Chapter 3

Turing: What is Machine Intelligence?
Overview

• What is machine intelligence?
• Turing Test
• Artificial intelligence and Machine intelligence
• Semantic Networks
• Computation complexity
• Decision problems
• Intractability
• Description Logic
• Ontology
• Inference Engines
• Software Agents
What is Machine Intelligence

• Intelligent machinery
• What is meant by “thinking” and “intelligence”?  
• Human intelligence reflects: Ability to learn, organize, apply knowledge
• AI addresses the question of what it means for a machine to have intelligence
• After WW2, AI became more than just science

IF WE COULD STOP THE ARTIFICIAL INTELLIGENCE AND WORK ON HUMAN INTELLIGENCE

THAT'D BE GREAT
Turing Test

- Alan Turing suggested computers can be called intelligent
- The Turing Test
- The Loebner Prize: A scaled down test limited to a specific topic
John Searle’s Chinese Room

- Doubt about intelligent machines
- The Chinese Room
- Where does insight reside?
Artificial Intelligence

- How far is AI from reaching human-level intelligence?

- Two main lines of AI research: Biological and formalizing common sense

- Strong AI: Machines that can think on a level equal to humans

- Weak AI: Simply holds for thinking-like features

- What is Web Intelligence?

- Still on an early stage

- IBM machine beat world champion in chess
Ex Machina
Machine Intelligence

• Some subbranches of AI is of particularly relevance to the Semantic Web:
• Computation complexity
• Descriptive Logic (DL)
• Ontology
• Inference
• Software Agents
A semantic network is a graphic approach.

A more complex semantic network is called frames.

Declarative graphic representation is common to all semantic networks.
Recap of AlgDat
Computation Complexity

• A problem is in reality a class of related questions

• Example: Determine the prime factors of a number

• Time complexity

• If a problem can be solved in \(n^2\) steps, the problem has time complexity of \(O(n^2)\)
Decision problems

• Complexity theory
• Answer always comes down to Yes or No
• Example: Decide whether or not a number is a prime
• Complexity classes: P, NP
• Intractability
Description Logic

- Description Logic (DL) as a class of logic-based knowledge-representation languages
- Components of DL is representation and reasoning
- Semantic Web requires a language that expresses data and rules for reasoning the data
- XML and RDF are important for the Semantic Web
- RDF is expressed in triples
  - Subject, predicate and object
  - Written in XML
- Computers must have access to structured collections of information as RDF
Ontology

• Discover common meanings

• A solution provided by the Semantic Web is called ontologies

• Document that defines the relation among terms

• Typical ontology uses a taxonomy and a set of inference rules

• Inference rules: Rule for manipulating information

• Example: UCSD —> San Diego —> California —> US

• The real power of Semantic Web is not realized yet
Inference engines and Software Agents

- Inference engines process knowledge available in the Semantic Web
- Inference engine controls overall execution
- Software agents are reactive
- Software agents are essential for the Semantic Web
Summary

- What is machine intelligence?
- The Turing Test
- Artificial intelligence
- Semantic network
- Computation complexity
- Description Logic
- Ontology
- Inference engines and software agents
Next chapter...