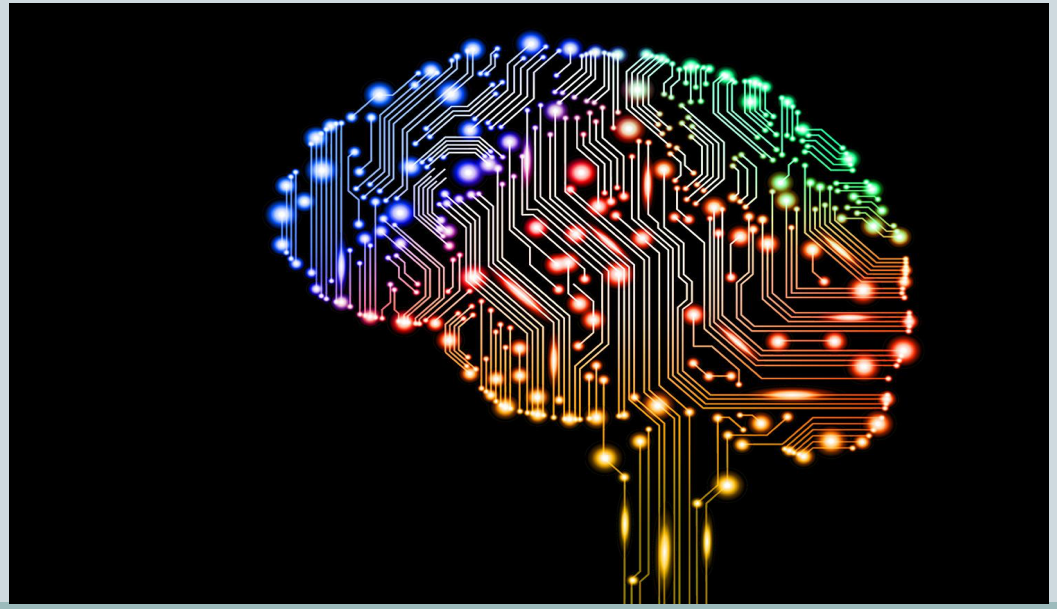
BIL 452 Yapay Zeka

2015 BAHAR

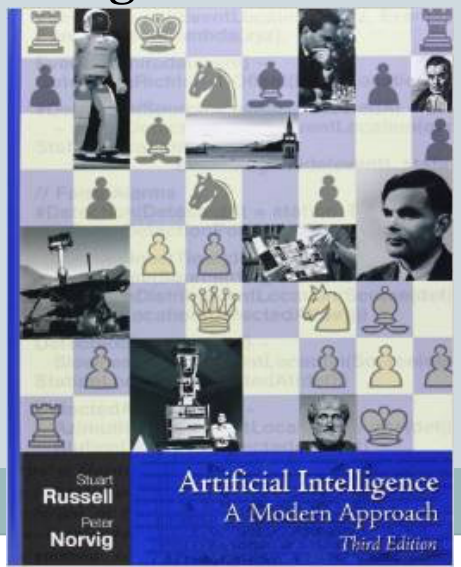
YRD. DOÇ. DR. ŞADI EVREN ŞEKER



BIL452

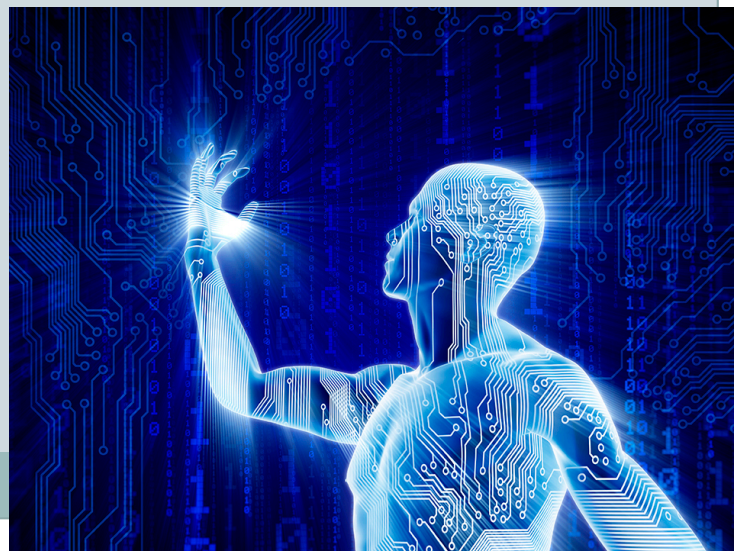
- Course home page: http://www.sadievrenseker.com/ai2015
- lecture notes, tutorials, assignment, grading, office hours, etc.

- Textbook: S. Russell and P. Norvig *Artificial Intelligence: A Modern Approach* Prentice Hall, 2009, Third Edition
- Lecturer: Sadi Evren SEKER : ai@sadievrenseker.com
- Grading: Class participation (10%), Programming assignment (15%),
- Midterm test (20%), Final exam (55%)
- Class participation includes participation in both lectures and tutorials (attendance, asking and answering questions, presenting solutions to tutorial questions).
- Note that attendance at every lecture and tutorial will be taken and constitutes part of the class participation grade.
- Midterm Exam (in class, 1 hr) and final exam (2 hrs) are both open-book
- A must check : http://aima.cs.berkeley.edu



Schedule

- BIL 452, Monday 10.00 a.m. – 12.30 p.m. & 13.00 p.m. to 15.30 p.m.
- Seoul between 5 – 10 March
- Dallas between 18 – 29 March
- Make up classes TBA

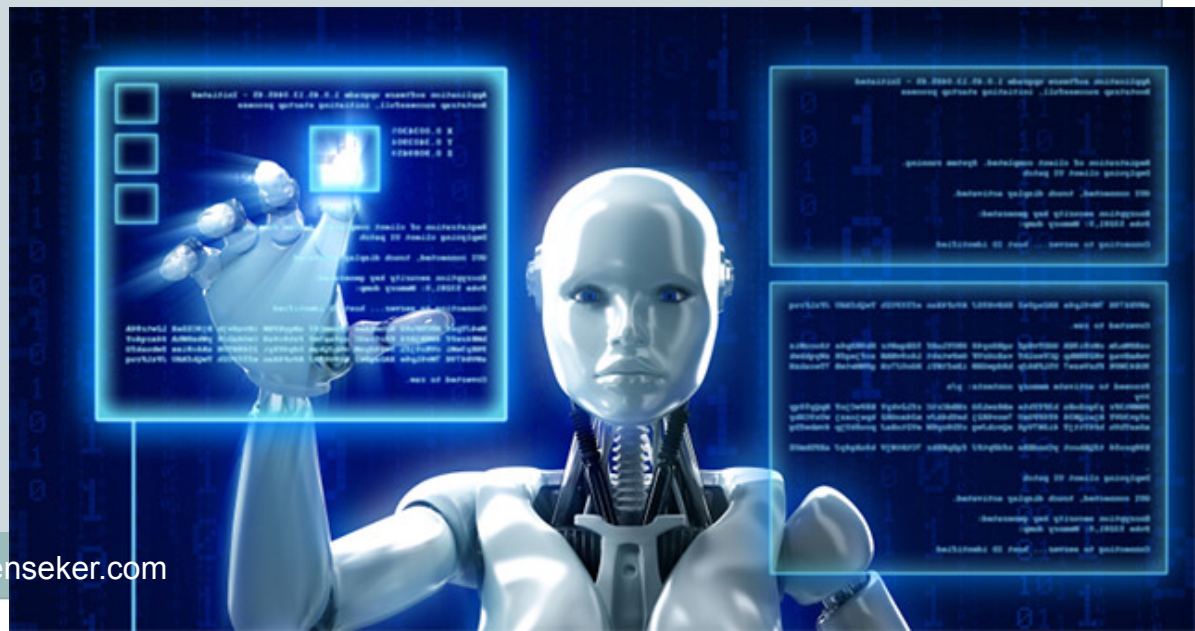


Outline

- Course overview
- What is AI?
- A brief history
- The state of the art

Course overview

- Introduction and Agents (chapters 1,2)
- Search (chapters 3,4,5,6)
- Logic (chapters 7,8,9)
- Planning (chapters 11,12)
- Uncertainty (chapters 13,14)
- Learning (chapters 18,20)
- Natural Language Processing (chapter 22,23)



What is AI?

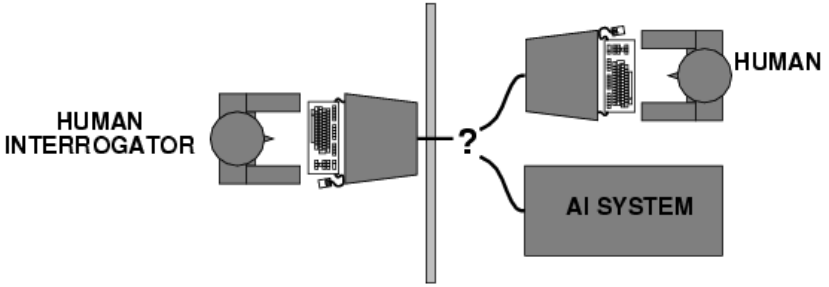
Views of AI fall into four categories:

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

The textbook advocates "acting rationally"

Acting humanly: Turing Test

- Turing (1950) "Computing machinery and intelligence":
- "Can machines think?" → "Can machines behave intelligently?"
- Operational test for intelligent behavior: the Imitation Game



- Predicted that by 2000, a machine might have a 30% chance of fooling a lay person for 5 minutes
- Anticipated all major arguments against AI in following 50 years
- Suggested major components of AI: knowledge, reasoning, language understanding, learning

Thinking humanly: cognitive modeling

- 1960s "cognitive revolution": information-processing psychology
- Requires scientific theories of internal activities of the brain
- -- How to validate? Requires
  1) Predicting and testing behavior of human subjects (top-down)
  or 2) Direct identification from neurological data (bottom-up)
- Both approaches (roughly, Cognitive Science and Cognitive Neuroscience)
- are now distinct from AI

Thinking rationally: "laws of thought"

- Aristotle: what are correct arguments/thought processes?
- Several Greek schools developed various forms of *logic*: *notation* and *rules of derivation* for thoughts; may or may not have proceeded to the idea of mechanization
- Direct line through mathematics and philosophy to modern AI
- Problems:
  1. Not all intelligent behavior is mediated by logical deliberation
  2. What is the purpose of thinking? What thoughts should I have?

Acting rationally: rational agent

- Rational behavior: doing the right thing
- The right thing: that which is expected to maximize goal achievement, given the available information
- Doesn't necessarily involve thinking – e.g., blinking reflex – but thinking should be in the service of rational action

Rational agents

- An agent is an entity that perceives and acts
- This course is about designing rational agents
- Abstractly, an agent is a function from percept histories to actions:

$$[f: \mathcal{P}^* \rightarrow \mathcal{A}]$$

- For any given class of environments and tasks, we seek the agent (or class of agents) with the best performance
- Caveat: computational limitations make perfect rationality unachievable
  → design best program for given machine resources

AI prehistory

- Philosophy — Logic, methods of reasoning, mind as physical system foundations of learning, language, rationality
- Mathematics — Formal representation and proof algorithms, computation, (un)decidability, (in)tractability, probability
- Economics — utility, decision theory
- Neuroscience — physical substrate for mental activity
- Psychology — phenomena of perception and motor control, experimental techniques
- Computer engineering — building fast computers
- Control theory — design systems that maximize an objective function over time
- Linguistics — knowledge representation, grammar

Abridged history of AI

• 1943	McCulloch & Pitts: Boolean circuit model of brain
• 1950	Turing's "Computing Machinery and Intelligence"
• 1956	Dartmouth meeting: "Artificial Intelligence" adopted
• 1952—69	Look, Ma, no hands!
• 1950s	Early AI programs, including Samuel's checkers program, Newell & Simon's Logic Theorist, Gelernter's Geometry Engine
• 1965	Robinson's complete algorithm for logical reasoning
• 1966—73	AI discovers computational complexity Neural network research almost disappears
• 1969—79	Early development of knowledge-based systems
• 1980--	AI becomes an industry
• 1986--	Neural networks return to popularity
• 1987--	AI becomes a science
• 1995--	The emergence of intelligent agents

State of the art

- Deep Blue defeated the reigning world chess champion Garry Kasparov in 1997
- Proved a mathematical conjecture (Robbins conjecture) unsolved for decades
- No hands across America (driving autonomously 98% of the time from Pittsburgh to San Diego)
- During the 1991 Gulf War, US forces deployed an AI logistics planning and scheduling program that involved up to 50,000 vehicles, cargo, and people
- NASA's on-board autonomous planning program controlled the scheduling of operations for a spacecraft
- `Proverb` solves crossword puzzles better than most humans

Questions ?

Homework

FIND AND LIST 10 MAJOR ACHIEVEMENTS IN LAST 10 YEARS

EMAIL TO : AI@SADIEVRENSEKER.COM