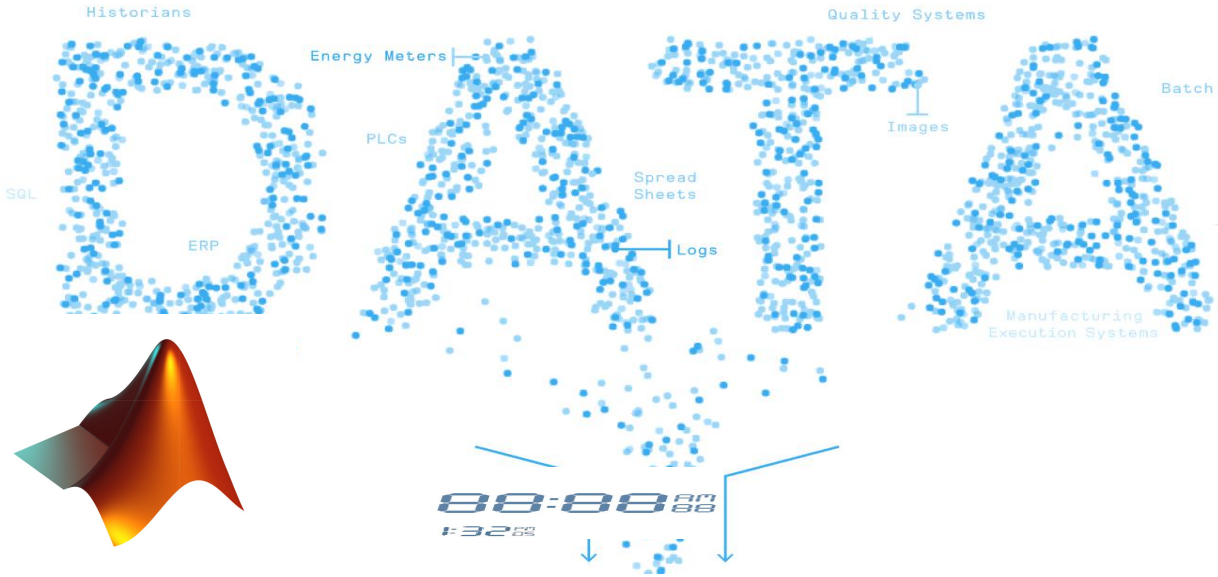
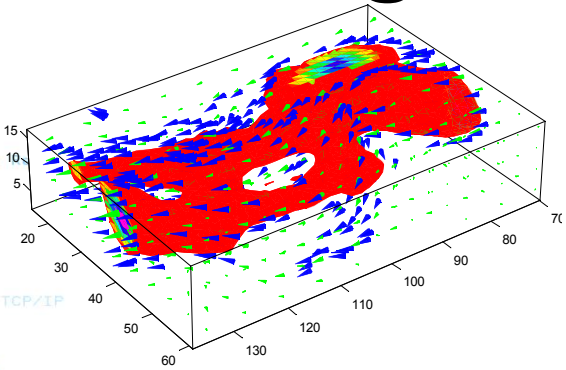
Introduction to Artificial Intelligence
- 05-01-01 Unsupervised Learning





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09/Mar/2022

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3. Artificial Neural Network
4. Fuzzy Logic and Fuzzy Systems
5. More AI Subsets
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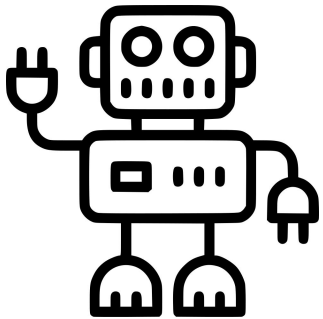
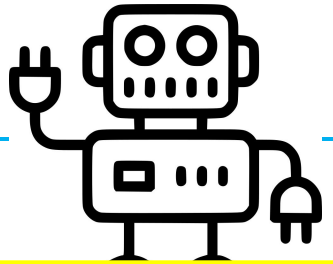


Chapter Contents



1.Deep Learning
2.Machine Learning
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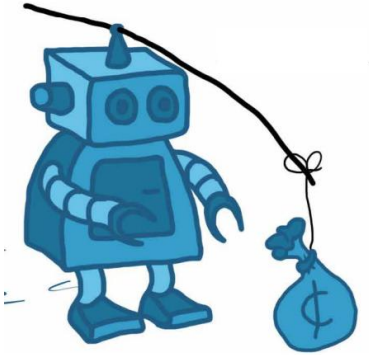
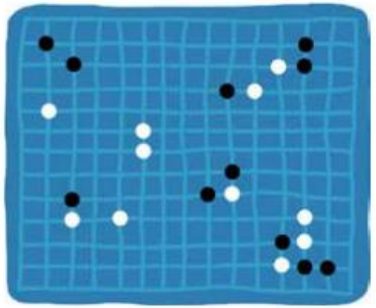


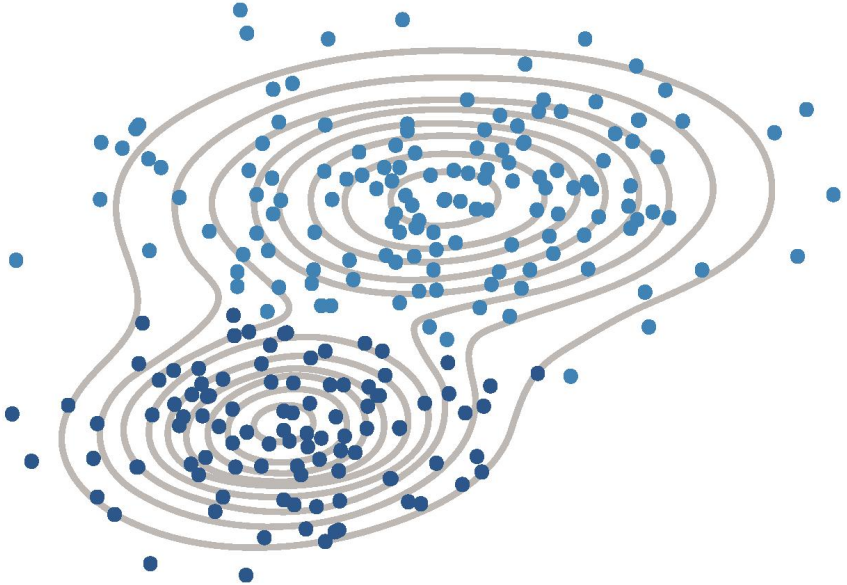


Unsupervised Learning (UL)

1. What is Unsupervised Learning
2. Why Use Unsupervised Learning
3. Fundamentals of Unsupervised Learning
4. Applications

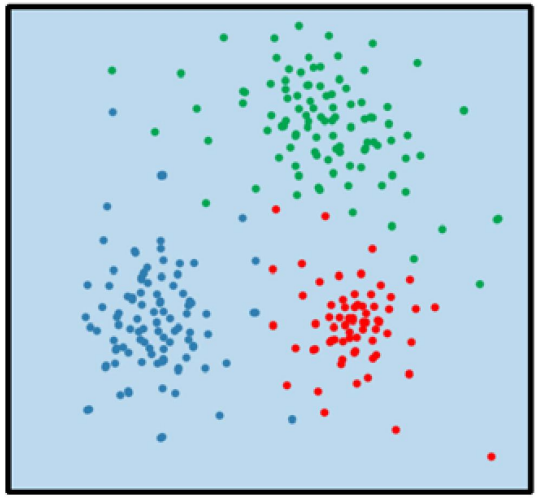
FAQ

Reference

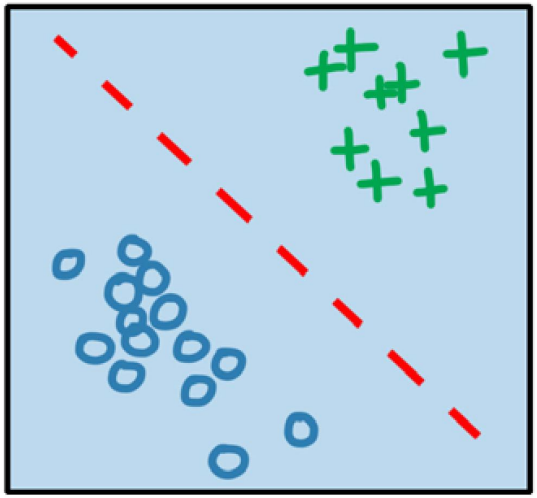


machine learning

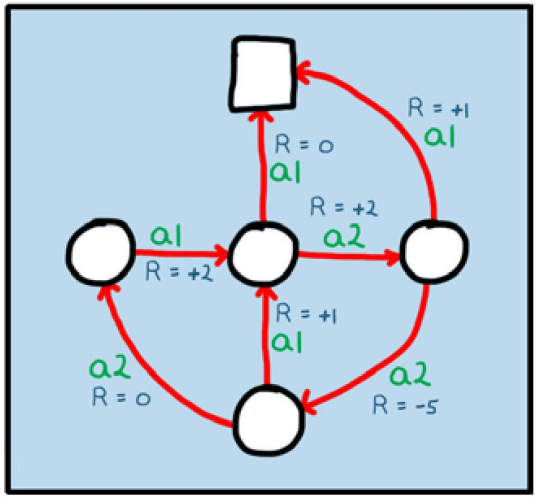
unsupervised learning



supervised learning



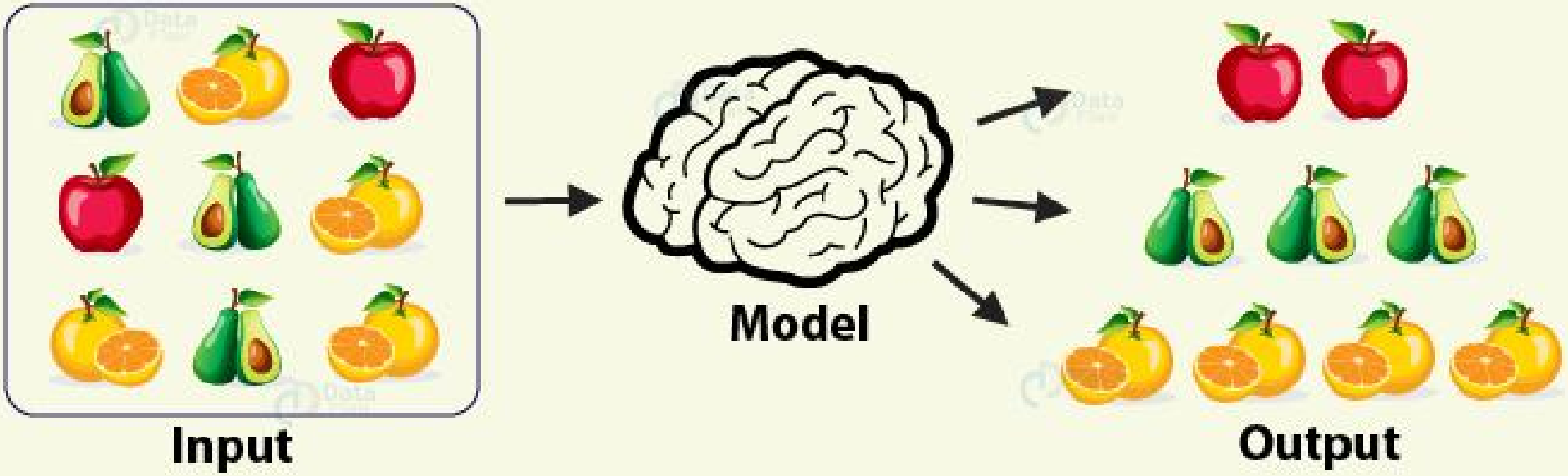
reinforcement learning



1 What is Unsupervised Learning

- **Unsupervised Learning** is a group of **ML** algorithms that work with "no-ground-truth" data **- unlabeled data.**
- **Unsupervised learning** is to **find** hidden **patterns** or intrinsic structures in input data. Unsupervised learning can be separated into **two** types of problems:
- **Clustering**: A clustering problem is where you want to discover the **inherent** groupings in the data.
- **Association**: An association rule learning problem is where you want to **discover rules** that describe large portions of your data.

Unsupervised Learning



2 Why Use Unsupervised Learning

- Unsupervised Learning finds all kinds of **unknown patterns** in data through **pattern recognition**.
- It takes place in **real-time**, so all the input data to be **analyzed & labeled** in learners' presence.
- Unsupervised methods help to search for **features** that can be useful for categorisation.

3 Fundamentals of Unsupervised Learning

In cluster analysis, **data** is partitioned into groups based on some **measure of similarity** or **shared characteristic**. Clusters are formed so that objects in the same cluster are very similar and objects in different clusters are very distinct.

Clustering algorithms fall into two broad groups:

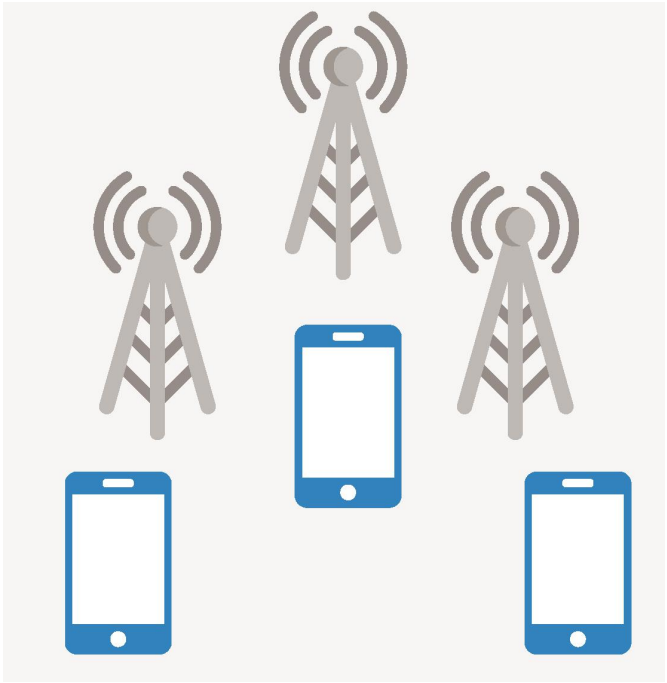
- **Hard** clustering, where each data point belongs to only one cluster
- **Soft** clustering, where each data point can belong to more than one cluster

If you don’t yet know how the data might be grouped:

- Use **self-organising** feature maps or **hierarchical** clustering to look for possible structures in the data.
- Use cluster evaluation to look for the “**best**” number of groups for a given clustering algorithm.

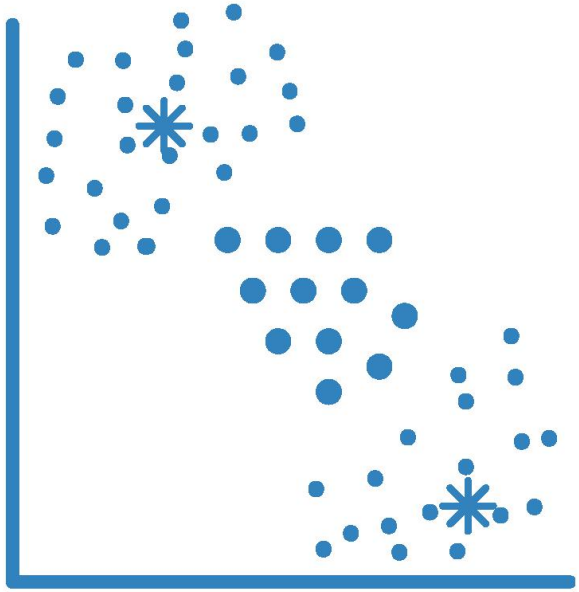
Hard Clustering Algorithms

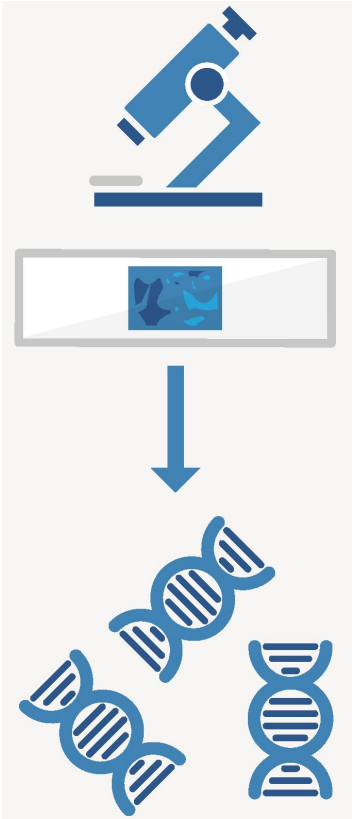
- K-Means
- K-Medoids
- Fuzzy C-Means
- Hierarchical
- Gaussian Mixture
- Neural Networks
- Hidden Markov Model
- Self-Organizing Map



Soft Clustering Algorithms

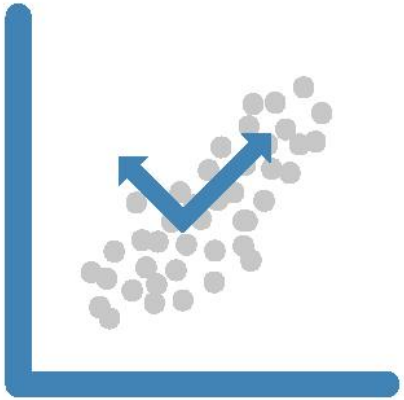
- Fuzzy c-Means
- Gaussian Mixture Model

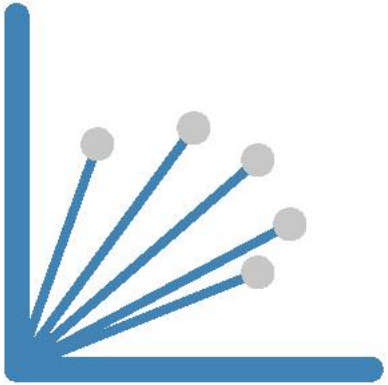


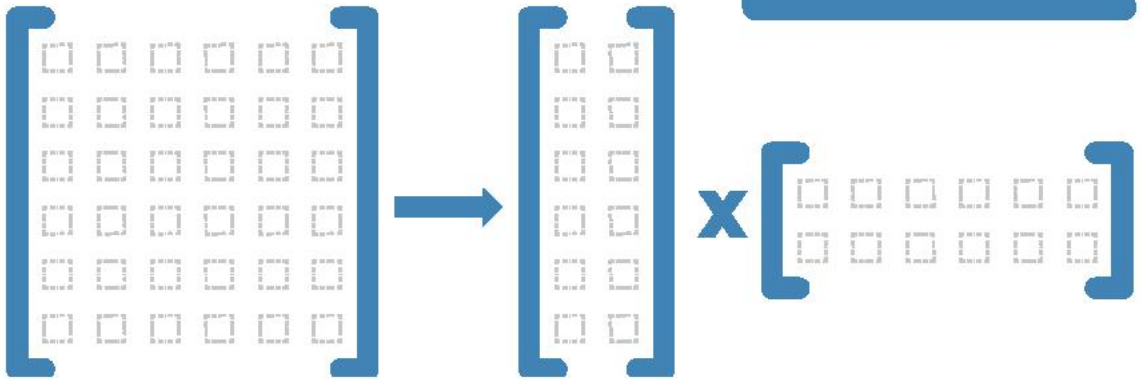


Dimensionality Reduction

- Principal Components Analysis
- Non-Negative Matrix Factorisation
- Factor analysis





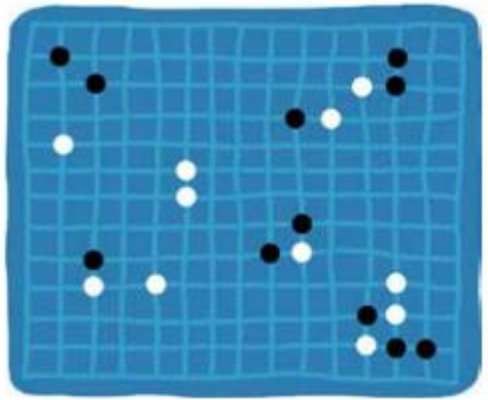


4 Applications[1]

- **Clustering** automatically devide the dataset into groups based on their **similarities**.
- **Anomaly detection** can discover unusual text or data points in your dataset. It is useful for **finding fraudulent** transactions.
- **Association** mining identifies sets of items that often occur together in your datapoints/dataset.
- **Latent variable** models are broadly used for data preprocessing. Like **reducing** the amount of **features** in a dataset or decomposing the dataset into multiple components

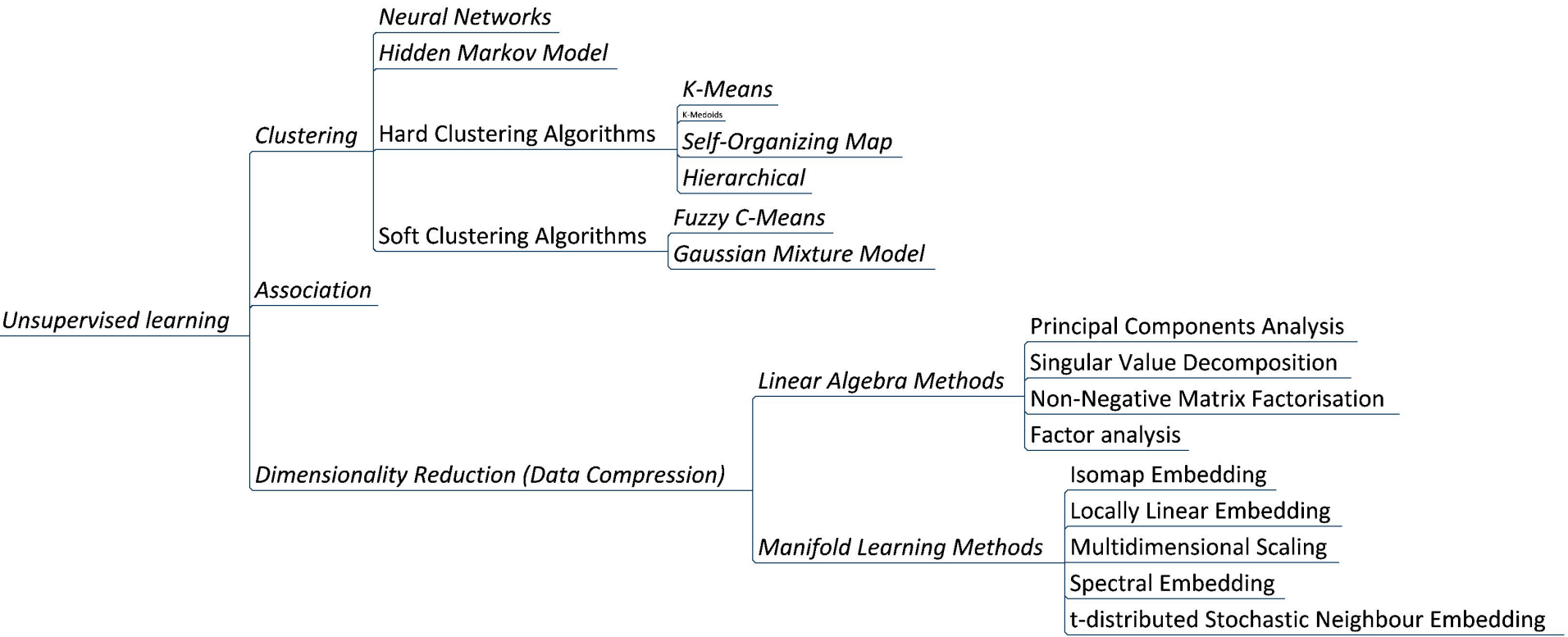
FAQ

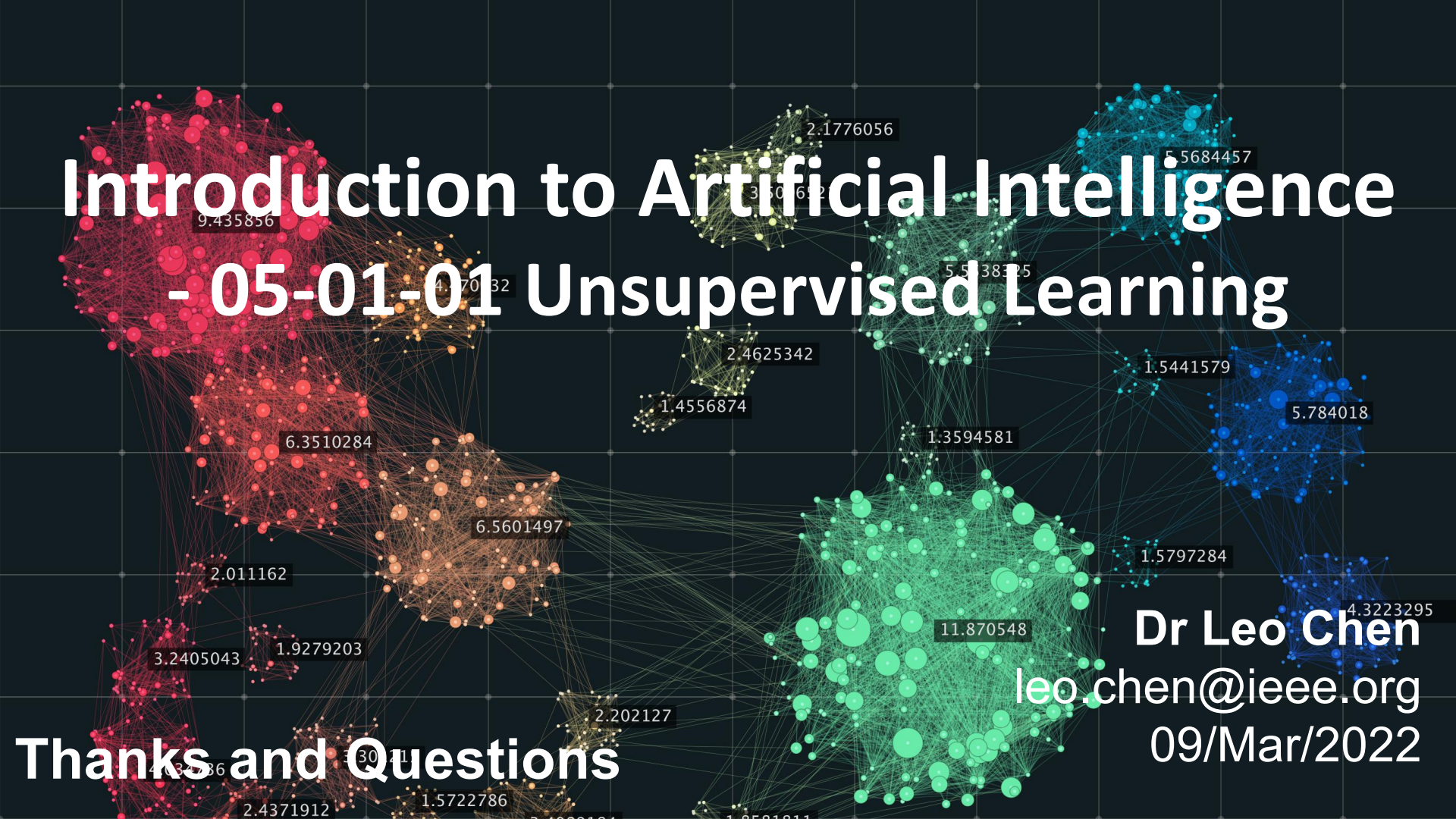
FAQ 01 Why Unsupervised Learning cannot be applied to a regression?



FAQ 01 Why Unsupervised Learning cannot be applied to a regression?

Since it is unknown what the output values/results could be, making it impossible to train the algorithm how you normally would.


Unsupervised learning
Clustering
Neural Networks
Hidden Markov Model
Hard Clustering Algorithms
K-Means
K-Medoids
Self-Organizing Map
Hierarchical
Soft Clustering Algorithms
Fuzzy C-Means
Gaussian Mixture Model
Association
Dimensionality Reduction (Data Compression)
Linear Algebra Methods
Principal Components Analysis
Singular Value Decomposition
Non-Negative Matrix Factorisation
Factor analysis
Manifold Learning Methods
Isomap Embedding
Locally Linear Embedding
Multidimensional Scaling
Spectral Embedding
t-distributed Stochastic Neighbour Embedding



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Thanks and Questions