Introduction to Machine Learning

Bernd Bischl, Fabian Scheipl, Daniel Schalk

https://github.com/compstat-lmu/lecture_i2ml

Concept

The course is organized as a digital lecture for ML beginners for statistics Bachelors and Data Science ESG student, which should be as self-contained and enable self-study as much as possible:

- Slides with lecture videos
- Interactive tutorials: Currently online quizzes and some very simple online coding exercises
- Complemented by a week-long inverted-classroom block course (code demos, slide discussion, supervised exercises)
- **Produce lecture like a piece of software / library: Literate programming, Github, collaborative, modular chunks, issues, pull requests, etc.**

Contents

- Risk minimization
- Linear models, KNN, Naive Bayes
- Performance evaluation, cross-validation, ROC
- Decision trees, random forests
- Tuning

Prerequisites

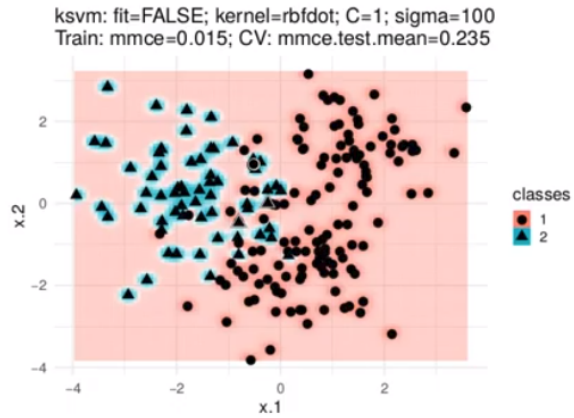
The course is targeted at ML beginners with a basic, university level, education in maths

- Simple linear algebra
- Simple calculus
- Simple probability theory
- Some stats knowledge, you should now what mean, variance, bias, etc., is (Linear) Modelling from a stats perspective can help, but is not required, we sometimes compare to that
- Working knowledge of R

Concept - Lecture Videos

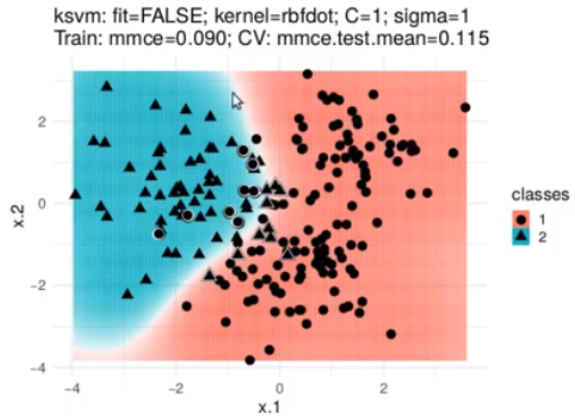
OVERFITTING

Overfitting learner

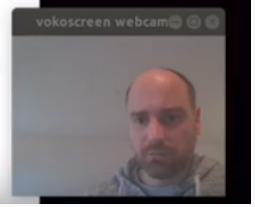


Better training set performance (seen examples)

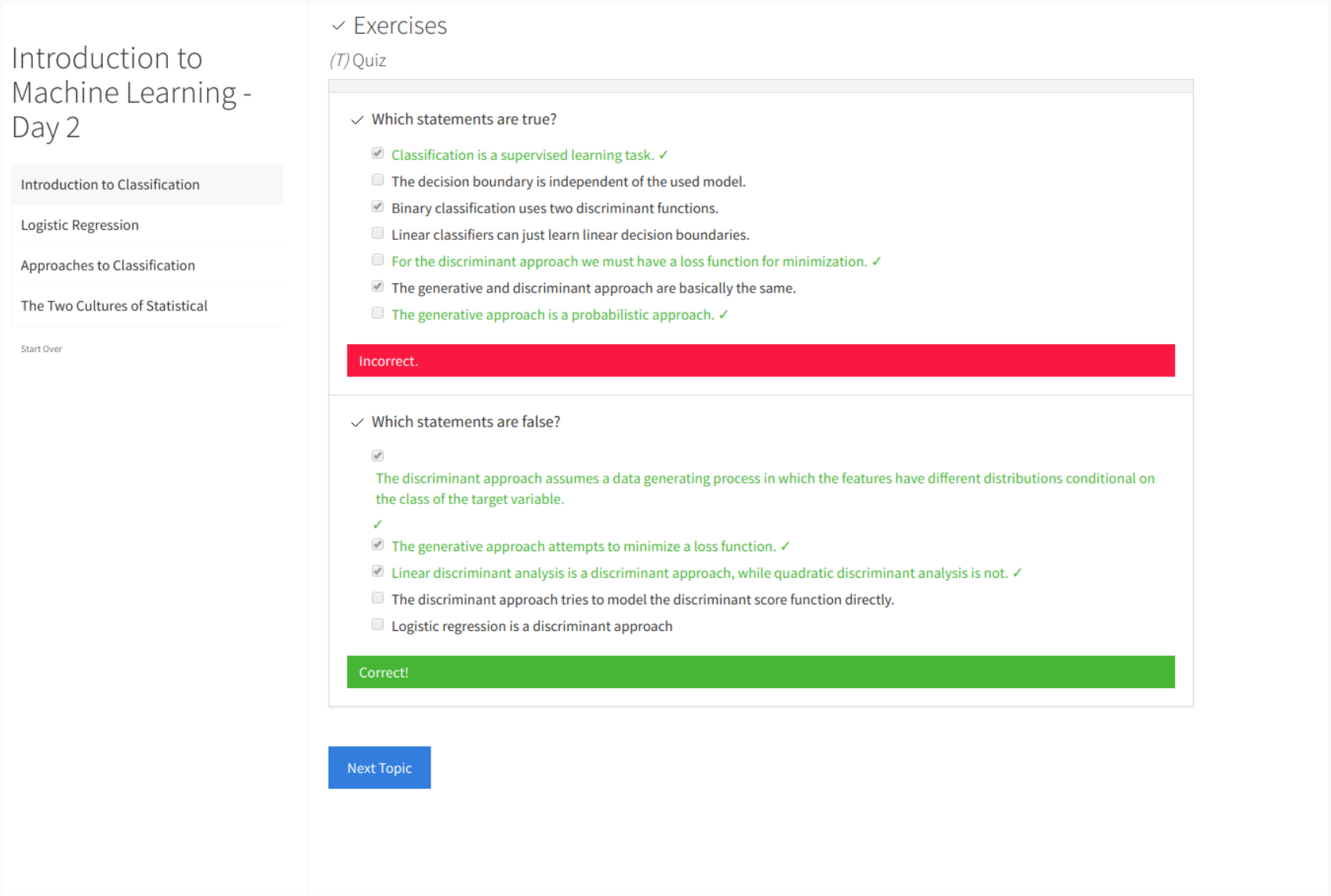
Non-overfitting learner



Better test set performance (unseen examples)



Concept - Interactive Tutorials (Quiz)



Concept - Interactive Tutorials (Examples)

Introduction to Machine Learning - Day 2

- Introduction to Classification
- Logistic Regression
- Approaches to Classification
- The Two Cultures of Statistical

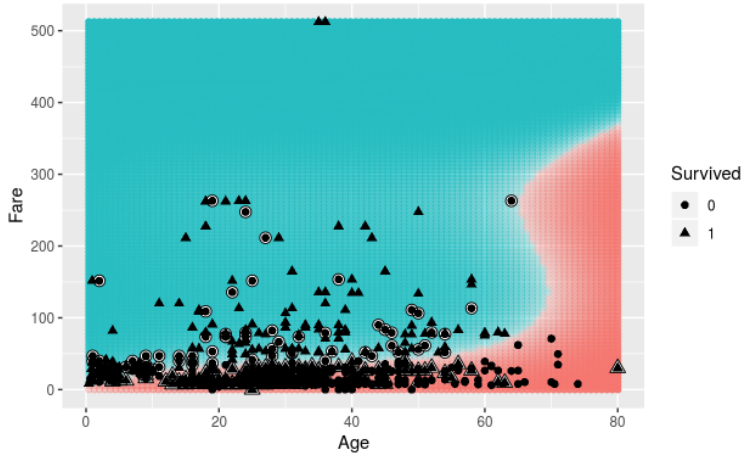
Start Over

(P) Training a logistic regression with non-linear decision boundaries

The next demonstration shows how to include the features `Age` and `Fare` as polynomials and the effect on the decision boundary. As mentioned in the video, it is possible to transform a linear classifier into a non-linear classifier by just mapping features into a higher dimensional feature space (feature map):

Code | Start Over | Run Code

```
1 library(ggplot2)
2
3 # Change degree and threshold here:
4 degree = 3
5 threshold = 0.5
6
```



Previous Topic | Next Topic

Outlook

- Cut lectures / videos down to smaller chunks
- Collaborative development with other lecturers / sites
- More code demos
- Better auto-correction of programming exercises
- Advertise material to other LMU departments / programs