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UNIVERSITY OF TECHNOLOGY

COS30019: Introduction to Artificial Intelligence

An overview of the field



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CENTRE FOR INFORMATION TECHNOLOGY RESEARCH

Sub-fields of Artificial Intelligence

AI now consists many sub-fields, using a variety of techniques, such as:

Neural Networks – e.g. brain modelling, time series prediction, classification

Evolutionary Computation – e.g. genetic algorithms, genetic programming

Vision – e.g. object recognition, image understanding

Robotics – e.g. intelligent control, autonomous exploration

Expert Systems – e.g. decision support systems, teaching systems

Speech Processing – e.g. speech recognition and production

Natural Language Processing – e.g. machine translation

Planning – e.g. scheduling, game playing

Machine Learning – e.g. decision tree learning, version space learning

Most of these have both engineering and scientific aspects.

2

Sub-fields of Artificial Intelligence



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Evolutionary Computation – e.g. genetic algorithms, genetic programming

Vision – e.g. object recognition

Robotics – e.g. intelligent agents

Expert Systems – e.g. diagnostic systems

Speech Processing – e.g. speech recognition

Natural Language Processing – e.g. machine translation

Planning – e.g. scheduling, route planning

Machine Learning – e.g. data mining, pattern recognition

COS30018 – Intelligent Systems

- Evolutionary Computation
- Neural Networks
- Expert Systems
- Machine Learning
- Deep Learning
- Reinforcement Learning

Most of these have both engineering and scientific aspects.



3

Speech Processing



As well as trying to understand human systems, there are also numerous real world applications: speech recognition for dictation systems and voice activated control; speech production for automated announcements and computer interfaces.

How do we get from sound waves to text streams and vice-versa?



Cen tre fo r Spee ch and Lan gua ge

How should we go about segmenting the stream into words?

How can we distinguish between “Recognise speech” and

“Wreck a nice beach”?



4

Natural Language Processing



For example, machine understanding and translation of simple sentences:

- John saw the boy in the park with a telescope
- John saw the boy in the park with a ball
- John saw the boy in the park with a statue

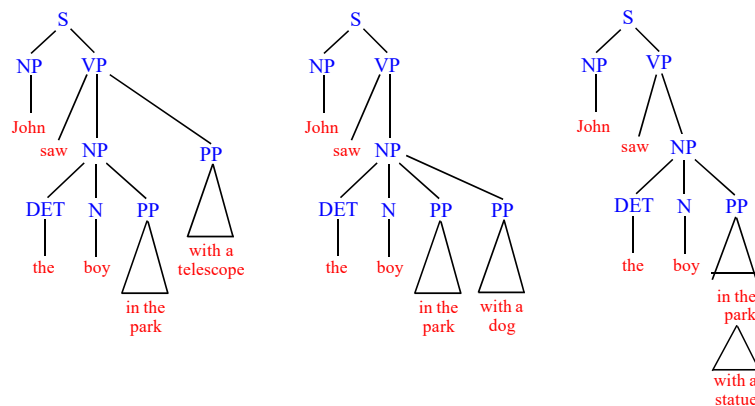


5

Natural Language Processing



For example, machine understanding and translation of simple sentences:



is not as simple as you might think!

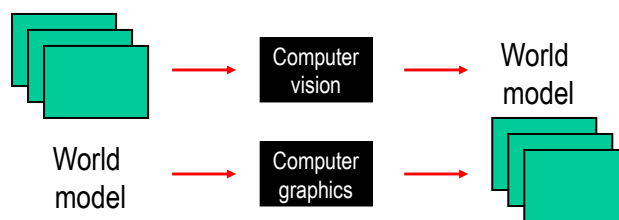


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Computer Vision



- Image Understanding (AI, behavior)
- A sensor modality for robotics
- Computer emulation of human vision
- Inverse of Computer Graphics



Definition of Robotics



■ A robot is...

- ☐ "An active artificial agent whose environment is the physical world"

--Russell and Norvig

- ☐ "A programmable, multifunction manipulator designed to move material, parts, tools or specific devices through variable programmed motions for the performance of a variety of tasks"

--Robot Institute of America

Relevance to Artificial Intelligence



- Effectors
- Sensors
- Architecture
- Integration of various inputs
 - Hierarchy of information representation
- Emotions

