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Machine Learning
Introduction

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Why bother about Machine Learning?

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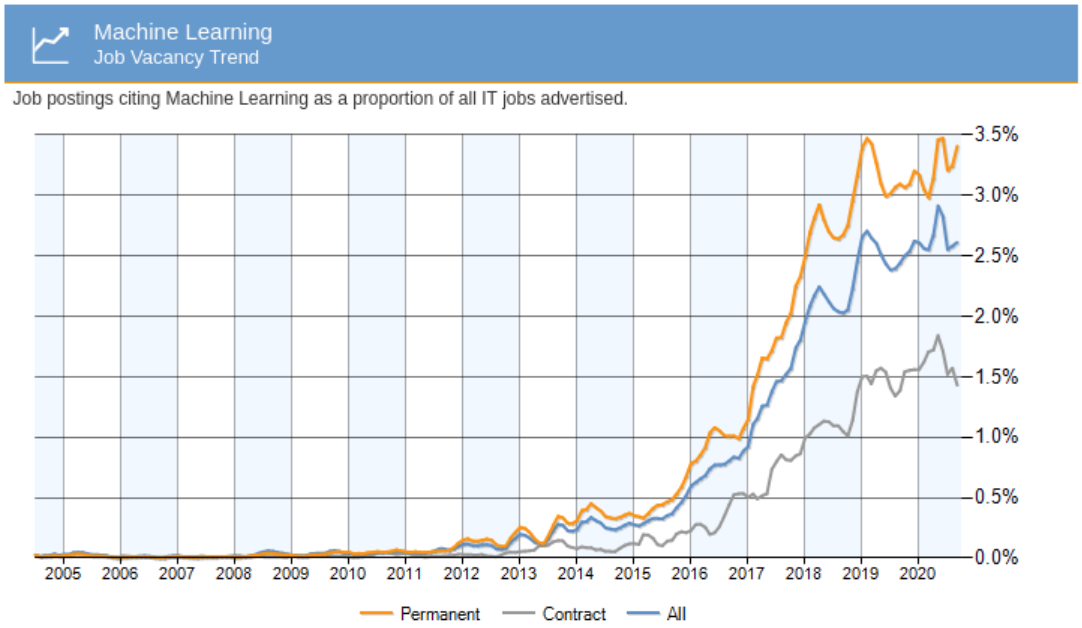

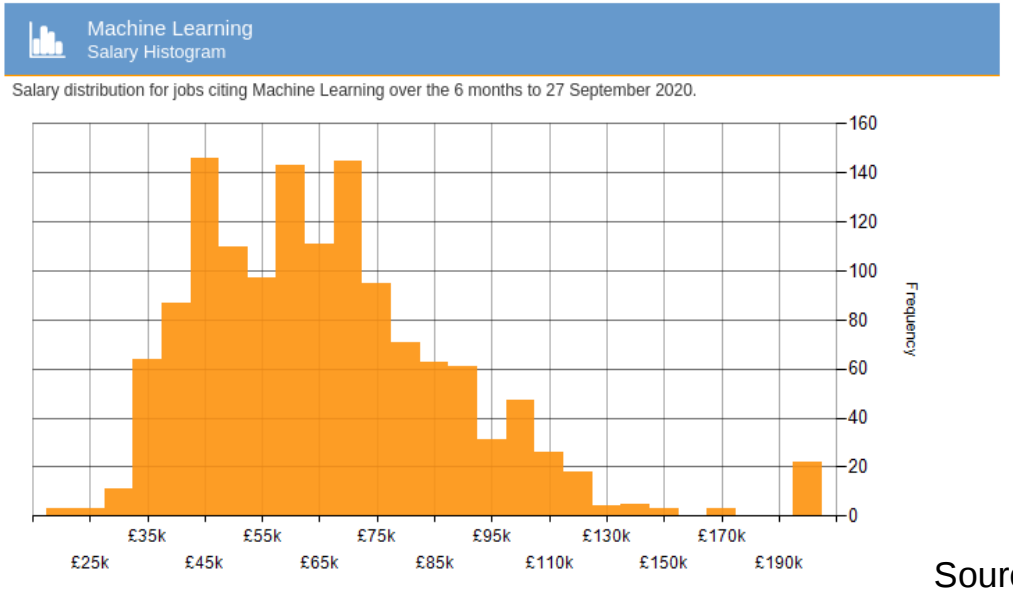

Source: https://www.itjobswatch.co.uk

What is Machine Learning?

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Machine Learning (ML):

The field of study that gives computers the ability to learn without being explicitly programmed.

Arthur Lee Samuel was an American pioneer in the field of computer gaming and artificial intelligence. He popularized the term "machine learning" in 1959.

Further resources on definition:
https://www.youtube.com/watch?v=ukzFI9rgwfU

How do you use Machine Learning in your everyday life?

Some Examples

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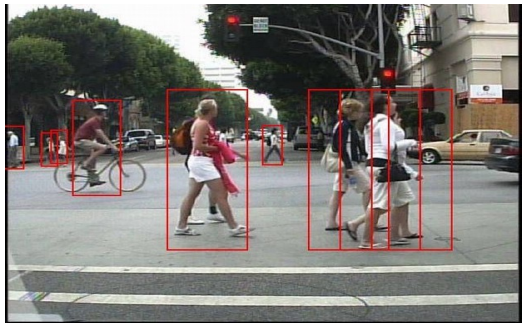
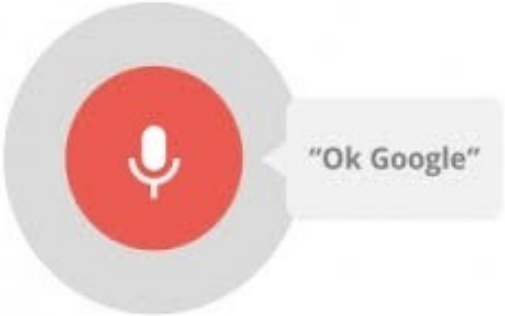
Spam filtering

Face detection

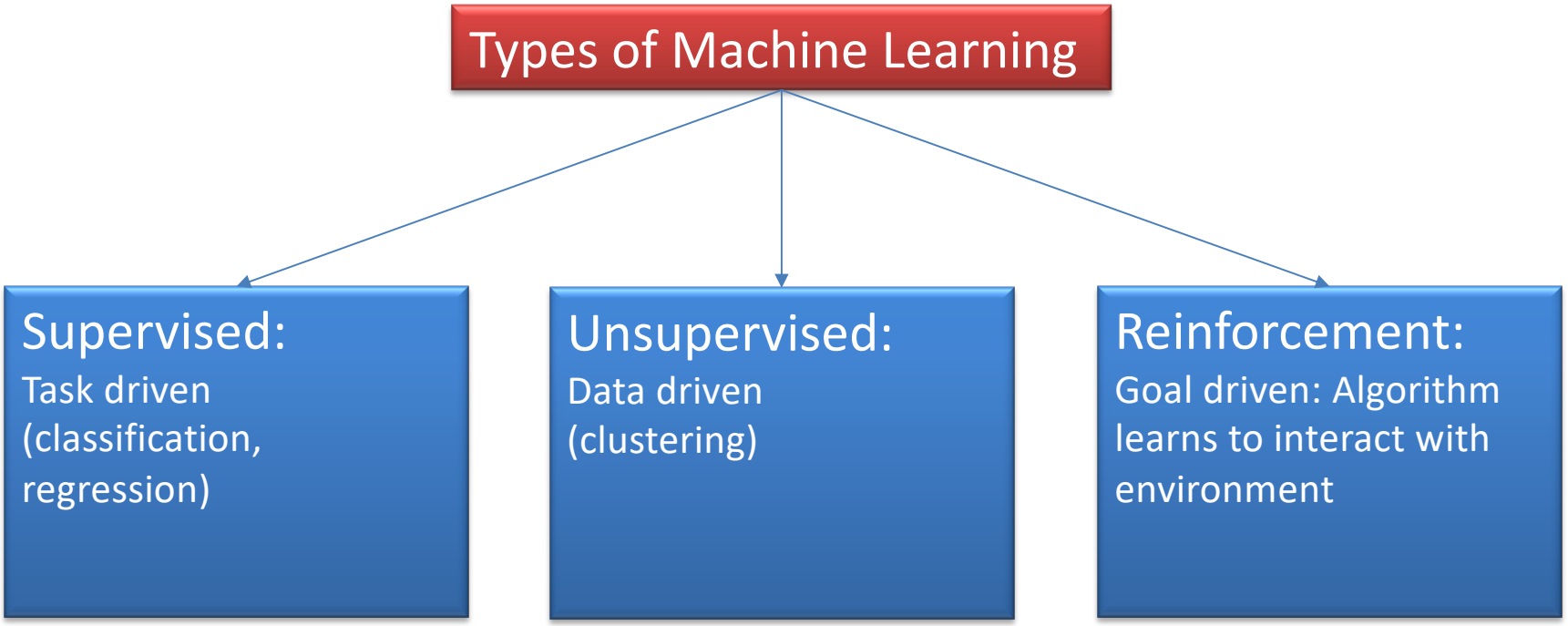


Pedestrian detection

Movie recommendation



Voice recognition


Types of Machine Learning
Supervised:
Task driven (classification, regression)
Unsupervised:
Data driven (clustering)
Reinforcement:
Goal driven: Algorithm learns to interact with environment

Regression

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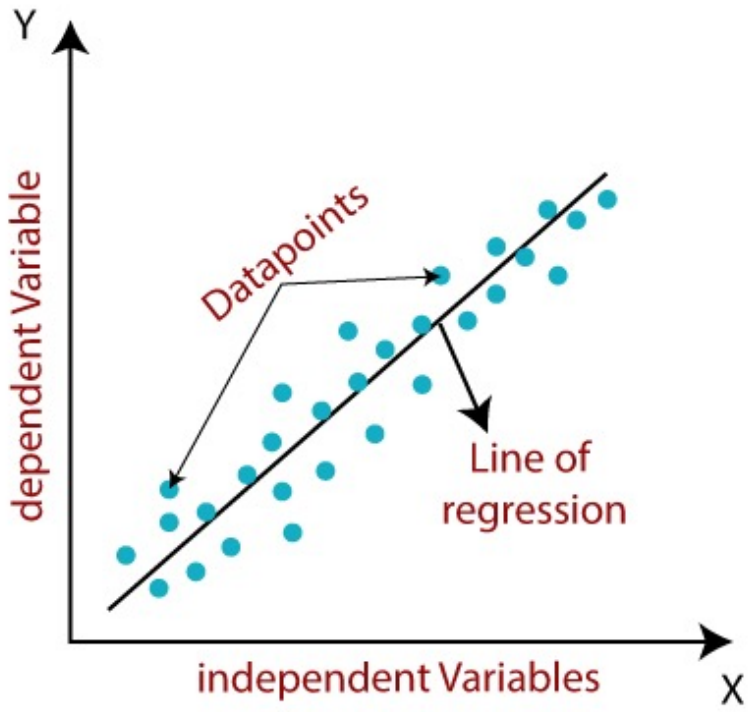
Task: predict a continuous dependent variable y (e.g. weight) given an independent variable x (e.g. height)

Dependent variables are also called target variables.

x	y
160	61
154	53
187	79
174	70
165	?



Classification

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Task: determine the discrete variable y (chair/table) given x (image)

Chair

Chair

Chair

Table

Table

?

Clustering

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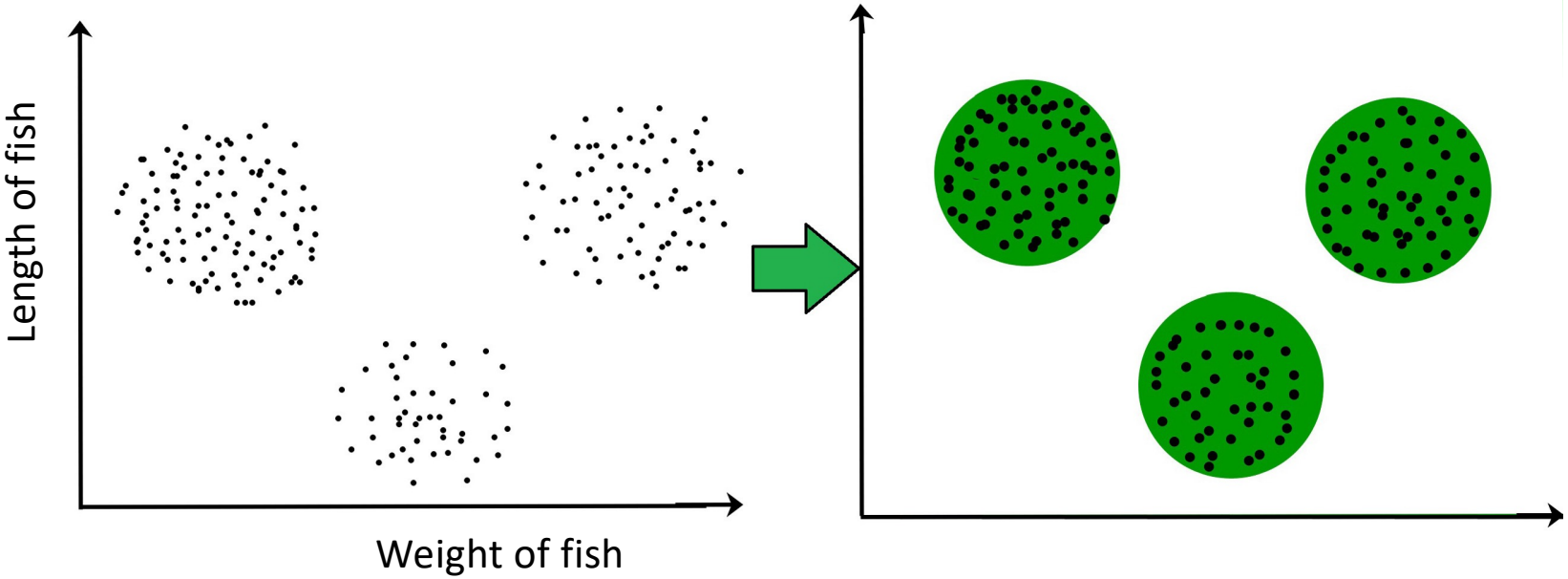
Task: cluster the data (e.g. height/weight) into coherent groups.



Reinforcement learning

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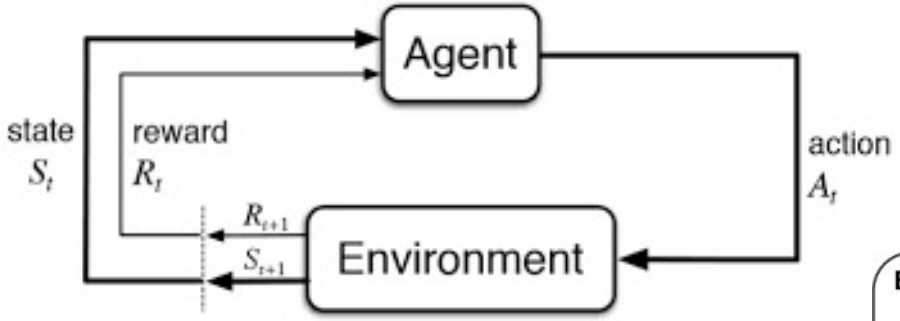
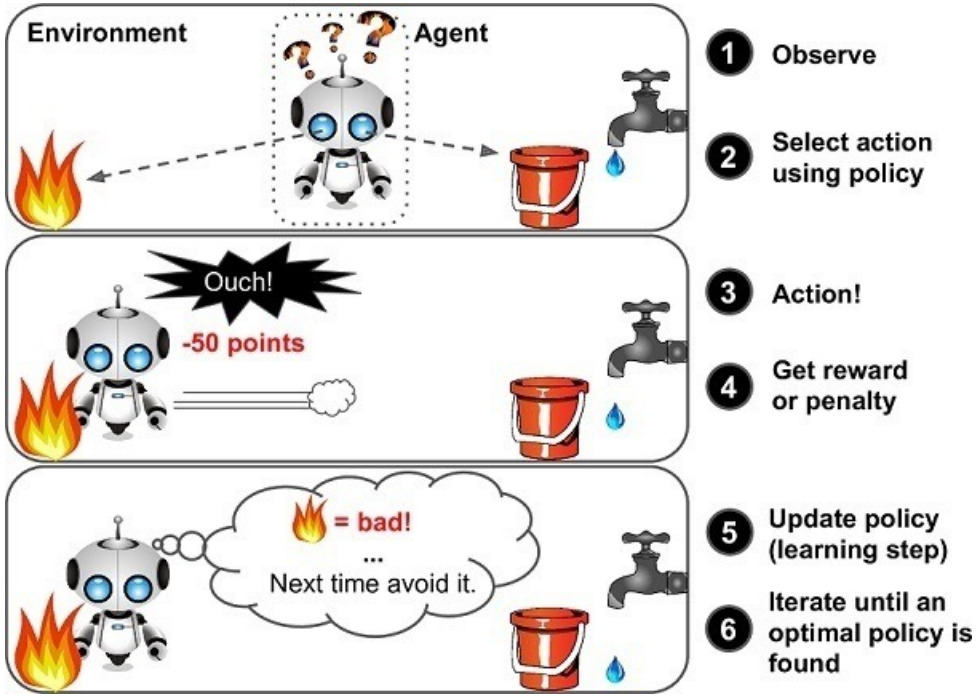
Goal: At any state S_t, the agent learns to take the best action a_t to maximize the reward r_t.





Goals

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- Know the foundation behind the most popular learning algorithms

- Code and apply those algorithms to datasets.

Machine Learning Process

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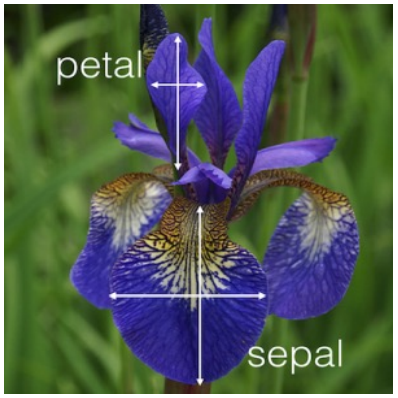
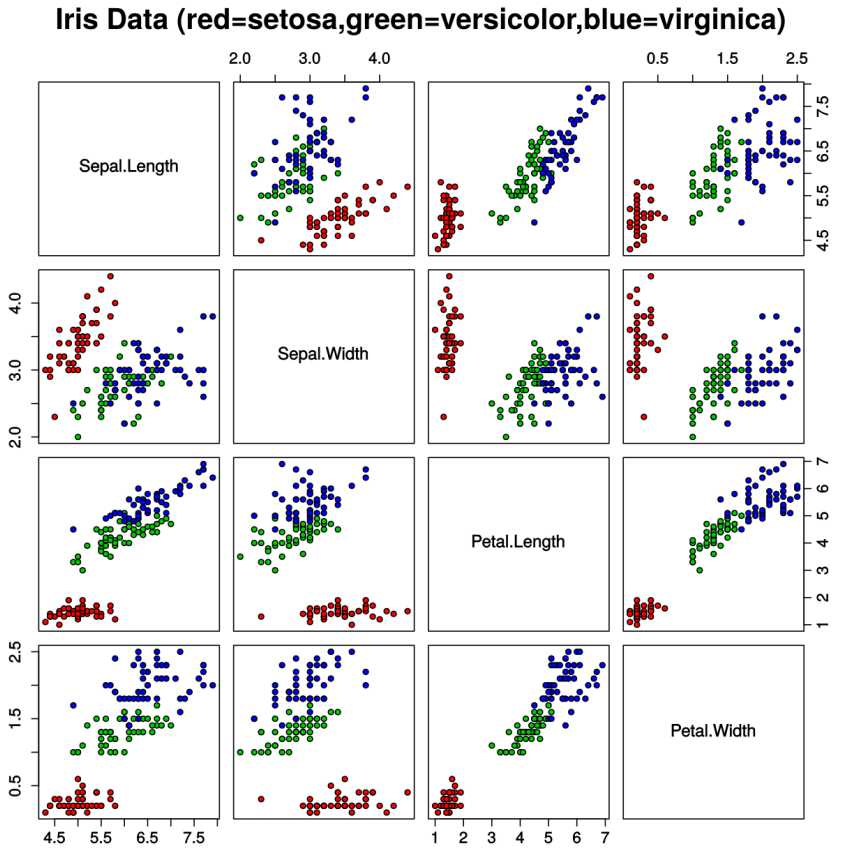
Data Collection:
For example, many images of various iris flowers

Feature Selection:
E.g., length/widths of petal and sepal in each flower





Machine Learning Process

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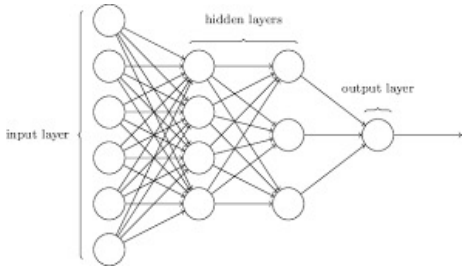
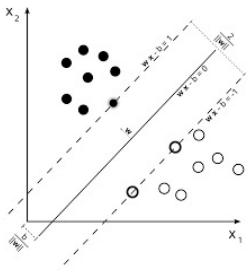
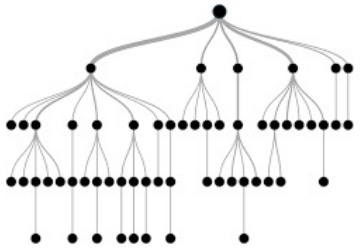
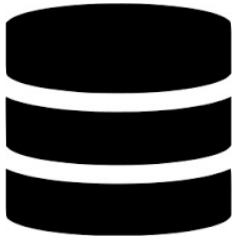
Model choice







Training



Tuned Parameters

Data

Evaluation

		PredictedClass		
		Setosa	Versicolor	Virginica
Actual Class	Setosa	**14**	1	1
	Versicolor	1	**11**	3
	Verginica	1	3	**10**

Machine Learning Process

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Data Collection

Feature Selection

Model choice

Training

Evaluation

Other information

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- Lectures: online on Zoom, recordings will be available on Minerva
- Tutorials: will follow the lecture, in-person, every other week (2, 4, ..) unless otherwise said.
- Labs: drop-in, DEC10
- Support: Use Teams page, PGR students
- Assessment plan (tentative):
  - Programming project - Python (20%)
  - In-course online test - Gradescope (30%)
  - Final online test - Gradescope (50%)
- Text books:
  - Machine Learning, An Algorithmic Perspective, Stephen Marsland,
  - Pattern Recognition and Machine Learning, Christopher Bishop