ARTIFICIAL INTELLIGENCE

Course Code: AFI 124

Artificial Intelligence A Modern Approach, Stuart Russel and Peter Norvig

Self Introduction

Pema Gurung

Education:

- MCA, Christ University, Bangalore, India in 2017

Experience:

- NLP Engineer, Awesummly, Bangalore, India (1 year)
- Senior NLP Engineer, Ekbana Solutions, Nepal (2018 - Current)

Contents:

1. Artificial Intelligence

   AI, AI Perspectives: acting and thinking humanly, acting and thinking rationally

1. History of AI
2. Foundations of AI: Philosophy, Economics, Psychology, Sociology, Linguistic, Neuroscience, Mathematics, Computer Science, Control Theory
3. Applications of AI
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Introduction to AI

The field of artificial intelligence, or AI, is concerned with not just understanding but also building intelligent entities.

What is AI?

Artificial Intelligence (AI) is a branch of Science which deals with helping machines finding solutions to complex problems in a more human-like fashion. This generally involves borrowing characteristics from human intelligence, and applying them as algorithms in a computer friendly way.

Some consider intelligence to be a property of internal thought processes and reasoning, while others focus on intelligent behavior, an external characterization.

AI Perspectives

From these two dimensions—human vs. rational and thought vs. behavior—there are four possible combinations

1. Acting humanly: The Turing test approach
2. Thinking humanly: The cognitive modeling approach
3. Thinking rationally: The “laws of thought” approach
4. Acting rationally: The rational agent approach

AI Perspectives: acting humanly

The Turing test, proposed by Alan Turing (1950), was designed as a thought experiment that would sidestep the philosophical vagueness of the question “Can a machine think?”

For Machines to think, we would need:

- natural language processing to communicate successfully in a human language;
- knowledge representation to store what it knows or hears;
- automated reasoning to answer questions and to draw new conclusions;
- machine learning to adapt to new circumstances and to detect and extrapolate patterns.

To pass the total Turing test, a robot will need

- computer vision and speech recognition to perceive the world;
- robotics to manipulate objects and move about.

AI Perspectives: thinking humanly

We can learn about human thought in three ways:

- introspection—trying to catch our own thoughts as they go by;
- psychological experiments—observing a person in action;
- brain imaging—observing the brain in action.

Once we have a sufficiently precise theory of the mind, it becomes possible to express the theory as a computer program.

AI Perspectives: thinking rationally

The Greek philosopher Aristotle was one of the first to attempt to codify “right thinking”, their study initiated the field called logic.

Logicians in the 19th century developed a precise notation for statements about objects in the world and the relations among them.

By 1965, programs could, in principle, solve any solvable problem described in logical notation. The so-called logicist tradition within artificial intelligence hopes to build on such programs to create intelligent systems

The theory of probability fills this gap, allowing rigorous reasoning with uncertain information.

AI Perspectives: acting rationally

Agents: An agent is just something that acts. Computer agents are expected to do more: operate autonomously, perceive their environment, persist over a prolonged time period, adapt to change, and create and pursue goals.

Rational Agents: A rational agent is one that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome.

AI has focused on the study and construction of agents that do the right thing. What counts as the right thing is defined by the objective that we provide to the agent. This general paradigm is so pervasive that we might call it the standard model. It prevails not only in AI, but also in control theory, where a controller minimizes a cost function; in operations research, where a policy maximizes a sum of rewards; in statistics, where a decision rule minimizes a loss function; and in economics, where a decision maker maximizes utility or some measure of social welfare.

Foundation of AI

1. Philosophy
2. Mathematics
3. Economics
4. Neuroscience
5. Psycology
6. Computer Engineering
7. Control Theory
8. Linguistic

1. Philosophy

- Can formal rules be used to draw valid conclusions?
- How does the mind arise from a physical brain?
- Where does knowledge come from?
- How does knowledge lead to action?

2. Mathematics

- What are the formal rules to draw valid conclusions?
- What can be computed?
- How do we reason with uncertain information?

3. Economics

- How should we make decisions in accordance with our preferences?
- How should we do this when others may not go along?
- How should we do this when the payoff may be far in the future?

4. Neuroscience

- How do brains process information?

5. Psychology

- How do humans and animals think and act?

6. Computer Engineering

- How can we build an efficient computer?

7. Control Theory

- How can artifacts operate under their own control?

8. Linguistics

- How does language relate to thought?

History of AI

1. The inception of artificial intelligence (1943–1956)
2. Early enthusiasm, great expectations (1952–1969)
3. A dose of reality (1966–1973)
4. Expert systems (1969–1986)
5. The return of neural networks (1986–present)
6. Probabilistic reasoning and machine learning (1987– present)
7. Big data (2001–present)
8. Deep learning (2011–present)

The State of the Art

1. ROBOTIC VEHICLES
2. AUTONOMOUS PLANNING AND SCHEDULING
3. MACHINE TRANSLATION
4. SPEECH RECOGNITION
5. RECOMMENDATIONS
6. GAME PLAYING
7. IMAGE UNDERSTANDING
8. MEDICINE
9. CLIMATE SCIENCE

Risks and Benefits of AI

1. LETHAL AUTONOMOUS WEAPONS
2. SURVEILLANCE AND PERSUASION
3. BIASED DECISION MAKING
4. IMPACT ON EMPLOYMENT
5. SAFETY-CRITICAL APPLICATIONS
6. CYBERSECURITY

Next Class

Intelligent Agents:

- Introduction of agents, Structure of Intelligent agent, Properties of Intelligent Agents
- Configuration of Agents, PEAS description of Agents, PAGE
- Types of Agents: Simple Reflexive, Model Based, Goal Based, Utility Based, Learning Agent
- Environment Types: Deterministic, Stochastic, Static, Dynamic, Observable, Semi-observable, Single Agent, Multi Agent

Github

Create an account

Create a New Project

From Website:

- Create a Note file as Readme.md
- Commit the readme file to the project

From local System:

- Clone the project
- Create a Note file as Readme.md
- Push the readme file to the project

Assignment

Book: Stuart Russel and Peter Norvig, Artificial Intelligence A Modern Approach, Pearson Reference

Assignment: Create a <topic>.md file of the topics studied from the book and push the code.

Take Away:

- Learning
- Documenting Projects
- Handson github
- Structuring Projects