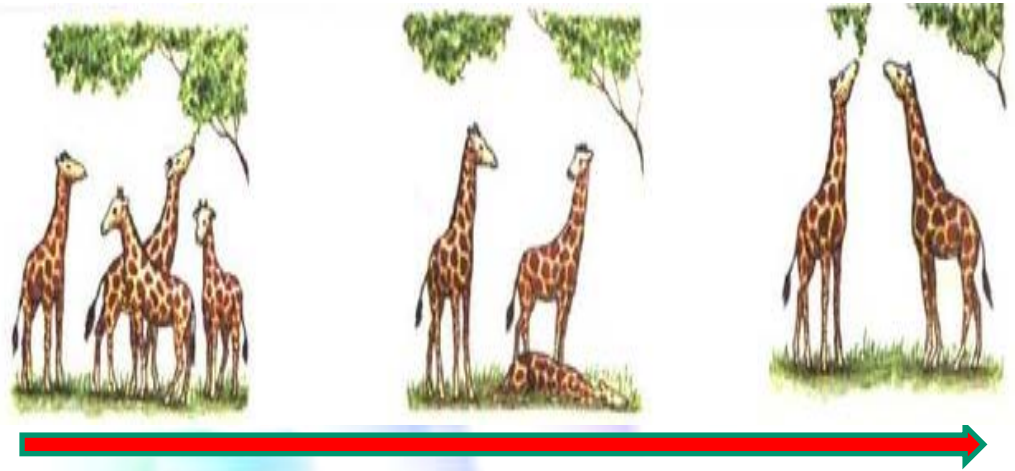


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Genetic Algorithms

遺傳基因演繹法

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Information Engineering
National Cheng-Kung University**

Class Contents

- **Soft Computing**
- **Evolutionary Computing (EC)**
 - Part 0. INTRODUCTION
 - **Part I. GENETIC ALGORITHMS**
 - **Part II. NUMERICAL OPTIMIZATION**
 - **Part III. EVOLUTION PROGRAMS**



Soft Computing

Soft Computing

Soft computing is an emerging approach to computing which parallel the remarkable ability of the human mind to reason and learn in an environment of uncertainty and imprecision.

■Main goal:

- to develop intelligent machines to provide solutions to real world problems, which are not modeled, or too difficult to model mathematically.

■Guiding Principle:

- To exploit the tolerance for Approximation, Uncertainty, Imprecision, and Partial Truth in order to achieve tractability, robustness and low solution cost.

Premises of Soft Computing

- The real world problems are pervasively imprecise and uncertain.
- Precision and certainty carry a cost.
- Many contemporary problems do not lend themselves to precise solutions such as
 - Recognition problems (handwriting, speech, objects, images...)
 - Mobile robot coordination, forecasting, combinatorial problems etc.

Techniques of Soft Computing

Soft Computing = Evolutionary Computing + Fuzzy Theory + Neural Network

Zadeh
1981

Rechenberg
1960

Zadeh
1965

McCulloch
1943

Techniques of Soft computing

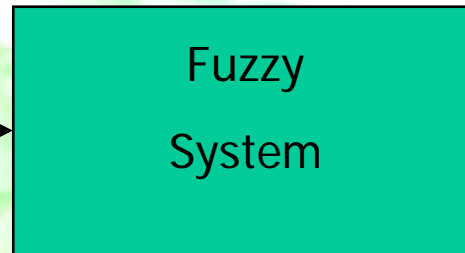
The principal constituents, i.e., tools, techniques, of Soft Computing (SC) are

- Evolutionary Computation (EC),
- Fuzzy Logic (FL),
- Neural Networks (NN),
- Support Vector Machines (SVM),
- Probabilistic Reasoning (PR), and
- Chaos System.

Fuzzy Theory



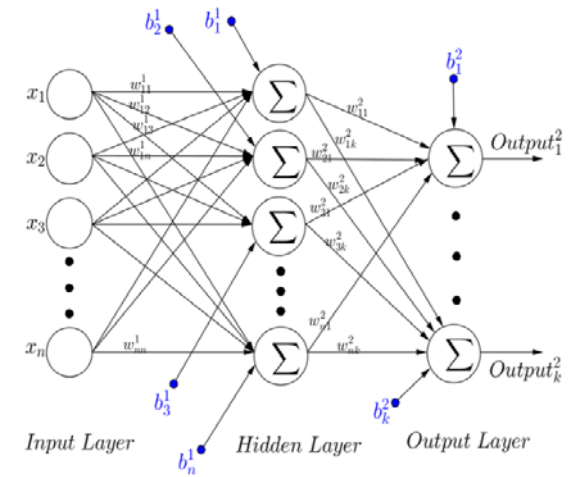
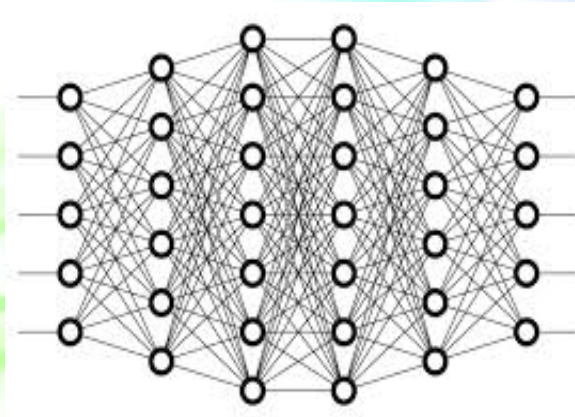
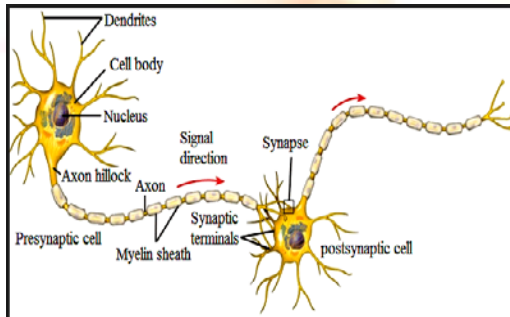
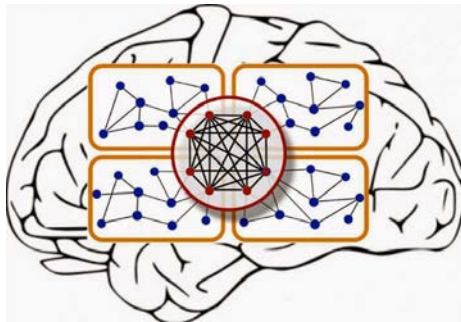
Crisp Input



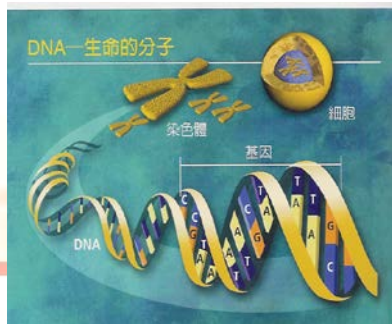
Crisp Output



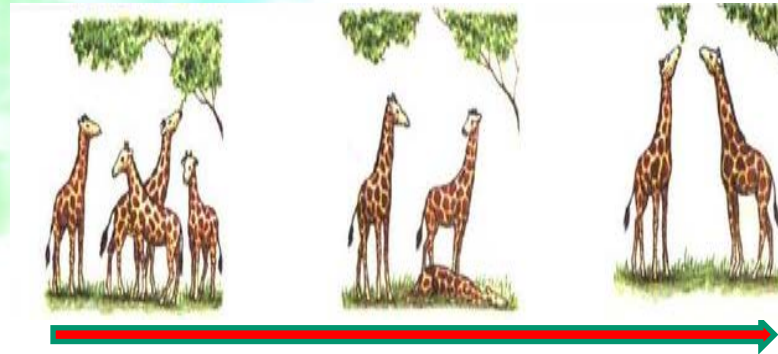
Neural Network



Evolutionary Computing (EC)



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Current Applications using Soft Computing

Soft computing is likely to play an especially important role in science and engineering, but eventually its influence may extend much farther.

- Handwriting recognition
- Automotive systems and manufacturing
- Image processing and data compression
- Architecture
- Decision-support systems
- Power systems
- Neurofuzzy systems
- Fuzzy logic control

模糊理論 (Fuzzy Theory)

- 模糊集合論 (Fuzzy Set Theory) 是1965年由美國加州柏克萊大學自動控制學家扎德教授 (L.A.Zadeh) 所提出來。
- 為了面對進而處理這些現實環境中之不確定 (uncertainty) 與模糊性 (fuzziness) 資料，必須以模糊集理論的觀念來對應。
- 把傳統集合論的特徵函數從非0即1的二值選擇，推廣為0到1之間 (歸屬函數) 任何值的FUZZY集合。



Q & A