atlantbh

DATA SCIENCE PROJECT

DEMO PRESENTATION

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MOTIVATION

DATA SCIENCE

MACHINE LEARNING

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PYTHON FOR DATA SCIENCE

- Important for DS
- Easy to use language
- Most common libraries used in data science:
  - Numpy
  - Pandas
  - Scikit-learn
  - Matplotlib

„Started from the bottom, now I‘m here“

CLASSIFICATION IN DATA SCIENCE

- Use-case scenario:
  - Titanic sank after colliding with an iceberg, killing 1502 out of 2224 passengers and crew (32% survival rate)
  - Latest discovery have shown that there were additional 10 passengers
- Goal:
  - Create the system which would predict probability of their survival
- Dataset was given

TITANIC

- Supervised learning
- Preprocessing:
  - 1303 examples, 4 features

	Name	PClass	Age	Sex	*Survived*
1	Allen, Miss Elisabeth Walton	1st	29	female	1

- Missing values in Age column and PClass column
- Only one outlier in PClass column
- Dimensionality reduction

	Title	PClass	LifeStage	*Survived*
1	Miss	1st	2	1

TITANIC

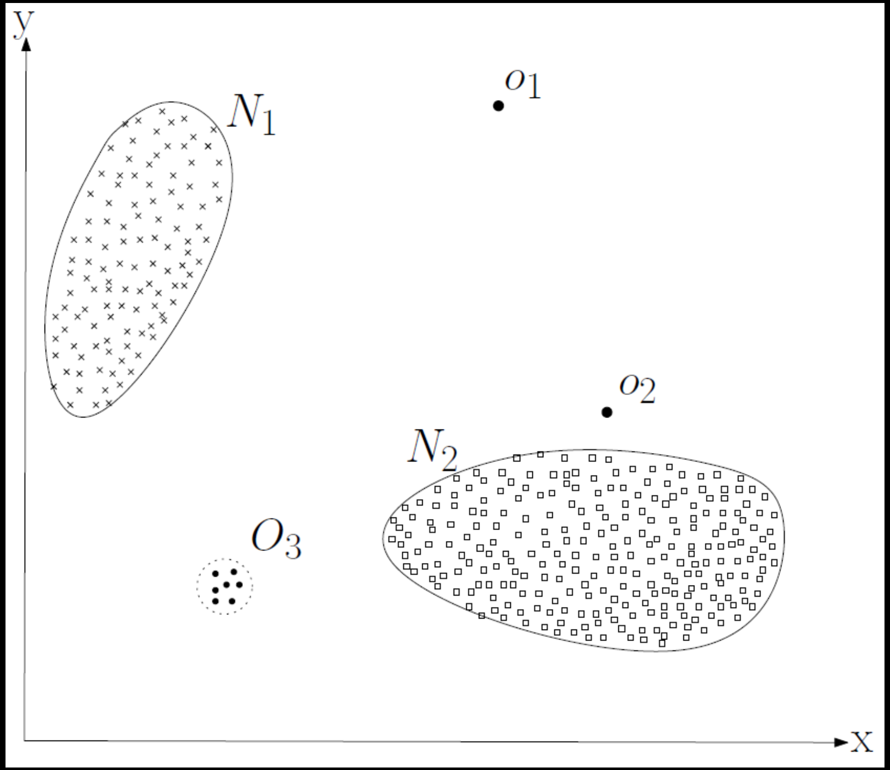
- There are many classification algorithms such as: Logistic Regression, Naive Bayes classifier, SVM, KNN, Decision Trees, etc.
- Support Vector Machine Classifier gave the best results

Actual output	Model output	Probability 0	Probability 1
0	0	0.98511669	0.01488331
0	0	0.98511669	0.01488331
1	0	0.78656724	0.21343276
0	0	0.96557864	0.03442136
0	0	0.99201528	0.00798472
0	0	0.99201528	0.00798472
1	1	0.19527331	0.80472669
1	0	0.78665345	0.21334655
1	1	0.15862112	0.84137888
1	1	0.21237841	0.78762159

Accuracy
Precision
Recall
F1-score

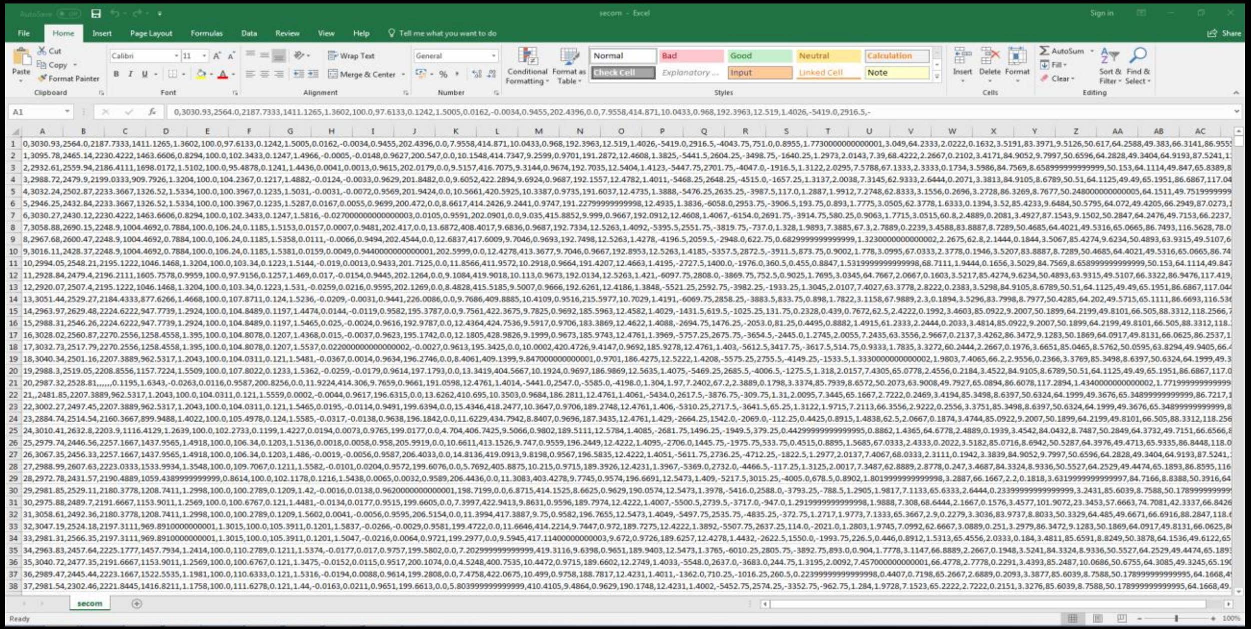
Anomaly detection

- Anomalies are patterns in data that do not conform to a well defined notion of normal behavior
- Anomaly detection techniques:
  - Classification based
  - Nearest Neighbor based
  - Clustering based
  - Statistical
  - Information theoretic
  - Spectral



Anomaly detection

- Develop system which can be used for smart production monitoring and fault detection in manufacturing processes
- Given dataset: 1567 instances, 591 features
- Unbalanced dataset: 104 fails
- Only numeric values
- Missing values
- Outliers



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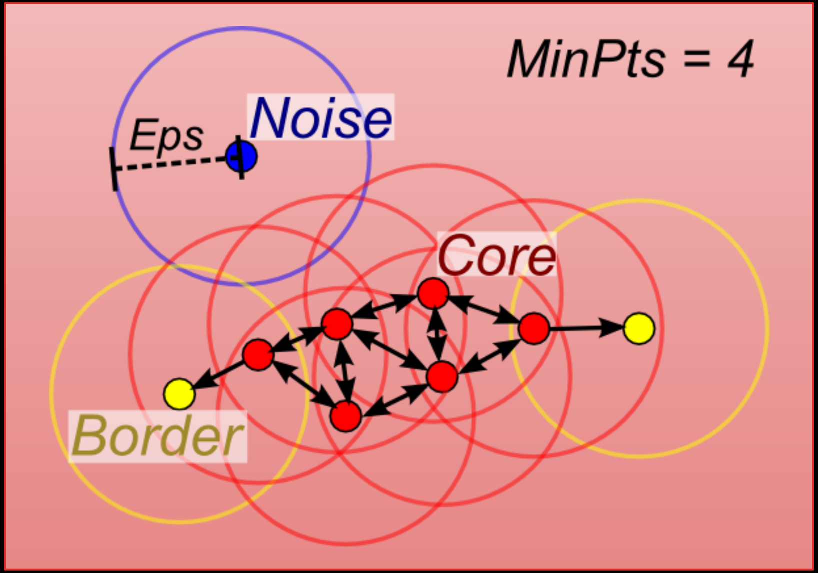
37 36,2989.47,2445.44,2223.1667,1522.5535,1.1981,100.0,110.6333,0.121,1.5316,-0.0194,0.0088,0.9614,199.2808,0.0,7.4758,422.0675,10.499,0.9758,188.7817,12.4231,1.4011,-1362.0,710.25,-1016.25,260.5,0.22399999999999998,0.4407,0.7198,65.2667,2.6889,0.2093,3.3877,85.6039,8.7588,50.178999999999995,64.1668,4
38 37,2981.54,2302.46,2221.8445,1416.8211,1.1758,100.0,111.6278,0.121,1.44,-0.0163,0.0211,0.9651,199.6613,0.0,5.803999999999999,410.4105,9.4864,0.9629,190.1748,12.4231,1.4002,-5452.75,2574.25,-3352.75,-962.75,1.284,1.9728,7.1523,65.2222,2.7222,0.2151,3.3276,85.6039,8.7588,50.178999999999995,64.1668,49.
```

Anomaly detection

- DBSCAN (Density-based spatial clustering of applications with noise) algorithm
  - Core point
  - Border point
  - Noise point

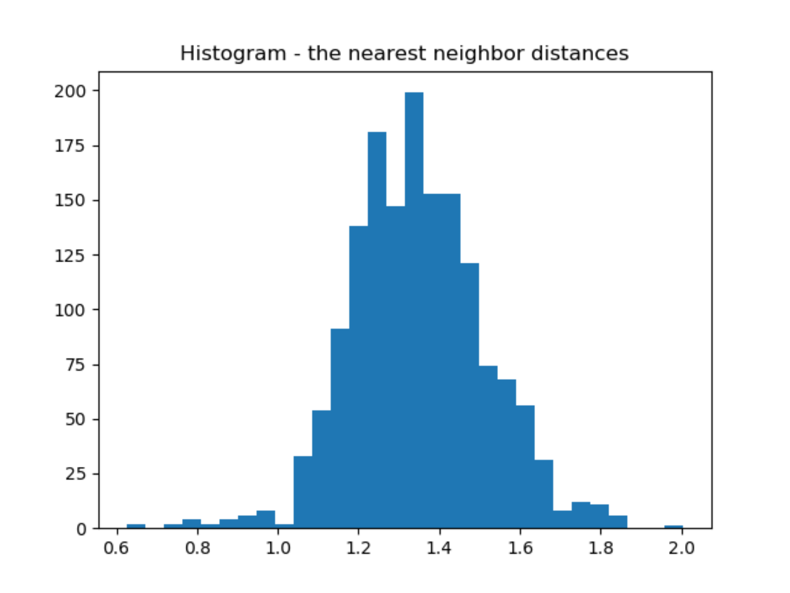


- Advantages:
  - Does not require number of clusters
  - Can find arbitrarily shaped clusters
  - Requires two parameters

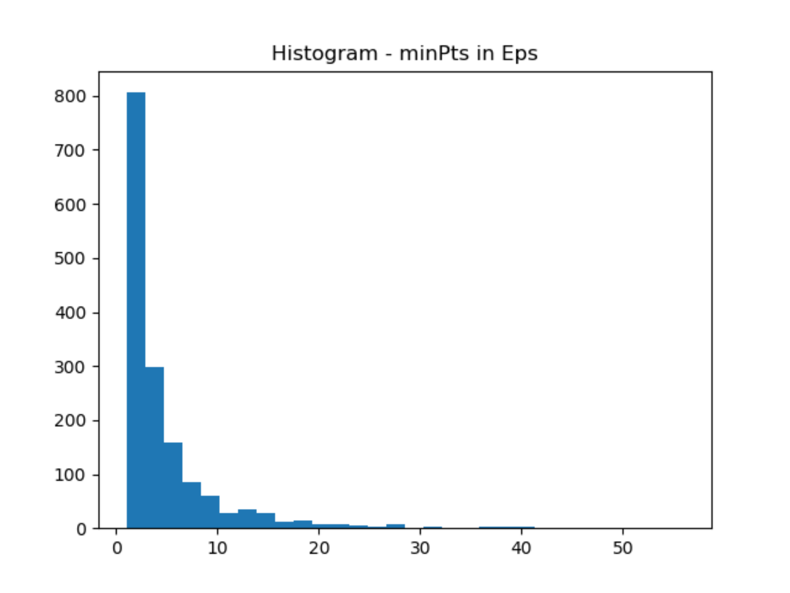
- Disadvantages:
  - border points that are reachable from more than one cluster can be part of either cluster, depending on the order the data are processed
  - Can‘t cluster data sets well with large differences in densities

Anomaly detection

- Parameter tuning:
  - In DBSCAN learning algorithm, thare are two parameters: eps and minPts



Eps = 1.45



minPts = 6

Anomaly detection

- Unbalanced dataset – accuracy is not a good measure

	Precision	Recall	F1-score	Support
-1	0.07	0.51	0.13	104
0	0.94	0.54	0.69	1463
Avg/total	0.88	0.54	0.65	1567

Anomaly detection

- Possible applications:
  - Fraud detection
  - Fault detection
  - System health monitoring

THANK YOU!