

Basics of Machine Learning

Dmitry Ryabokon, github.com/dryabokon



Basics of Machine Learning

Summary

1. Intro
2. Environments
3. Data manipulation
4. Data visualization
5. Feature engineering
6. Statistical ML
7. Bayesian approach
8. Regression methods
9. Confidence intervals for regression methods
10. Parametrical ML methods

Basics of Machine Learning

Summary

11. Non parametrical ML methods
12. Unsupervised Learning
13. Non-Bayesian approaches
14. Dimension reduction
15. Ensemble learning: RF
16. Ensemble learning: XGB, Adaboost
17. Benchmarking
18. Time Series
19. Introduction to Deep Learning

Basics of Machine Learning

Summary

- 21. Transformers and Attention mechanism
- 22. BERT
- 23. Topic modelling
- 24. BLUE score

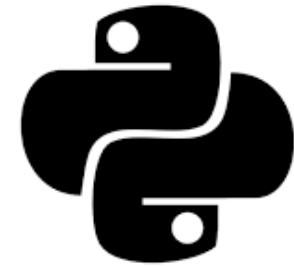
Lesson 01: Intro

- Introduction
- Goals
- Overview of the course
- Prerequisites
- Data engineering vs Data Science vs Machine Learning
- Overview of practical assignments
- Collaboration and feedback



Lesson 02: Environments

- Installing Python
- Virtual environments
- Using docker
- Jupyter notebook
- Google Collab
- IDEs
- Code repositories
- Datasets
- Example: vanilla classification problem



Lesson 03: Data Manipulation

Numpy

- Data inspection
- Combining data
- Insert and delete
- Reshape
- Slicing
- Sorting
- Aggregating

Pandas

- Creation
- Inspection
- Sorting
- Slicing
- Grouping



Lesson 04: Data Visualization

- Pairwise analysis
- Regression analysis
- Density chart
- Feature importance
- Confidence level
- Highcharts



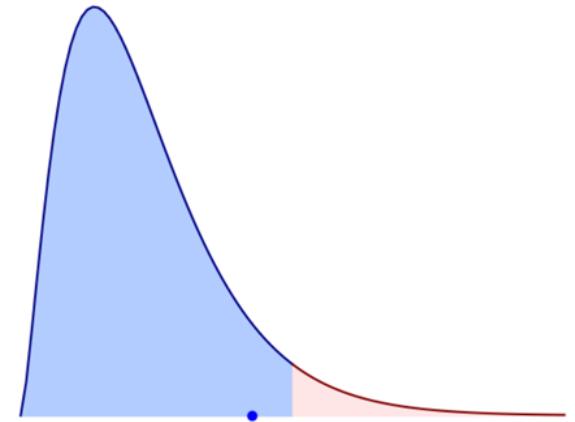
Lesson 05: Feature Engineering

- Handling Outliers
- Handling Missing Values
- Imputation
- Encoding
- Imbalanced dataset
- Sampling



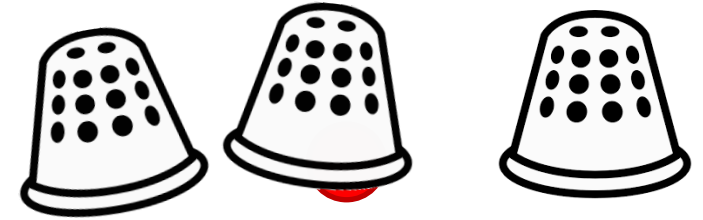
Lesson 06: Statistical ML

- P Value and null hypothesis significance testing
- Chi-squared test statistical hypothesis test
- Consistency check: KS value
- Feature importance
- Numerical and categorical features
- Multi collinearity and Variance Inflation Factor



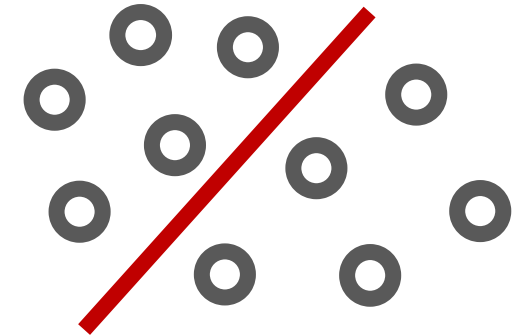
Lesson 07: Bayesian approach

- Bayesian decision model
- Bayesian risk
- Decision strategy
- Example: TBD
- Homework: TBD



Lesson 08: Regression methods

- Linear discrimination
- Linear regression for data prediction
- Logistic regression for data classification

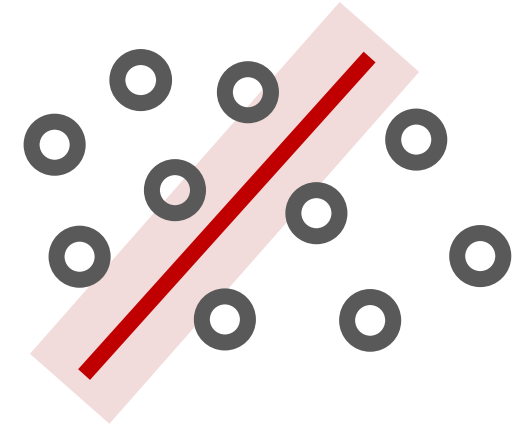


https://www.w3schools.com/python/python_ml_multiple_regression.asp

<https://medium.com/codex/step-by-step-guide-to-simple-and-multiple-linear-regression-in-python-867ac9a30298>

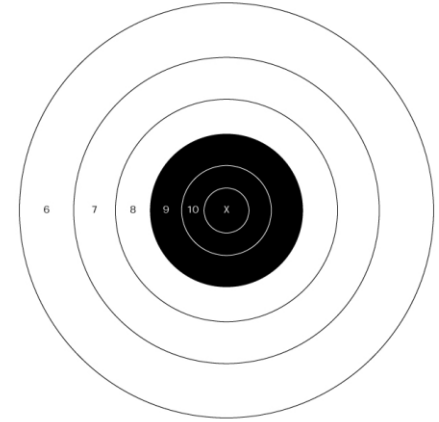
Lesson 09: Confidence intervals for regression methods

- Coding session
- Confidence interval evaluation
- Out-of-box solutions



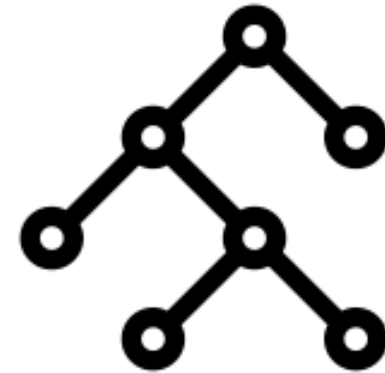
Lesson 10: Supervised Learning parametrical methods

- Naive Bayes classifier
- Gaussian classifier
- SVM



Lesson 11: Supervised Learning non-parametrical methods

- KNN: K-nearest-neighbors
- Decision tree
- Bias vs Variance tradeoff



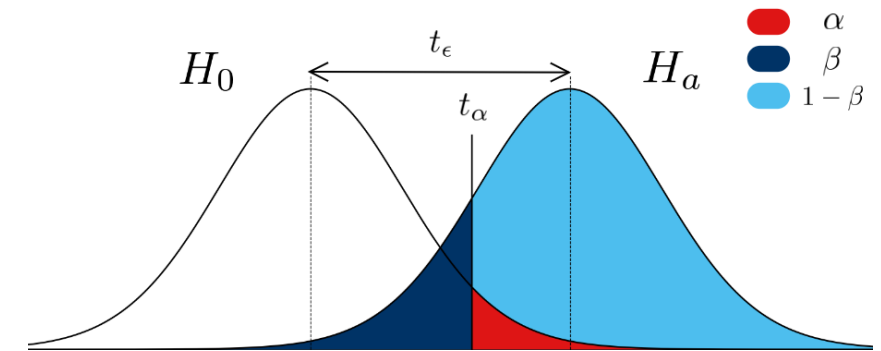
Lesson 12: Unsupervised Learning

- K-means
- EM algorithm
- dbscan



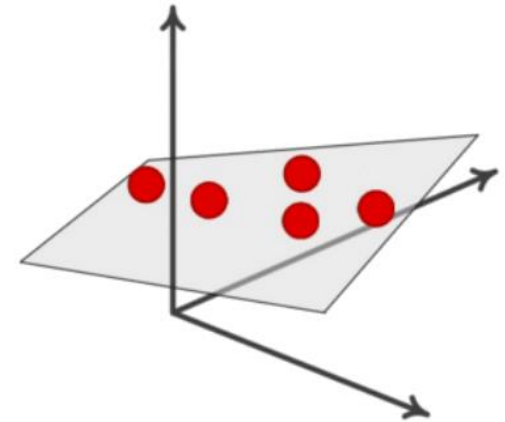
Lesson 13: Non-Bayesian Approach

- Error Type I
- Error Type II
- Neyman-Pearson approach
- Minimax approach
- Example: TBD
- Homework: TBD



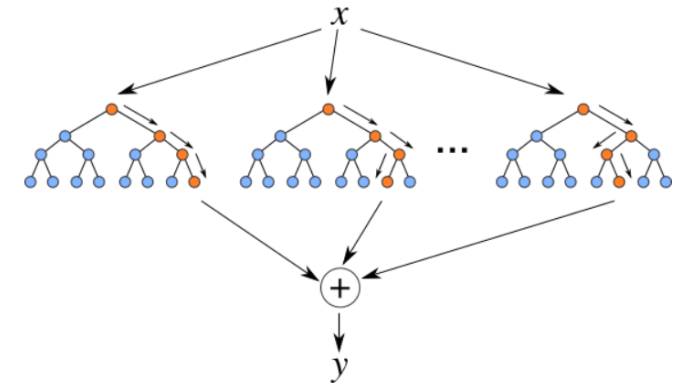
Lesson 14: Dimension Reduction

- PCA
- tSNE
- umap



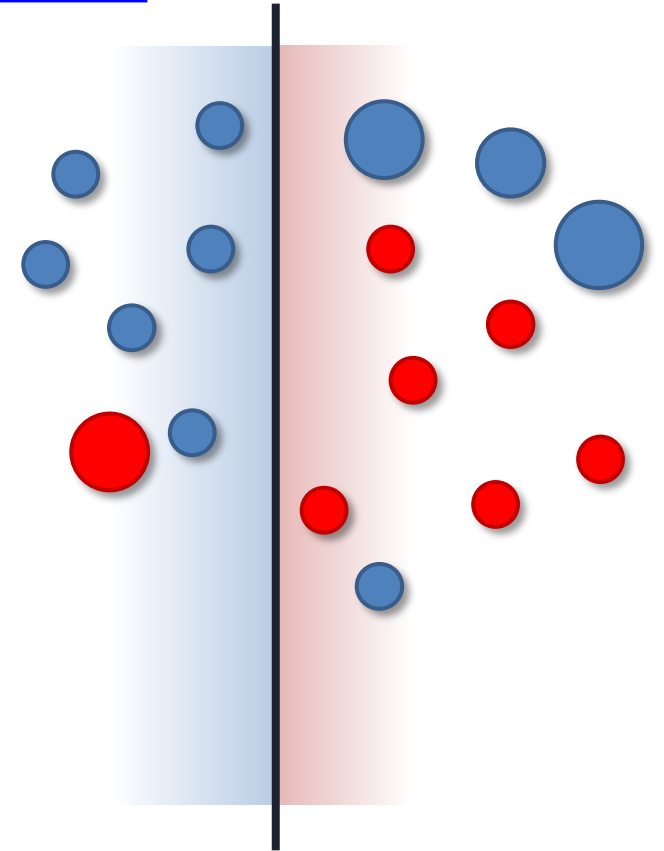
Lesson 15: Ensemble learning - RF

- Bagging
- Boosting
- Bootstrapping
- Random Forest



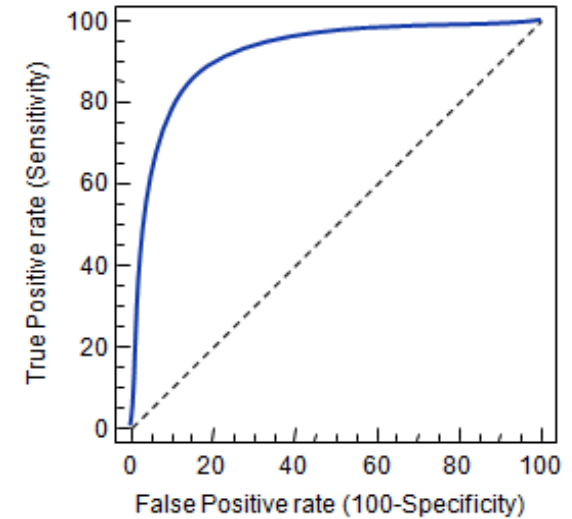
Lesson 16: Ensemble learning - Adaboost and XGB

- Adaboost
- XGB



Lesson 17: Benchmarking

- Accuracy
- Precision
- Recall
- F1 score
- ROC curve
- PR curve



Lesson 18: Time series

- Stationarity, Trends, Seasonality
- Regression approaches
- Regularization with Ridge regression
- ARIMA
- Gated Recurrent Units (GRU)



Lesson 19: Introduction to Deep Learning

- Basic operations
- CNNs out of box
- Convolution in details
- Transfer learning
- Engineering CNN with tensorflow.keras
- Visualization of layers and kernels

