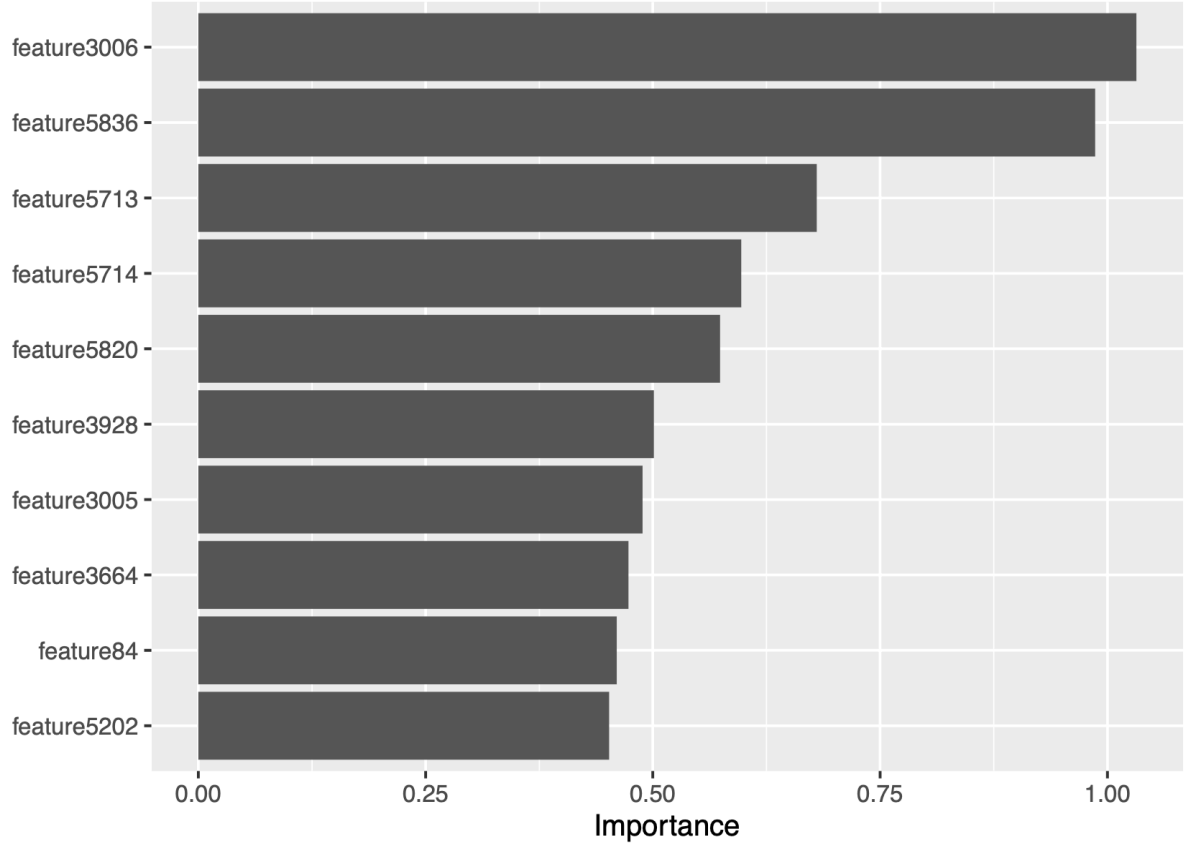
Model

- Gradient Boosting – Baseline
- Neutral Network – Advanced
- Linear Discriminant Analysis
- Logistic Regression
- Support Vector Machine
- Random Forest
- Extreme Gradient Boosting
- Ensemble Extreme Gradient Boosting and Support Vector Machine

Baseline model: Gradient Boosting Machine (GBM)

- Testing Accuracy : 40.4%
- Time for training model GBM : 1816.61s
- Pros :
  - accuracy not bad
  - no need for data pre-processing
- Cons :
  - computational expensive
  - less interpretable

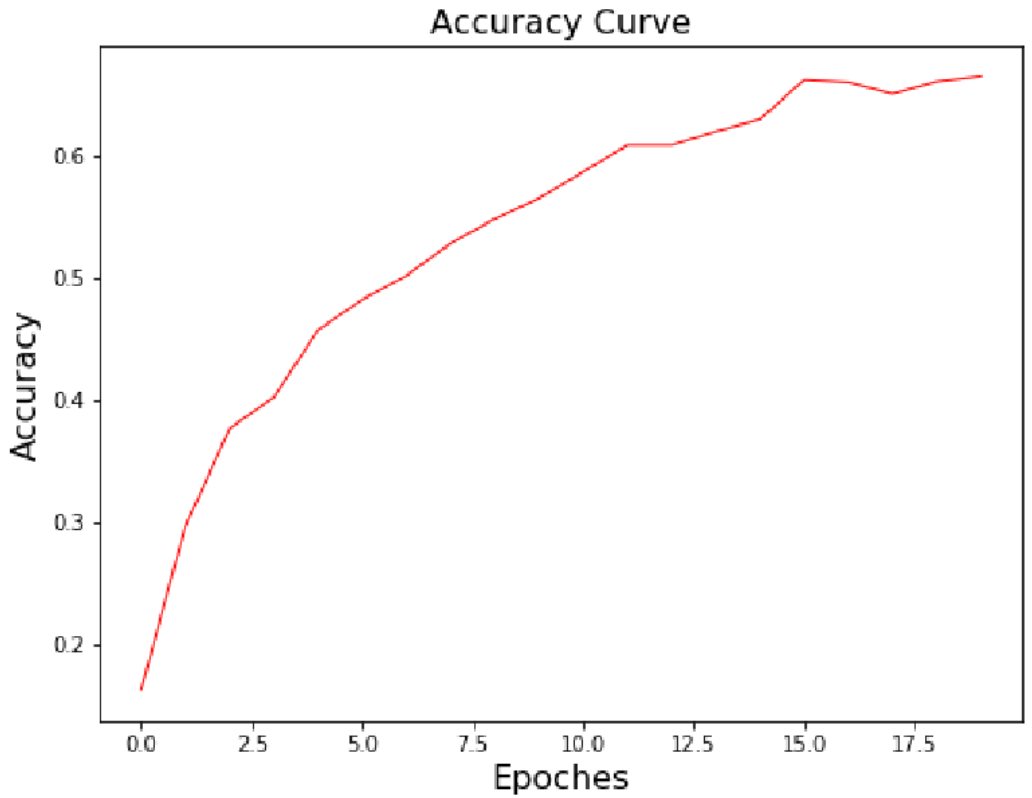
n.trees	shrinkage	interaction.depth	n.minobsinnode
300	0.15	2	10



Advanced model: Neutral Network (NN)

- Testing Accuracy : 56.2%
- Time for training model NN: 35s
- The Neural Network gives us a good prediction accuracy within a very short time.

Epoches	Training Accuracy	Testing Accuracy
20	66.5%	56.2%



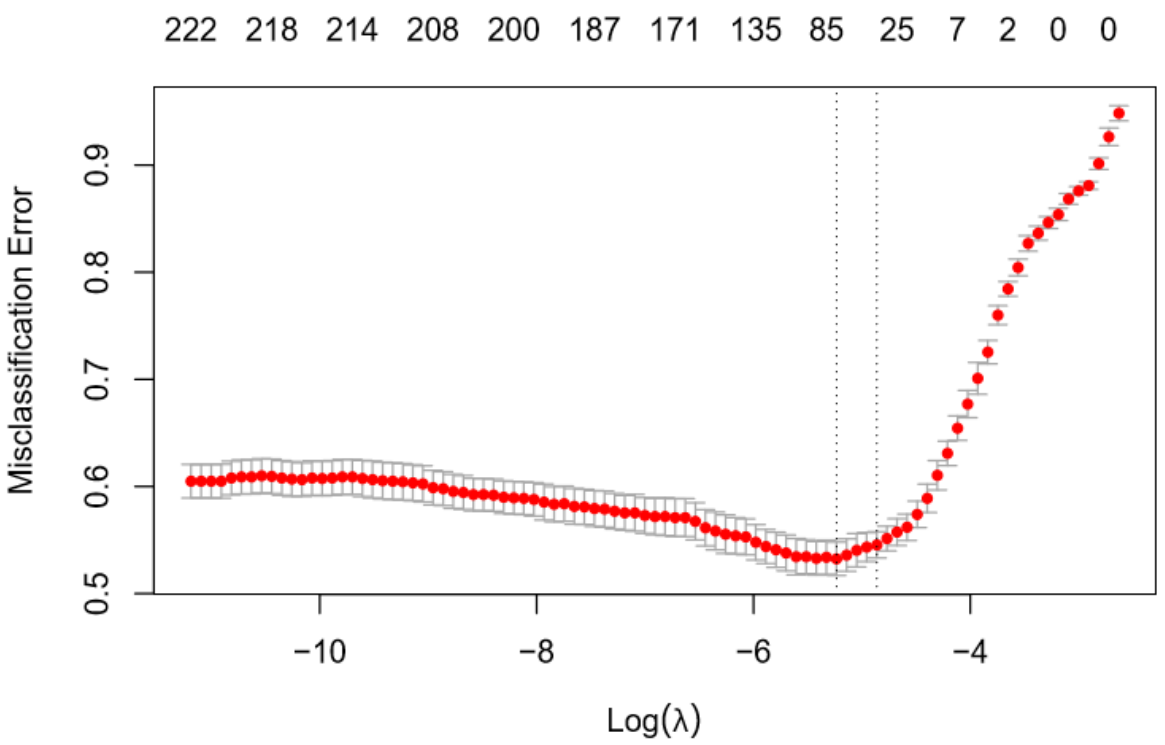
Linear Discriminant Analysis (LDA) with PCA

- Input : Fiducial Points Coordinate With PCA
- Testing Accuracy : 44.1%
- Time for training model LDA : 88.012s

Logistic Regression Model (LR)

- Input : Fiducial Points Coordinate With PCA
- Optimal Lambda : 0.0079388
- Testing Accuracy : 39.2%
- Time for training model LR : 421.2s

Find Optimal Lambda



Support Vector Machine (SVM)

- The global argument we need to consider is stated below :
  - kernel: the kernel used in training and predicting
  - degree: parameter needed for kernel of type polynomial (default: 3)
  - gamma: parameter needed for all kernels except linear (default: 1/(data dimension))

- Testing Accuracy : 51.4%

- Time for training model SVM : 117.39s

Random Forest (RF)

- The global argument we need to consider is stated below :
  - ntrees: the number of trees in the forest.
  - mtry: the number of features to consider when looking for the best split.
  - max_depth: the maximum depth of each tree.

  optimal parameter as mtry = 77

- Testing Accuracy : 41.4%

- Time for training model RF : 519.99s

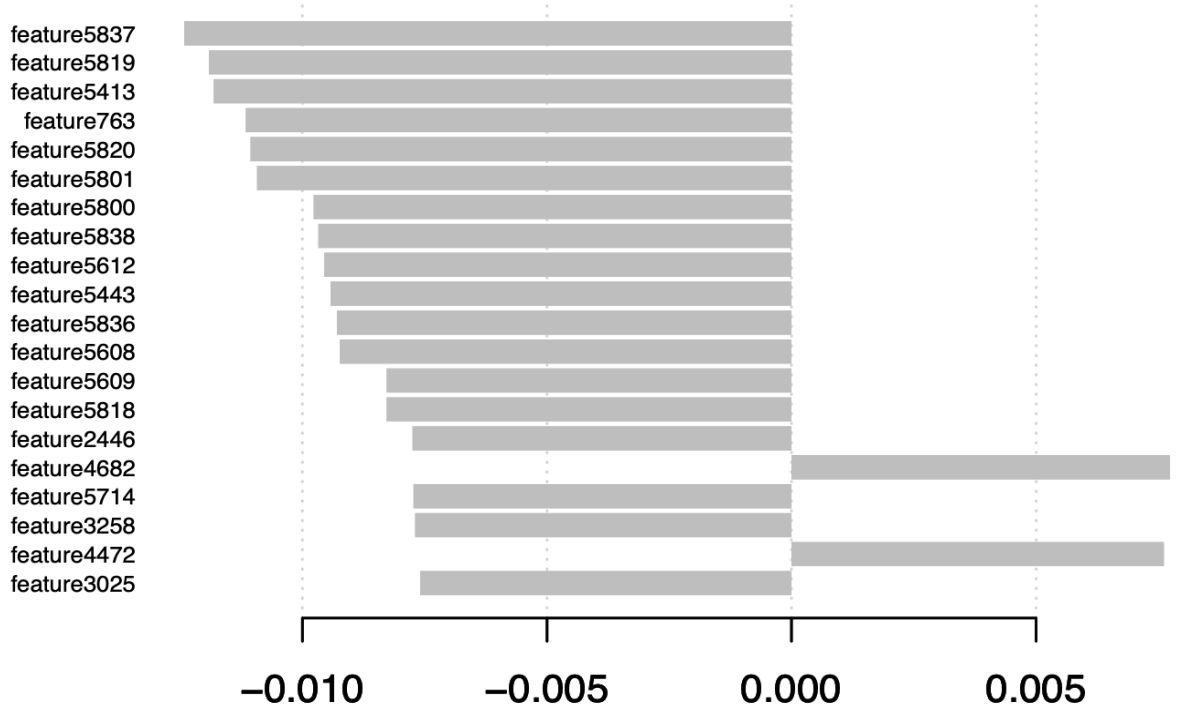
Extreme Gradient Boosting (XGBoost)

- Testing Accuracy: 53.6%
- Time for training model XGBoost: 533.71s
- Pros:

  - Higher accuracy

  - Higher efficiency in both training and testing process

booster	objective	eval_metric	lambda	Lambda_bias	alpha
gblinear	multi:softmax	mlogloss	1.46	0.23	0.0198



Ensemble Extreme Gradient Boosting (XGBoost) and Support Vector Machine (SVM)

- XGBoost and SVM (With some seed, SVM has the accuracy above 50%) have better performance than others.
- Build a simple ensemble model based on XGBoost result and SVM result, calculating a weighted average of the probability matrix then deciding the final prediction, will increase the accuracy.
- Testing Accuracy : 56%
- Time for training model Ensemble model XGBoost and SVM : 701.346s

Summary

	GBM - baseline	NN - advanced	LDA	LR	SVM	RF	XGBoost	Ensemble model XGBoost and SVM
Testing accuracy	40.4%	56.2%	44.1%	39.2%	51.4%	41.4%	53.6%	56%
Time for training model	1816.61s	35s	88.01s	421.23s	117.39s	519.99s	533.71s	701.346s
Time for testing model	13.2s	0.274 s	4.26s	0.35s	8.83s	0.608s	0.54s	9.822s

Thank you for listening!