

Machine Learning

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Agenda

Overview

- What is machine learning and why it matters?
- Learning and data

Supervised Learning

- Model
- Linear algorithms. Demo – linear regression
- Neural networks

Unsupervised Learning

- Algorithms
- Demo – K-means

What is machine learning?

Definition

“Machine learning is the field of study that gives computers the ability to learn without being explicitly programmed.”

Arthur Samuel

“A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P , if its performance at tasks in T , as measured by P , improves with experience E .”

Tom Mitchell

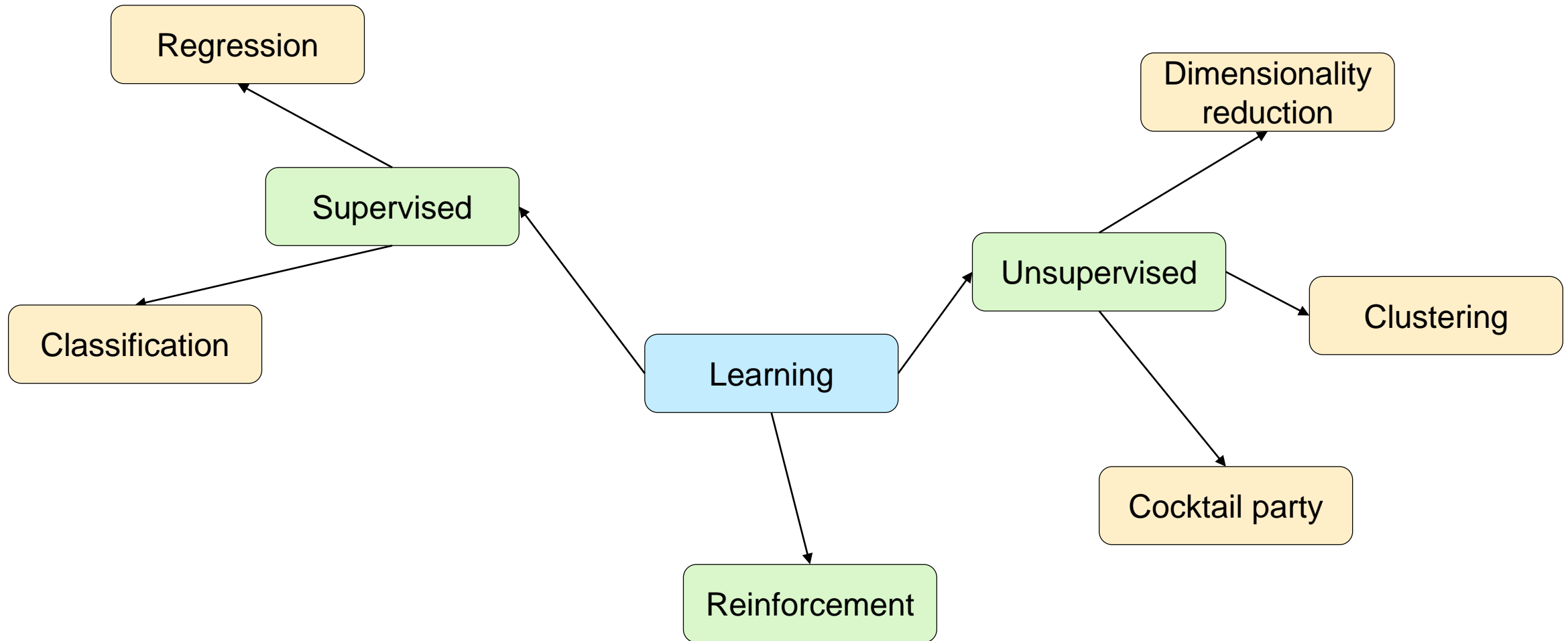
Machine learning problems

- A data exists
- A pattern exists
- It cannot be pinned down mathematically

Why now?

- Improved algorithms
- Increased computational power
- A lot of data

Learning and data



Supervised learning

These learning algorithms are fed with structured data (input, target) for solving two types of problems:

- Regression
- Classification

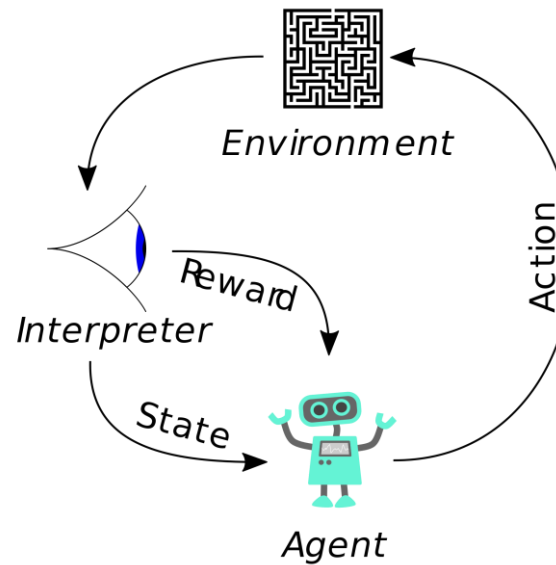
Unsupervised learning

If the data does not contain information for the effect of the input, it is considered as unstructured data. It can be used for solving problems as:

- Clustering
- Dimensionality reduction
- The cocktail party

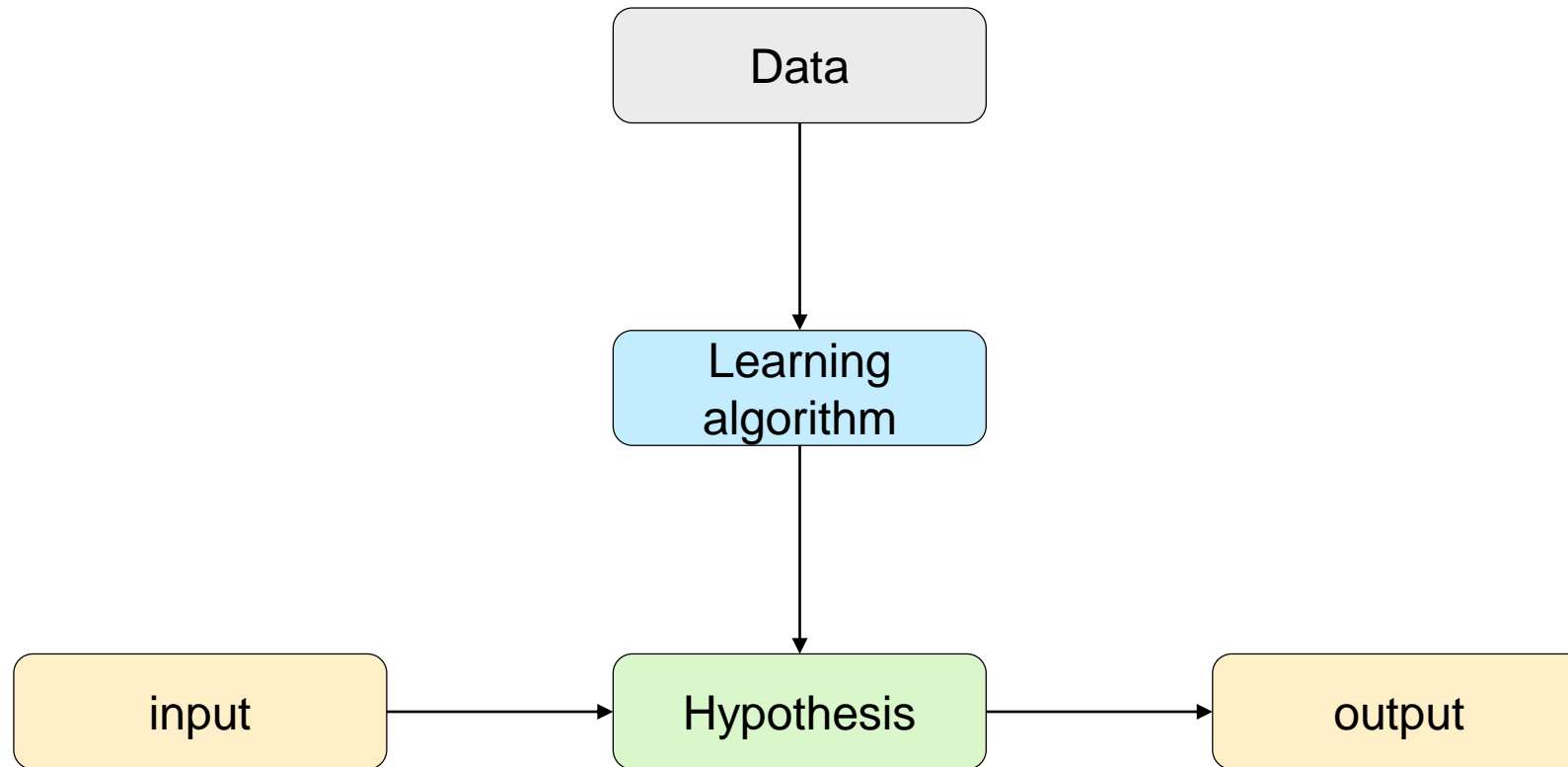
Reinforcement learning

These algorithms are fed with (input, grade) instances and are useful for solving problems where some sort of “agent” “explores” some space.



Supervised learning

Learning model



Linear algorithms

- Perceptron
- Linear regression
- Logistic regression

Demo: linear regression

Artificial neural networks

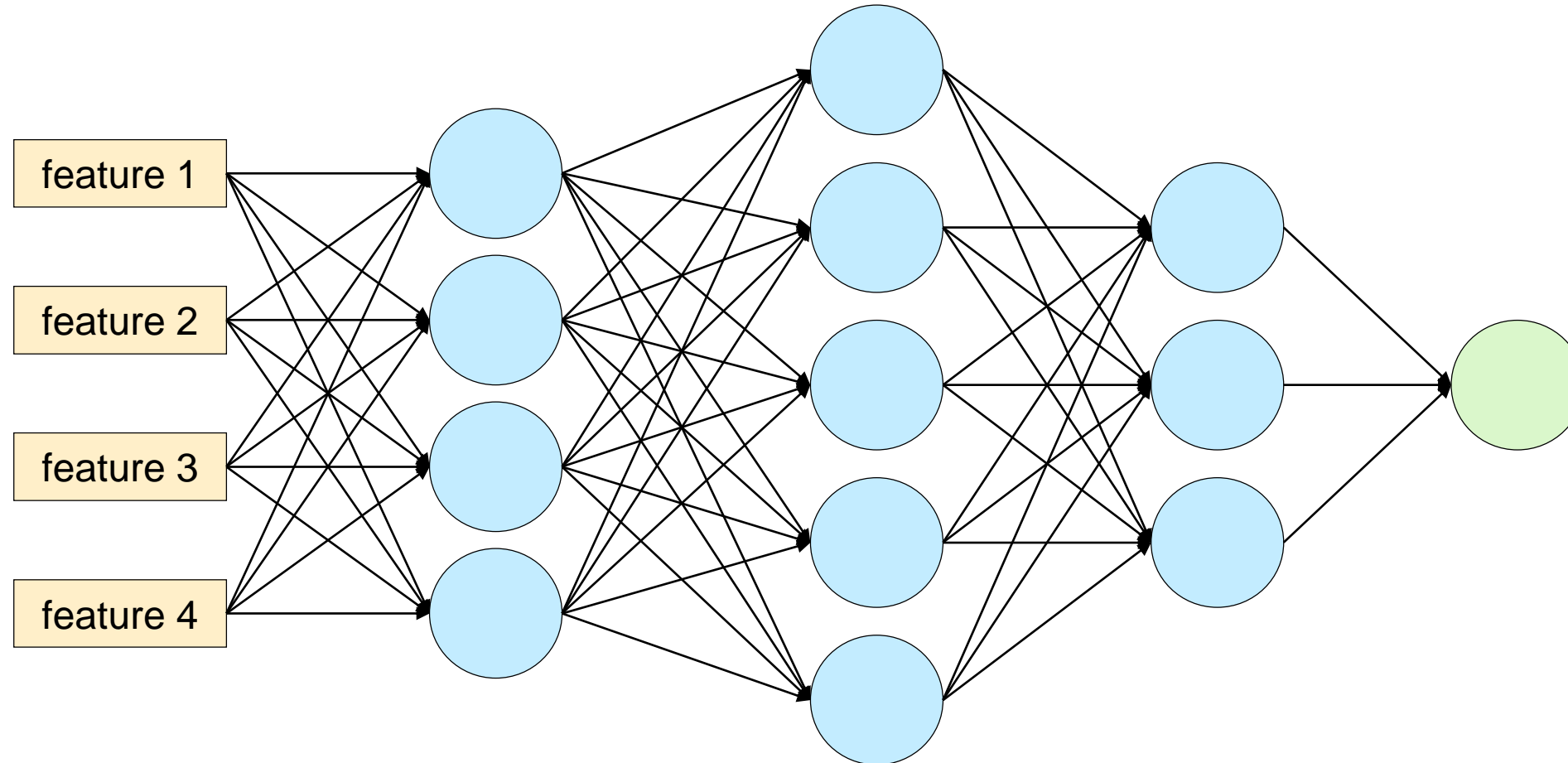
input layer

hidden layer 1

hidden layer 2

hidden layer 3

output layer



Steps of a neural network algorithm

- Inputs
- Output(s)
- Weights
- SUM
- Activation function
- Train

Unsupervised learning

Algorithms

- Clustering (K-means, Hierarchical clustering)
- Principal component analysis
- Independent component analysis

Demo: K-means clustering

Thank you.