Applications of AI

Artificial Intelligence can be used to solve a lot of problems. It can also be used to automate complex systems. There are a number of AI approaches which can be used to solve different types of problems. Note that, any approach cannot be used to solve any problem. The approach we use to solve a problem depends on the type of problem. This document is intended to provide students a suggestion for what approaches to use to solve different classes of problems.

Search, Goal finding, Path finding, planning

Approach(es):

- State space search

Examples:

- Water-Jug problem
- 8-puzzle problem
- 8-Queen problem
- Finding shortest path between cities
- Solving a theorem

Classification, Pattern recognition

Approach(es):

- Neural network
- Markov model
- Support Vector Machine

Examples:

- Speech recognition (Hidden markov model/Neural nework)
- Image processing (Neural network/ Support Vector Machine)

Game playing (Two player games)

Approach(es):

- Mini-maxing
- Alpha-beta pruning
- Trained Neural networks

Examples:

- Chess
- Go
- Tic-tac-toe

Decision making (in uncertain environment)

Approach(es):

- Markov decision process
- Bayesian network
- Dempster-Shafer theorem
- Neural network

Examples:

- Symptom diagnosis (Bayesian network/ Neural network)

Control system (in uncertain environment)

Approach(es):

- Fuzzy logic

Examples:

- Washing machine
- Temperature control system (Air conditioner)

Knowledge representation and inference

Approach(es):

- Predicate logic
- First-Order Predicate logic

Examples:

- Einstein's puzzle
- Symptom diagnosis
- Answering questions about a domain

Tools:

- Prolog
- LISP (List Processor)

Popular approaches based on problems

Image processing:

Neural network

Support Vector Machine (SVM)

Object recognition:

Support Vector Machine (SVM)

Deep Neural network (Multi-Layer Backpropagation / Recurrent Neural network)

Speech recognition:

Support Vector Machine (SVM)

Deep Neural network (Multi-Layer Backpropagation / Recurrent Neural network)

Decision making, planning:

Bayesian network (Symptom diagnosis)

Markov decision process (Online attack prevention)

Automated car driving:

Deep Neural network

Fuzzy logic

AI in two player games:

Minimaxing with alpha beta pruning (Chess/Tic-tac-toe)

Neural Network + Minimaxing with alpha beta pruning (GO)

Intelligent control systems:

Fuzzy systems (Washing machine/ Air conditioner/ Robot control)

Neural networks (Robot control)

Natural Language processing:

Speech recognition -> Predicate logic -> Inference