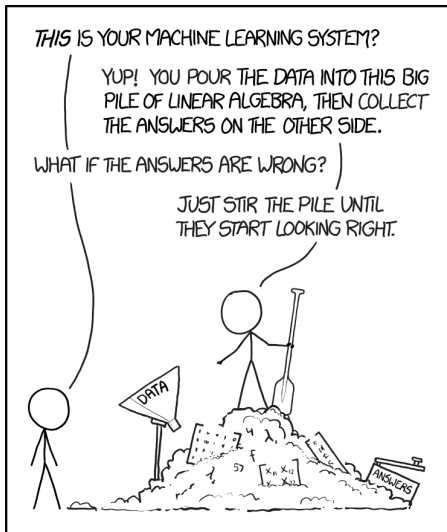# Course introduction 2020

Mitko Veta, Federica Eduati
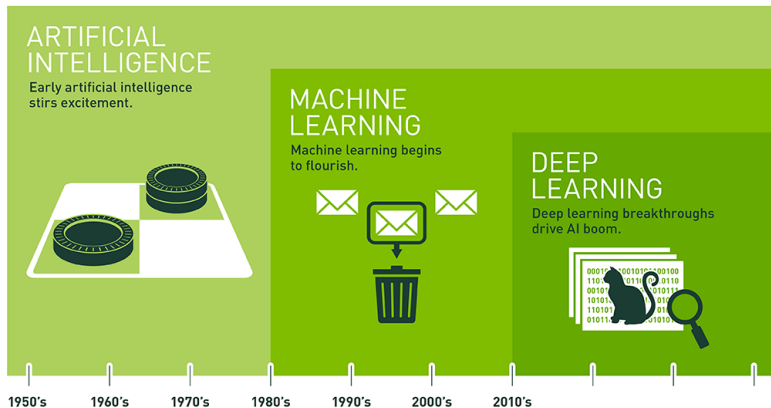
Eindhoven University of Technology
Department of Biomedical Engineering

2020

Why machine learning?

Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Figure source: nvidia.com

Topics covered in the course

- Week 1: Machine learning fundamentals I (Mitko Veta)
- Week 2: Machine learning fundamentals II (Mitko Veta)
- Week 3: Linear models (Federica Eduati)
- Week 4: Deep learning I (Mitko Veta)
- Week 5: Deep learning II (Jelmer Wolterink, UMCU/UvA)
- Week 6: SVM, random forests (Federica Eduati)
- Week 7: Unsupervised machine learning (Federica Eduati)

Weeks 1-6 lecture and practical. Week 7 only lecture.

The course in a nutshell

- Assessment
  - 65% written exam
  - 25% practicals
  - 10% reading assignment
  - 0% **mandatory** Python self-assessment quiz in the first week
- GitHub repository used for material dissemination
- Canvas used for communication and submissions/grading
- Lectures, time: Mondays 13.30 - 15.30, location: Atlas - 1.210 and on-line
- Guided self-study, time: Mondays 15.30 - 17.30, location: on-line via Microsoft Teams

Study materials

- Main: lecture slides and practicals
- Books
    - **Deep Learning**, Ian Goodfellow and Yoshua Bengio and Aaron Courville
    - **The elements of Statistical Learning**, Trevor Hastie, Robert Tibshirani, Jerome Friedman
- Specific chapters and additional material (such as papers) are referenced in the lecture slides

Practicals

- Distributed as Python notebooks
- Deliverables
  - Python functions and/or classes (.py files) that implement basic functionalities (e.g. a k-NN classifier)
  - A **single** Python notebook that contains the experiments, visualization and answer to the questions and math problems.
- The assessment rubric for the practicals can be found in the handouts for week 1
- Instructions to setup the environment are in GitHub
- Each group has a teaching assistant that can be contacted via Teams during the prectical sessions
- You are encouraged to use Canvas Discussion to ask general questions

Reading assignment

- Select a paper per group with following criteris
  - Describes an application of Machine Learning to a Medical Imaging or Computational Biology problem
  - Recently published (after 2015)
  - Published in a high-quality journal (reference list in github)
  - On a topic that you find interesting and want to learn more about
- Use the 'paper selection' assignment to discuss paper selection with us (propose a list)
- Write a review (800 words) with:
  - Summary of the application domain of the paper
  - Summary of the used (Machine Learning) methodology and evaluation metrics
  - Discussion of strong and weak points of the methodology and evaluation metrics
  - Suggestion of alternative methodology, evaluation metrics and ideas for improvement