Overview of Artificial Intelligence

Abu Saleh Musa Miah

Overview of Artificial Intelligence

Can machines think?

Its depend on how we define the word think and machine

Chapter Outline

- What is AI?
- What is Intelligence
- Can we build an Intelligent System?.
- What AI is Not
- Application of AI
- What is Knowledge
- Representation of knowledge

What is AI?

- Artificial Intelligence is concerned with the design of intelligence in an artificial device.
- The term was coined by McCarthy in 1956 .
- We can also say “study and design of intelligent agents“

- There are two ideas in the definition.
    1. Intelligence
    2. artificial device

What is Intelligence

- **Dictionary definition of Intelligence:**

  The ability to acquire, understand and apply knowledge, or ability to exercise thought and reason. **Of course intelligence is more than this.**

- A system with intelligence is expected to behave as intelligently as a human
- A system with intelligence is expected to behave in the best possible manner.
- Are we looking at the thought process or reasoning ability of the system?

Typical AI problems

While studying the typical range of tasks that we might expect an "intelligent entity" to perform, we need to consider both "common-place" tasks as well as expert tasks.

Examples of common-place tasks include

- Recognizing people, objects.
- Communicating (through natural language).
- Navigating around obstacles on the streets

Expert tasks include

- Medical diagnosis.
- Mathematical problem solving
- Playing games like chess

Can we build an Intelligent System?

- Yes! systems have already been developed that
  - Can learn from example and past related experience **Tesla(self-driving features and sheer technological "coolness."), John Paul, Amazon.com**
  - Can solve complex problems in Mathematics

Cogito

  - Can find optimal system configuration **Boxever**
  - Can diagnosis medical diseases **Netflix, Pandora**
  - Can understand Natural Language **Nest**

What AI is Not

- Read and understand articles in a newspaper)
- The study of mind, body or human language

  (they are part of psychology, physiology, cognitive science or linguistics).

- Interpret an arbitrary visual scene

pplication of AI

- **Game playing : -**

  A machine can give you a very tough competition in computer games. There is some AI in them, but they play well against people mainly through brute force computation looking at hundreds of thousands of positions.

- **Medicine:-**

  A medical clinics can use artificial intelligence systems to **organize bed schedules**, make a **staff rotation**, and **provide medical information**. Artificial neural networks are used for **medical diagnosis**

- ***Speech recognition :-***

  AI facilitates us with giving access to our intelligent machine through speech instruction. It can also free us from carrying ID card or relevant paper identity information with us , cause our voice could help to identify us.

Application (Cont.)

- ***Expert systems***

  we could explain this fact like an intelligent machine stores a **huge range of knowledge related to any particular domain of knowledge also thousands of circumstances under it.**

- ***Worker :***

  Using the concept of expert system ,we can produce hardworking and efficient workers for risky work fields like **chemical factories , mine , simulated financial trading competition, running aircraft in Auto pilot mode**.

- **Telecommunications**

  Many telecommunications **companies make use of heuristic search in the management of their workforces, for example BT Group has deployed heuristic** search in a scheduling application that provides the work schedules of 20000 engineers.

Application (Cont.)

- **Aviation**
  - running aircraft in Auto pilot mode
  - air craft control through speech command
- **Other Applications**
  - text recognition
  - data mining
  - e-mail spam filtering.
  - Facial expression recognition

Subareas of AI

- **Perception:** Vision, Speech understanding, etc.
- Machine Learning, Neural networks.
- Robotics
- Natural language processing
- Reasoning and decision making
  - ✓ **Knowledge** Representation
  - ✓ **Reasoning** (Logical, probabilistic)
  - ✓ **Decision making** (Search, Planning, Decision theory

Knowledge: General concepts

Chapter 2

What is Knowledge

- **Definition of Knowledge**

- Knowledge is a familiarity with someone or something, which can include facts, information, descriptions, or skills acquired through experience or education.
- It can refer to the theoretical or practical understanding of a subject.
- It can be implicit (as with practical skill or expertise) or explicit (as with the theoretical understanding of a subject).

Or

The act, fact or state of knowing

Some Definitions

- **Knowledge**: We define knowledge as true justified ***belief.***
- **Belief**: Essentially any meaningful expression that can be represented. **Thus a belief may be true or false.**
- **Hypothesis**:
  - A justified belief that is not known to be true.
  - A belief that is backed up by some evidence, but it may still be false.

  "If *P*, then *Q*", *P* denotes the hypothesis (or antecedent); *Q* can be called a consequent. *P* is the assumption

Knowledge expression

Knowledge	Expresses
Joe is tall	**An attribute possessed by a person**
Bill loves Sue	**A complex binary relationship between two person**
Bangladesh is a developing country	**Economic state or knowledge about a country**

Classification of knowledge

- **Declarative Knowledge**
  passive knowledge expressed as statement of facts about the world.
  Example: (I am a Boy)

- **Procedural Knowledge**
  Compiled knowledge related to the performance of some task (Algorithm)

Classification of knowledge (Cont.)

- **Heuristics**
  A special kind of knowledge used by human to solve complex problem. Heuristics are usually acquired with much experience (locating the fault in TV set)

- **Epistemology**
  Study of the nature of knowledge, what,how,necessery.

- **Meta Knowledge**
  Knowledge about what we know

Representation of knowledge

- **First order Predicate logic (FOPL)**

Translate the text "Every man is mortal. John is a man. Therefore, John is mortal" into a FOPC formula.

$(\forall x)\ ((MAN(x) \rightarrow MORTAL(x)) \wedge MAN(john)) \rightarrow MORTAL(john)$

- **Fuzzy Logic**

The inventor of fuzzy logic, Lotfi Zadeh, observed that unlike computers, **The human decision making includes a ra of possibilities between YES and NO, such as –**

CERTAINLY YES
POSSIBLY YES
CANNOT SAY
POSSIBLY NO
CERTAINLY NO

Object Oriented method

AI Programming Language

Java, Python, Lisp, Prolog, and C++ are major AI programming language used for artificial intelligence capable of satisfying different needs in development and designing of different software.

Python

- Python developers favorites programming languages in AI development because of its syntax simplicity and versatility.
- Compared to Java and C++, Python is faster in development..
- portable language used on **platforms Linux, Windows, Mac OS and UNIX.**
- supporting **object-oriented, procedural and functional styles**
- Python supports **neural networks and development of NLP solutions**.
- Have tools for **machine learning, ANN**.
- rich and ex**tensive variety of library and tools.**
- Not suitable for mobile computing.

Java

Java **multi-paradigm language that follows object-oriented principles**.
AI programming language **run any platform that supports it without need recompilation**.
Java is one of the most commonly used and not just in AI development.

C++

- C++ is the fastest computer language,
- Speed is appreciated for AI programming projects time sensitive.
- It provides **faster execution and has less response time** which is applied in **search engines and development of computer games**.
- It **allows extensive use of algorithms and is efficient in using statistical AI techniques.**

PROLOG

- **Like Lisp, also a primary computer language for artificial intelligence**.
- It has mechanisms that facilitate **flexible frameworks developers enjoy working with**.
- It is a **rule-based and declarative language as it contains facts and rules that dictate its artificial intelligence coding language**.
- Prolog supports basic mechanisms such as **pattern matching, tree-based data structuring,** and automatic backtracking essential for AI programming.

LISP

- LISP List Processing Language is language used for artificial intelligence development.
- Second oldest programming language after Fortran.
- It is highly **suitable in inductive logic projects and machine learning**
- Program save as .lisp extension.

```
(write-line "Hello World") (write-line "I am at 'Tutorials “)
 (+ 7 9 11) (write (+ 7 9 11))
  a * ( b + c ) / d
  (/ (* a (+ b c) ) d)
   setq x 10
     (setq ch nil)
      (setq n 123.78)
     (setq bg 11.0e+4)
      (print x)
```

```
(60 * 9 / 5) + 32
(write(+ (* (/ 9 5) 60) 32))
```

Comparison of AI Programming Language

Python	C++	Java	Prolog	Lisp
Packages for a number of applications including General AI, Machine Learning, Natural Language Processing and Neural Networks	C++ is the fastest computer language, have stl.	Java is also a multi-paradigm language that follows object-oriented principles that run any platform	a declarative language expressed in terms of **relations, symbolic reasoning, database and language parsing** applications	List processing, is a programming language that was designed for easy manipulation of data strings
x = raw_input ('What is ur name?') , print 'ur name' + x	Cin>>x Cout<< "Your name is "<<X	X=sc.nextInt() ;	write(term) read(term)	(write (+ 15.0 (read)))
widely used for artificial intelligence, Developer,	Widely used for object Oriented	Widely used for GUI Development	widely used for artificial intelligence, Developer,	Lisp grow standard in AI. has unique macro system

Confession

- It is possible that some sentences or some information were included in these slides without mentioning exact references. I am sorry for violating rules of intellectual property. When I will have a bit more time, I will try my best to avoid such things.
- These slides are only for students in order to give them very basic concepts about the giant, “Networking”, not for experts.
- Since I am not a network expert, these slides could have wrong/inconsistent information…I am sorry for that.
- Students are requested to check references and Books, or to talk to Network engineers.