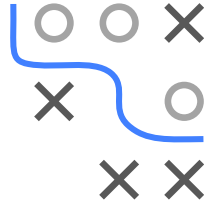
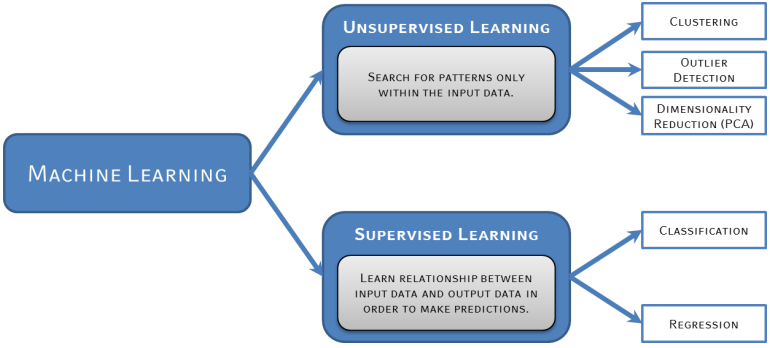
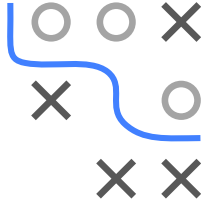
Introduction to Machine Learning

Introduction - Ontology of ML Tasks



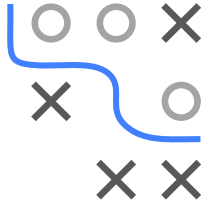
MACHINE LEARNING TASKS





In this course, we will deal with **supervised learning** for regression and classification only: predicting labels y based on features x, using pattterns that we learned from labeled training data.

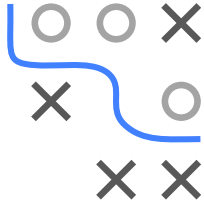
ADDITIONAL LEARNING TASKS



Unsupervised learning

- Data without labels y
- Search for patterns within the inputs x
- *unsupervised* as there is no external criterion to optimize or “true” output
  - Dimensionality reduction (PCA, Autoencoders ...) : Compress information in $\mathcal{X}$
  - Clustering: Grouping similar observations, separating dissimilar observations
  - Outlier detection, Anomaly detection
  - Association rules

ADDITIONAL LEARNING TASKS / 2



Semi-Supervised learning

- Large amount of labeled data necessary to train reliable model
- Creating labeled datasets often very expensive
- Learn from labeled (expensive) **and** unlabeled (cheap) data
- Unlabeled data in conjunction with a small amount of labeled data improves learning accuracy

Reinforcement learning

- Select actions in subsequent states within a certain environment to maximize lagged future reward
- Example: train neural net to play mario kart (environment)
  - Accelerate/ steer/ break (actions) at each time point (states) during playing
  - Reward: ranking after finish, should be maximized