

L3: Overview of machine learning types and tasks

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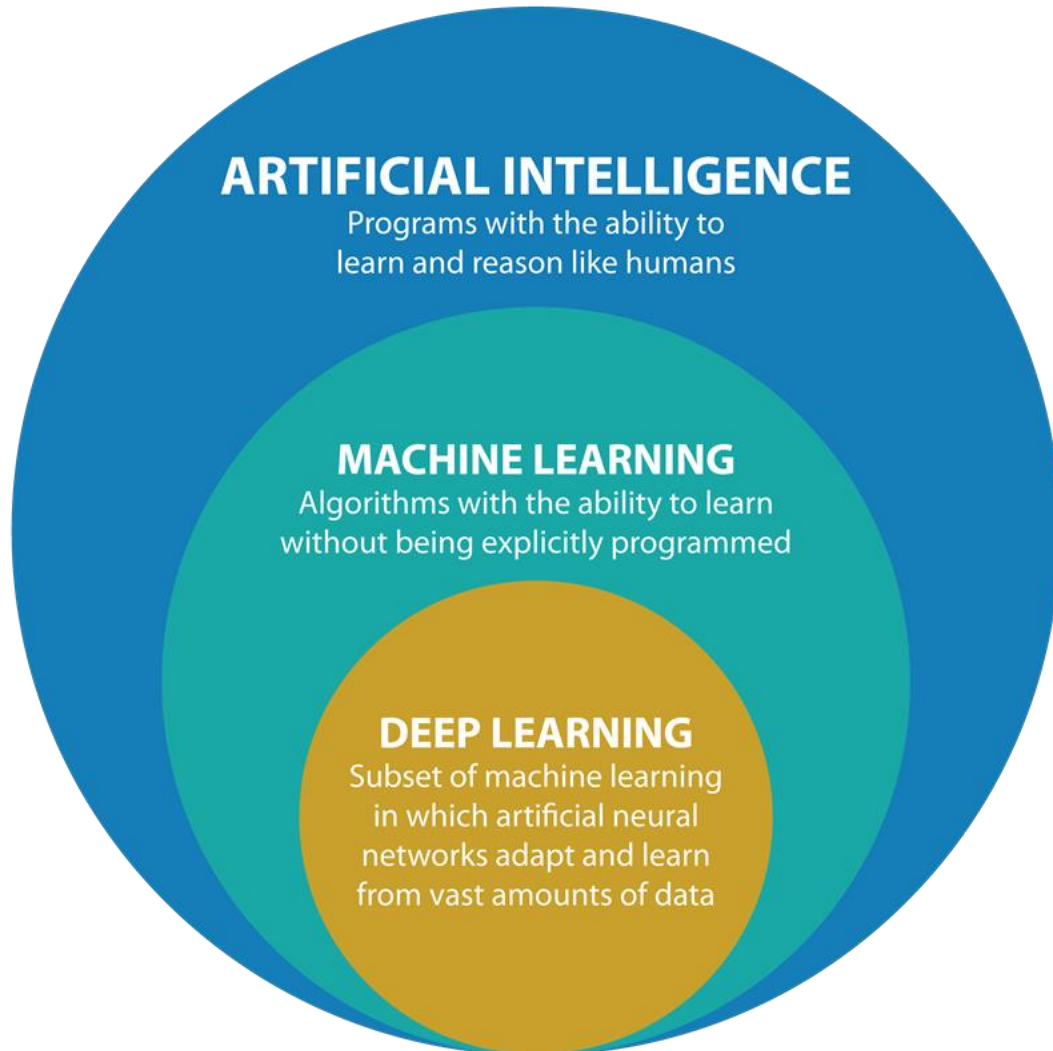
Review of last class

- What is machine learning?
 - Method that can learn from data
- When do we use machine learning?
 - The relationship of data are hard to explain
 - Automatic, no human expertise/intervention

Outline

- A systematic view of machine learning
 - Machine learning VS AI
 - Supervised Learning VS Unsupervised Learning
 - Regression VS. classification
 - Training VS validation VS testing

AI VS. Machine Learning



- **Artificial intelligence** is a wide field, which aims at making machines intelligent. AI has a set of tools through which it enables a machine to mimic human intelligence.
 - Natural language processing
 - Robotics
 - Machine Learning
 - Self-driving cars
 - https://en.wikipedia.org/wiki/Artificial_intelligence#Reasoning,_problem_solving
- One of the tools AI have is **machine learning**, that gives the machines to learn without being told explicitly what to do.
- Machine learning again has various tools in its pocket, one of them being neural networks. **Neural networks** try to mimic the activity of a human brain. **Deep learning** is the use of more sophisticated neural networks, with more non-linear layers, convolutional layers etcetera.

Supervised vs. Unsupervised Learning

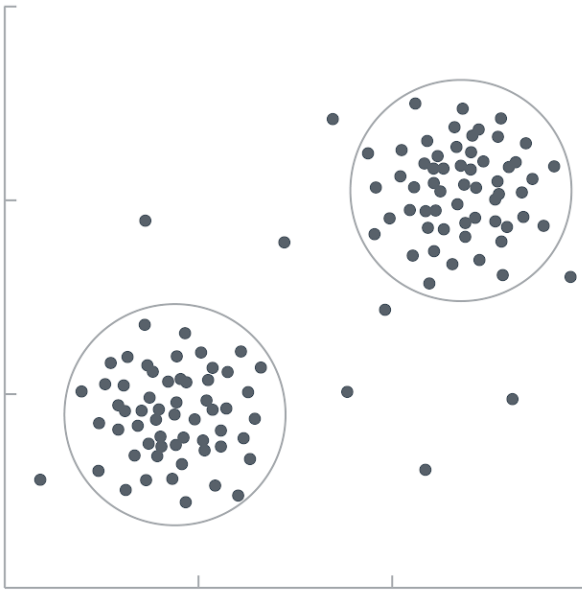
◆ Supervised Learning

- Goal: A program that performs a task as good as humans.
- TASK – well defined (the target function)
- EXPERIENCE – training data provided by a human
- PERFORMANCE – error/accuracy on the task

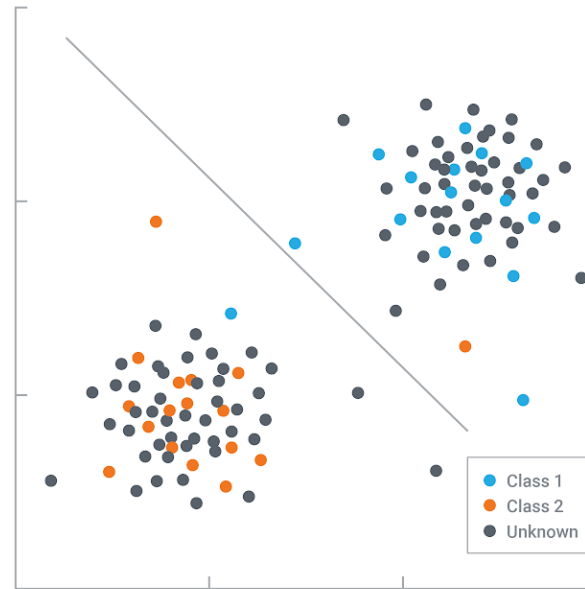
◆ Unsupervised Learning

- Goal: To find some kind of structure in the data.
- TASK – vaguely defined
- No EXPERIENCE
- No PERFORMANCE (but, there are some evaluations metrics)

UNSUPERVISED

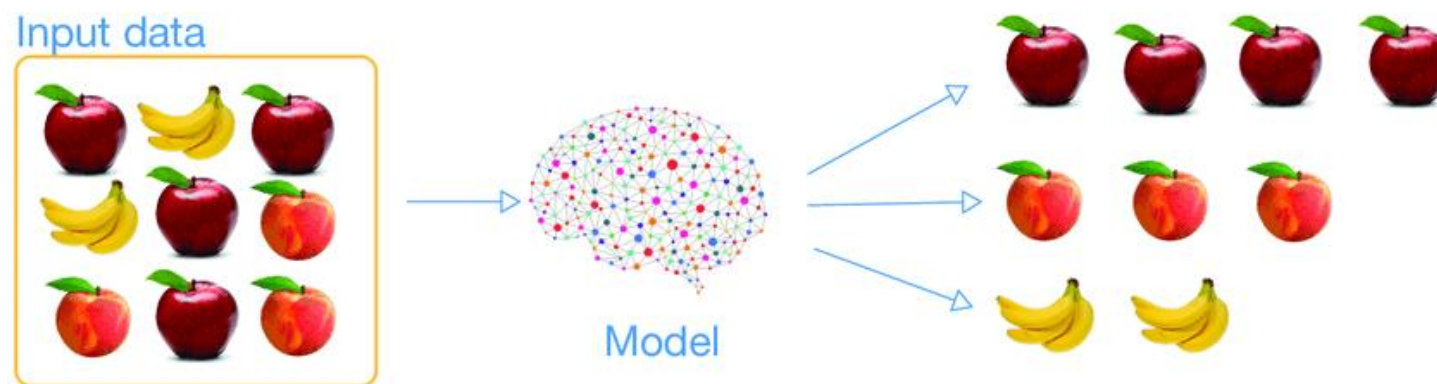
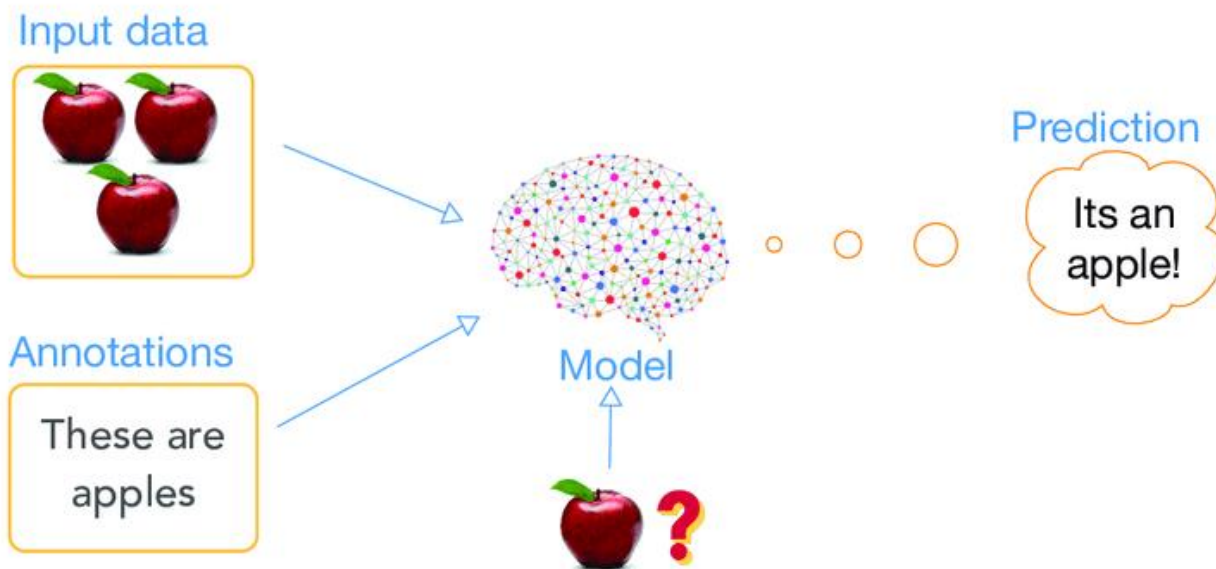


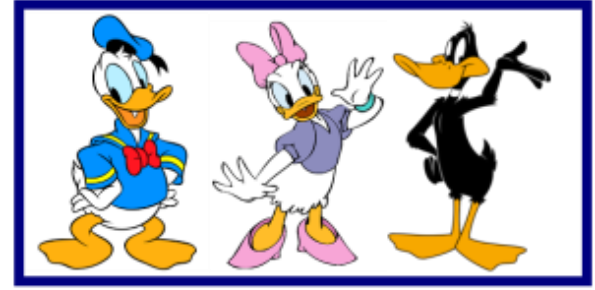
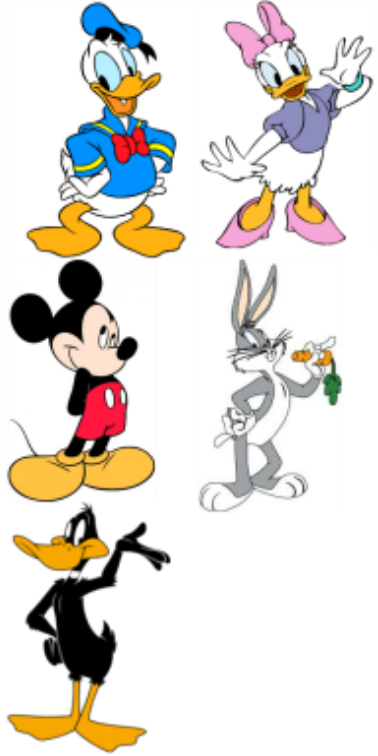
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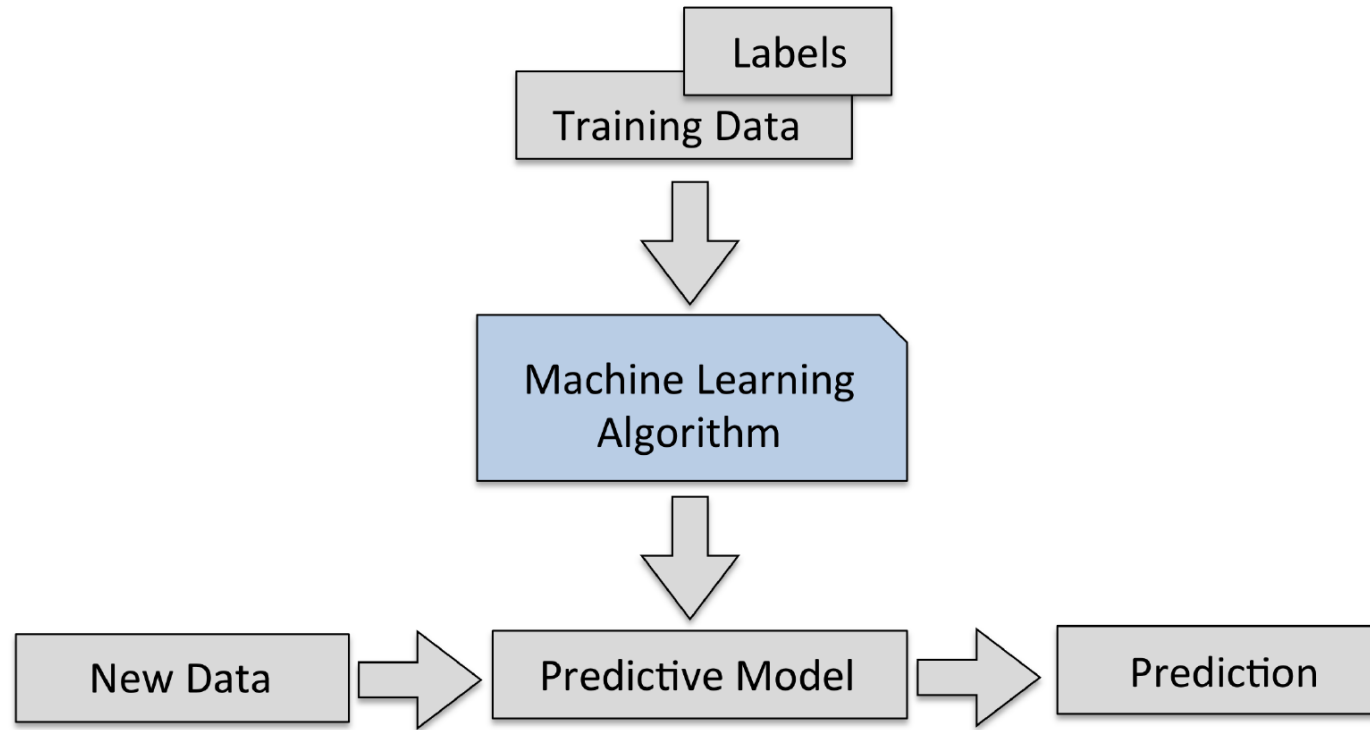
Two classes of ML:
supervised VS. unsupervised

- Supervised learning:
 - Goal: perform task as good as humans
 - Experience: training data provided by human
 - Performance: accuracy/error on the task
- Unsupervised learning:
 - Goal: find some structure in data
 - No experience
 - No (explicit) performance metric





Supervised learning



- Predicting the future with supervised learning

What is Supervised Learning?

- Supervised learning is one of the methods associated with machine learning which involves allocating **labeled data** so that a certain pattern or function can be deduced from that data. It is worth noting that supervised learning involves allocating an input object, a vector, while at the same time **anticipating** the most desired output value, which is mostly referred to as the supervisory signal. The bottom line property of supervised learning is that the **input data is known and labeled appropriately**.

Check yourself: is this supervised learning or unsupervised?

- 1. You get a bunch of photos with information about what is on them and then you train a model to recognize new photos.
- 2. You have a bunch of photos of 6 people but without information about who is on which one and you want to divide this dataset into 6 piles, each with the photos of one individual.
- 3. You have a bunch of molecules and information about which are drugs and you train a model to answer whether a new molecule is also a drug.
- 4. A friend invites you to his party where you meet totally strangers. Now you will classify them on the basis of gender, age group, dressing, educational qualification or whatever way you would like.
- 5. We are conducting a survey of 500 questions about predicting the IQ level of students in a college. Since this questionnaire is too big, so after 100 students, administration decides to trim the questionnaire down to fewer questions which would yield to the same evaluation effectiveness.