



Artificial Intelligence

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Source

<http://www.abdn.ac.uk/~csc111/teaching/CS3014/lectures/>

Agenda

- **Different Types of Tasks**
- **Knowledge Representation**
- **Recognition Tasks**
- **Reasoning Tasks**
- **A Division of Labor**
- **Recognition Tasks**
- **Modeling of a single neuron**

Artificial Intelligence...

□ Context so far...

- ❖ Use algorithm to solve problem
- ❖ Database used to organize massive data
- ❖ Algorithms implemented using hardware
- ❖ Computers linked in a network

Educational Goals for this Chapter:

□ The computer as a tool for

- ❖ Solving more human-like tasks
- ❖ Build systems that “think” independently
- ❖ Can “intelligence” be encoded as an algorithm?

Introduction

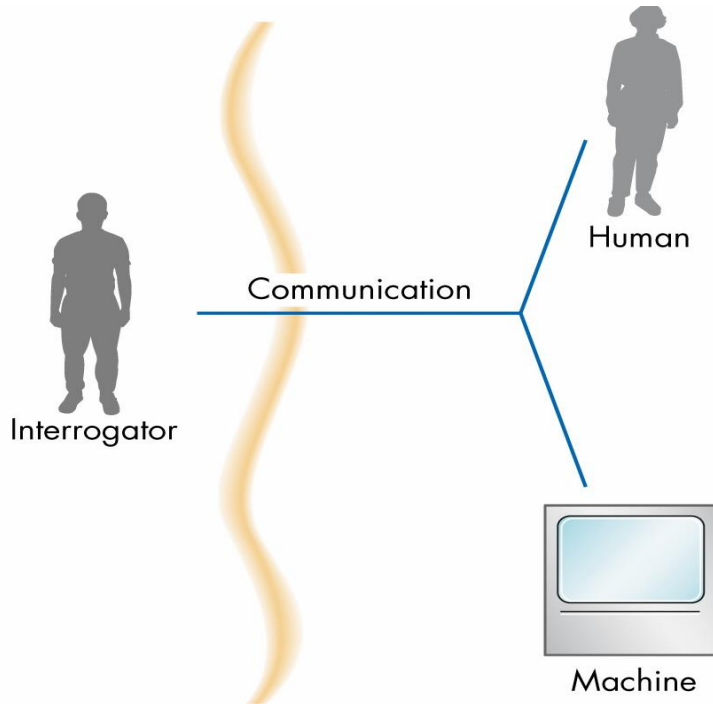
□ Artificial intelligence (AI)

- ❖ Explores techniques for incorporating aspects of “*intelligence*” into computer systems

□ Turing Test (Alan Turing)

- ❖ A test for intelligent behavior of machines
- ❖ Allows a human to interrogate two entities, both hidden from the interrogator
 - ◆ *A human*
 - ◆ *A machine (a computer)*

The Turing Test



If the interrogator is unable to determine which entity is the human and which the computer, then the computer has passed the test

Introduction (continued)

- **Artificial intelligence** can be thought of as *constructing computer models* of human intelligence
- **Early attempt: Eliza** (see notes, website)

Eliza Psychiatrist

- ❑ Seemingly human, but without understanding
- ❑ Implement via pattern matching of clever rules
- ❑ Understanding involves interpretation of information in light of knowledge already acquired

A Typical Conversation with Eliza

Men are all alike

IN WHAT WAY?

They're always bugging us about something or other

CAN YOU THINK OF A SPECIFIC EXAMPLE?

Well, my boyfriend made me come here

YOUR BOYFRIEND MADE YOU COME HERE

He says I'm depressed most of the time

I'M SORRY TO HEAR YOU ARE DEPRESSED

It's true, I am unhappy

DO YOU THINK COMING HERE WILL HELP YOU NOT TO BE UNHAPPY?

I need some help, that much seems certain

WHAT WOULD IT MEAN TO YOU IF YOU GOT SOME HELP?

Perhaps I could learn to get along with my mother

TELL ME MORE ABOUT YOUR FAMILY

My mother takes care of me

WHO ELSE IN YOUR FAMILY TAKES CARE OF YOU?

My father

YOUR FATHER?

You are like my father in some ways

WHAT RESEMBLANCE DO YOU SEE?

You are not very aggressive, but I think you don't want me to notice that

WHAT MAKES YOU THINK I AM NOT VERY AGGRESSIVE?

You don't argue with me

WHY DO YOU THINK I DON'T ARGUE WITH YOU?

You are afraid of me

DOES IT PLEASE YOU TO BELIEVE I AM AFRAID OF YOU?

My father is afraid of everybody

WHAT ELSE COMES TO MIND WHEN YOU THINK OF YOUR FATHER?

Bullies

DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR BOYFRIEND MADE YOU COME HERE?

Is Eliza really “intelligent”?

□ How Eliza does it...

Eliza rules

- Keywords: I, YOU, MOTHER, HATE ..etc
- Response:
AAA You are BBB ==> I am (inversion BBB)
inversion: ME/YOU, MY/YOUR
- Templates:
T1: What makes you think XXX
T2: Tell me more about XXX
T3: Does it please you to believe XXX
- Encouragement to engage:
“You don't seem very talkative today”

A Division of Labor

- **Categories of “human-like” tasks**
 - ❖ **Computational tasks**
 - ❖ **Recognition tasks**
 - ❖ **Reasoning tasks**

A Division of Labor (continued)

□ Computational tasks

- ❖ Tasks for which algorithmic solutions exist
- ❖ Computers are better (faster and more accurate) than humans

□ Recognition tasks

- ❖ Sensory/recognition/motor-skills tasks
- ❖ Humans are better than computers

□ Reasoning tasks

- ❖ Require a large amount of knowledge
- ❖ Humans are far better than computers

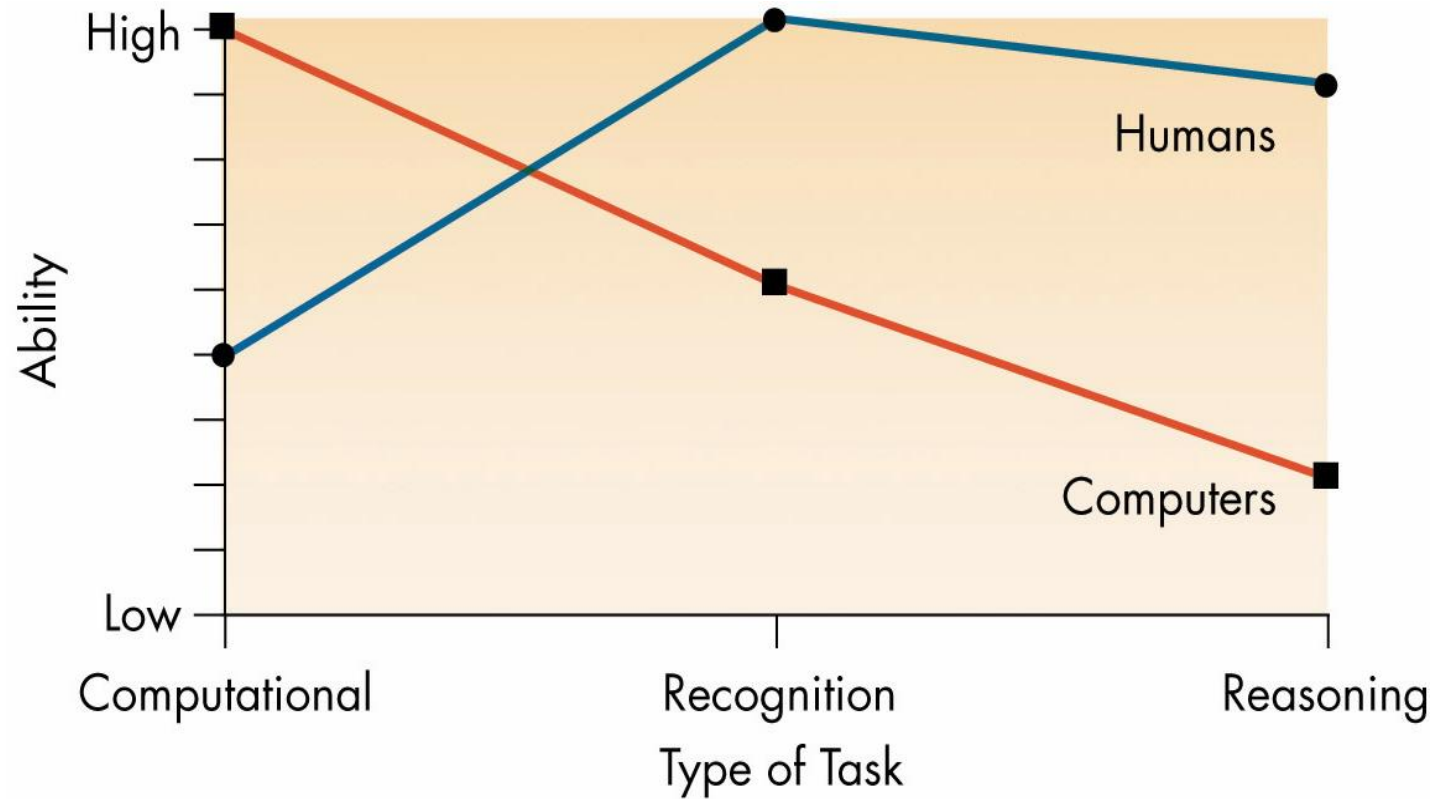


Figure 14.2: Human and Computer Capabilities

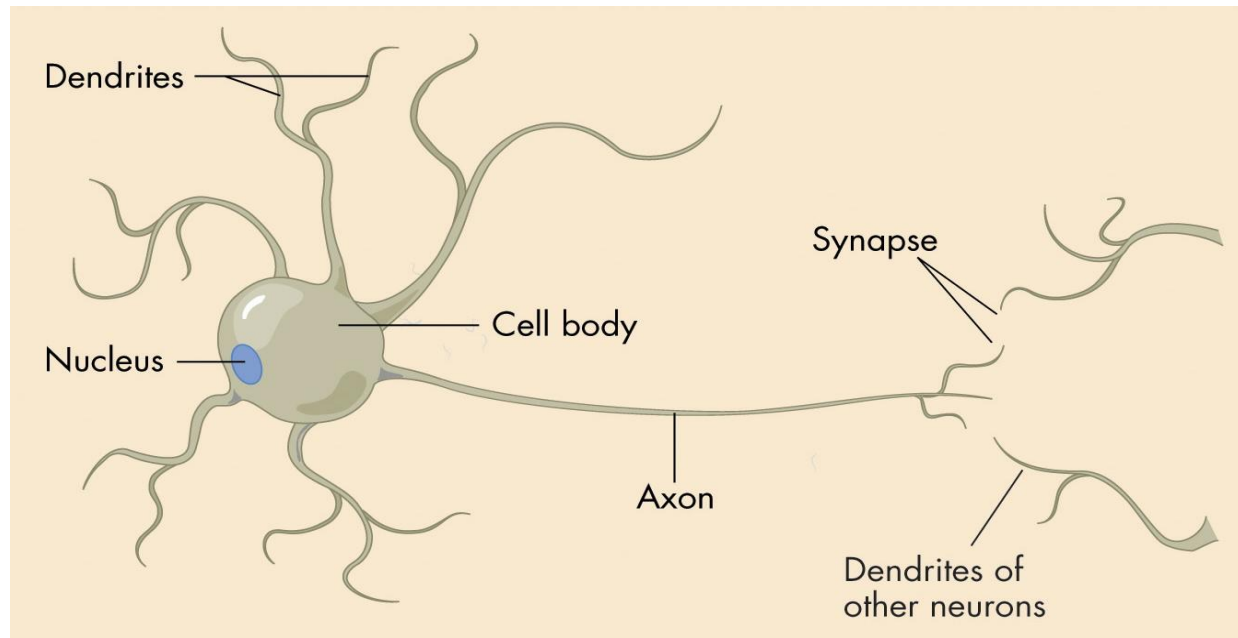
Artificial Intelligence



Contents:

- ❖ Different Types of Tasks
- ❖ Knowledge Representation
- ❖ Recognition Tasks
 - ◆ *Modeling of Human Brain*
 - ◆ *Artificial Neural Networks*
- ❖ Reasoning Tasks

Recognition Tasks: Human



A Neuron

- **Neuron – a cell in human brain; capable of:**
 - ❖ **Receiving stimuli from other neurons through its dendrites**
 - ❖ **Sending stimuli to other neurons thru' its axon**

Human Neurons: How they work

□ Each neuron

- ❖ Sums up activating and inhibiting stimuli it received – call the sum V
- ❖ If the sum V equals or exceeds its “*threshold*” value, then neuron sends out its own signal (through its *axon*) [*fires*]

- Each neuron can be thought out as an extremely *simple computational device* with a single on/off output;

Recognition Tasks (continued)

□ Human brain: a connectionist architecture

- ❖ A large number of simple “processors” with multiple interconnections

□ Von Neumann architecture

- ❖ A small number (maybe only one) of very powerful processors with a limited number of interconnections between them

Recognition Tasks (continued)

- **Artificial neural networks (neural networks)**
 - ❖ **Simulate individual neurons in hardware**
 - ❖ **Connect them in a massively parallel network of simple devices that act somewhat like biological neurons**

- **The effect of a neural network may be simulated in software on a sequential-processing computer**

Conclusion

- ❑ **Different Types of Tasks**
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- ❑ **Reasoning Tasks**
- ❑ **A Division of Labor**
- ❑ **Recognition Tasks**
- ❑ **Modeling of a single neuron**

End of



Any questions?