

# DBMS Praktikum

## AI Tools Lab

### SS 2020

parnet/Data-Science-Praktikum

Lime Team

Takak & parnet

Version : 16.06.2020

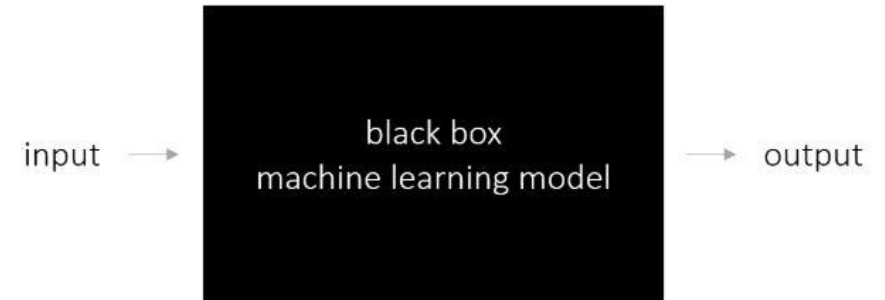
# Contents

- Datasets
- LIME
- MS IML Implementation
- IBM AIX360 Implementation
- Evaluate and Compare
- Source

# LIME (short version)

## Some Important Properties

*LIME* can be applied to any machine learning model

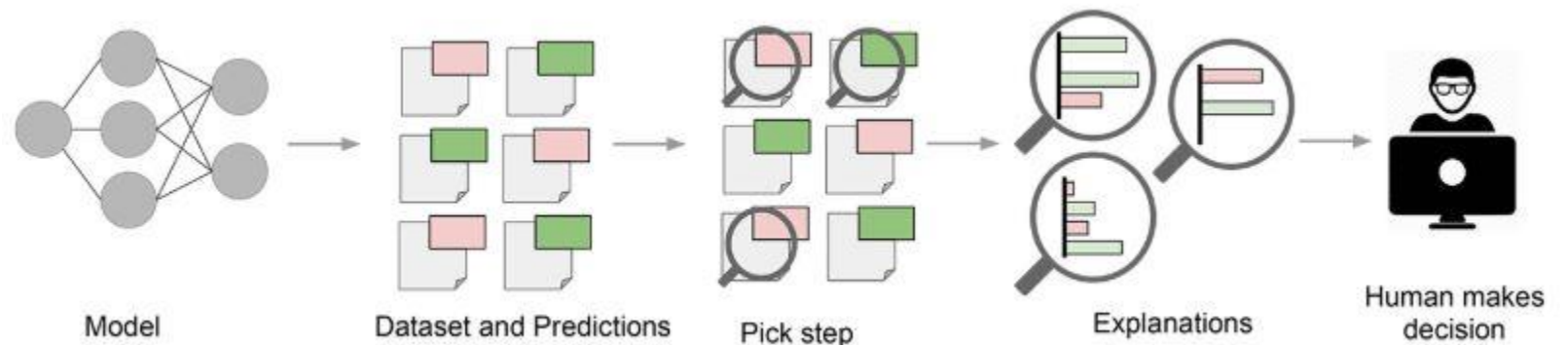


<https://towardsdatascience.com/understanding-model-predictions-with-lime-a582fdff3a3b>

*LIME* try to understand the model by perturbing the input of data samples and understanding how the predictions change.

*LIME* provides local model interpretability.

Local  
Interpretable  
Model-Agnostic  
Explanation



<https://www.oreilly.com/content/introduction-to-local-interpretable-model-agnostic-explanations-lime/>

# Dataset (1)

## Mobile Price Classification

classify mobile price range

**Goal**    predict price range of an mobile phone  
price range indicating how high the price is  
depending on individual parts such as battery power and memory

Price Range	
0	very cheap
1	cheap
2	expensive
3	very expensive



**Source :** <https://www.kaggle.com/iabhishekofficial/mobile-price-classification>

# MS IML Explanation Mobile Price

- Trainings data 67%
- Test data 33%

- Linear Regression

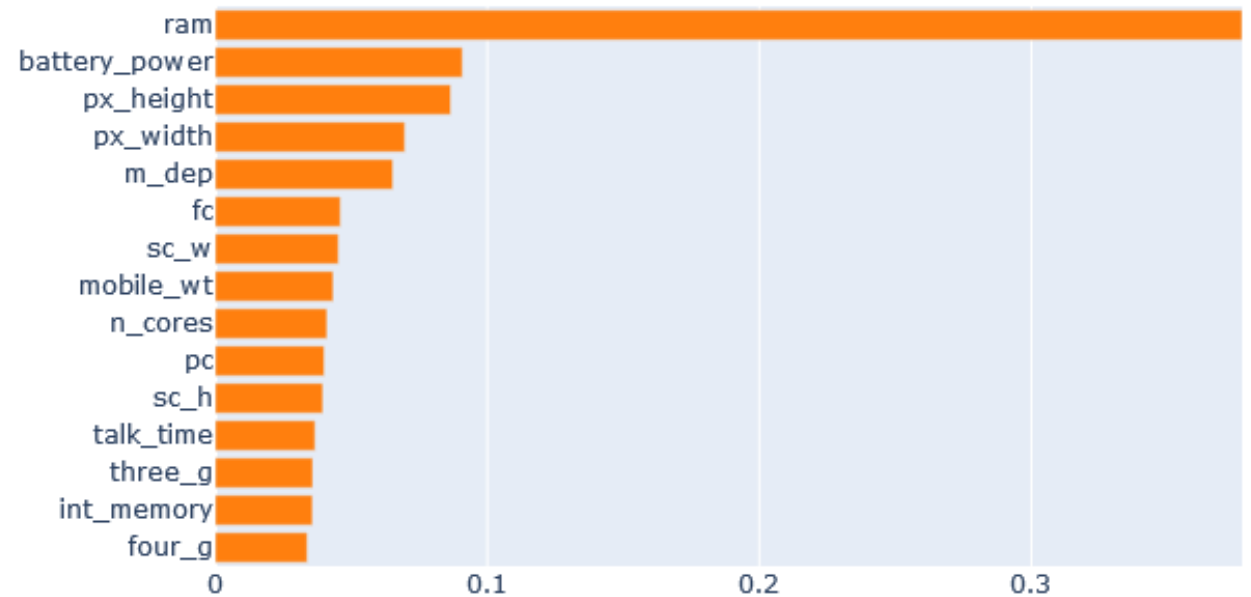
$$R^2 \approx 0.91$$

- Supported Vector Machine

$$R^2 \approx 0.95$$

( $R^2$  coefficient of determination)

Morris Sensitivity  
Convergence Index: 0.060

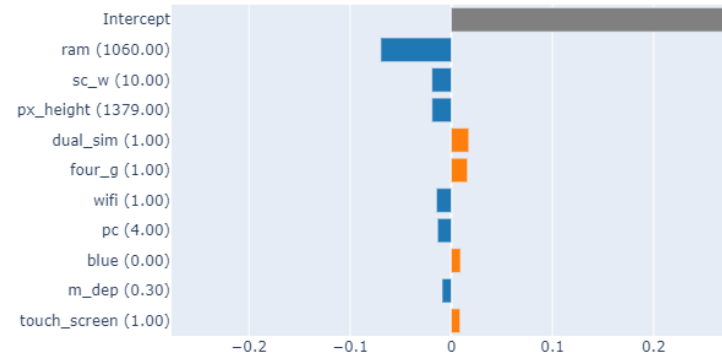


**Ram** is dominant

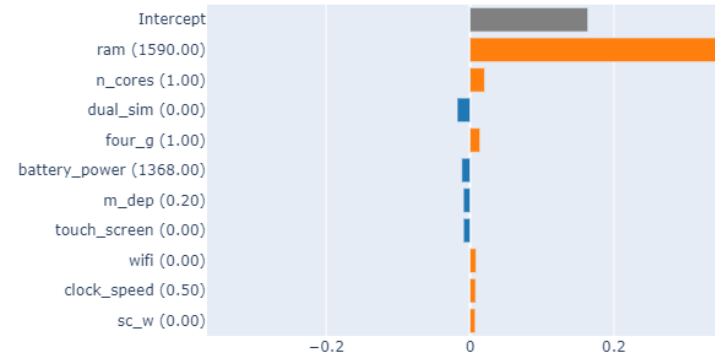
# MS IML Explanation

Mobile Price

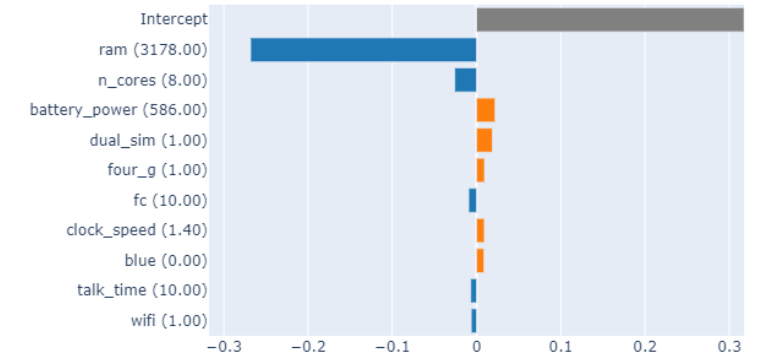
Predicted 0.28 | Actual 1.00



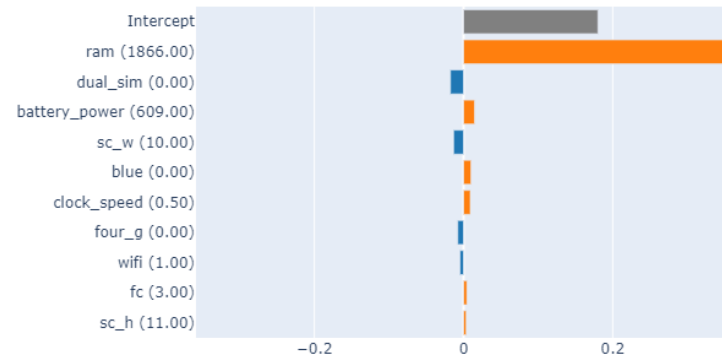
Predicted 0.69 | Actual 1.00



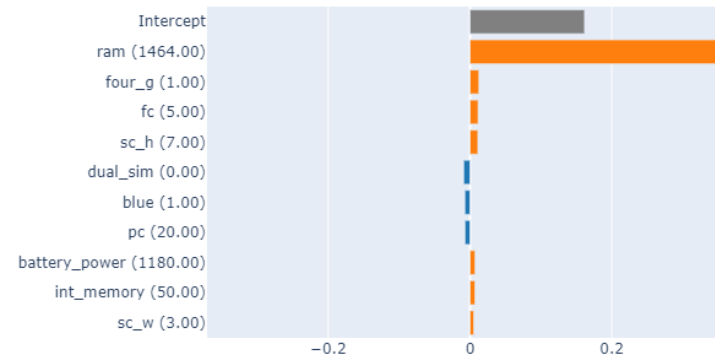
Predicted 0.13 | Actual 2.00



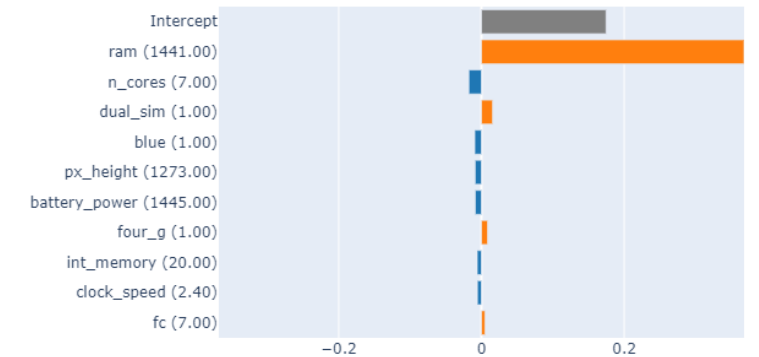
Predicted 0.59 | Actual 1.00



Predicted 0.58 | Actual 1.00



Predicted 0.50 | Actual 1.00



Data relate to class 1 (cheap)

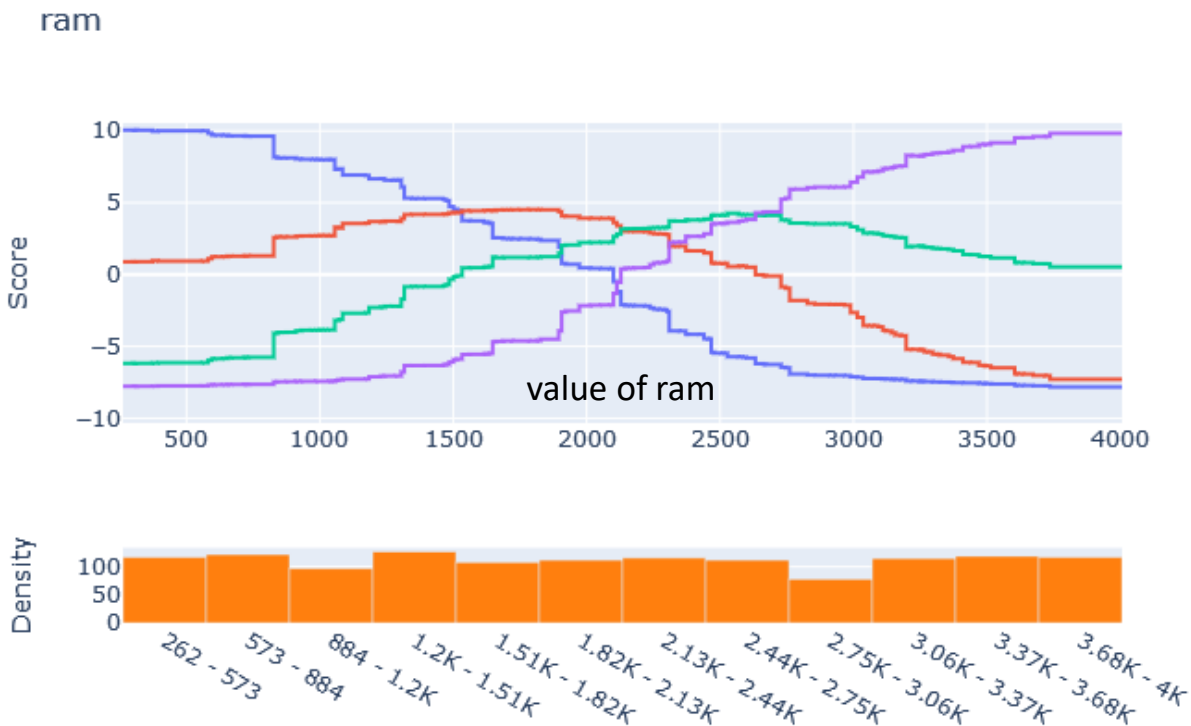
**Ram** is dominant

# MS IML Explanation

Mobile Price

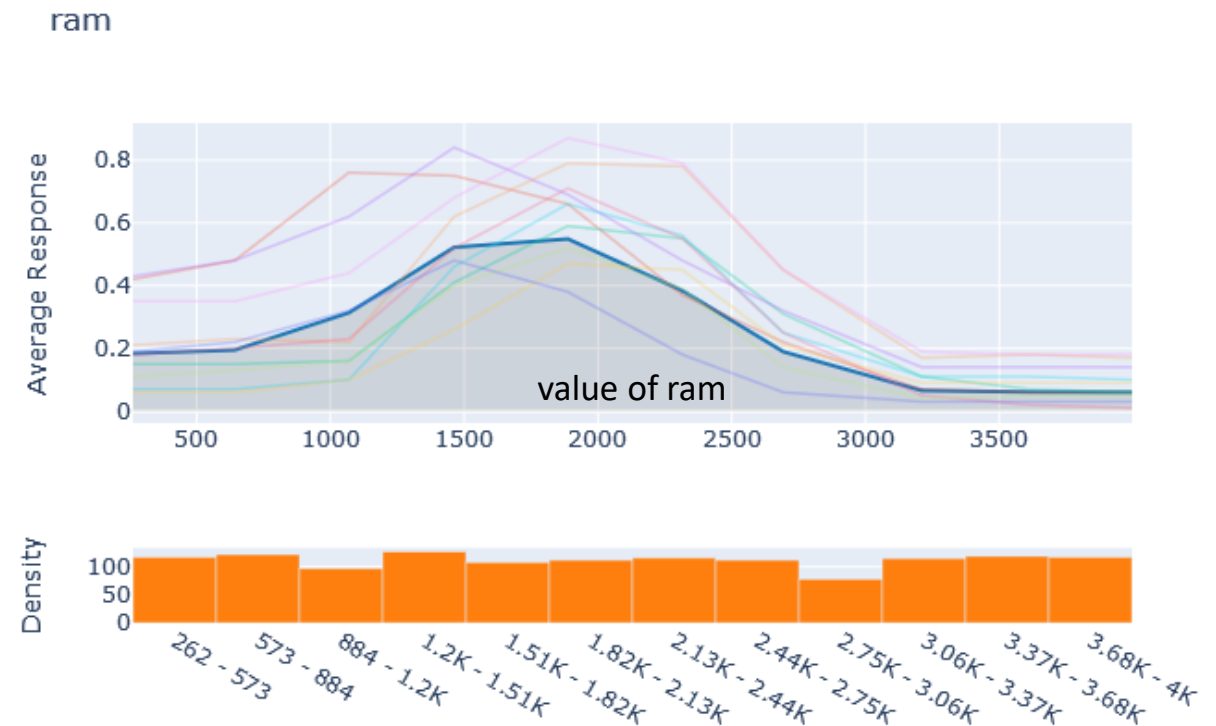
## Explainable Boosting Machine

How probably is the assignment to a class depending on RAM



## Partial Dependence

Average response of each attribute depending on RAM



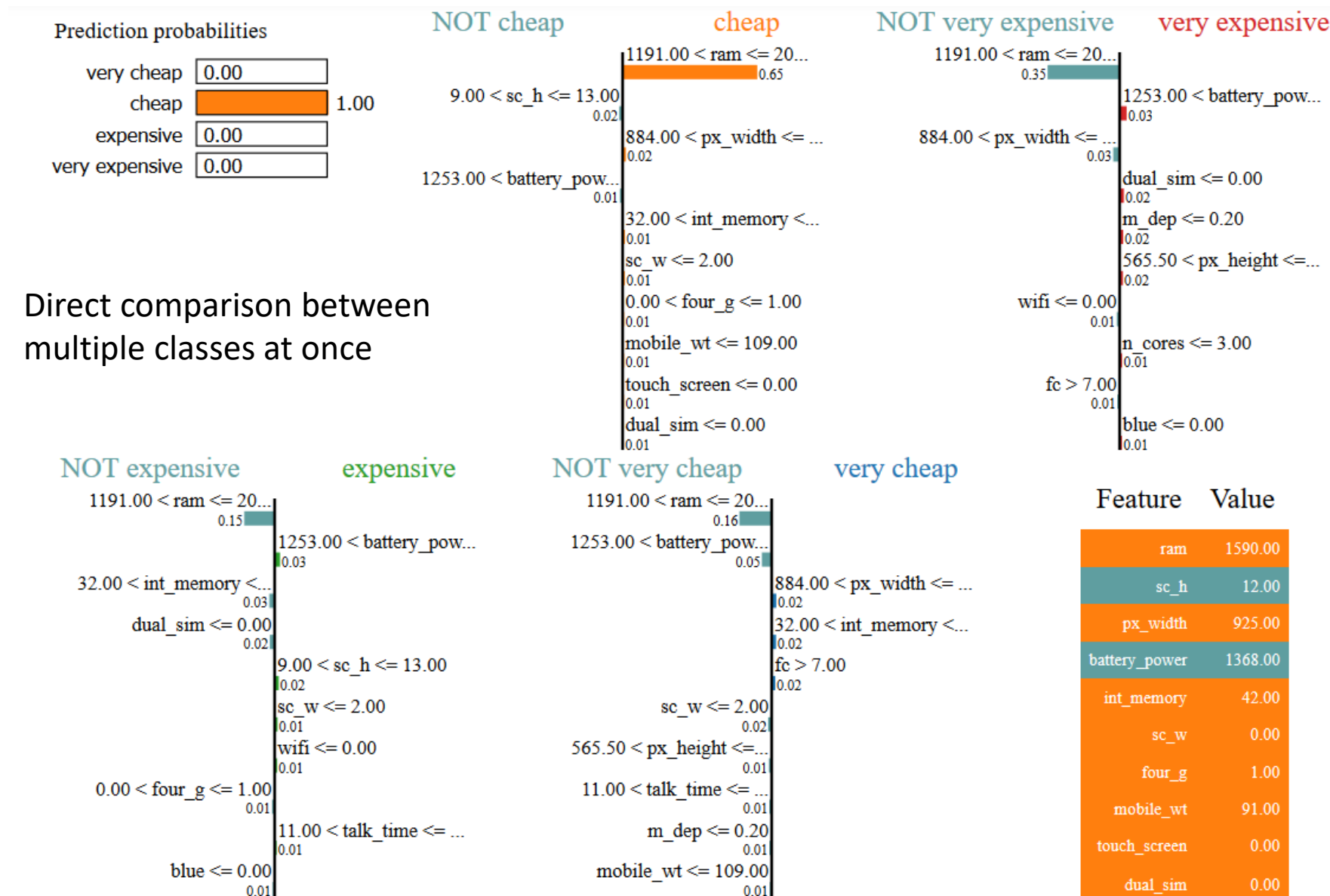
Data quality

data is not realistic



# IBM AIX360 Explanation

Mobile Price





# Dataset (2)

## NASA: Asteroids Classification

classify dangerousness of an Asteroid



**Goal** predict whether an Asteroid is dangerous or not

finding potential hazardous and non-hazardous asteroids

depending on individual parts such as asteroid size, speed and orbit

Hazardous	
True	dangerous
False	safe

**Source :** <https://www.kaggle.com/shrutimehta/nasa-asteroids-classification>

# MS IML Explanation Asteroids

- Trainings data 67%
- Test data 33%
- Standardized

- Linear Regression

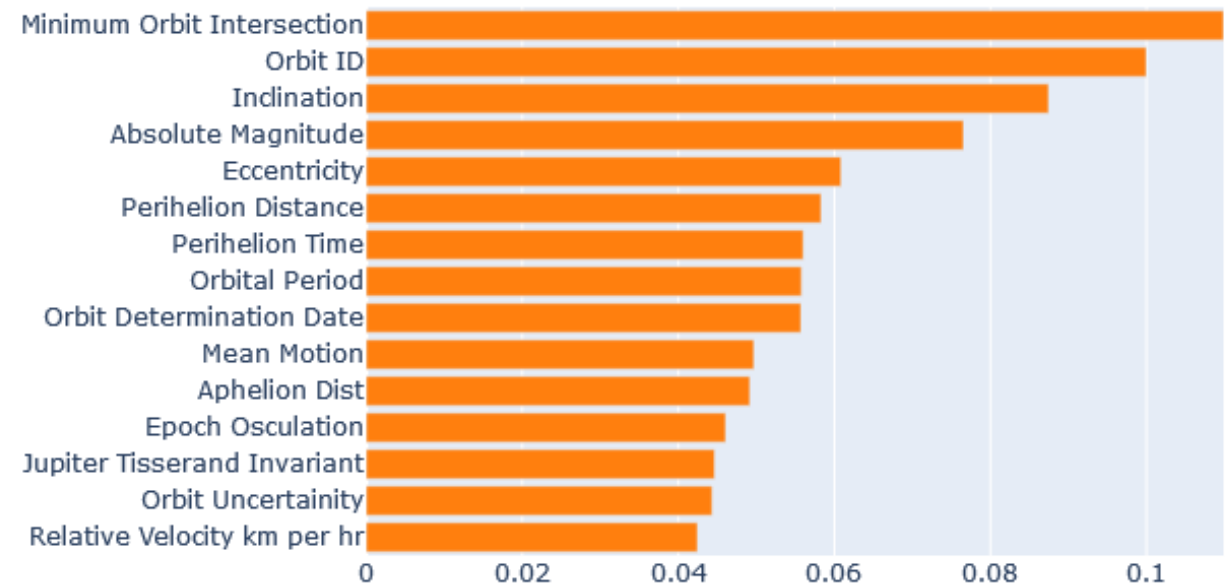
$$R^2 \approx 0.40$$

- Random Forest Classifier

$$R^2 \approx 0.89$$

( $R^2$  coefficient of determination)

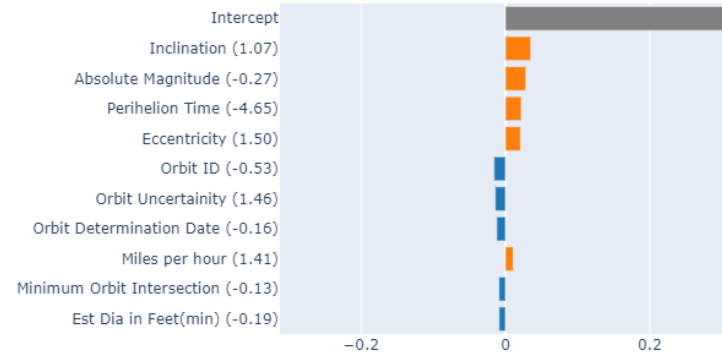
Morris Sensitivity  
Convergence Index: 0.080



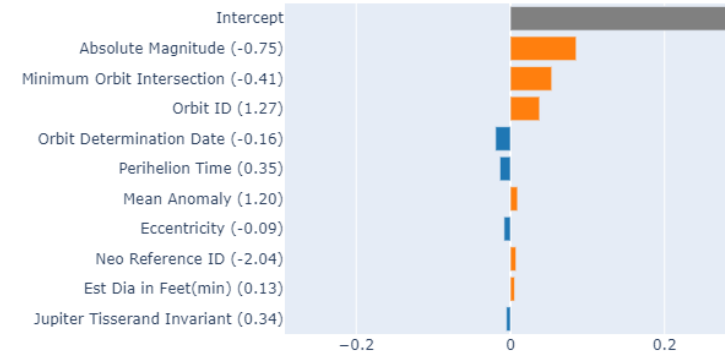
No linear relationships basing on single attribute

# MS IML Explanation Asteroids

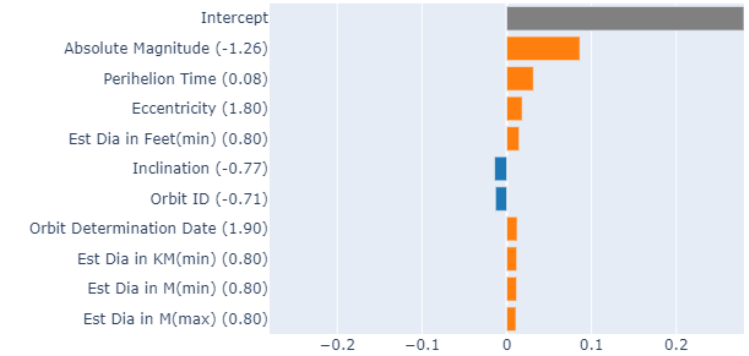
Predicted 0.23 | Actual 0.00



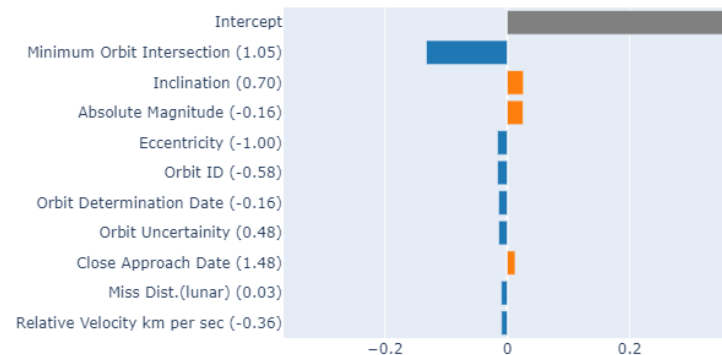
Predicted 0.64 | Actual 1.00



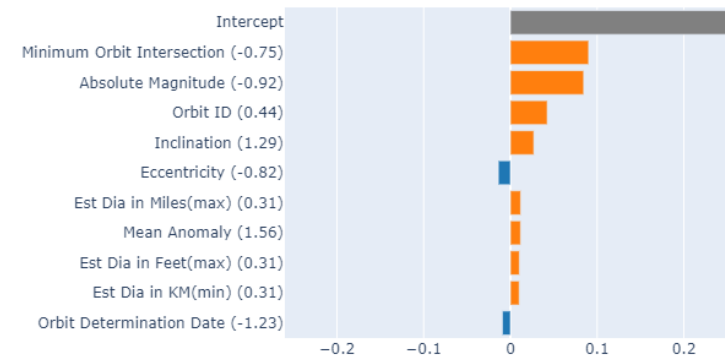
Predicted 0.27 | Actual 0.00



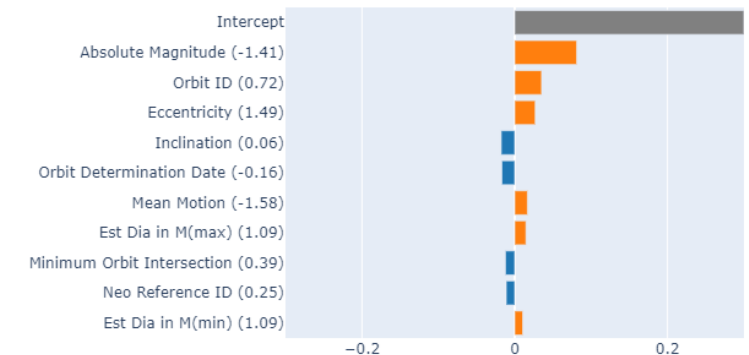
Predicted 0.01 | Actual 0.00



Predicted 0.65 | Actual 1.00



Predicted 0.41 | Actual 0.00



Data relate to class 1 (safe)

# MS IML Explanation Asteroids

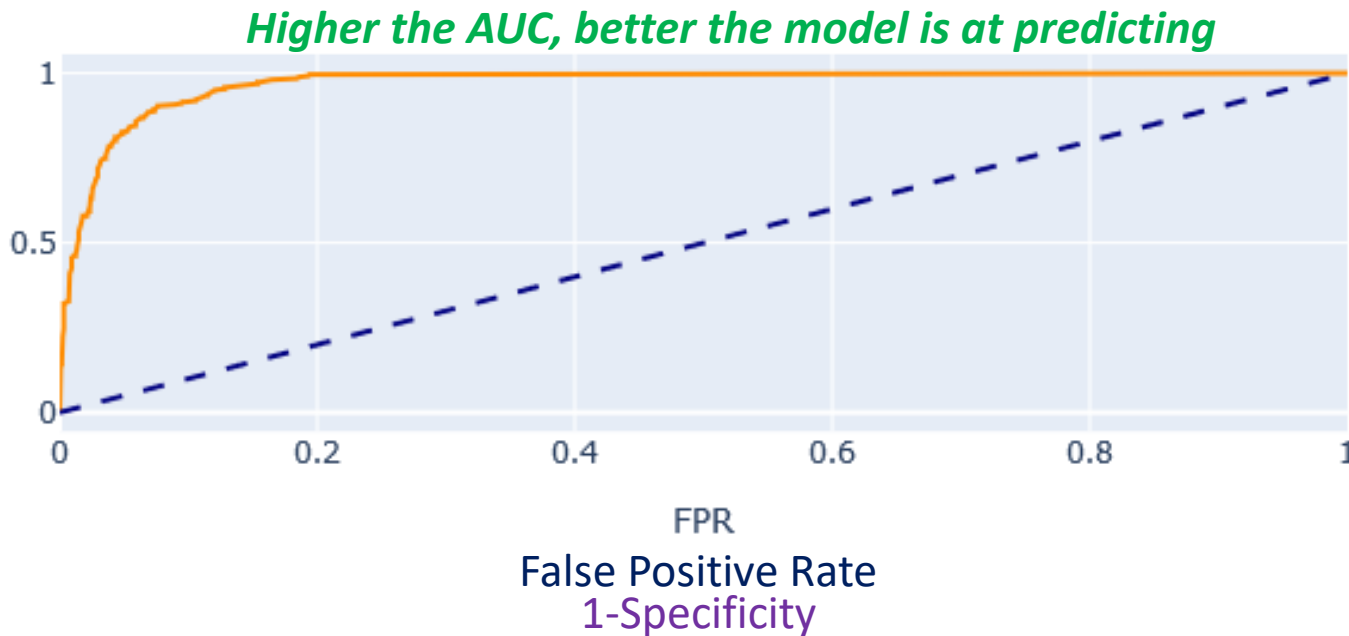
Receiver Operating Characteristics

ROC Curve: Blackbox  
AUC = 0.9710

Area Under The Curve

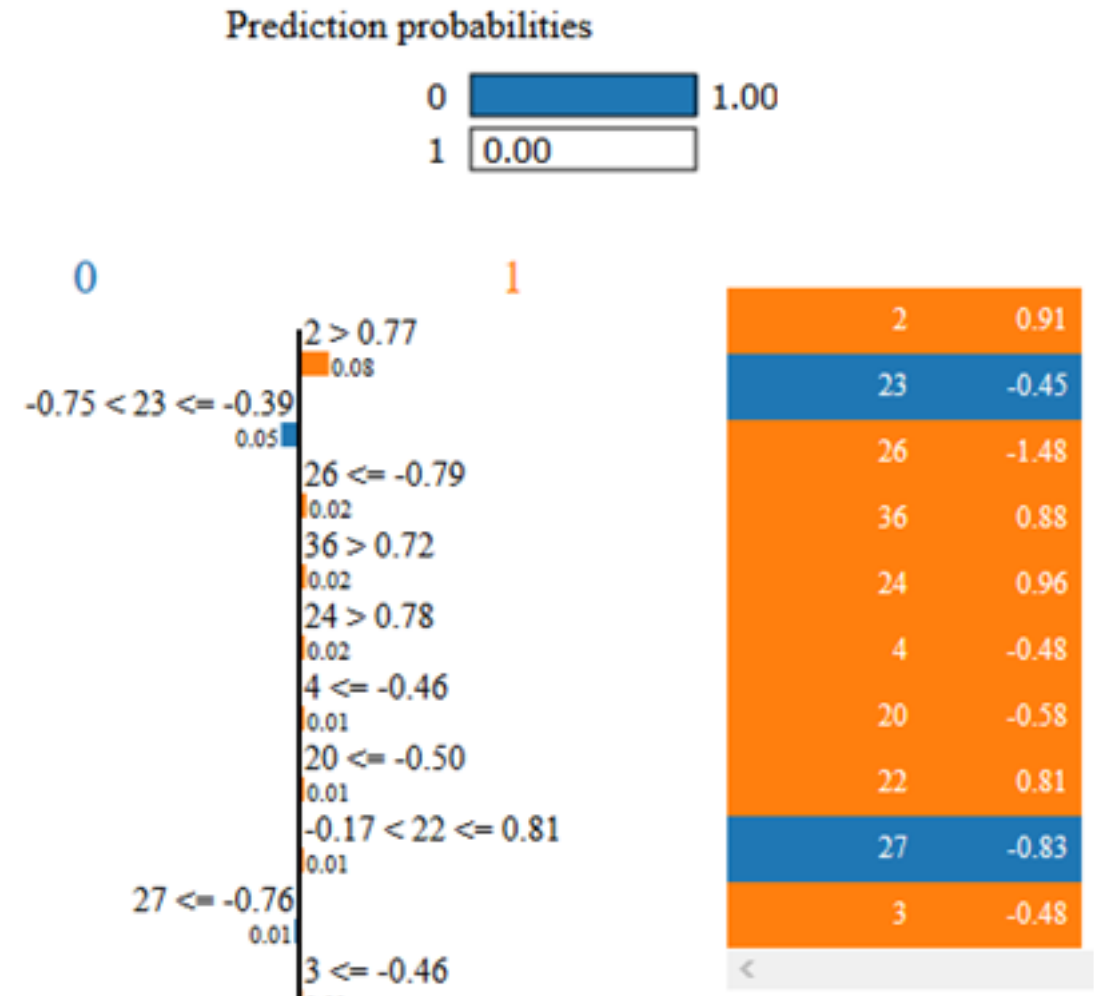
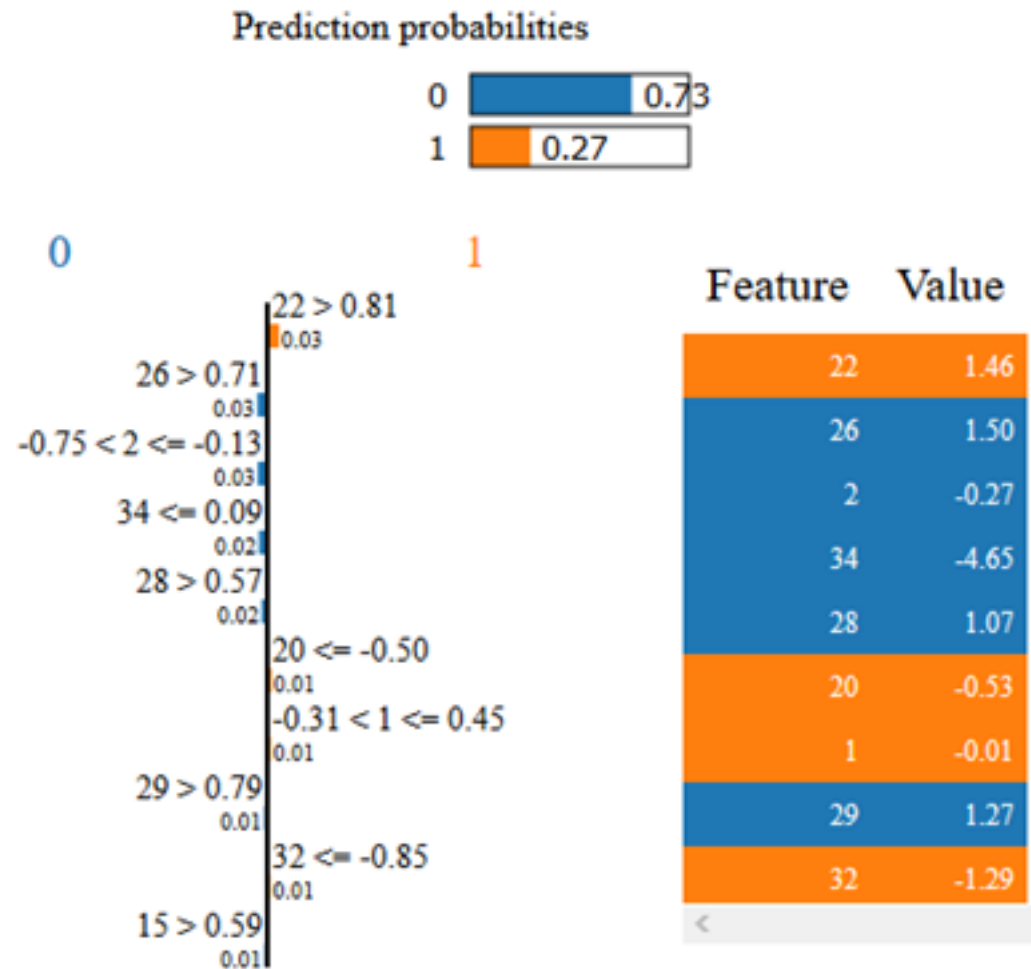
True Positive Rate  
Sensitivity

TPR



Review the performance of a classification model

# IBM AIX360 Explanation Asteroids



# Evaluate and Compare

## **Interpret ML**

- more easy global explanation features
- restrictet to tabular data
- more manageable outputs/graphs
- Summarization of different explainability methods

## **AIX360**

- Many example notebooks
- comparison between multiple classes
- processing with images, texts, tabular, voices etc. is available

# Source

- <https://www.oreilly.com/content/introduction-to-local-interpretable-model-agnostic-explanations-lime/>
- <https://towardsdatascience.com/understanding-model-predictions-with-lime-a582fdff3a3b>
- [https://www.youtube.com/watch?v=hUnRCxnydCc&feature=emb\\_logo](https://www.youtube.com/watch?v=hUnRCxnydCc&feature=emb_logo)
- <https://www.statistik-nachhilfe.de/ratgeber/statistik/deskriptive-statistik/visualisierung-von-daten/roc-kurve>
- <https://towardsdatascience.com/understanding-auc-roc-curve-68b2303cc9c5>
- Datasets
  - <https://www.kaggle.com/iabhishekofficial/mobile-price-classification>
  - <https://www.kaggle.com/shrutiimehta/nasa-asteroids-classification>
- Project Files
  - <https://github.com/parnet/Data-Science-Praktikum/>