

# Lecture 1: Introduction to Artificial Intelligence

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## 1 Problems in AI and Related Areas

### What is AI?

- ‘...*science and engineering of making intelligent machines, especially intelligent computer programs.*’ John McCarthy.
- A branch of *cybernetics* concerned with automation of deductive constructions (reasoning).
- The study and design of intelligent agents.

**Remark 1.** <http://www-formal.stanford.edu/jmc/whatisai/>  
[http://en.wikipedia.org/wiki/Artificial\\_intelligence](http://en.wikipedia.org/wiki/Artificial_intelligence)

### Major Problems in AI

- How does human think? (cognitive science)
- Reasoning and problem solving (choosing goals, subgoals).
- Pattern recognition (primarily visual and aural).
- Learning (e.g. machine learning).
- Natural human languages (recognition of the meaning of sentences and expressions, maintaining a dialogue).

- Instruction and self-instruction.
- Algorithms for the control of movements (artificial limbs, robots).
- Synthesis of an artificial voice, speech.
- Conversational and dialogue (human-machine) systems.
- Increase of productivity (expert systems, games).

### Branches and Related Areas

**Cybernetics:** science of the control, communication and processing of information. Includes theories of control, communication, information processing, operations research, decisions.

**Cognitive science:** the study of (human) intelligence by algorithms simulating human behaviour. Computational theory of mind.

**Machine learning:** concerned with adaptive systems and algorithms, where knowledge is modified to improve problem-solving capability.

**Neuroscience:** the study of nervous system. Mostly related to AI are cognitive and computational neuroscience.

**Logic:** (propositional, first-order, boolean, fuzzy) used for automated reasoning.

**Optimisation:** extremal problems, approximation, optimal control.

**Probability:** uncertainty, information theory, statistics.

## 2 Questions about Intelligence

### What is Intelligence?

- The ability to reason, plan, make decisions, solve problems and learn.
- Some also add comprehend and use language to communicate.
- ‘... *computational part of the ability to achieve goals in the world*’ John McCarthy.

**Question 1.** *Does intelligence require emotion or consciousness?*

## The Turing Test

- *Imitation game* proposed in:  
Turing, A. (1950, October). Computing Machinery and Intelligence, *Mind*, *LIX*(236), 433–460
- Three participants in isolated rooms: computer, human and human judge.
- The judge can communicate via text both with the computer and human.
- The computer wins (passes the test) if the judge cannot tell which of the two is the computer.

## 3 Applications of AI

### Applications of AI

- Decision support systems, management and finance.
- Data-mining and knowledge discovery in databases.
- Image processing (medicine, geophysics, criminology).
- Automatic scheduling, planning and optimisation.
- Robotics.
- Space industry.
- Game industry.
- Security and military applications.

## References

- Turing, A. (1950, October). Computing machinery and intelligence. *Mind*, *LIX*(236), 433–460.