Explainable SVM
Digitalization Project "Webtools for teaching"

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Wissen durch Praxis stärkt

Agenda

Introduction

Support Vector Machines

Used Technologies

Live Demo

Solved Challenges

Conclusion

Introduction

- SVMs important machine learning algorithm
- support web-based teaching via interactive visualizations
- distance learning more important due to Corona

Image by Jan Babroák, unsplash.com

SVM

- supervised learning
- commonly used for classification, also regression
- learning means finding a separating boundary (hyperplane)
- Vapnik & Chervonenkins 1963

Used Technologies

Sources: HTML5, CSS3 CC-BY 3.0, jQuery, Bootstrap, MathJax, Plotly.

Live Demo

Solved Challenges: D3 vs Plotly

- d3 is very flexible
- d3 is very low-level, SVG-oriented
- Plotly has standard pipelines for common plot types
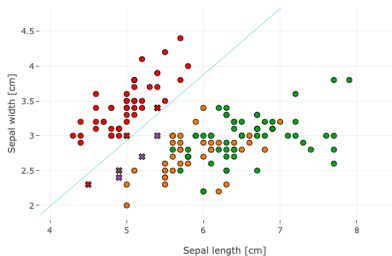- Plotly is still very customizable (builds upon d3)

Solved Challenges: Plotting

- smoothing
  - use sigmoid function instead of sign
- drawing the separating boundary
  - drawing a line doesn't work for all kernels
  - calculating line equation is difficult
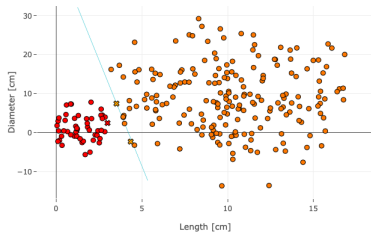 - simple trick: use a 2-level contour plot
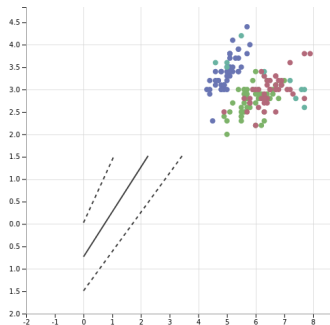
Solved Challenges: Data Sets

Iris

Salmon*

*implemented Python script to generate new data sets
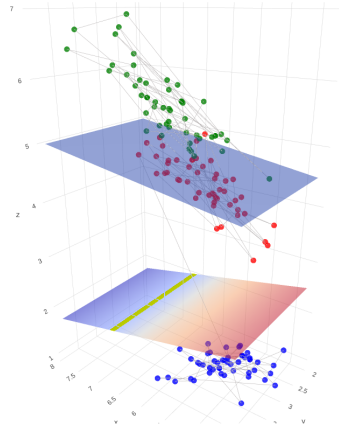
Solved Challenges: SVM Implementation

Implemented API:

- `svm = new SVM({ X, y, C, tol, kernel })`
  - `kernel` **can be any function** `(x, y) -> float`
- `classification = svm.output(point)`
- `svm.main_routine()`
- `svm.main_routine_step({examine_all})`

based on *Support Vector Machines Succinctly* by Alexandre Kowalczyk

Conclusion

- built a wonderful SVM visualization
- great teamwork,
  complementary skills
- future work
  - step through SVM convergence
  - drawing margins around the
    hyperplane
  - more complex visualizations
  - more kernel functions

Any Questions?