

# **Soft Computing**

# Course Plan

- 1. Introduction to Soft Computing**
- 2. Fuzzy sets and Fuzzy logic systems**
- 3. Neural Network**
- 4. Genetic Algorithms**
- 5. Introduction to Machine Learning**

# Reference

## Books:

1. Principles of SOFT COMPUTING :  
S.N Deepa  
S.N Sivanandam(WILEY)3<sup>rd</sup> edition 2021
2. Evolutionary Algorithm for Solving Multi-objective  
Optimization Problems (2<sup>nd</sup> Edition)  
Collelo, Lament, Veldhnizer ( Spring, 2010)
3. Fuzzy Logic with Engineering Applications  
Timothy J. Ross (Wiley, 2015)
4. Soft Computing : Fundamentals and Applications (2nd Ed.)  
D. K. Pratihar (Narosa, 2013)

## Introduction to Soft Computing

- ▶ Concept of computing
- ▶ Important characteristics of "Computing"
- ▶ Soft computing vs. "**Hard**" Computing
- ▶ Few examples of Soft computing applications
- ▶ Characteristics of Soft computing
- ▶ Hybrid computing

# Concept of Computing

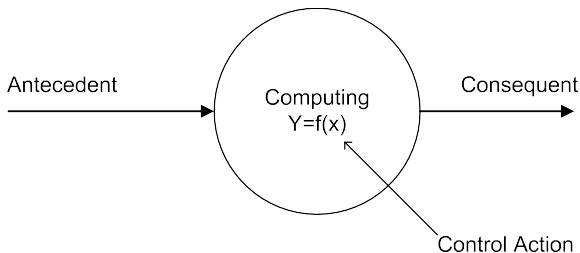


Figure : Basic of computing

$y = f(x)$ ,  $f$  is a mapping function

$f$  is also called a formal method or an algorithm to solve a problem.

# Important Characteristics

1. Should provide precise solution.
2. Control action should be unambiguous and accurate.
3. Suitable for problem, which is easy to model mathematically.

# Hard Computing

In 1996, LA Zade (LAZ) introduced the term hard computing.

According to LAZ: We term a computing as "Hard" computing, if

- ▶ **Precise result is guaranteed**
- ▶ **Control action is unambiguous**
- ▶ **Control action is formally defined (i.e. with mathematical model)**

Example:

- ▶ Solving numerical problems (e.g. Roots of polynomials, Integration etc.)
- ▶ Searching and sorting techniques
- ▶ Solving "Computational Geometry" problems (e.g. Shortest tour in Graph theory, Finding closest pair of points etc.)

# Problems in some other areas of applications

- ▶ Medical diagnosis
- ▶ Person identification / Computer vision
- ▶ Hand written character recognition
- ▶ Pattern recognition and Machine Intelligence MI
- ▶ Weather forecasting
- ▶ VLSI design
- ▶ Network optimization



# Characteristics of Soft Computing

- ▶ It does not require any mathematical modeling of problem solving
- ▶ It may not yield the precise solution
- ▶ Algorithms are adaptive (i.e. it can adjust to the change of dynamic environment)
- ▶ Use some biological inspired methodologies such as genetics, evolution, Ant's behaviors, particles swarming, human nervous systems etc.

It is a combination of the conventional hard computing and emerging soft computing

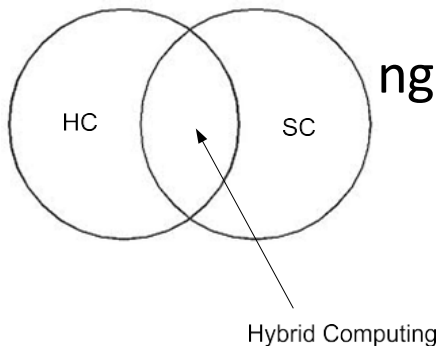


Figure : Concept of Hybrid Computing