atlantbh

DATA SCIENCE INTERNSHIP – MONTH 1

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MOTIVATION

- Effects of machine learning algorithms are all around us
- Curiosity
- Digit recognition

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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
- Supervised learning

TITANIC

Preprocessing

- 1303 examples, 4 features
- Missing values in Age column and PClass column
- Only one outlier in PClass column
- Dimensionality reduction

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

	Title	PClass	LifeStage	Survived
1	Miss	1st	2	1

TITANIC

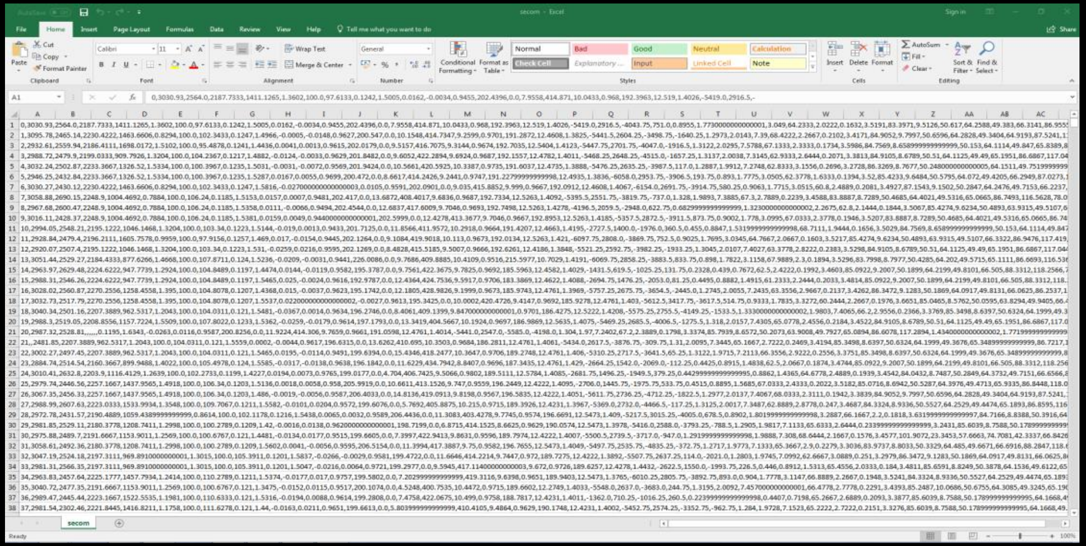
- There are many classification algorithms such as: Logistic Regression, Naive Bayes classifier, SVM, KNN, Decision Trees, etc.
- Support Vector Machine Classifier gave the best results

Name	Probability of survival	Actually survived
Sage, Miss Constance	0.0148	0
Sage, Miss Dorothy	0.0148	0
Wilkinson, Mrs Elizabeth Anne	**0.2134**	**1**
Thomas, Master Assad Alexander	0.0344	0
Zakarian, Mr Artun	0.0079	0
Zakarian, Mr Maprieder	0.0079	0
Anderson, Mr Harry	0.8047	1
Andrews, Miss Kornelia Theodosia	**0.2133**	**1**
Brown, Mrs John Murray (Caroline Lane Lamson)	0.8413	1
Carter, Mr William Ernest	0.7876	1

Accuracy
Precision
Recall
F1-score

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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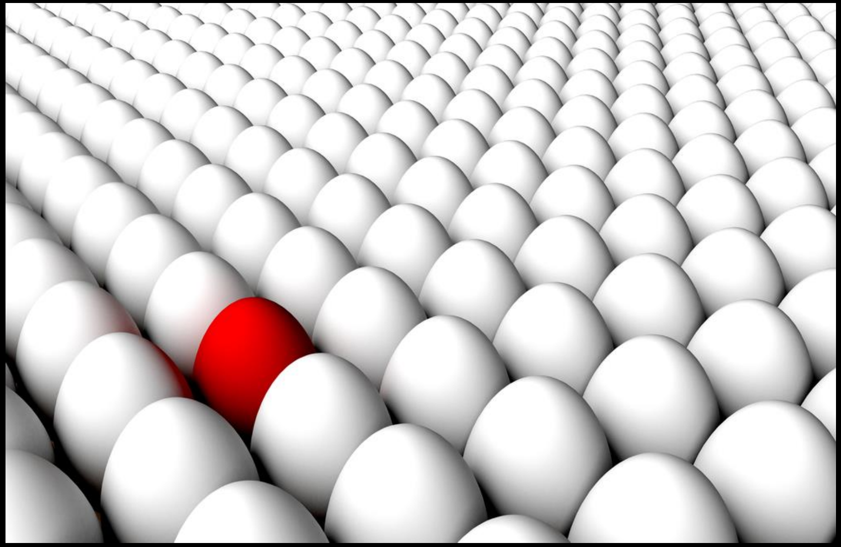
38  37,2981.54,2302.46,2221.8445,1416.8211,1.1758,100.0,111.6278,0.121,1.44,-0.0163,0.0211,0.9651,199.6613,0.0,5.803999999999999,410.4105,9.4864,0.9629,190.1748,12.4231,1.4002,-5452.75,2574.25,-3352.75,-962.75,1.284,1.9728,7.1523,65.2222,2.7222,0.2151,3.3276,85.6039,8.7588,50.17899999999995,64.1668,49.
```

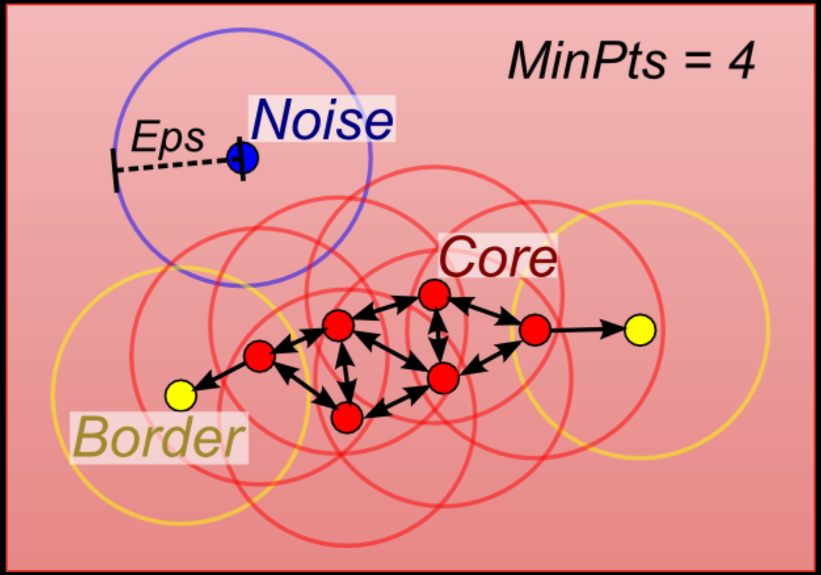
Anomaly detection

- 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

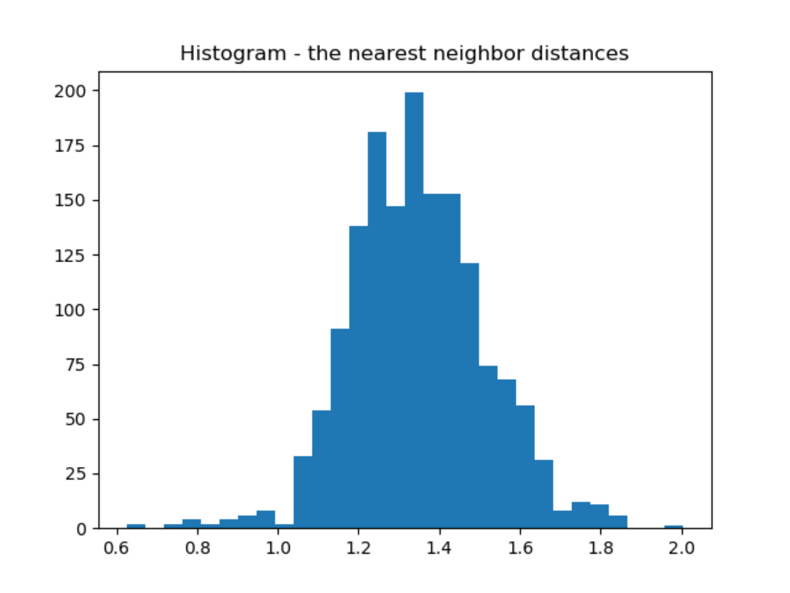
- DBSCAN (Density-based spatial clustering of applications with noise) algorithm
    - Core point
    - Border point
    - Noise point

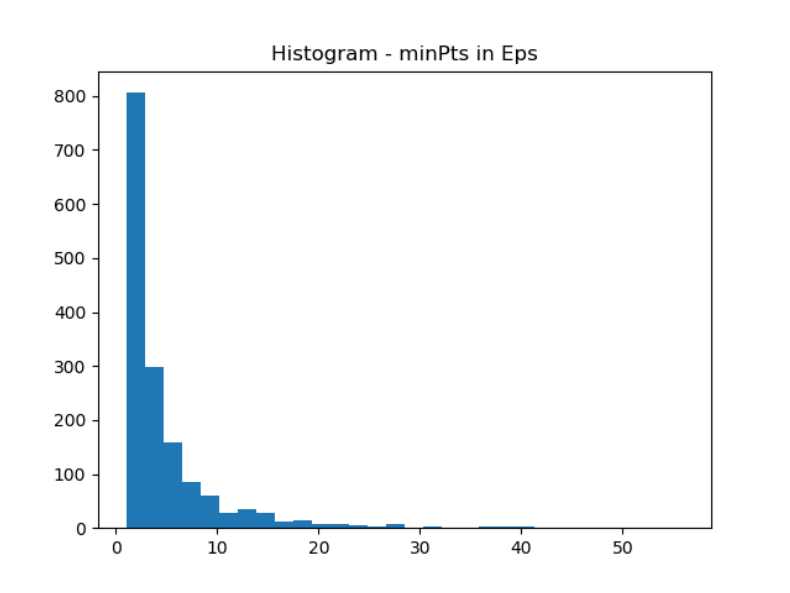


https://www.naftaliharris.com/blog/visualizing-dbscan-clustering/

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
- It‘s important to detect the fault in a timely manner

	Precision	**Recall**	**F1-score**	**Support**
Outlier	0.07	0.51	0.13	104
Not outlier	0.94	0.54	0.69	1463
Avg/total	0.88	0.54	0.65	1567

CONCLUSION

- Learn while working
- Math is fun
- Advantage of creative mindset
- There is no general approach for solving machine learning problems

THANK YOU!