

Artificial Intelligence

Lecture 1

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Instructor Notes

About Me

Instructor: Supta Richard Philip

Designation: Senior Lecturer

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Course Notes and Books

Reference Book

- Essential Books (Text Books): Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Third Edition
- Recommended Reference Books: Principles of Artificial Intelligence, Nils J. Nilson



Assessment Policies

- Mid Term Exam - 30%
- Final Term Exam - 40%
- Quizzes- 20% (Best 2 out of 3)
- Attendance and others- 10%



Course overview

- intelligent agents
- search and game-playing
- logical agent(First order logic)
- uncertainty—probability and decision theory
- learning (Include Machine learning)
- Natural language Processing
- perception (Vision/image processing)



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Course Notes and Books

Reference Book

- Essential Books (Text Books): Patrick Blackburn, Johan Bos, Kristina Striegnitz. Learn Prolog Now
- Python : any books and beginner guide
- Work on Jupyter Notebook(Install Anaconda)

Assessment Policies

- Mid Term Exam - 20%(solve two problems)
- Final Term Exam - 30%(solve three problems)
- Project and Presentation- 30%
- Assignments - 10% (discuss in the class)
- Attendance and others- 10%



Project and Presentation

- Everyone should have one github account.
- Make a group of three members.
- Proposal and Presentation(Before mid term).
- Report, presentation and demo(Before Final Term).



Project Category

- Image processing(Use openCV and python)
- Natural Language processing(Machine Learning)(Use Python as well)



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Role: Data Scientist

- OOP and Design Pattern.
- AI, Machine learning.
- Agile development methodologies.
- Work with Python, Java 8, Scala.
- Work with big data, Hadoop and Spark.
- Work in Devops (Git, Jenkins, Docker, ansible etc).



Role: Java Application Developer

- OOP and Design Pattern.
- Core Java 8, Core Spring, REST, test frameworks (JUnit, Mockito, Wiremock etc), Maven, databases (Oracle, Postgres), version handling (GIT), Amazon Web Services.



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What is AI?

- (The automation of) activities that we associate with human thinking, activities such as decision-making, problem solving, learning ...” (Bellman, 1978)
- “The study of mental faculties through the use of computational models” (Charniak+McDermott, 1985)



What is AI?

- “The study of how to make computers do things at which, at the moment, people are better” (Rich+Knight, 1991)
- “The branch of computer science that is concerned with the automation of intelligent behavior” (Luger + Stubblefield, 1993)



What is AI?

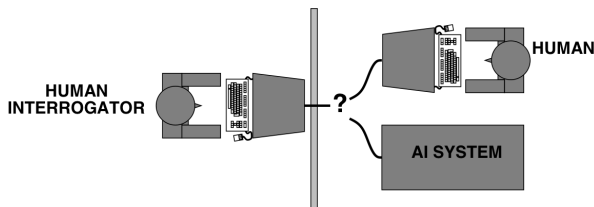
Views of AI fall into four categories:

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

- Suggested major components of AI:
knowledge, reasoning, language
understanding, learning.



Acting Humanly: Turing Test



- Turing (1950) "Computing machinery and intelligence":
- "Can machines think?" "Can machines behave intelligently?"
- The Imitation Game (2014)

Thinking Humanly: Cognitive Modelling

- How human thinks?
- Two ways to determine a given program thinks like human (i)Through introspection , (ii)Through psychological experiments
- After defining theory, we can express it as a computer program and check if it is behaving like human



Thinking Rationally: Laws of Thought

- Normative rather than descriptive
- Aristotle was one of the first to attempt to codify “right thinking” – reasoning processing



Thinking Rationally: Laws of Thought

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Acting Rationally

- Rational Behavior: doing the right thing
- Right thing: maximizes our goal achievement, given the available information.
- Doesn't necessarily involve thinking – but thinking should be in the service of rational action.



Rational Agent

- An agent is an entity that perceives and acts. Abstractly, an agent is a function from percept histories to actions:

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

- Doesn't necessarily involve thinking – but thinking should be in the service of rational action.



Rational Agent

- For any given class of environments and tasks, we seek the agent with the best performance
- Caveat: computational limitations make perfect rationality unachievable.
- Target is to design best program for given machine resources



AI prehistory

Philosophy	logic, methods of reasoning mind as physical system
Mathematics	foundations of learning, language, rationality formal representation and proof algorithms computation, (un)decidability, (in)tractability probability
Psychology	adaptation phenomena of perception and motor control experimental techniques (psychophysics, etc.)
Linguistics	knowledge representation grammar
Neuroscience	physical substrate for mental activity
Control theory	homeostatic systems, stability simple optimal agent designs



Abridged history of AI

1943	McCulloch & Pitts: Boolean circuit model of brain
1950	Turing's "Computing Machinery and Intelligence"
1952–69	Look, Ma, no hands!
1950s	Early AI programs, including Samuel's checkers program, Newell & Simon's Logic Theorist, Gelernter's Geometry En
1956	Dartmouth meeting: "Artificial Intelligence" adopted
1965	Robinson's complete algorithm for logical reasoning
1966–74	AI discovers computational complexity Neural network research almost disappears
1969–79	Early development of knowledge-based systems
1980–88	Expert systems industry booms
1988–93	Expert systems industry busts: "AI Winter"
1985–95	Neural networks return to popularity
1988–	Resurgence of probabilistic and decision-theoretic methods Rapid increase in technical depth of mainstream AI "Nouvelle AI": ALife, GAs, soft computing




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