SWINBURNE UNIVERSITY OF TECHNOLOGY

COS30019: Introduction to Artificial Intelligence

An overview of the field

1

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

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- **Machine Learning**

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"?

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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

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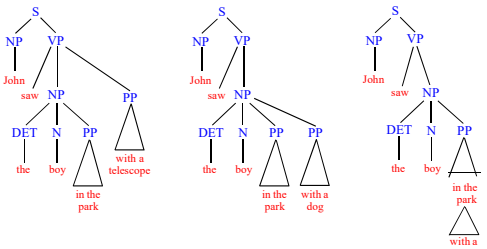
Natural Language Processing

For example, machine understanding and translation of simple sentences:



is not as simple as you might think!

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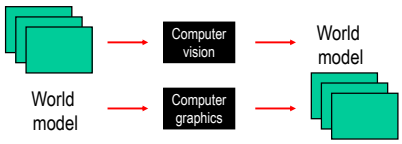
Computer Vision

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



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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

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Relevance to Artificial Intelligence

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

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