Universidad Autónoma de Nuevo León

Facultad de Ingeniería Mecánica y Eléctrica

Artificial Intelligence

Assignment 1: Artificial Intelligence: background and foundations

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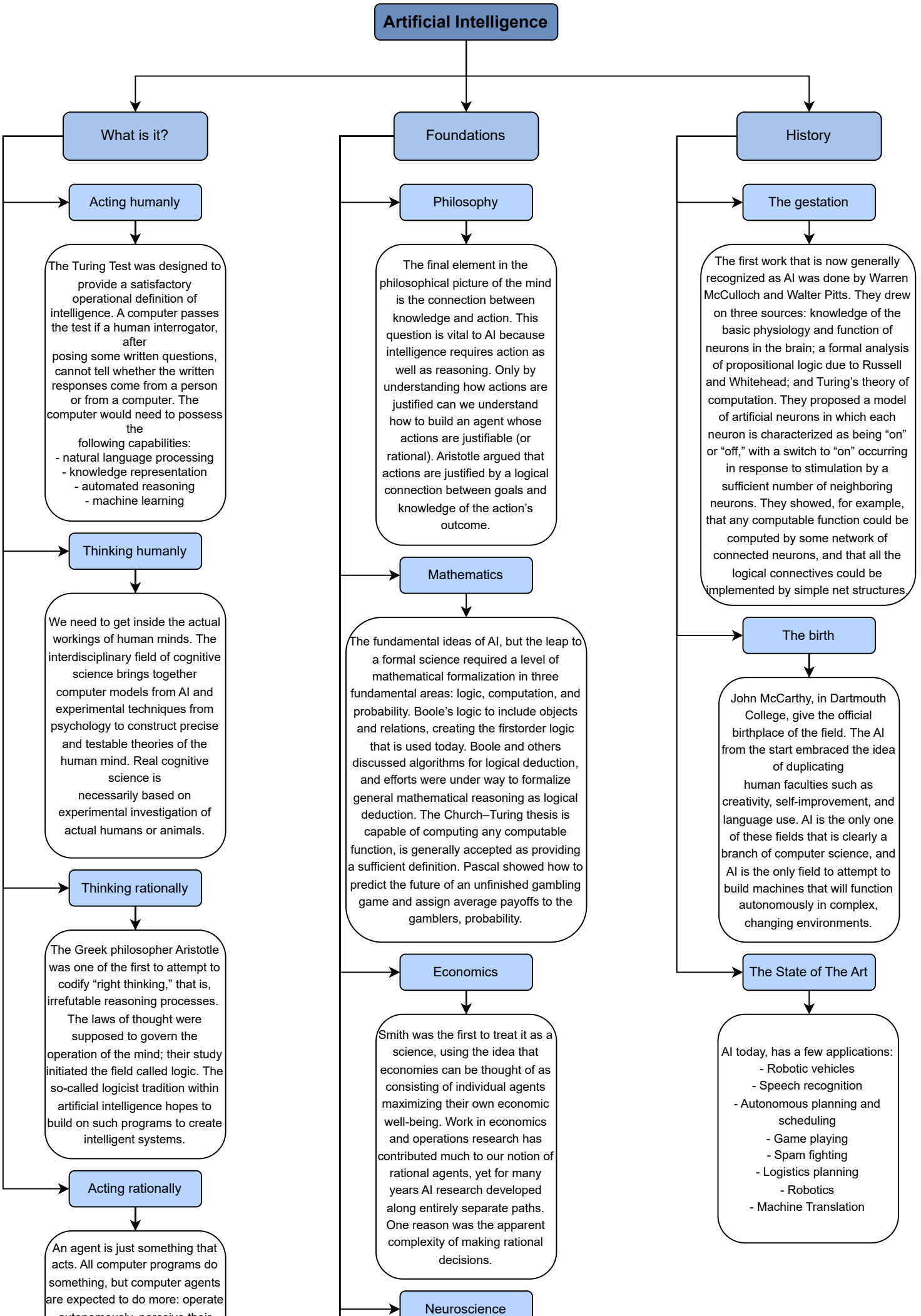

Artificial Intelligence
What is it?
Acting humanly
The Turing Test was designed to provide a satisfactory operational definition of intelligence. A computer passes the test if a human interrogator, after posing some written questions, cannot tell whether the written responses come from a person or from a computer. The computer would need to possess the following capabilities:
- natural language processing
- knowledge representation
- automated reasoning
- machine learning
Thinking humanly
We need to get inside the actual workings of human minds. The interdisciplinary field of cognitive science brings together computer models from AI and experimental techniques from psychology to construct precise and testable theories of the human mind. Real cognitive science is necessarily based on experimental investigation of actual humans or animals.
Thinking rationally
The Greek philosopher Aristotle was one of the first to attempt to codify "right thinking," that is, irrefutable reasoning processes. The laws of thought were supposed to govern the operation of the mind; their study initiated the field called logic. The so-called logicist tradition within artificial intelligence hopes to build on such programs to create intelligent systems.
Acting rationally
An agent is just something that acts. All computer programs do something, but computer agents are expected to do more: operate
Foundations
Philosophy
The final element in the philosophical picture of the mind is the connection between knowledge and action. This question is vital to AI because intelligence requires action as well as reasoning. Only by understanding how actions are justified can we understand how to build an agent whose actions are justifiable (or rational). Aristotle argued that actions are justified by a logical connection between goals and knowledge of the action's outcome.
Mathematics
The fundamental ideas of AI, but the leap to a formal science required a level of mathematical formalization in three fundamental areas: logic, computation, and probability. Boole's logic to include objects and relations, creating the firstorder logic that is used today. Boole and others discussed algorithms for logical deduction, and efforts were under way to formalize general mathematical reasoning as logical deduction. The Church–Turing thesis is capable of computing any computable function, is generally accepted as providing a sufficient definition. Pascal showed how to predict the future of an unfinished gambling game and assign average payoffs to the gamblers, probability.
Economics
Smith was the first to treat it as a science, using the idea that economies can be thought of as consisting of individual agents maximizing their own economic well-being. Work in economics and operations research has contributed much to our notion of rational agents, yet for many years AI research developed along entirely separate paths. One reason was the apparent complexity of making rational decisions.
Neuroscience
History
The gestation
The first work that is now generally recognized as AI was done by Warren McCulloch and Walter Pitts. They drew on three sources: knowledge of the basic physiology and function of neurons in the brain; a formal analysis of propositional logic due to Russell and Whitehead; and Turing's theory of computation. They proposed a model of artificial neurons in which each neuron is characterized as being "on" or "off," with a switch to "on" occurring in response to stimulation by a sufficient number of neighboring neurons. They showed, for example, that any computable function could be computed by some network of connected neurons, and that all the logical connectives could be implemented by simple net structures.
The birth
John McCarthy, in Dartmouth College, give the official birthplace of the field. The AI from the start embraced the idea of duplicating human faculties such as creativity, self-improvement, and language use. AI is the only one of these fields that is clearly a branch of computer science, and AI is the only field to attempt to build machines that will function autonomously in complex, changing environments.
The State of The Art
AI today, has a few applications:
- Robotic vehicles
- Speech recognition
- Autonomous planning and scheduling
- Game playing
- Spam fighting
- Logistics planning
- Robotics
- Machine Translation

autonomously, perceive their environment, persist over a prolonged time period, adapt to change, and create and pursue goals. A rational agent is one that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome.

Neuroscience

Neuroscience is the study of the nervous system, particularly the brain. Despite the advances, we are still a long way from understanding how cognitive processes actually work. Brains and digital computers have somewhat different properties. The brain makes up for that with far more storage and interconnection than even a high end personal computer, although the largest supercomputers have a capacity that is similar to the brain's.

Psychology

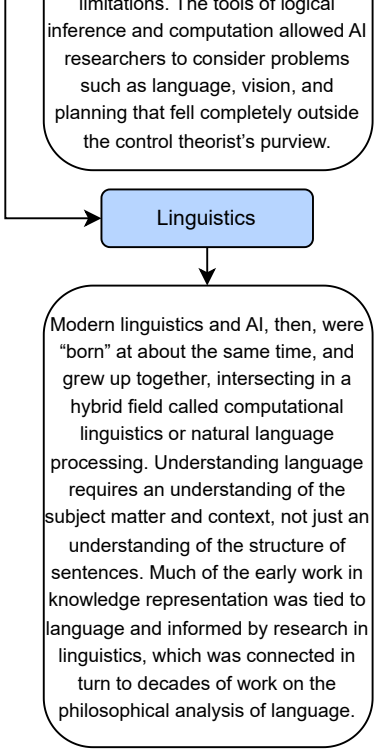
Computer models could be used to address the psychology of memory, language, and logical thinking, respectively. It is now a common view among psychologists that "a cognitive theory should be like a computer program"; that is, it should describe a detailed information processing mechanism whereby some cognitive function might be implemented.

Computer engineering

AI owes a debt to the software side of computer science, which has supplied the operating systems, programming languages, and tools needed to write modern programs. Work in AI has pioneered many ideas that have made their way back to mainstream computer science, including time sharing, interactive interpreters, personal computers with windows and mice, rapid development environments, the linked list data type, automatic storage management, and key concepts of symbolic, functional, declarative, and object-oriented programming.

Control theory and cybernetics

Modern control theory, especially the branch known as stochastic optimal control, has as its goal the design of systems that maximize an objective function over time. This roughly matches our view of AI: designing systems that behave optimally. Calculus and matrix algebra, the tools of control theory, lend themselves to systems that are describable by fixed sets of continuous variables, whereas AI was founded in part as a way to escape from the these perceived


limitations. The tools of logical inference and computation allowed AI researchers to consider problems such as language, vision, and planning that fell completely outside the control theorist's purview.
Linguistics
Modern linguistics and AI, then, were "born" at about the same time, and grew up together, intersecting in a hybrid field called computational linguistics or natural language processing. Understanding language requires an understanding of the subject matter and context, not just an understanding of the structure of sentences. Much of the early work in knowledge representation was tied to language and informed by research in linguistics, which was connected in turn to decades of work on the philosophical analysis of language.

References

Russell, S. J. (2020). Artificial intelligence: a modern approach. Pearson Education, Inc.