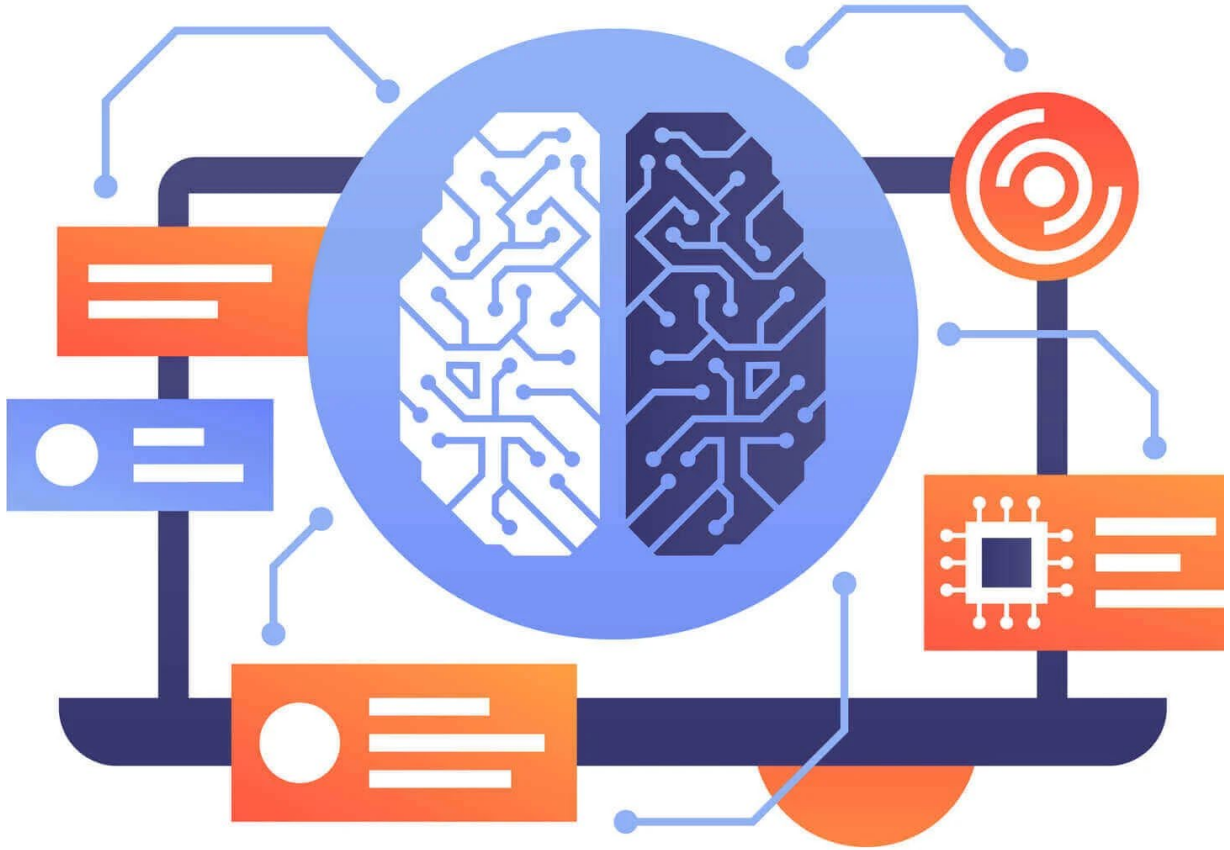


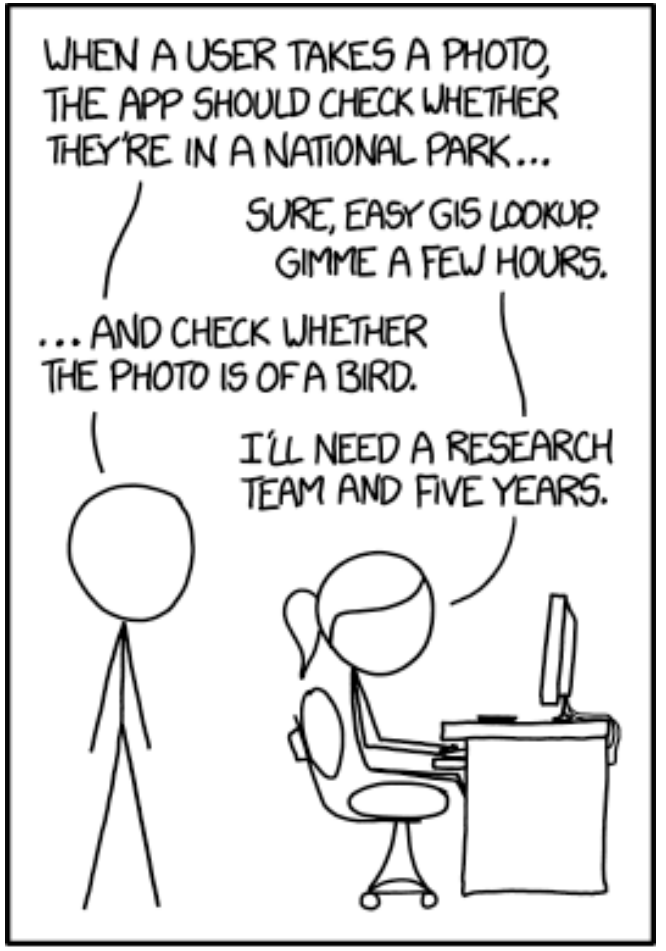
ÜK 259

ICT-Lösungen mit Machine Learning entwickeln

NOSERYOUNG

What is Machine Learning?

- What is Intelligence?
- What is Artificial Intelligence?
- What's the difference between Machine learning and conventional computational analysis?



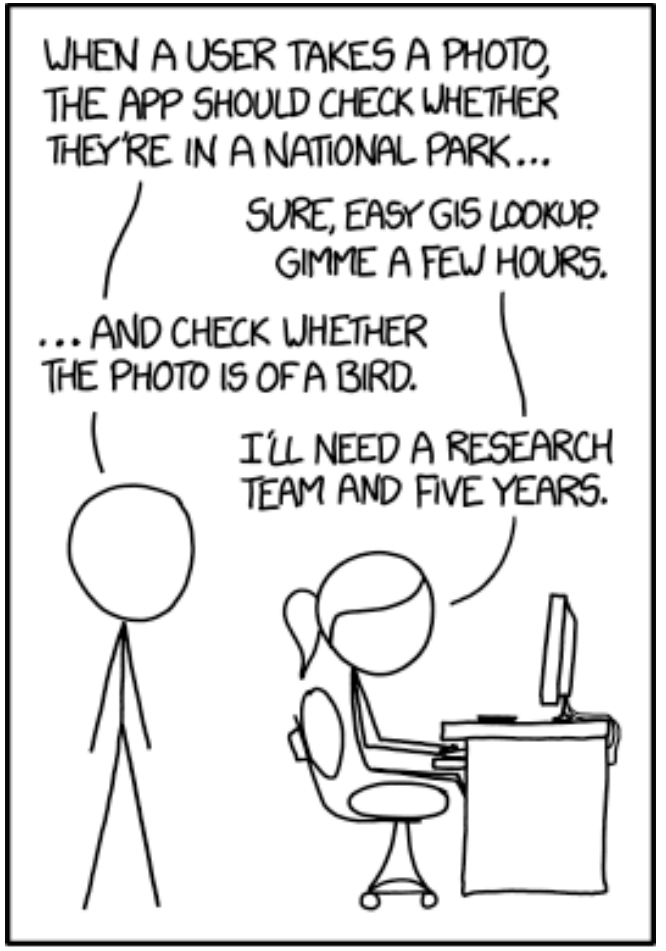
What is Machine Learning?

- **What is Intelligence?**

  “Ability to process information and use it to solve a problem”

- **What is Artificial Intelligence?**

  “Algorithms that imitate decision structures of humans to (somewhat) independently solve problems”

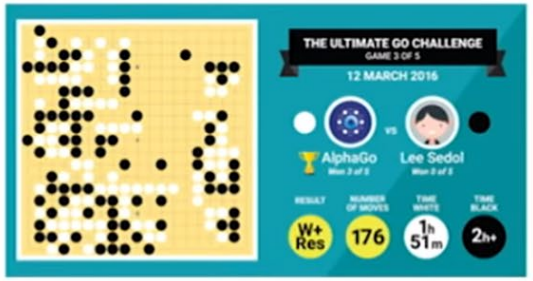


Machine Learning is…

- “A lot of Maths”
- A set of algorithms that improve automatically through experience and by the use of data
- A method to solve a problem that we don’t know the solution for (yet)

NOSERYOUNG

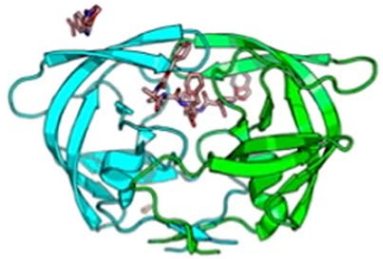
Use Cases



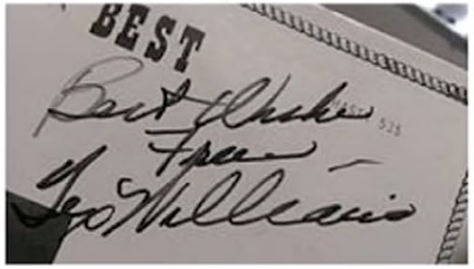
AlphaGo

NETFLIX

Recommendation systems



Drug discovery



Character recognition

2σ TWO SIGMA

Hedge fund stock predictions

Voice assistants

Assisted driving

Face detection/recognition

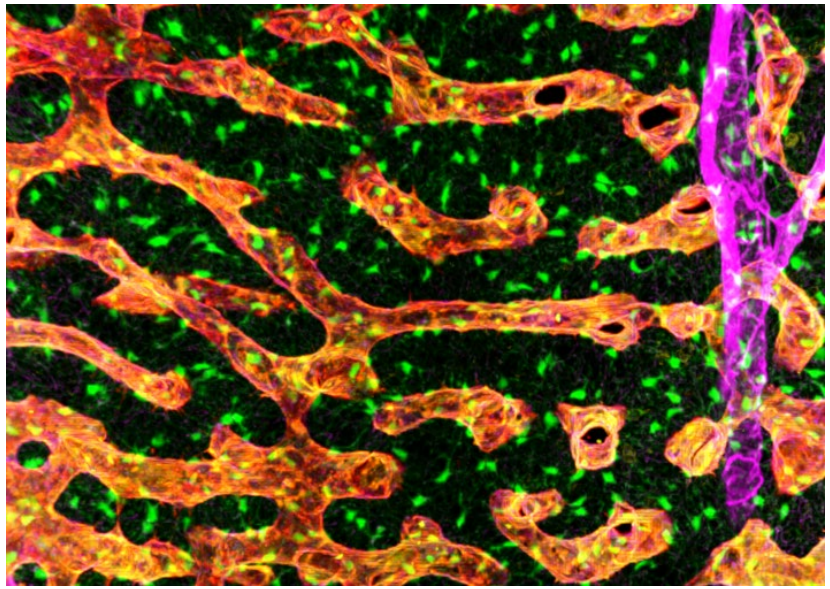
Cancer diagnosis

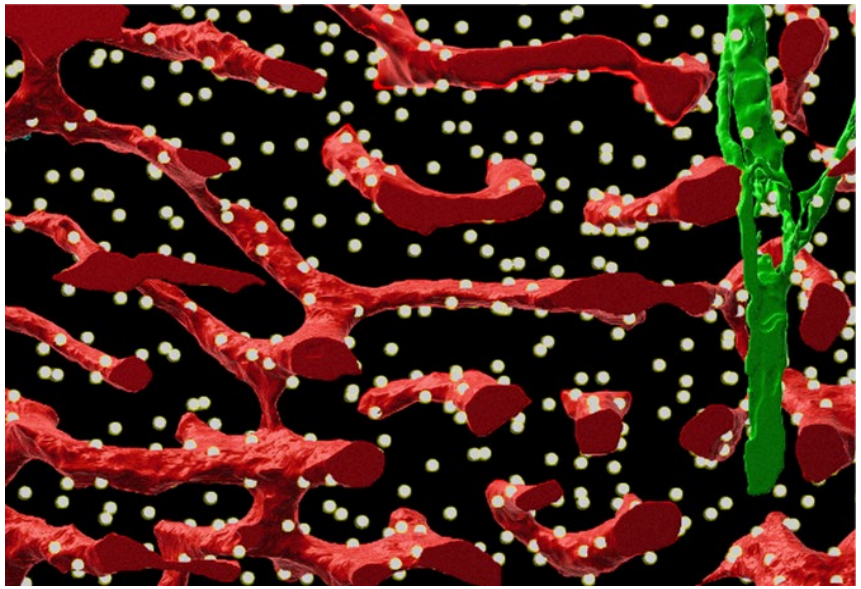
NOSERYOUNG

What can ML do?

Some examples

- AVIA: AI Composer
- This Persone does not exist: thispersondoesnotexist.com
- Github CoPilot: https://copilot.github.com/
- MINTIF: 3D microscopy segmentation





NOSERYOUNG

üK 259

Goals

- Understand how machines “learn”
- Get an overview of current ML methods and their applications
- Get a feeling for common problems and workflows in data analysis
- Gather first experiences in applying those methods on real world problems

NOSERYOUNG

üK 259

HANOKS

- 1.1 Kennt die verschiedenen Technologien im Machine Learning Umfeld und deren Anwendungsgebiete.
- 1.2 Kennt Lösungsvarianten und den Mehrwert für ICT-Lösungen im Vergleich zu bestehenden Lösungen
- 1.3 Kennt die Kategorien des Machine Learning und wählt aus diesen die geeignete Technologie für eine ICT-Lösung aus.
- 1.4 Kennt Modelle und Verfahren im Machine Learning Umfeld2.1 Kennt die gesetzlichen Kriterien zur Bestimmung schützenswerter Daten.
- 2.2 Kennt Massnahmen zur Gewährleistung des Datenschutzes bei der Nutzung und Verarbeitung von schützenswerten Daten.
- 3.1 Kennt die Eigenschaften von Daten und die Vorgehensweise, zur Extraktion von Features für eine Datenanalyse.
- 3.2 Kennt die drei Datentypen und deren Eigenschaften.
- 3.3 Kennt die Möglichkeiten, Daten für eine weitere Verarbeitung aufzubereiten

NOSERYOUNG

üK 259

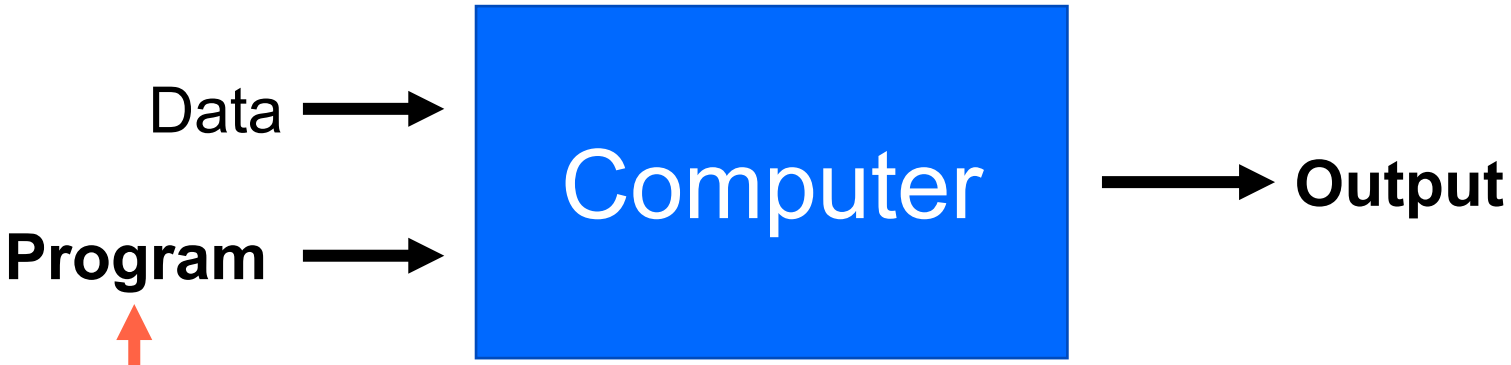
HANOKS

- 4.1 Kennt den Ablauf der Entwicklung einer ICT-Lösung mit Machine Learning gemäss den folgenden Schritten: Zieldefinition, Datenbeschaffung und Aufbereitung der Daten, Lernphase, Interpretation der Ergebnisse und produktivem Einsatz.
- 4.2 Kennt das Vorgehen zum Trainieren und Testen eines Modells
- 5.1 Kennt die Wahrheitsmatrix und deren Funktion.
- 5.2 Kennt die statistischen Gütekriterien zur Beurteilung der Wahrheitsmatrix.
- 6.1 Kennt die erforderlichen Zugriffsmechanismen und die benötigten Schnittstellen eines Machine Learning Dienstes.
- 6.2 Kennt die Komponenten und Dienste sowie das Vorgehen zur Konfiguration nach Vorgaben.
- 7.1 Kennt eine Programmierumgebung und deren Framework zur Entwicklung einer ICT-Lösung mit Machine Learning.
- 7.2 Kennt verschiedene Pipelines zur Entwicklung eines Machine Learning Modells.

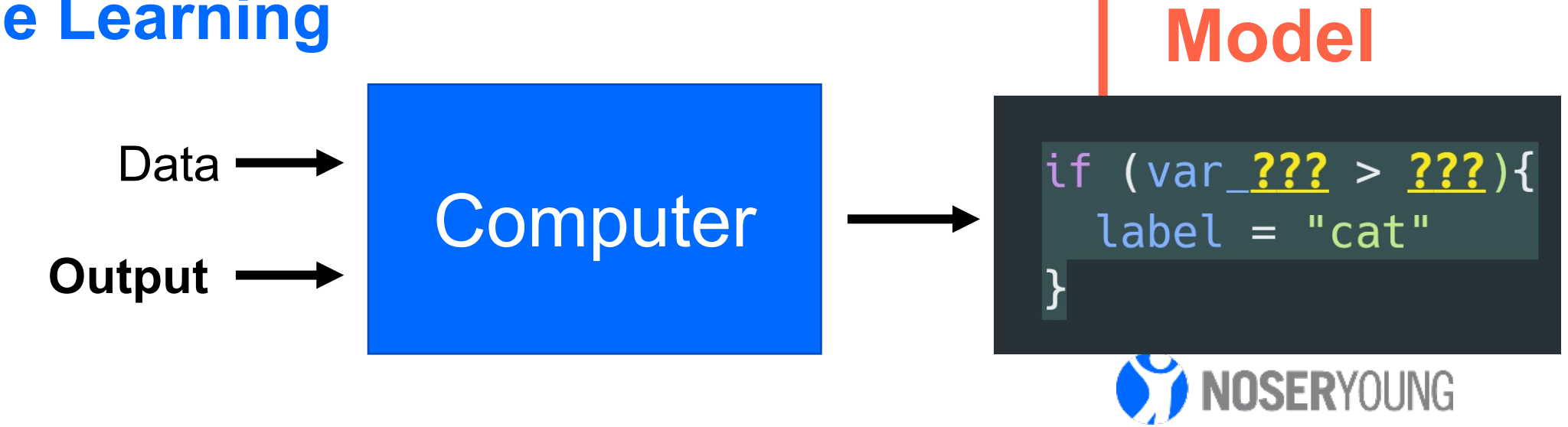
NOSERYOUNG

Traditional Programming vs. ML

Traditional Programming



Machine Learning



NOSERYOUNG

What is a Model?

- **A model is a set of instructions (Algorithm) used to come to a decision based on input data**

  ➔ It represents the general set of solutions / strategies used to solve the problem

  ➔ A “**trained**” model is such an algorithm **with tuned variables** to solve a specific problem.

NOSERYOUNG

What is a Model?

- **A model is a set of instructions (Algorithm) used to come to a decision based on input data**

  ➔ It represents the general set of solutions / strategies used to solve the problem

  ➔ A "**trained**" model is such an algorithm **with tuned variables** to solve a specific problem.

  E.g. Predicting the weather for tomorrow based on todays weather vs. predicting tomorrows stock price

Problems to solve with machine learning

Classification

Clustering

Regression

Dimensinality Reduction

When is traditional computing better than machine learning?

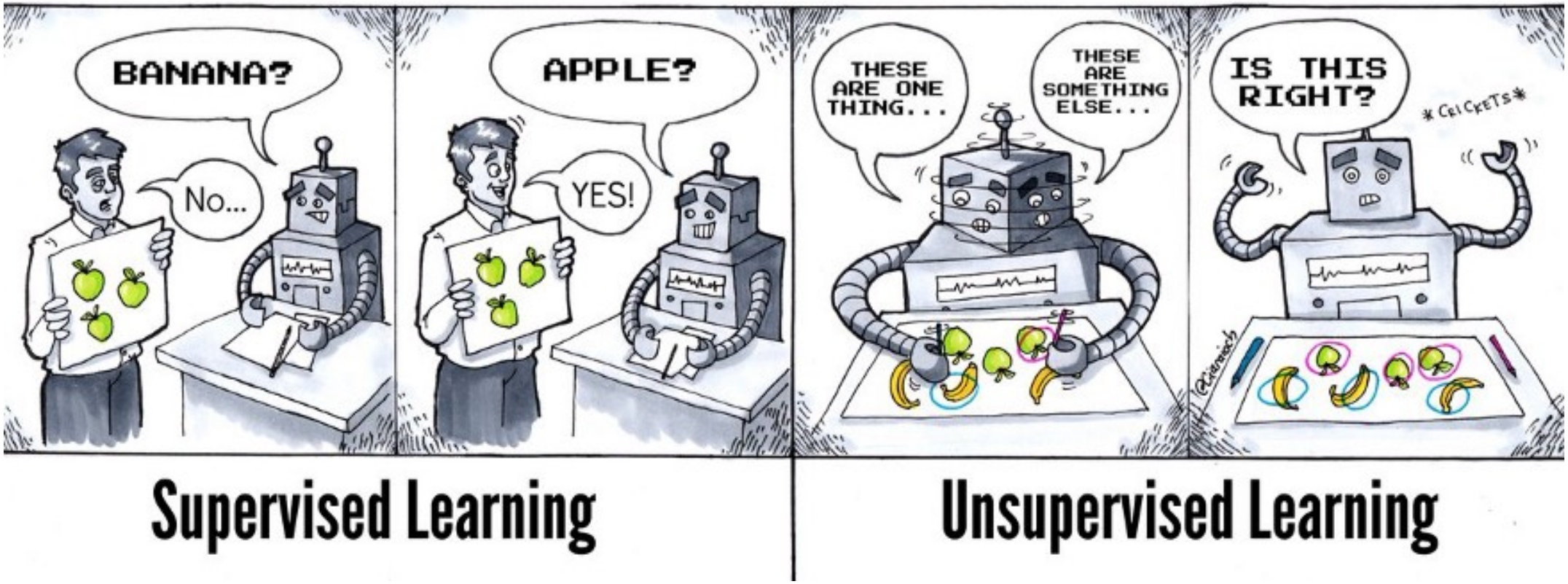
Not enough data

Noisy Data

No time & money

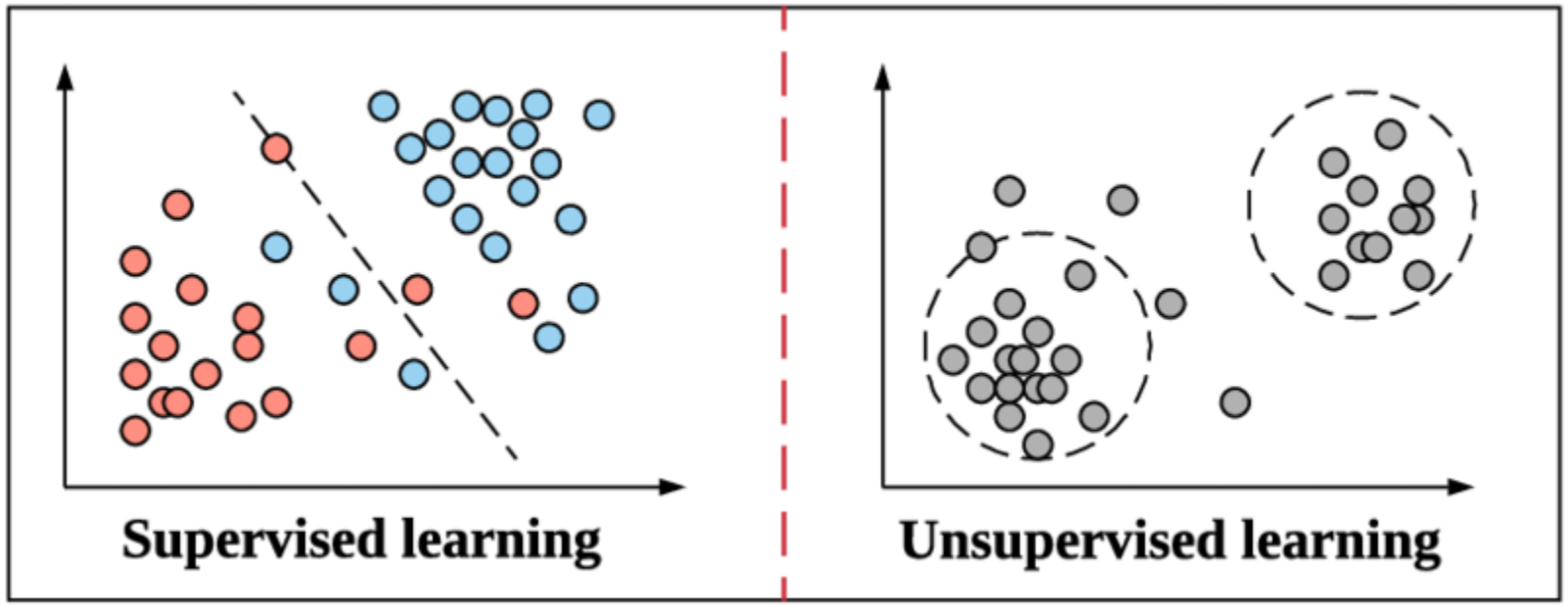
Simple problem to solve

Types of Machine Learning



NOSERYOUNG

Types of Machine Learning



NOSERYOUNG

CLASSICAL MACHINE LEARNING

Data is pre-categorized or numerical

SUPERVISED

Predict a category

CLASSIFICATION

«Divide the socks by color»

Predict a number

REGRESSION

«Divide the ties by length»

Data is not labeled in any way

UNSUPERVISED

Divide by similarity

CLUSTERING

«Split up similar clothing into stacks»

Find hidden dependencies

DIMENSION REDUCTION (generalization)

«Make the best outfits from the given clothes»

Identify sequences

ASSOCIATION

«Find what clothes I often wear together»

JNG

Main Types of Machine Learning

- **Unsupervised ML:** Find patterns & trends in the data, without any prior knowledge.

- **Supervised ML**: Given a dataset and its corresponding desired output, determine the best Algorithm to predict the output from the data.

- (Reinforcement Learning): Given a set of rules, develop a strategy to maximize a score

NOSERYOUNG

Tools for Machine Learning

- **Python**
- Anaconda
  - Numpy
  - Pandas
  - MatplotLib & Seaborn
  - Scikit Learn
  - Tensorflow
- Jupyter (Lab)

NOSERYOUNG