Semester: Spring 2022
Course Number: CSE4107
Course Title: Artificial Intelligence

Main Text Book :

S. J. Russell, P. Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 4th Edition, 2021.

- http://aima.cs.berkeley.edu [For supplementary material]

Chapter 1. Introduction to Modern Artificial Intelligence (AI)

Topic 1.1 Course Foundation

I. Purpose: AI attempts to understand and to build intelligent entities.

II. The State of the Art

a) Game Playing

- 1997: IBM's Deep Blue 3.5 points, Gary Kasparov 2.5 points
- IBM's share price increases by USD 18 billion.
- Presently, no human can defeat the best chess playing machines.
- Latest: Go, AlphaGo, AlphaGo Zero (2017) [DeepMind, Google]

b) Autonomous Control (Planning and scheduling)

- NASA's Mars exploration vehicles: 2004 – 2020 (Perseverance)
- European Space Agency's Mars Express (2008); …
- China's Zhurong (2021, famous selfie)
- Robotic vehicles: BOSS won 2006 Urban Challenge; …; Taxi ….

c) Speech Recognition and Machine Translation

- Automatic air ticket reservation
- Arabic-English translation (2007)
- Alexa, Siri, Cortana, Google Duplex, …

d) Spam filtering and Cybersecurity

Classifies billions of messages as spam daily; Malware detection

e) Recommender systems

Amazon, Facebook, Netflix, Spotify, YouTube, Walmart, and others use machine learning to recommend what you might like.

** Logistics planning, Medical diagnosis, Geological survey, Robotics (industrial, servicing, dancing, karaoke, battlefield), image understanding, climate science, etc.

** Risks and Benefits of AI: *Human-level AI, Artificial general intelligence (AGI), Artificial superintelligence (ASI);* Gorilla problem, King Midas problem.
How beneficial to humans?

III. AI background

Philosophy	Mathematics
Psychology	Economics
Linguistics	Neuroscience
Control theory	Computer Engineering

IV. Historical developments

- 1940s/50s: Simple circuit model of neurons
- Official birth – summer 1956 at Dartmouth Workshop
- Knowledge based systems: Industry of expert systems (1980 - **present**)
- New Emergence of Neural Networks (1986 - **present**)
- Probabilistic reasoning and machine learning (1987 - **present**)
- Intelligent Agent Technology (1995 - **present**)
- Learning from Large Data Sets (2001 - **present**)
- Deep learning (2011 - **present**)

V. Approaches to AI

- Systems that act like humans: Turing test
- Systems that think like humans: Experimental psychology
- Systems that think rationally: Implementing laws of thought & logic
- Systems that act rationally: Rational behavior

VI. Subfields that AI currently encompasses

- Knowledge & Reasoning
- Problem solving with informed search
- Uncertainty management
- Planning problems
- Gaming problems
- Learning
- Communicating