Feb 27, 2023

Machine Learning Methods and Applications

Week 1: Introduction to Machine Learning

Aim of the course

- Get to know the background of ML methods
- To experience hands-on application of ML
- No more what?, usually **why?**, and **so what?**

Playgrounds

+

or

+

Grading

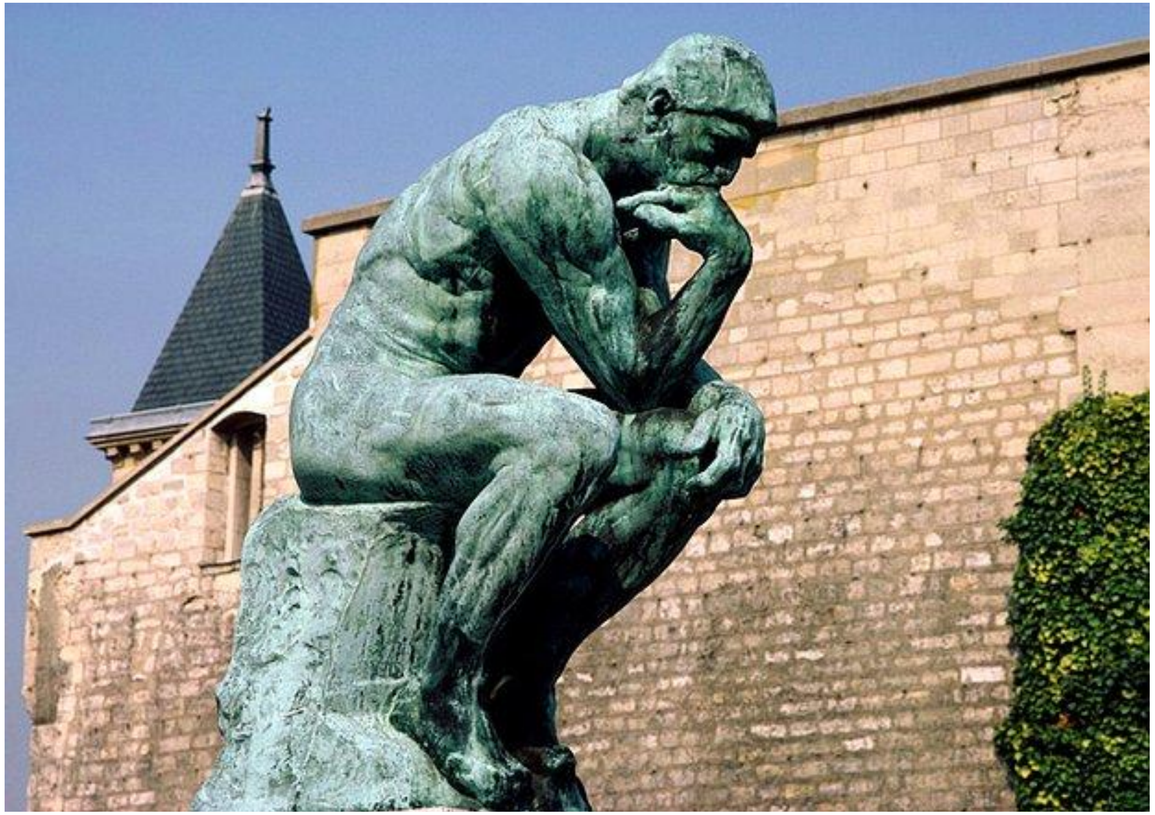
- Biweekly 5 homeworks (50%)
- A midterm exam (20%)
- Final exam (30%)

Tracking course materials

You can reach all course materials and submit your homework on

/mcavs/ESTUStat_2023Spring_MachineLearningMethodsandApplications

Introduction to ML



Le Penseur, Auguste Rodin (1840-1917)

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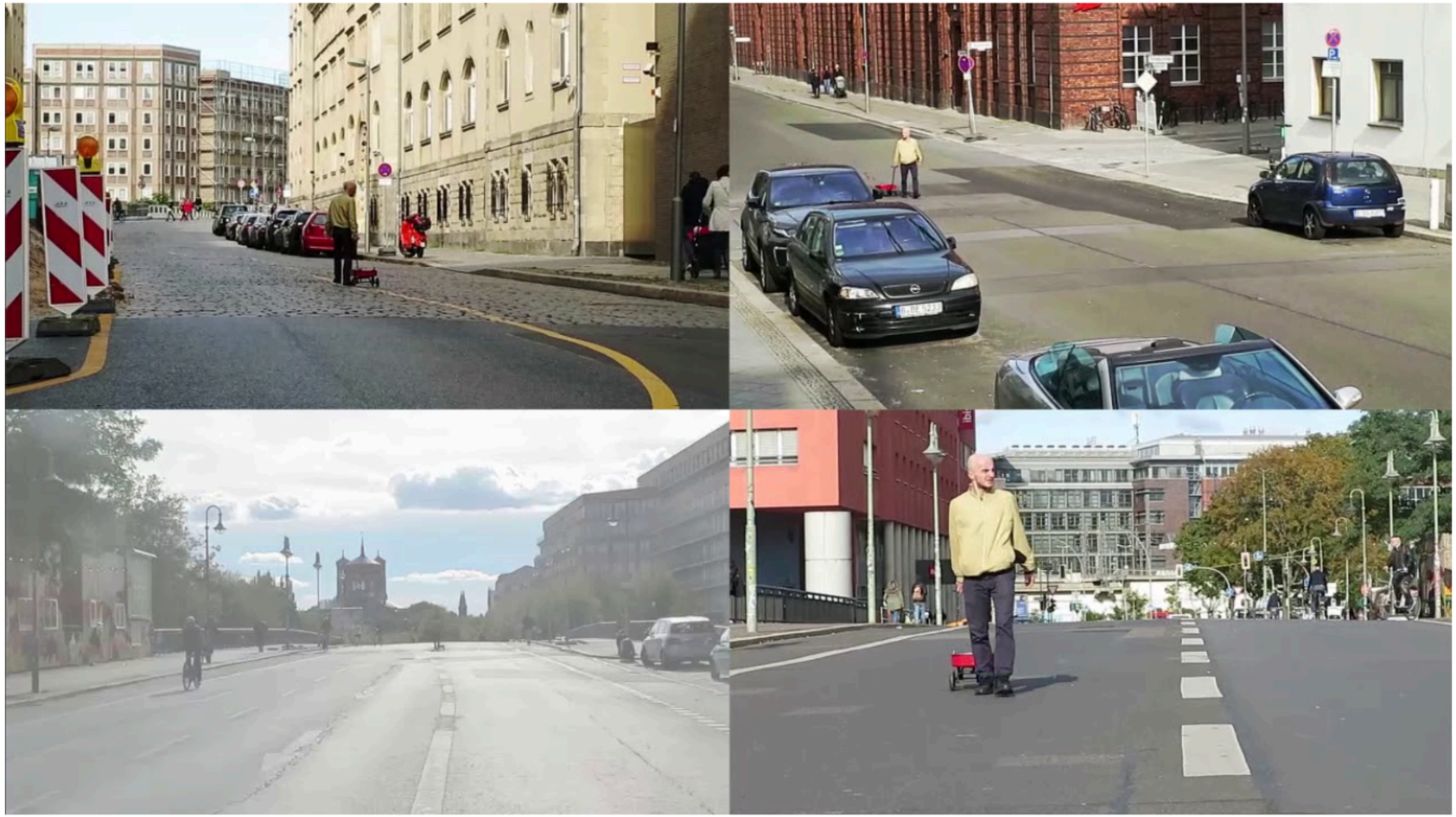

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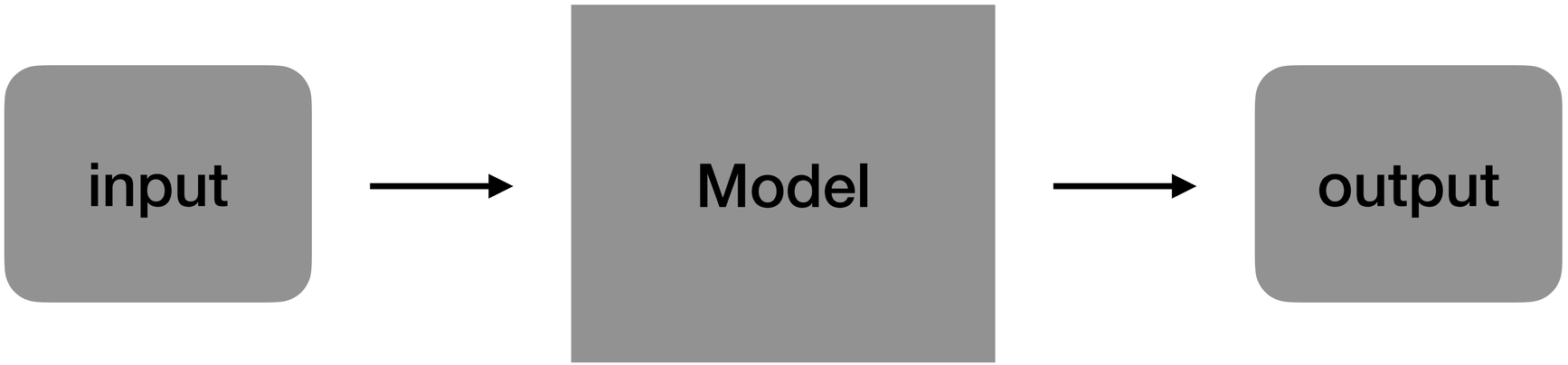
A basic learning process



Introduction to ML

Definitions

- A set of tools for **making predictions** from the data.
- **Intersection** of Statistics and Computer Science.
- Ability to learn from the data **without programmed**.
- **Learns patterns** from data and applies it to new data.
- **Quality** of the process depends on the data.

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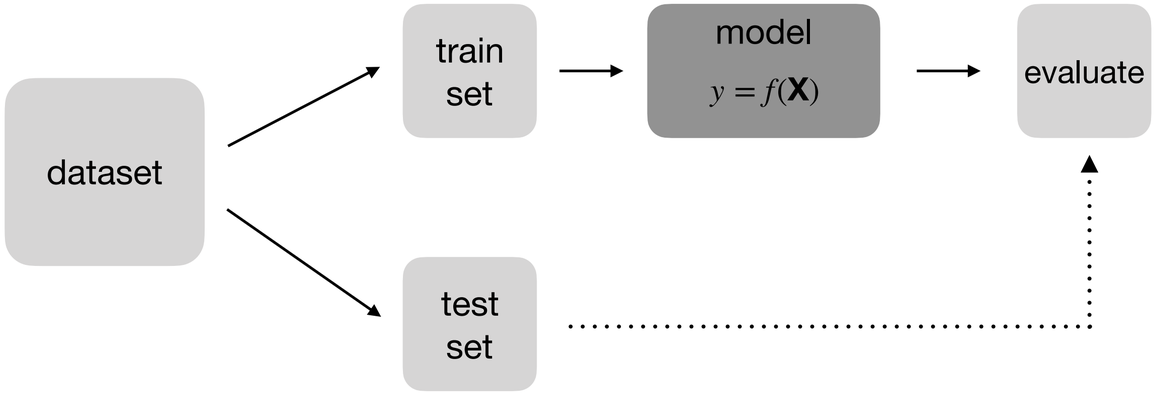
Workflow



Train set: data that model learn from

Test/validation set: new data to measure/validate the performance of the model

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Major branches

1. Supervised Learning
    - Regression
    - Classification
2. Unsupervised Learning
    - Clustering
3. …

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Different perspectives

What is the difference between Statistics and Machine Learning?

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Statistics

Major branches of Statistics

1. **Descriptive Statistics:** summarizing and visualizing data.
2. **Inferential Statistics:** estimation, hypothesis testing, predictive models.

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Difference

The major difference between machine learning and statistics is **their purpose**. Machine learning models are designed **to make the most accurate predictions** possible. Statistical models are designed for **inference about the relationships between variables**.

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Difference(s)

Terminology

explanatory variable independent variable predictor covariate	input feature
dependent variable response predicted variable	output target
fit estimate	train
observation	instance case
coefficient	parameter

The video recording of today's lecture will be available on YouTube, and slides on **GitHub**.
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