Artificial Intelligence & Machine Learning

Bodhayan Roy

Department of Mathematics,
Indian Institute of Technology Kharagpur

Lecture 1

What is Artificial Intelligence?

- Artificial Intelligence is the simulation of human intelligence by machines.

What is Artificial Intelligence?

- Artificial Intelligence is the simulation of human intelligence by machines.

- Ordinary computing focuses on solving problems efficiently.

A brief history of AI

A brief history of AI

- Ancient and medieval times: Slow progress in automata.

A brief history of AI

- Ancient and medieval times: Slow progress in automata.
- Early modern period: Invention of mechanical computing devices (calculator, analog computer), development of modern mathematical tools (decision tree, regression, chain rule).

A brief history of AI

- Ancient and medieval times: Slow progress in automata.
- Early modern period: Invention of mechanical computing devices (calculator, analog computer), development of modern mathematical tools (decision tree, regression, chain rule).
- Beginning of 20th century: Russel and Whitehead show that elementary mathematics can be reduced to mechanical reasoning using formal logic.

A brief history of AI

- Ancient and medieval times: Slow progress in automata.
- Early modern period: Invention of mechanical computing devices (calculator, analog computer), development of modern mathematical tools (decision tree, regression, chain rule).
- Beginning of 20th century: Russel and Whitehead show that elementary mathematics can be reduced to mechanical reasoning using formal logic.
- Next several decades: Seminal work by Turing, the first digital computer, study of the human brain, design of intelligent algorithms, AI defeats chess world champion.

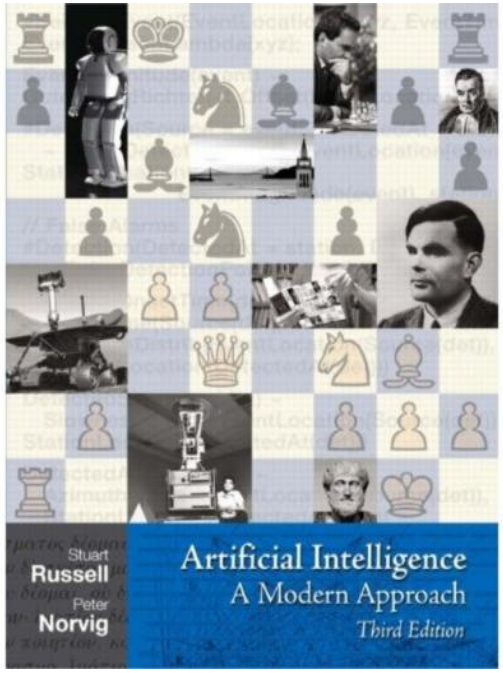
A brief history of AI

- Ancient and medieval times: Slow progress in automata.
- Early modern period: Invention of mechanical computing devices (calculator, analog computer), development of modern mathematical tools (decision tree, regression, chain rule).
- Beginning of 20th century: Russel and Whitehead show that elementary mathematics can be reduced to mechanical reasoning using formal logic.
- Next several decades: Seminal work by Turing, the first digital computer, study of the human brain, design of intelligent algorithms, AI defeats chess world champion.
- 21st century: Widespread application of deep neural networks.

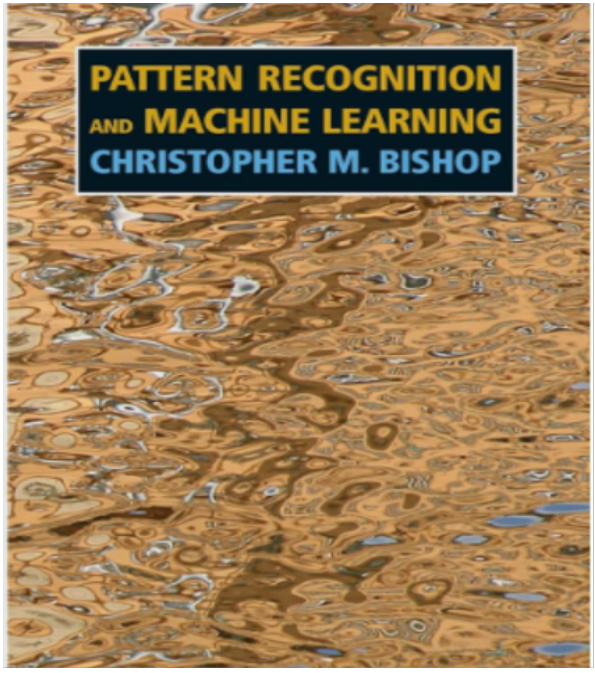
Tentative structure of the course

- Module 1 - Searching: BFS, DFS, depth bounded, A^*, uniform cost search, minimax, alpha-beta.
- Module 2 - Clustering: k-means, agglomerative hierarchical, DBSCAN.
- Module 3 - Neural Networks: Gradient descent, perceptron, deep neural networks, back propagation.
- Module 4 - Natural computation: Genetic algorithms, swarm algorithms (particle swarm, ant colony etc).

Textbooks

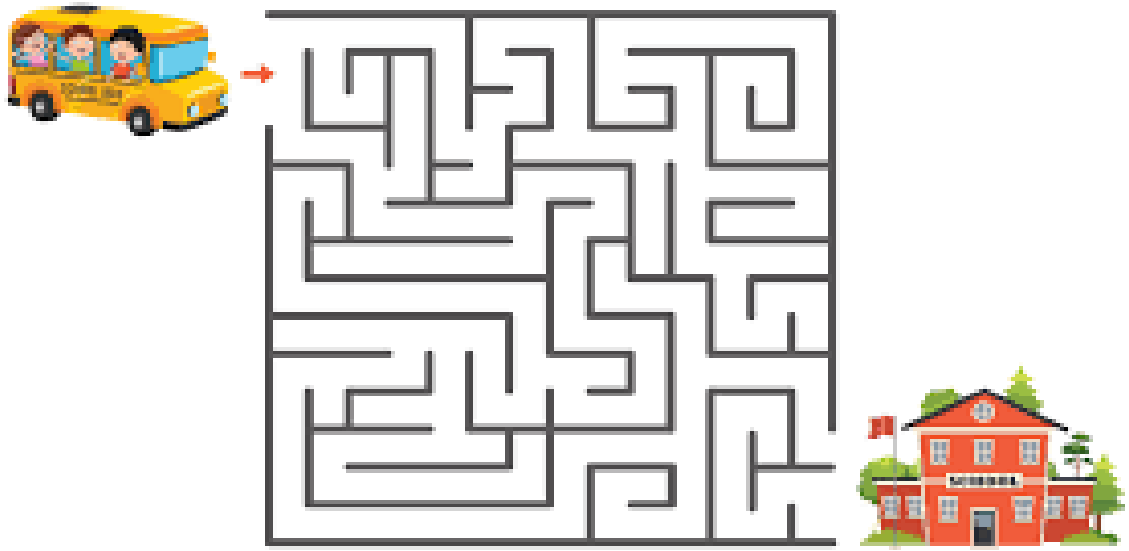


Russel and Norvig



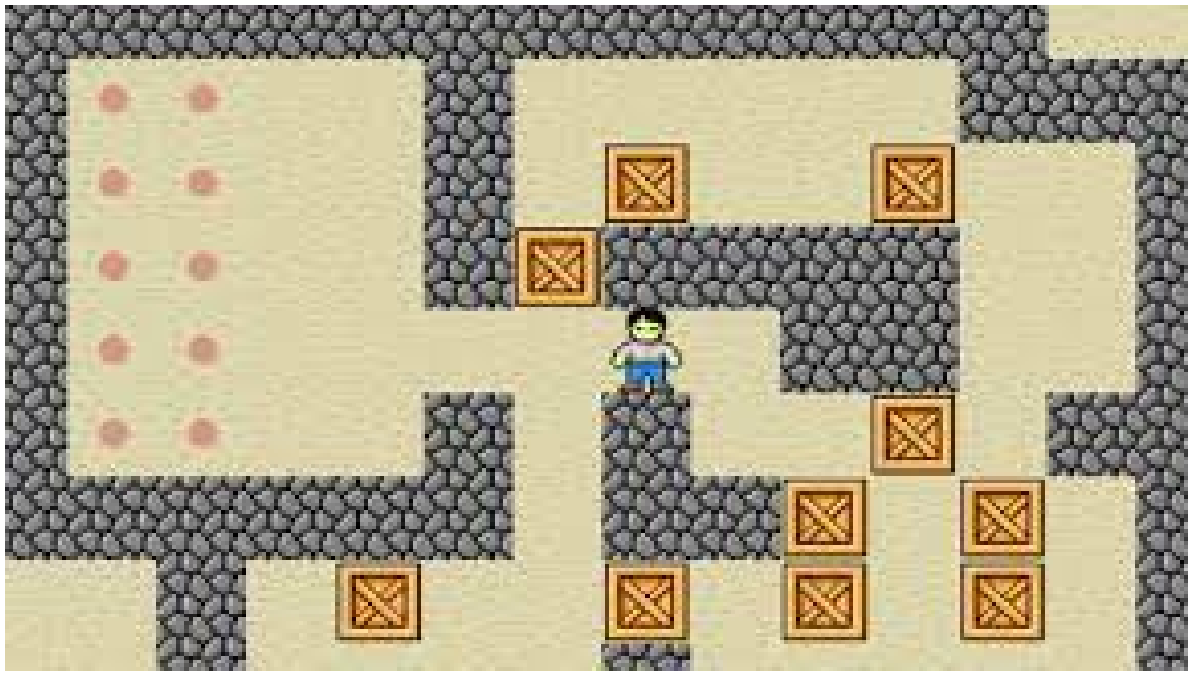
Bishop

Searching



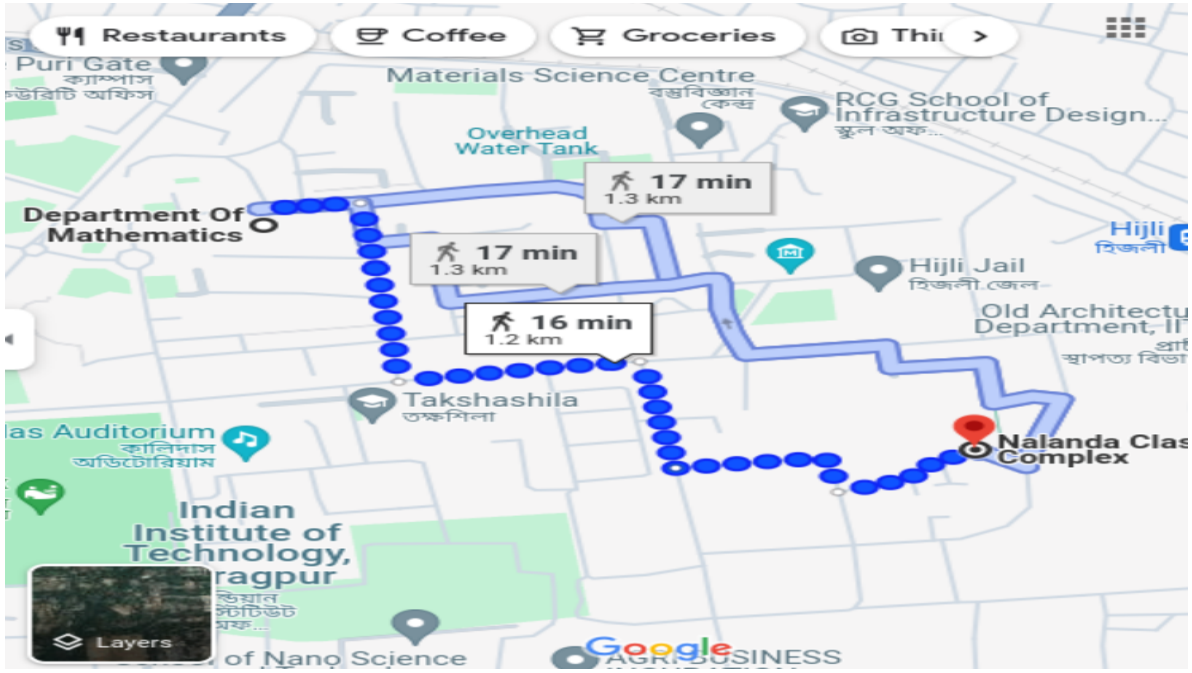
Maze games

Searching



Sokoban

Searching



Efficient path finding in maps

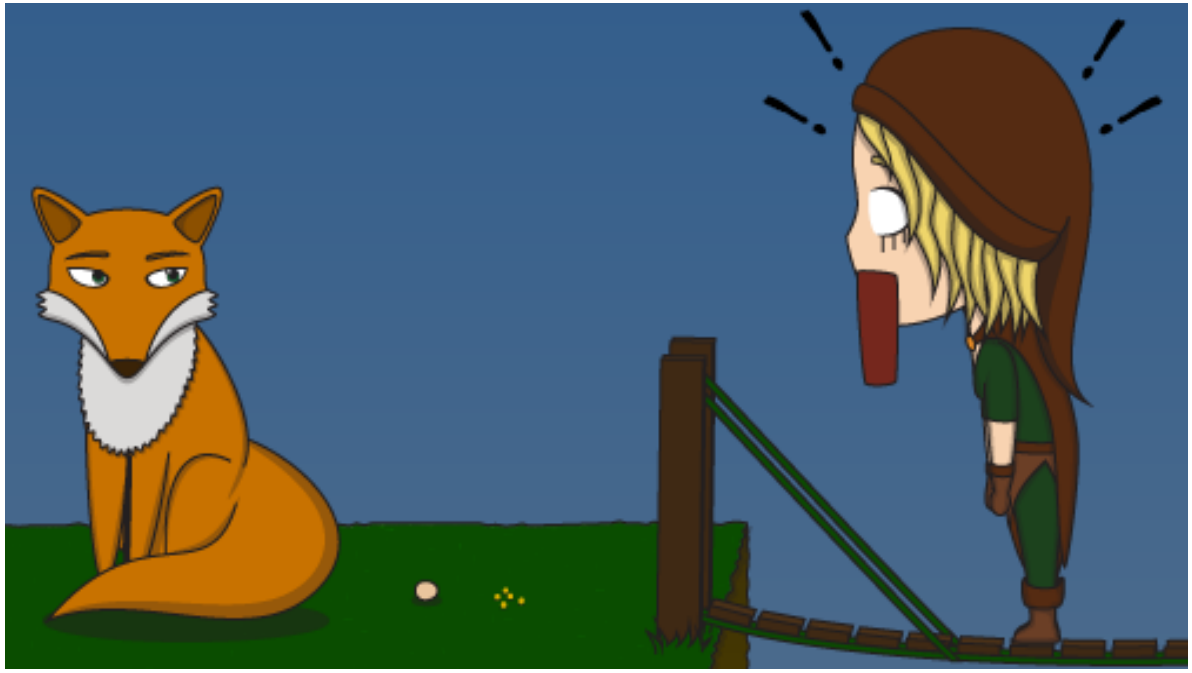
Searching

Fox-chicken-fodder game

Searching

Fox-chicken-fodder game

Searching



Fox-chicken-fodder game