40 Years of I.T. and A.I. and What It Means for the Next 20 Years

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http://www.rogerclarke.com/EC/AIYV (.html, .pdf)

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The Original Conception of Artificial Intelligence (AI Old)

- Based on "the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it"

- "The hypothesis is that a physical symbol system [of a particular kind] has the necessary and sufficient means for general intelligent action"

McCarthy et al. (1955)

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From Conjecture and Hypothesis To Belief

"Within the very near future - much less than twenty-five years - we shall have the technical capability of substituting machines for any and all human functions in organisations."

"Duplicating problem-solving and information-handling capabilities of the brain is not far off ... surprising if it were not accomplished within the next decade" (1960)

"By the end of the 2020s [computers will have] intelligence indistinguishable to biological humans" (2005)

Simon (1960)
Kurzweil (2005, p.25)

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How to Recognise 'an AI'

Intelligence is exhibited by an artefact if it:

1. evidences perception and cognition of relevant aspects of its environment
2. has goals; and
3. formulates actions towards the achievement of those goals and?
4. implements those actions

**Embodiments of AI**

- **Computers**
- **Robots**
  - 'A Computer that Does' &
  - 'A Machine that Computes'
- **Humanoid Robots**
  - Androids
  - Gynoids
  - Fembots
- **Vehicles**
  - Terrestrial (Road, Rail), Airborne, Water-borne, Submerged

- **Bus-Stops**
  - And other everyday Things
- **Cyborgs**
  - A Human whose natural capabilities have been enhanced by technological means
  - A Hybrid of a human and one or more associated, attached or embedded artefacts

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**But Intelligence also requires Second-Order Intellect or Insight**

- **Values-Driven** Formulation of Goals
- **Common-Sense Understanding** of Context
- **Detection of Changes** of Relevance
- **Ongoing Re-Evaluation** of Values
- **Ongoing Adaptation** of Goals

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**AI Sceptics are in Good Company**

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Dreyfus H.L. (1972)
Weizenbaum J. (1976)
Degrees of Autonomy

<table>
<thead>
<tr>
<th>Decision Support System</th>
<th>Function of the Artefact</th>
<th>Function of the Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NIL</td>
<td>Analyse, Decide, Act</td>
</tr>
<tr>
<td>1</td>
<td>Analyse Options</td>
<td>Analyse, Decide, Act</td>
</tr>
<tr>
<td>2</td>
<td>Advise re Options</td>
<td>Analyse, Decide, Act</td>
</tr>
<tr>
<td>3</td>
<td>Recommend Act</td>
<td>Analyse, Approve/Reject Act</td>
</tr>
<tr>
<td>4</td>
<td>Notify Impending Act</td>
<td>Override/Veto Impending Act</td>
</tr>
<tr>
<td>5</td>
<td>Act and Inform</td>
<td>Interrupt/Suspend/Cancel an Act</td>
</tr>
<tr>
<td>6</td>
<td>Act</td>
<td>NIL</td>
</tr>
</tbody>
</table>

Social Impacts and Implications

- **People-Replacement**  
  Effect on Income Distribution

- **De Facto Delegation**  
  'The computer says no'

- **Unexplainability**  
  Accountability Undermined

- **Unfair Decisions, Actions**  
  Discriminatory Behaviour

- **Economic, Social Scoring**  
  Non-Conformist Victimisation

- **Undeniable Accusations**  
  Power, Information Asymmetry

- **Denial of Services, Movement and Identity**  
  Public Resentment, Violence

- **'Predestination'**  
  Predictive Policing

Science Fiction Anticipates Reality

- **The Machine Stops**  
  E.M. Forster

- **B Borrow**  
  Sue Grafton

- **The Shockwave Rider**  
  William Gibson

- **Neuromancer**  
  Neal Stephenson

Artefact Intelligence

**What We Want From It**

- Do things well that humans do poorly, or cannot do at all:
  - Dull, Dirty, Dangerous
  - Precise, Fast, ...

- Perform functions within systems that include both humans and artefacts

- Interface effectively, efficiently, adaptably with humans, other artefacts
Human Intelligence & Artefact ‘Intelligence’ & Augmented Intelligence
  AI New #1 & AI New #2

Effectors & Actuators \(\Rightarrow\) Capability

My Challenge to You

Compare smart technology not against old AI, but against new AI and AC

- What is the nature of its Artefact Intelligence?
- Can the artefact explain its rationale?
- Does it replace or augment Human Intelligence?
- Does it include any actuators?
- Does it replace or augment Human Capability?