



TECHNISCHE HOCHSCHULE
OSTWESTFALEN-LIPPE
UNIVERSITY OF
APPLIED SCIENCES
AND ARTS

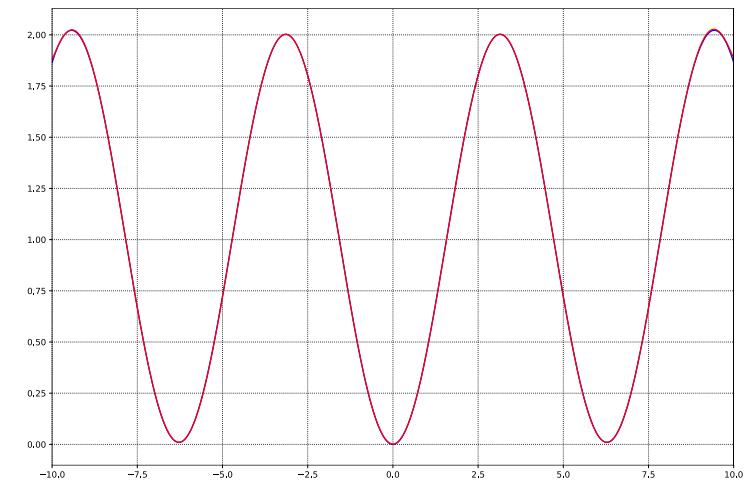
Welcome

to Advanced Topics in Algorithms

Backlog: Regression

```
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import PolynomialFeatures

...
features = PolynomialFeatures(2)
x_poly = features.fit_transform(x_train)
regressor = LinearRegression(n_jobs=-1)
regressor.fit(x_poly, y_train)
y_pred = regressor.predict(x_poly)
...
```



<https://scikit-learn.org/stable/modules/generated/sklearn.preprocessing.PolynomialFeatures.html>

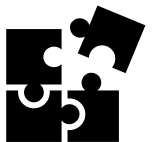
Results ATA - Exercises 2

- **AtoMos**
- **NICE**
- **Elite Group**

Next deadline: 11/04/2022

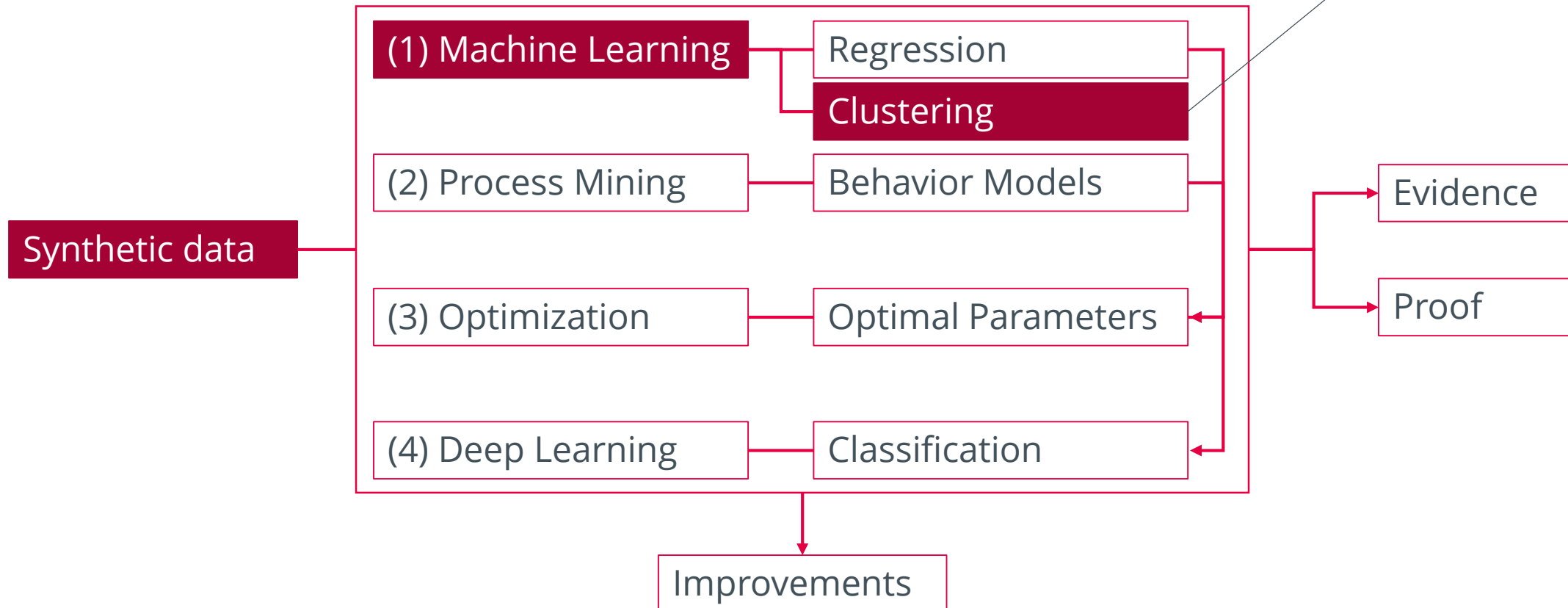
Subject: ATA E3 [TEAMNAME]

Only one PDF

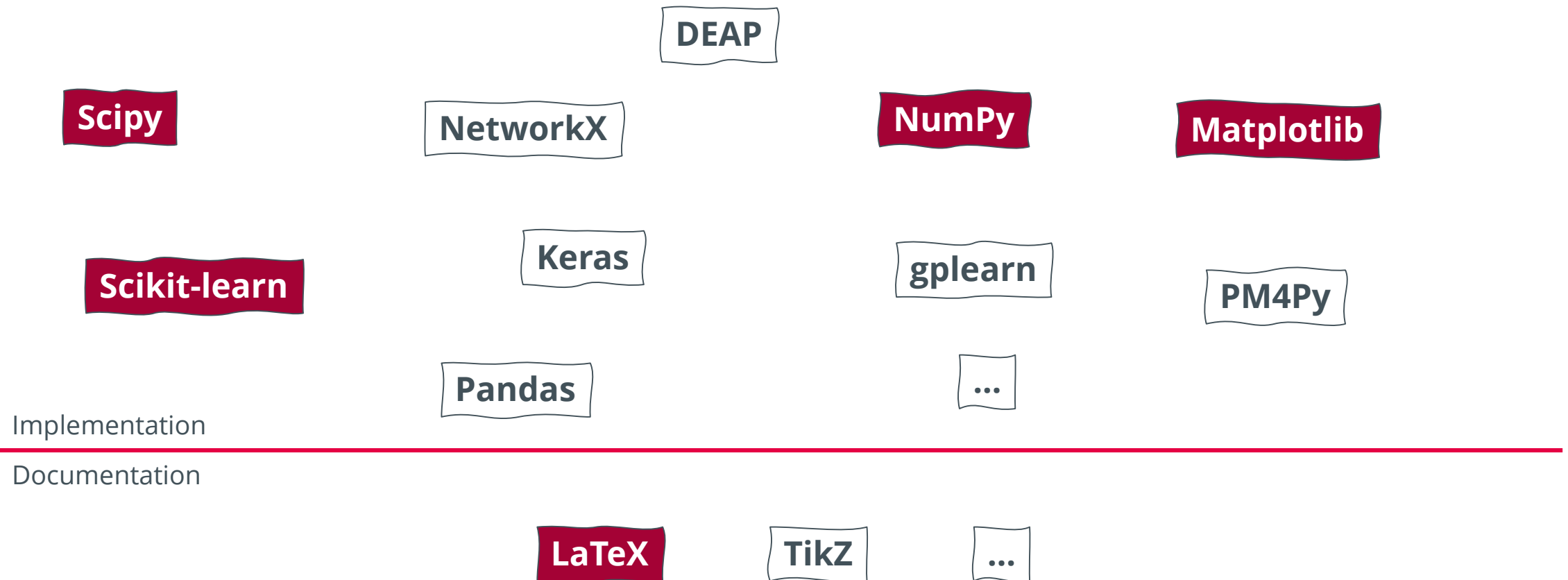


Overview: Advanced Topics in Algorithms

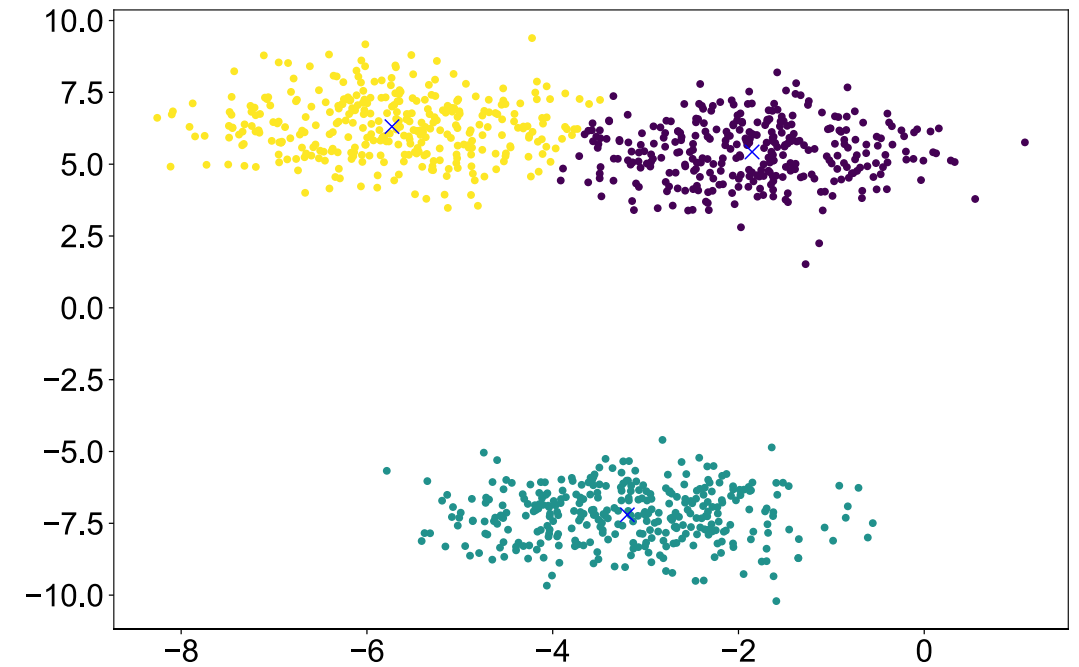
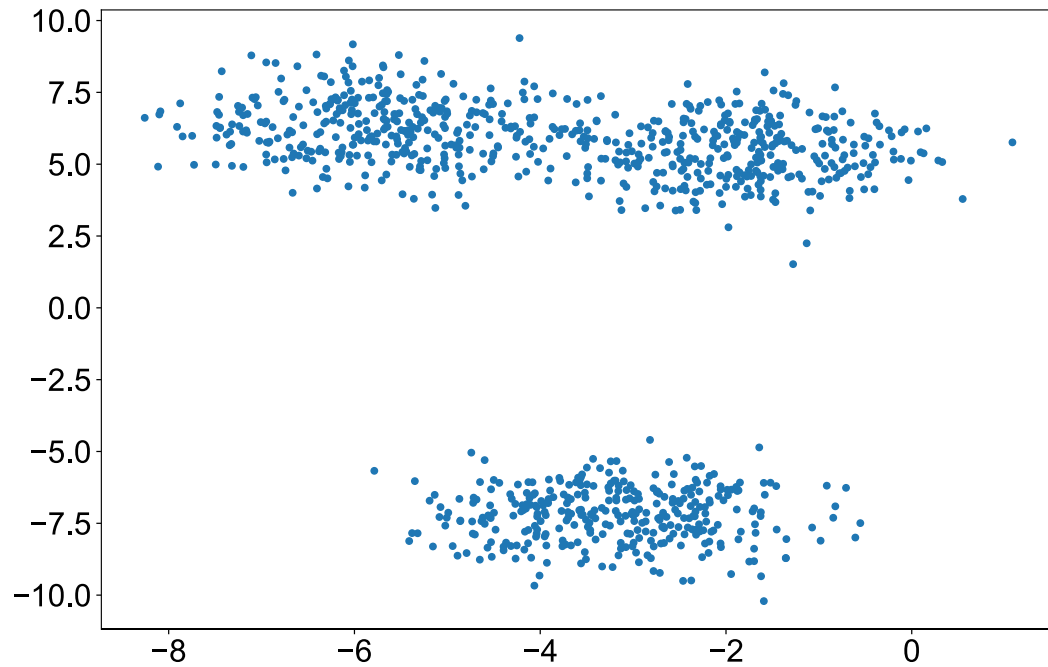
Automatic grouping of similar objects into sets.



Overview: Practical Part

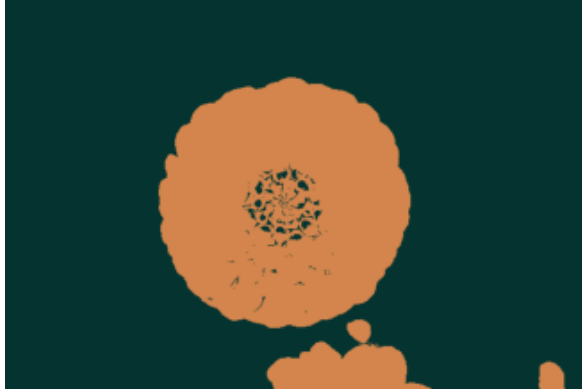


K-Means



K-Means

Quantized image (2 colors, K-Means)



Quantized image (16 colors, K-Means)



Quantized image (32 colors, K-Means)



Quantized image (64 colors, K-Means)



Quantized image (128 colors, K-Means)



Original image (96,615 colors)



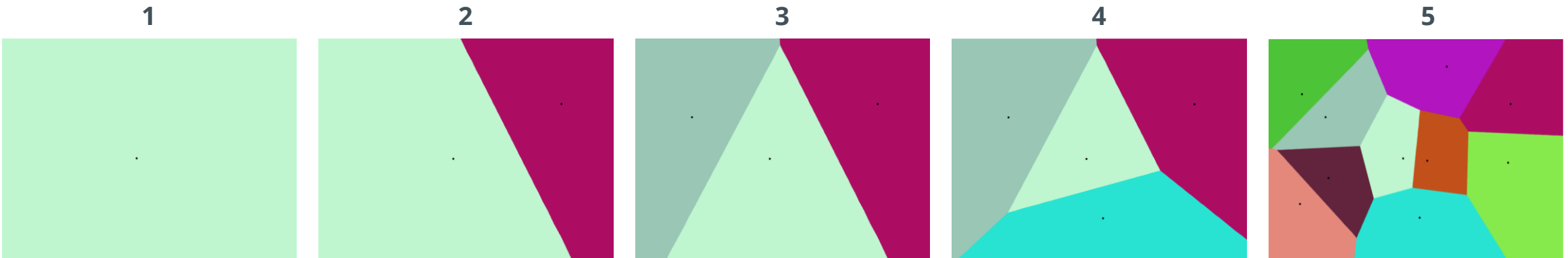
K-Means

The algorithm can also be understood through the concept of Voronoi diagrams [1]:

1. First the Voronoi diagram of the points is calculated using the current centroids. Each segment in the Voronoi diagram becomes a separate cluster.
2. Secondly, the centroids are updated to the mean of each segment.

The algorithm then repeats this until a stopping criterion is fulfilled.

Voronoi Diagram [2]



Fortune's algorithm: $O(n \log n)$ time and $O(n)$ space

[1] <https://scikit-learn.org/stable/modules/clustering.html#k-means>

[2] <http://alexbeutel.com/webgl/voronoi.html>



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Thank you!