

Intelligent Methods for Health Informatics

/a PhD Research/

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Research Objectives

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- Investigating intelligent methods and research techniques with application in pattern recognition, machine vision, medical imaging and medical diagnosis
- Testing the developed methods on function optimisation problems of high dimensionality and on real-world benchmark datasets
- Investigating and implementing intelligent system for pattern recognition and classification problems from the medical diagnosis area - DNA microarrays for cancer diagnosis



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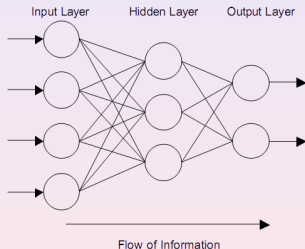
Supervised Learning

Definition

Supervised learning is a machine learning technique for extracting functional relationships from training data, for which the expected result is known. The aim of the learning is to enable the network to generalize, i.e. to be able to recognize, map, classify, etc. when unseen during the training data is presented.



Supervised Learning



Approaches

- Artificial neural networks
- Support vector machines
- Decision trees
- K-nearest neighbor
- Naive Bayes, etc.



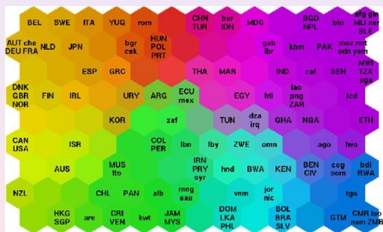
Unsupervised Learning

Definition

Unsupervised learning is a machine learning technique that distinguishes from the supervised learning in that the output for a given input is not known. The network has to learn for itself from the available data, based on similarities, uniformity and variance in the data distribution.



Unsupervised Learning

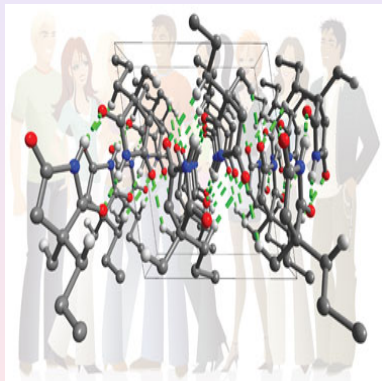


Approaches

- Self-organizing maps (SOM)
- Adaptive resonance theory (ART)
- Multivariate analysis
- Expectation-maximization algorithm, etc.



Optimisation

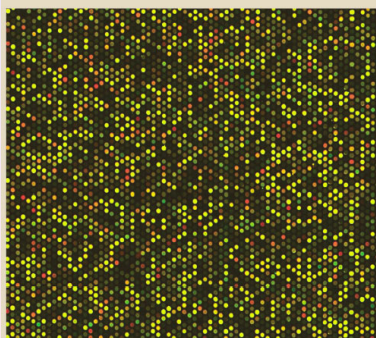


Approaches

- Evolutionary algorithms
- Simulated annealing
- Differential evolution
- Swarm-based optimisation algorithms
- etc.



DNA Microarrays



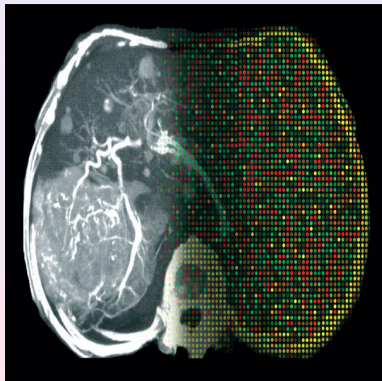
This DNA microarray locates binding on the host genome of specific host-transcription factors and transcriptional regulators. (Source: Richard Jenner, PhD)

DNA microarrays

A technique that makes it possible to estimate the expression level of tens to hundreds of thousands of genes simultaneously.



DNA Microarrays



DNA microarrays for medical diagnosis

Medical checkups often involve screening blood to measure the levels of such components as glucose, cholesterol, and triglycerides. One day an ordinary screening test may also include checking your DNA to tell whether you might be developing cancer.



Thank you for your attention!

