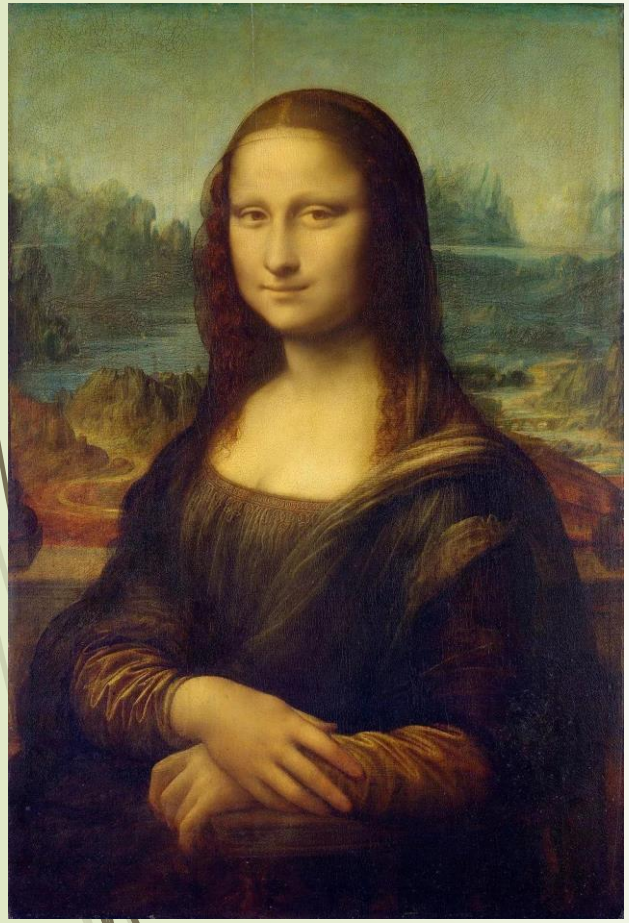


What's on Monalisa's Mind?

Model evaluation and selection using Predictive Analytics

Young Sim, Feichi Gu, Chang Qu,
Mo Yang, Thomson Batidzirai

Client's current setup:

- Classifier: Boosted Decision Stumps
- Takes 972.63 seconds to compute
- Accuracy? 45%

Our objective:

- Develop a model to classify face images by emotions
- Ensure that the algorithm is computationally efficient:

  computational time must be minimized
- Algorithm should have higher prediction levels: accuracy level should be higher than the baseline model (what the client is currently using)

Our solution…

STEP 1: Feature Engineering/Extraction

Feature Extraction Method	Number of Features
Original Features (Fiducial Points)	6,006
Principal component analysis (PCA)	30
Histogram of Oriented Gradients (HOG)	54
MyFeature1(Fiducial Points Distances)	506
MyFeature2 (Fiducial Points Distances)	98
Color - RGB	1,440

STEP 2: Selecting the model

- Paired the different features with different classification algorithms
- Tested many different combinations for:
  - Accuracy
  - Computational efficiency (computational time)
- Compared the above results to the results from the baseline model
- Picked the model that performed better than the baseline model

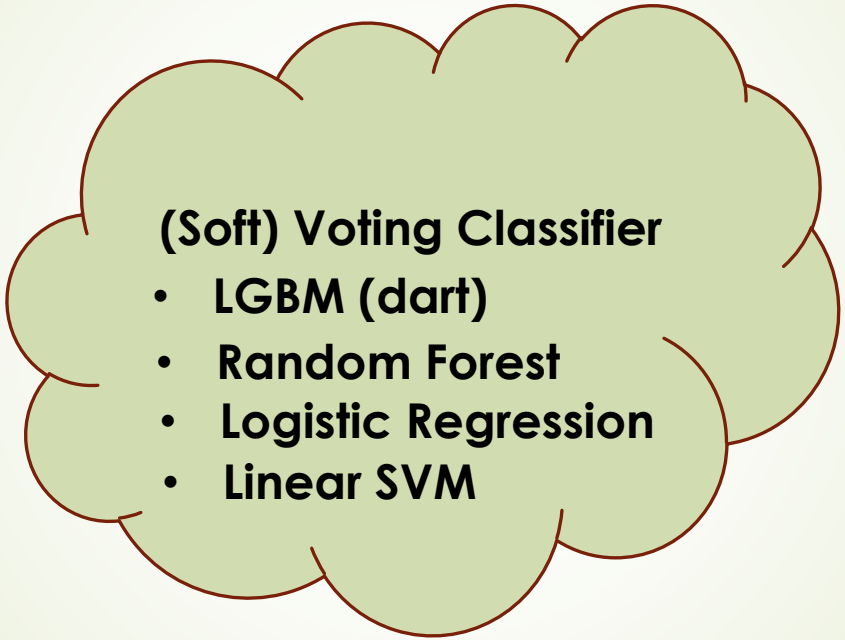
STEP 2 Continued

- XGBoost
- Linear SVM
- Random Forest
- LGBM
- Logistic Regression
- Neural Net (CNN)
- K Nearest Neighbors
- Ensemble (Voting Classifier)

Results--Accuracy

Features / Model	PCA (30)	HOG (54)	MyFeature1 (506)	MyFeature2 (98)	Original (6,006)	ImageData Generator
Baseline model	-	-	-	-	**45%**	-
XGBoost	5.62%	7.60%	39.60%	39.15%	44.92 %	-
Linear SVM	9.20%	4.80%	40.60%	42.6%	-	-
Random Forest	4.80%	14.50%	29%	40%	-	-
Logistic Regression	-	-	-	42.8%	-	-
LGBM	-	-	-	42%	-	-
KNN	-	-	-	29.4%	-	-
CNN	-	-	-	-	-	4.4%
Voting Classifier	-	-	-	**47.4%**	-	-

Final Model


(Soft) Voting Classifier
• LGBM (dart)
• Random Forest
• Logistic Regression
• Linear SVM

Results from Train_Test_Split

Using 500 test images provided, here are the final results

	Parameters	Accuracy	Running Time (seconds)
Selected Model (Voting Classifier)	Distance between selected fiducial points (Myfeature2)	47.4%	Training: 168.33 Testing: 2.03
Baseline model	Distance between fiducial points	45%	Training: 972.63 Testing: 0.91

A tight race indeed!

But the guy in yellow… wins!

Thank You!