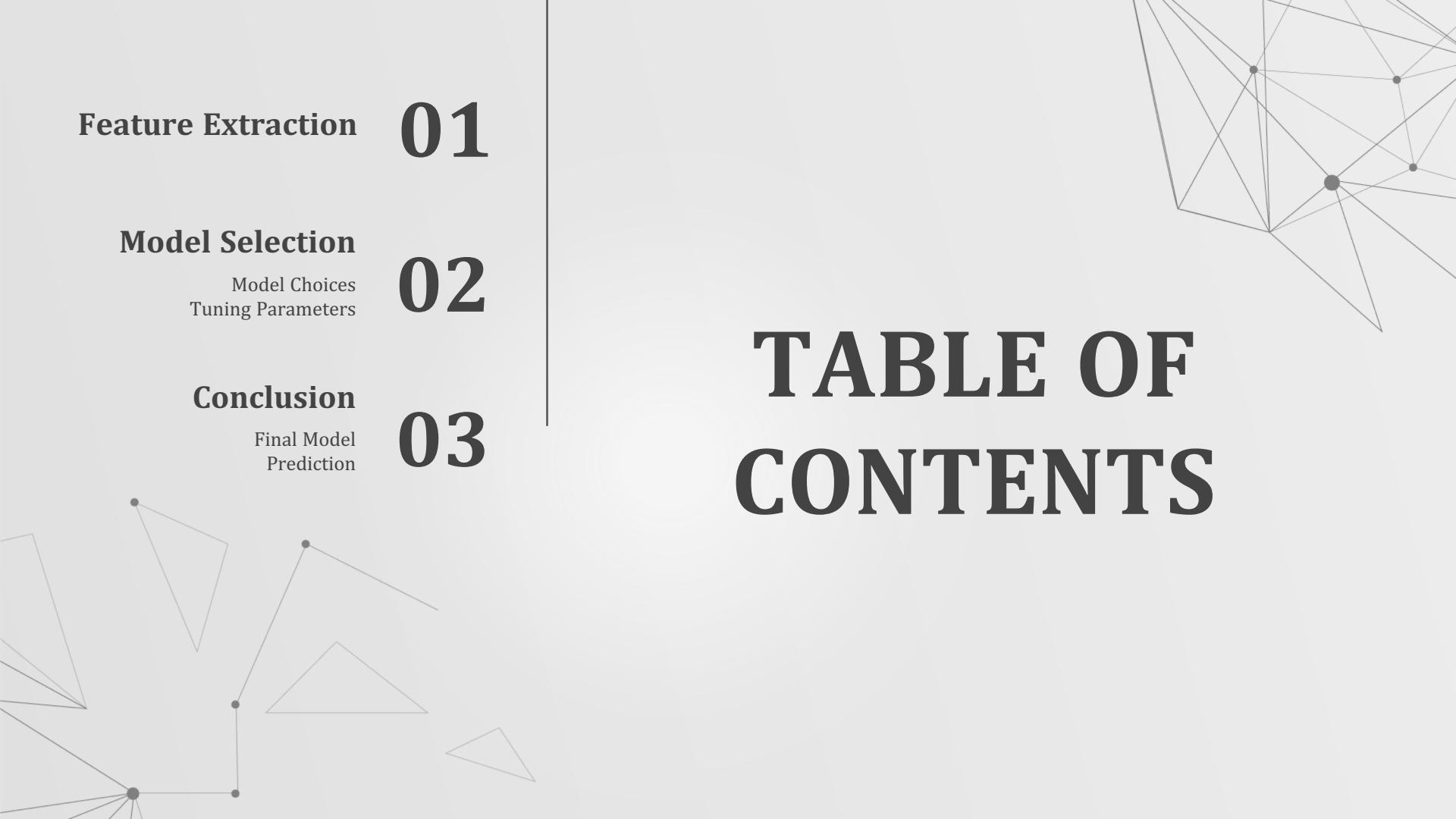
A faint background network graph consisting of numerous small, semi-transparent grey dots connected by thin grey lines. Interspersed among these dots are several larger, hollow grey triangles of varying sizes.

Applied Data Science

Project 3 : Predictive Modeling Facial Emotion Recognition

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Feature Extraction

01

Model Selection

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Final Model
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01. Feature Extraction



- Used **pairwise distances** between all the fiducial points as a feature for facial emotion recognition.
- A model that used pairwise distances as a feature showed much higher prediction accuracy than a model that used location of fiducial points.

Image source: <https://link.springer.com/article/10.1186/1687-5281-2013-8>

02. Model Selection

Baseline
GBM

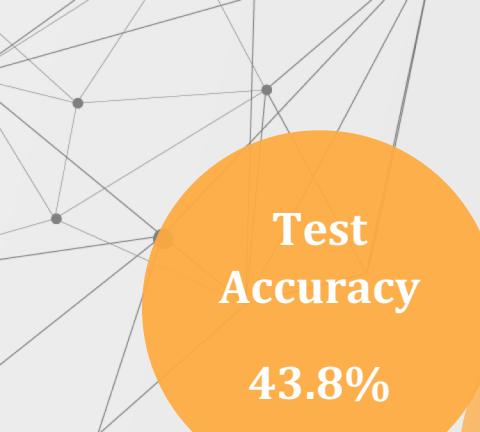
XGBOOST

SVM

Classification Models

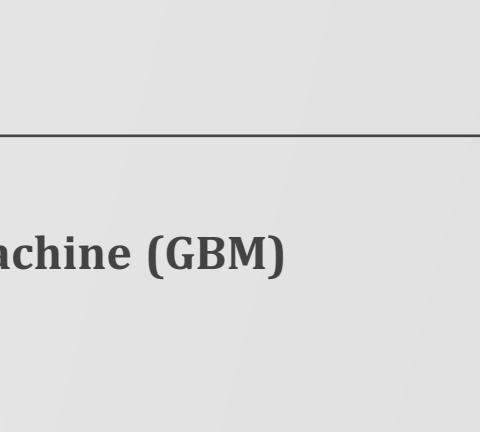
- Baseline model
 - GBM
- Advanced Models
 - XGBOOST
 - SVM

02. Model Selection



Test Accuracy

43.8%



Train Accuracy

100%

Predicting Time

0.523s

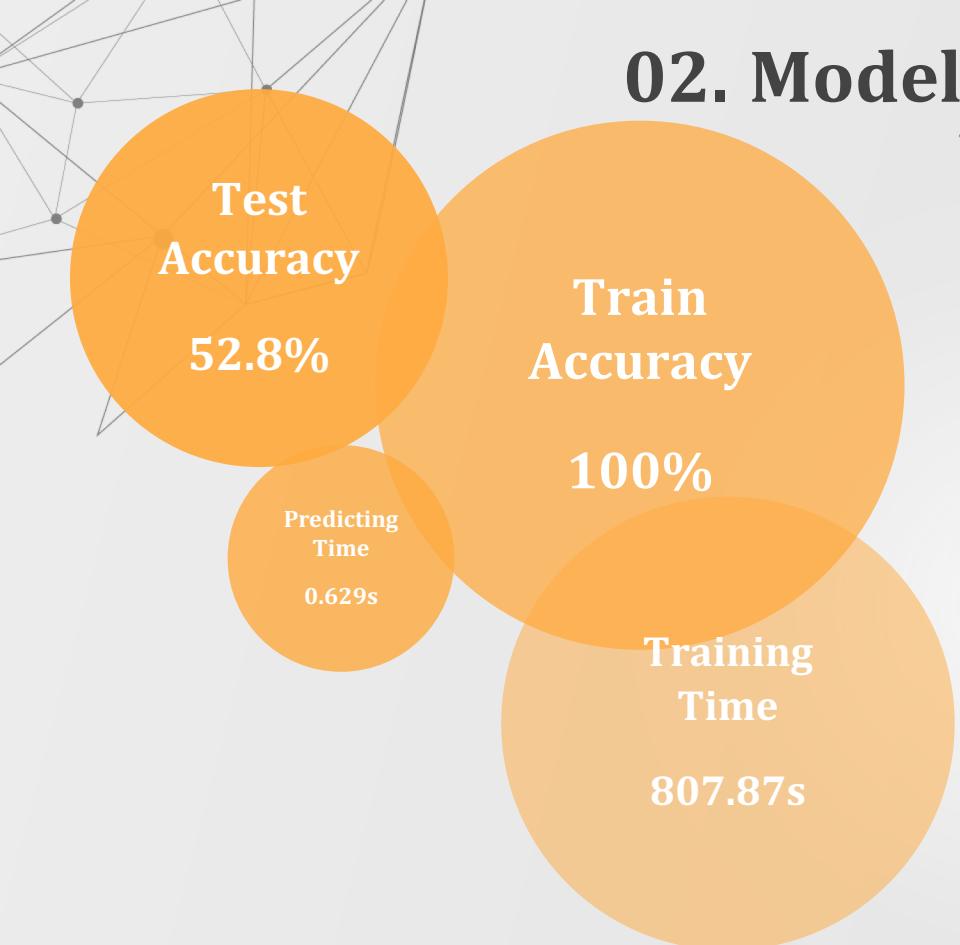
Training Time

274.6s

Gradient Boosting Machine (GBM)

- Baseline model
- Disadvantages
 - Can overemphasize outliers and cause overfitting
 - Often requires many trees (>1000) which can be time and memory exhaustive
 - Requires a large grid search during tuning

02. Model Selection

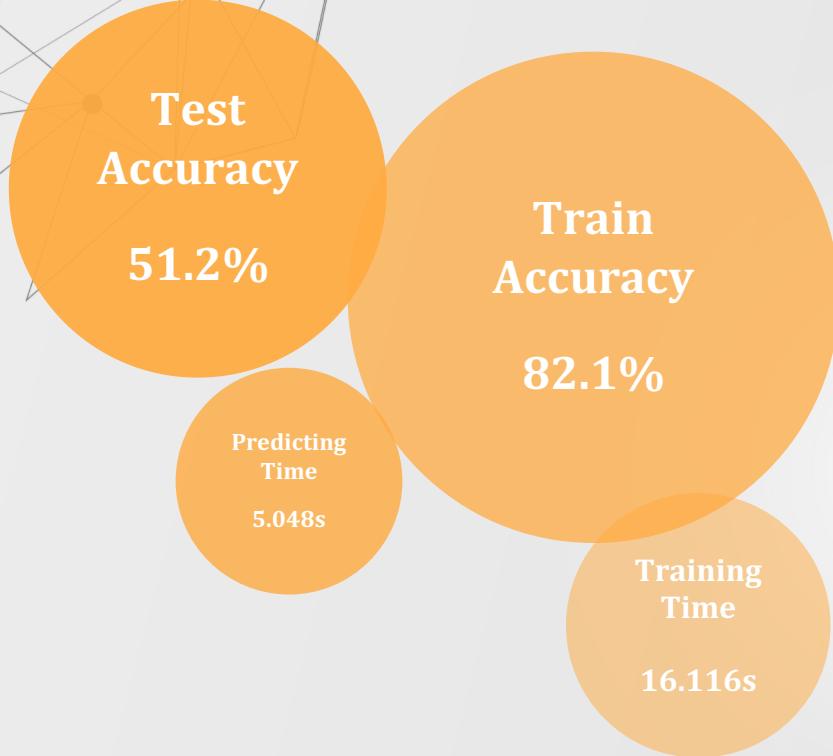


Model Choices

eXtreme Gradient Boosting (XGBOOST)

- XGBOOST vs GBM
 - Both follow Gradient Boosting
 - XGBOOST uses more regularized model formalization to control overfitting (better performance)
 - XGBOOST is more memory efficient
- Chosen Parameters
 - `n_estimators = 1000` (Number of Trees to fit)
 - `min_child_weight = 1`

02. Model Selection



Model Choices

Support Vector Machine (SVM)

- Why SVM?
 - Effective in high dimensional spaces
 - Uses a subset of training points (support vectors) in the decision function, so it is memory efficient.
- Chosen Parameters
 - Kernel : RBF
 - $c = 10$ (Penalty parameter)
 - $\text{gamma} = 0.0001$ (Kernel coefficient)

03. Conclusion

	Training Time	Test Accuracy
GBM : Baseline	274.6s	43.8%
XGBOOST	807.87s	52.8%
SVM	15.9s	50.6%

Summary