

Assignment Project Exam Help

# Introduction to AI

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# Course outline

## Part I (FT)

- Fundamentals of search and planning in AI
- Resolution and unification and their use in automated reasoning
- Foundations of logic programming
- Rule-based systems for robotics

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## Part II (AR)

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- Foundation of abductive logic programming with algorithms
- (Declarative) Answer Set Programming for real-world applications
- Satisfiability problem and algorithms for Sat-solving



# Logistics

- one assessed coursework (pen and paper and Prolog)
- summer term exam (2/2 questions)

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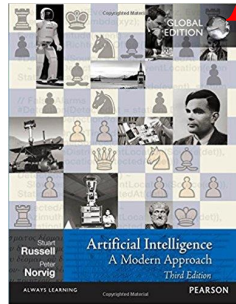
- **Part I (FT)**

- Lectures + tutorials: Tuesdays 16:00-17:00 and Thursdays 9:00-11:00
- Labs(mostly coursework Q&A): Tuesdays 17:00-18:00
- **No** panopto recordings as they
  - hinder spontaneity (in both students and lecturers)
  - hinder interactions (amongst students and between lecturers and students)
  - encourage rote learning
- **Yes** Piazza
- Slides complemented by reading material – integral part of course

# Reading material for the introductory lecture

Recommended reading:

Chapter 1



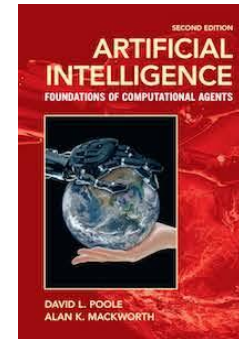
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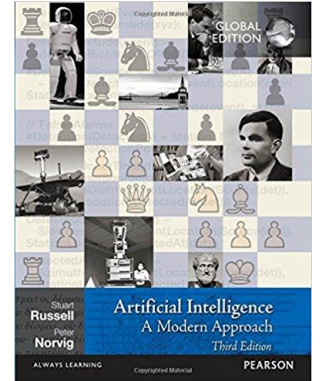
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Additional reading:

Chapter 1



# What is Artificial Intelligence?



Design and build systems that

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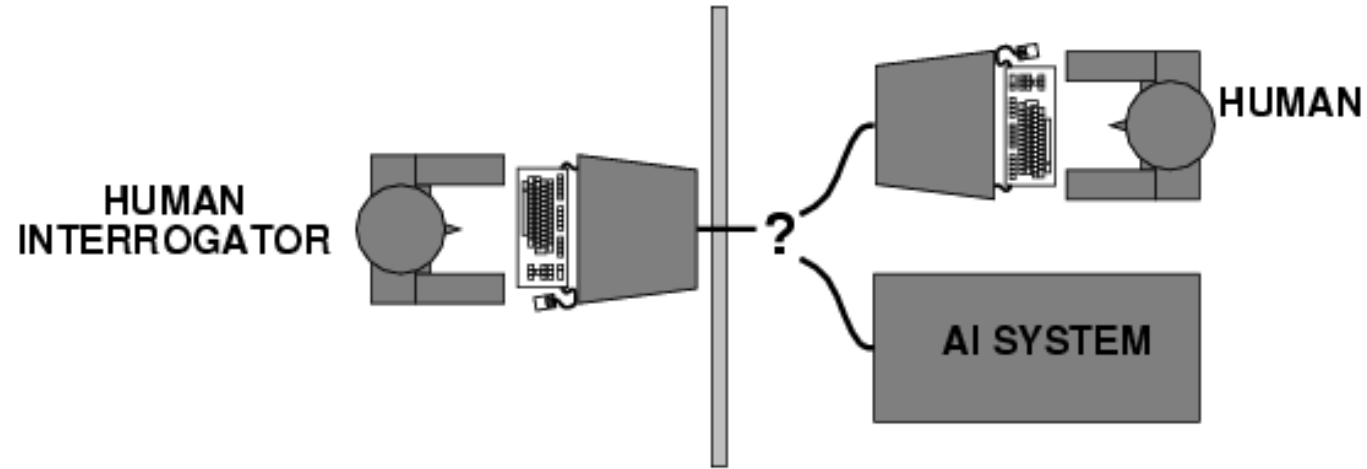
	like humans <a href="https://tutorcs.com">https://tutorcs.com</a>	rationality
think	cognitive (neuro)science Mechanics studies	logic
act	Turing test	agents

# The Turing test

DOI:10.1145/3122814

**Answering questions correctly from standardized eighth-grade science tests is itself a test of machine intelligence.**

BY CARISSA SCHOENICK, PETER CLARK, OYVIND TAFJORD,  
PETER TURNEY, AND OREN ETZIONI



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**captcha** - Completely  
Automated Public Turing  
Test To Tell Computers and  
Humans Apart

# Moving Beyond the Turing Test with the Allen AI Science Challenge

Cognitive (neuro)science

scientific theories of internal activities of the brain

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Predict and test behavior of human subjects

Link to neurological data

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# Logic - the study of *valid* arguments



## *1<sup>st</sup> meaning: valid chains of reasoning*

- ✓ Every human is mortal, Socrates is human, therefore **Socrates is mortal**
- ✗ Every human is mortal, Socrates is human, therefore **Socrates is blond**
- ✓ No Martian is human, every human is mortal, therefore **some mortal is not Martian**
- ✓ Axioms of number theory hold, therefore  **$\sqrt{2}$  is irrational**

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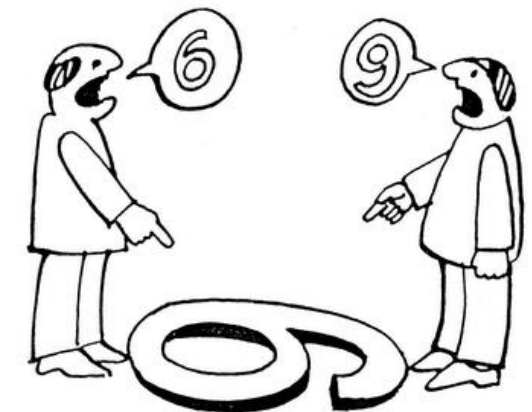
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## *2<sup>nd</sup> meaning: valid disputes*

There are two sides to every issue

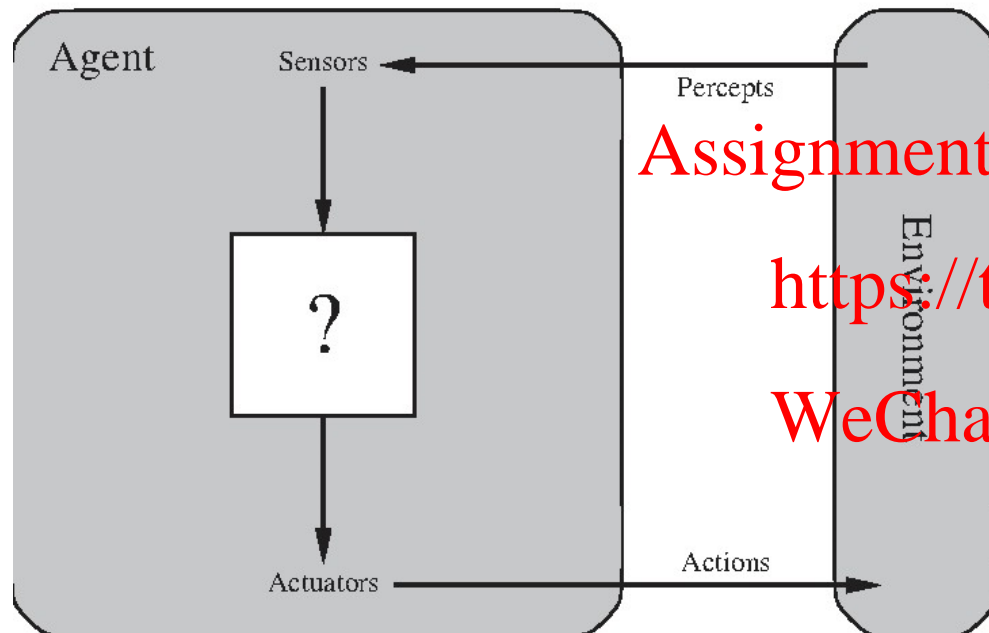
*(Protagoras 490 – 420 BC & Sophists 5th century BC)*





# Rational agents

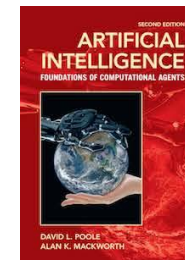
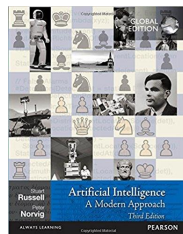
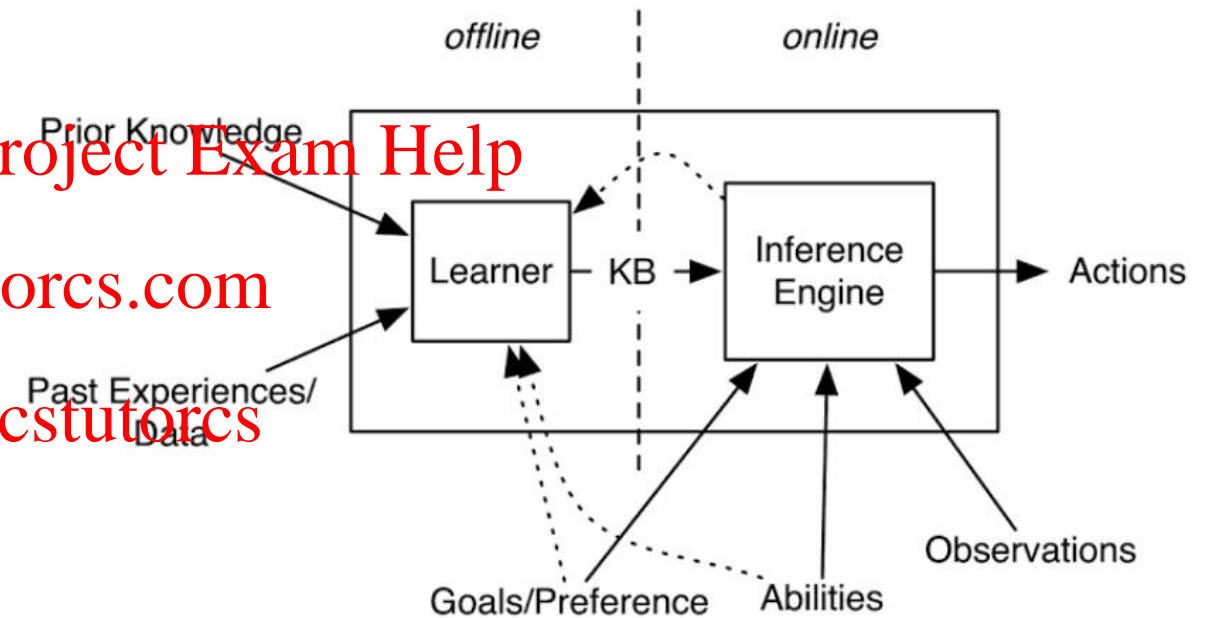
(Doing the right thing)



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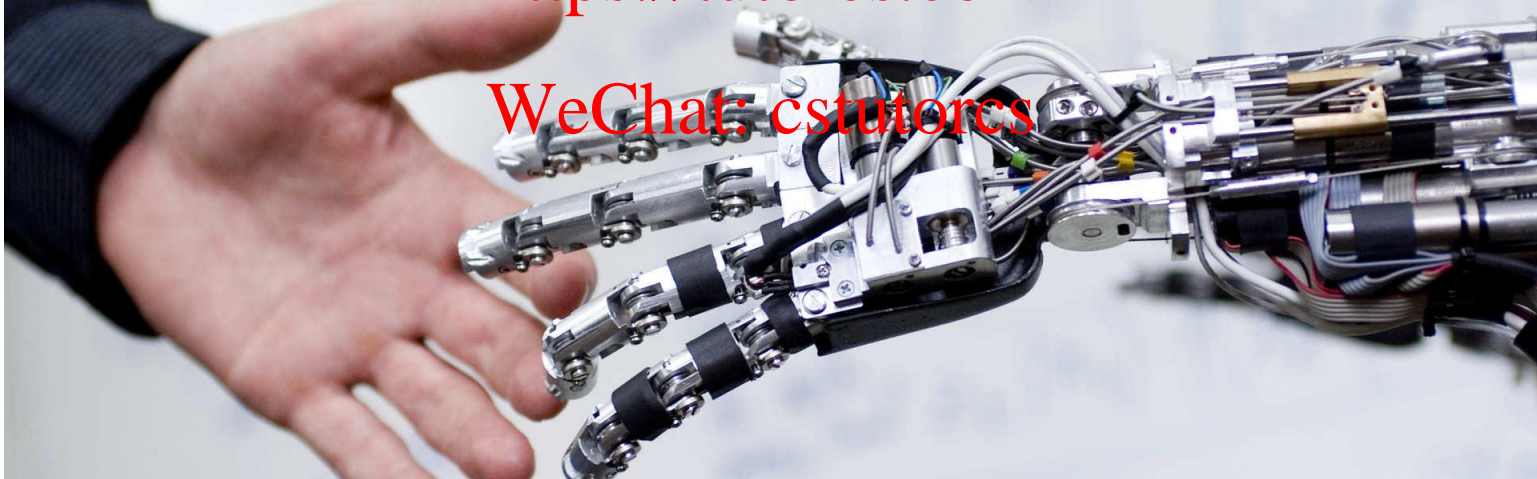
# What is Artificial Intelligence?

“Intelligent” systems able to interact with /relate to humans

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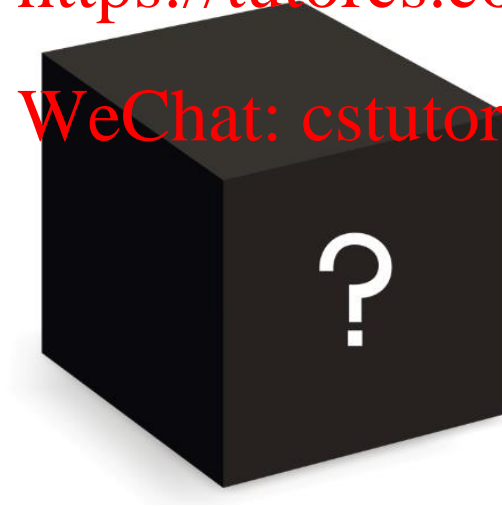
# *General Data Protection Regulation (GDPR)*

“humanisation” of machine-generated decisions

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# What is Artificial Intelligence?

A collection/combination of methods & systems

- machine learning
- search
- planning
- knowledge representation
- reasoning
- constraint satisfaction
- natural language processing
- robotics and perception
- multiagent systems

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27th International Joint Conference on AI  
joint with the 23rd European Conference on AI

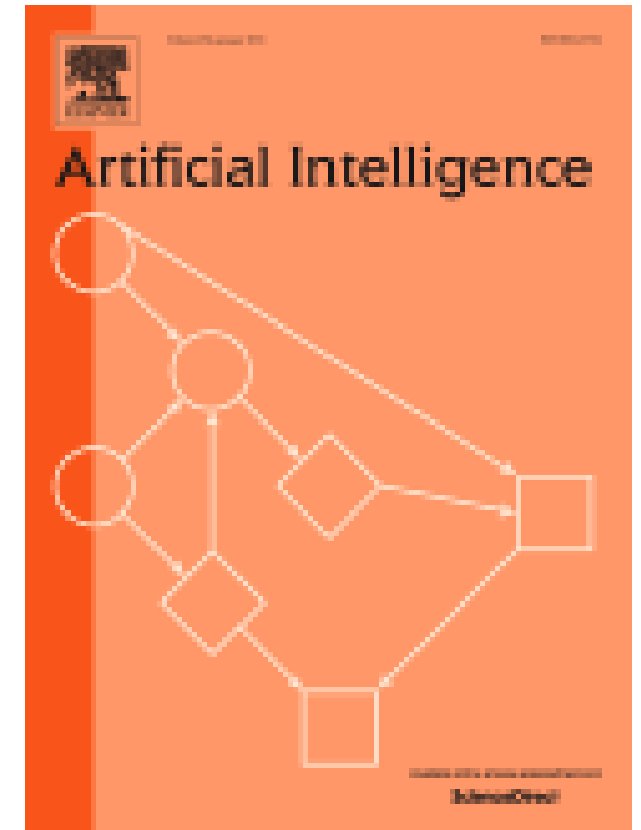
# What is Artificial Intelligence?

- Automated reasoning and inference
- Case-based reasoning
- Cognitive aspects of AI
- Commonsense reasoning
- Constraint processing
- Heuristic search
- High-level computer vision
- Intelligent interfaces
- Intelligent robotics
- Knowledge representation
- Machine learning
- Multiagent systems
- Natural language processing
- Planning and theories of action
- Reasoning under uncertainty or imprecision

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# How did AI come about?

- “A logical calculus of the ideas immanent in nervous activity”

McCulloch & Pitts **1943:**

*for any logical expression satisfying certain conditions, one can find a net behaving in the fashion it describes.*

- “Computing Machinery and Intelligence” Turing **1950:**

*Can machines think?... I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted.*

- Dartmouth summer research project on AI **1956:**

*how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.*

# A partial abridged history of AI

- Newell and Simon (1956): discover proofs in propositional logic
- Wang (1960): prove every theorem in Principia Mathematica
- Samuel (1961): beat humans at checkers
- Minski (1952), Rosenblatt (1958): learning neural networks
- McCarthy, Hayes (1969): logical representations
- Minsky (1975): frames
- Expert systems (1970-80): DENDRAL (chemistry)+MYCIN (medicine)
- Logic-based reasoning (1970-80): Prolog
- Brookes (1987): Intelligence without representation
- Agents and multi-agent systems (1990-)
- NLP: STUDENT (Bobrow 1967 ), SHRDLU (Winograd 1972), CHAT-80 (Warren-Pereira 1982)...IBM Watson
- Semantic web (2001-)
- Deep neural networks (2006-)

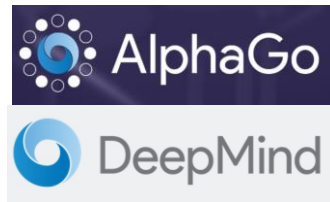
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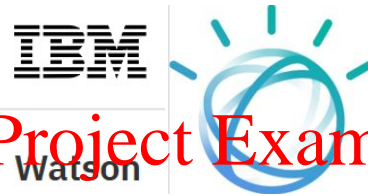
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# What can AI do today?

Play (and win) games



Answer queries



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Drive vehicles



Recognise speech

Recognise faces



vacuum clean



Translate across languages





# Weak vs Strong AI

- Weak AI: technology leading to tools

- Narrow focus

- Specific domains

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- Strong AI (Artificial General Intelligence):

- general-purpose: consciousness? commonsense?

- Ethics

# Commonsense



## Winograd “schema” Assignment Project Exam Help

- The council refused demonstrators a permit as **they** feared violence
- The council refused demonstrators a permit a **they** advocated violence
- Easy for humans to map they to council and demonstrators respectively
- Grammar/statistical test will not help: commonsense is needed

# Introduction - summary

AI

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- What (several “<https://tutorcs.com>”/interpretations)  
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- What for (several uses/applications)