Artificial Intelligence: Foundations & Applications

Introduction



Prof. Partha P. Chakrabarti & Arijit Mondal Indian Institute of Technology Kharagpur

General information

- Class timings
 - Monday 1000-1100
 - Wednesday 0800-1000
 - Thursday 1000-1100
 - Saturday 1030-1200
- Venue: MS Teams
- url: http://facweb.iitkgp.ac.in/~arijit/2020_AIFA_AUTUMN/
- Instructors
 - Arijit Mondal
 - Partha P Chakrabarti
 - There will be a few guest faculty members
- TAs
 - Omprakash Chakraborty
 - Poonam
 - Shubhajit Datta

Books

- Artificial Intelligence: A Modern Approach by Peter Norvig, Stuart Russell
- Artificial Intelligence A New Synthesis by Nils J Nilsson

Evaluation

- Tests 4-6 numbers (topic wise) (Tentatively 60% weightage)
- Assignments 2 nos (Tentatively 40% weightage)
 - Group of maximum 4 Students
 - Survey on AI Topics will be shared
 - Al in your domain
 - Need to create 15-20 minutes video

Introduction

- "... the science and engineering of making intelligent machines" (John McCarthy)
- Al is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans. (Wikipedia)
- Al attempts not just to understand but also to build intelligent entities. (Russell & Norvig)
- Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment. (Nilsson)

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 - Right thinking, irrefutable reasoning processes
- Act rationally Rational agent
 - Acts to achieve the best outcome in presence of uncertainty, the best expected outcome



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- Problems that cannot be solved by computers
 - Example detection of infinite loop in a program

Application domains

- Computer vision
- VLSI
- NLP
- Transportation
- Vehicle routing
- Airline/train scheduling
- Supply chain management
- Smart grid
- Operations research
- Healthcare

- Economics
- Games
- Robotics
- Weather forecast
- Agriculture
- Matching
- Linguistic
- Proving theorem
- etc.

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Many problem domains but solved using a few set of techniques.

Broad techniques

- Search
- Logic
- Constraint satisfaction
- Planning
- Probabilistic reasoning
- Machine learning symbolic / logical, statistical
- Deep learning

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 - Product sulfuric acid, aqua regia, Components sulfur, chlorine, nitric acid Chemical industry

Logic

There are five houses. The Englishman lives in the red house. The Spaniard owns the dog. Coffee is drunk in the green house. The Ukrainian drinks tea. The green house is immediately to the right of the ivory house. The Old Gold smoker owns snails Kools are smoked in the vellow house. Milk is drunk in the middle house. The Norwegian lives in the first house. The man who smokes Chesterfields lives in the house next to the man with the fox. Kools are smoked in the house next to the house where the horse is kept. The Lucky Strike smoker drinks orange juice. The Japanese smokes Parliaments. The Norwegian lives next to the blue house.

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Zebra puzzle

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- Job-shop scheduling Consider car assembly consisting of the tasks: install axles (front and back), affix all four wheels (right and left, front and back), tighten nuts for each wheel, affix hubcaps, and inspect the final assembly. Each task requires some time, some tasks are dependent. Is it possible to finish the job within a given time *T* say?

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- Real life problems will have more number of constraints

Planning

• Three missionaries and three cannibals are on one side of a river that they wish to cross. A boat is available that can hold at most two people and at least one. You must never leave a group of missionaries outnumbered by cannibals on the same bank.



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- Applications dialog management, risk management, robotics, etc.



Probabilistic reasoning

- Two events can cause grass to be wet: an active sprinkler or rain. Rain has a direct effect on the use of the sprinkler
 - What is the probability that it would rain, given that we wet the grass?



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- Finance Risk assessment/management, fraud detection
- Law Logical analysis

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Thank you!