

Artificial Intelligence and Consciousness

Sonal Lakhotia

University of Goettingen

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Introduction

- AI has influenced Human life in diverse ways. Some of the most prominent domains are Robotics, Natural Language Processing, Autonomous Systems, Computer vision.
- Machine Learning, Deep Neural Networks have enabled machines to augment Human Intelligence.
- Advancements made in AI through the years and it has been able to outperform human in certain tasks.
 - * Waymo's driver-less cars drove 4 million miles on the road
 - * DeepMind's AlphaGo defeated the best human Go player in the world.

[1]Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness".

[3]Christopher DiCarlo, How to Avoid a Robotic Apocalypse: A Consideration on the Future Developments of AI, Emergent



Figure: AI beats world Go champion Ke Jie



Figure: Waymo's self-driving cars

- Humanoid robots have been able to break through the uncanny valley.
- Sophia is a chat-bot with a human body that can respond with facial expressions and scripted answers. Sophia was given Saudi Arabia citizenship in 2017. Is she alike Human?



Figure: Humanoid Robot Sophia at Morals and Machines Conference in Dresden

[4]Thomas Riccio, Sophia Robot, An Emergent Ethnography.

- Although well proven experiments like the Chinese Room have established that a machine could never be conscious, there is a globally prevalent drive to develop a sentient and conscious form of Artificial Intelligence.(Strong AI)



Figure: Optical Illusion: One image with two different perceptions.

[7]David Hsing,Artificial Consciousness is impossible.

What is Consciousness?

- Consciousness is a unique characteristic controlled by the brain.
- It is an emergent property of the billions of neurons in the brain.
- As defined by a physicist, Consciousness is just another state of matter like solid, liquid or gas.
- Possessing a brain differentiates the living organisms from a computer or a machine, which is also made of matter.

[1]Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness".

[3]Christopher DiCarlo, How to Avoid a Robotic Apocalypse: A Consideration on the Future Developments of AI, Emergent Consciousness, and the Frankenstein Effect.

[6]M.Tegmark, Solid, Liquid, Consciousness.

Consciousness in Human

- Human Beings possess an utmost enhanced awareness of concepts, emotions, and sentiments of all living creatures.
- The awareness is subjective and unique in every individual. We can modify our thoughts, actions, and concepts through trials and error.
- Humans can perceive mortality. This is an important aspect of consciousness.
- We can derive a unique bond between our beliefs and surroundings.
- Due to different arrangement of neurons in the brain, an awake or dreaming human is comparatively more conscious than a sleeping or anesthetized human.

Consciousness in Machines

- At present, Robots or machines with qualia are possible only in science fictions.
- Humans are capable of contextual adaption which enables them to learn and develop efficiently. Strong AI should be able to adapt to unknown factors and provide effective results without failing.

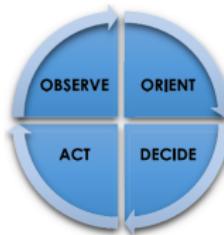


Figure: OODA Loop: A possible feature for developing Strong AI in future

[1] Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness".

Observe

- Observation implies focusing on important areas of information and drawing meaningful relationships between them.
- At present, AI requires huge amount of highly annotated and high training data for prediction process.
In future, if training data is not available, techniques of transfer or zero-shot learning would be employed.
- Adaption to be obtained by constraining algorithms and feature extraction which could be used in a new task.
- This process mimics Human intelligence of perceiving the relationship between different tasks. An appropriate application would be Sentient Surveillance Systems

[1] Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness".

Orient

- Orientation to a new state requires analysing past experience and synthesizing them to present observations.
- Requires AI to be emotionally aware and augment the decision making process for Human.
- The expectation is not to have a machine that could cry but recognize the situation of the human and adjust its actions. An emotionally intelligent cyborg could be developed.

[1] Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness".

Decide

- Effective decision making is inspired by imagination.
At present, AI can only address what is embedded in the data, in future it could also understand why it is embedded.
- Imaginative capability in AI would result in creativity in arts, music and engineering.
- An imaginative machine capable of aiding in design and development of machines and materials could be created.

[1] Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness".

- Current AI is pre-programmed to perform well-defined tasks.
In future AI should be capable of performing autonomously even when not trained or pre-programmed for a particular task.
- It is possible by integration of perception, sensing, planning, analysing, decision-making and executing.
- Robotic systems that could function autonomously and collaboratively need to be developed.



Figure: Autonomous and Collaborative robots to be developed.

Are we approaching Machine Consciousness?

- A group of robots was put to the “wise men” logic puzzle test.
- Each of them was given a “dumbing pill” which would mute them.

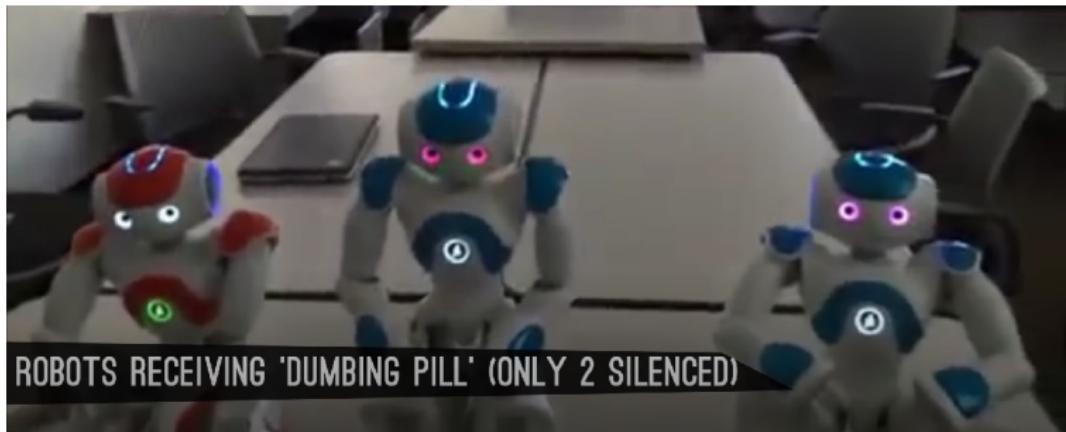


Figure: Robots under test for self-awareness

[2]This robot passed a 'self-awareness' test that only humans could handle until now

- As programmed a robot shouted, “I don’t know” when asked which one of them did not receive the dumbing pill.
- The robot heard its reply and changed its answer according to the question.

- **Experiment in Action**

- The robot saved a mathematical proof of the conclusion to its memory.
- It could be told that the robot is self-aware and hence conscious. Although it is a very small subset of consciousness.

[2]This robot passed a 'self-awareness' test that only humans could handle until now

Future Work

- The emergence of consciousness in living species is still unexplained.
- Self-referential AI system capable of contextual adaption need to be developed. As the common saying goes, "insane are the one's who keep doing same things again and again and expect different results".
- A very narrow subset of consciousness has been proved through the experiments.
- Laws and Rights for machines and robots would have to be formulated if Strong AI is created.

[1]Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness".

[3]Christopher DiCarlo, How to Avoid a Robotic Apocalypse: A Consideration on the Future Developments of AI, Emergent Consciousness, and the Frankenstein Effect.

- Turing test that determines the functional capability of a machine cannot determine if it is human-like in thoughts or actions. Better testing strategies to be developed for Strong AI.
- Achieving conscious AI by uploading brains to the machine and maintaining uniqueness is very challenging. All AI would be connected through a brain hive and would know each thought or decision-made by every machine.
- Philo-psychological and phenomenological consciousness are only possible in living creatures. It is most prominent in human beings.

[5]James Moor, The Turing Test: The Elusive Standard of Artificial Intelligence.

Conclusions

- Consciousness has been explained in varied ways.
Adhering to one of the definitions to prove AI consciousness is not enough.
- As of today, Narrow AI is only capable of solving stipulated issues.
- Intelligence and Consciousness work hand in hand in a Human Being but they are discreetly implemented in a machine.
- AI consciousness seems far-fetched.
If we understand the reason for consciousness, we might be able to replicate it. At least theoretically!

[1]Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness".

References

- [1] Gee-Wah Ng, Wang Chi Leung "Strong Artificial Intelligence and Consciousness". [Link](#)
- [2] This robot passed a 'self-awareness' test that only humans could handle until now [Link](#)
- [3] Christopher DiCarlo, How to Avoid a Robotic Apocalypse: A Consideration on the Future Developments of AI, Emergent Consciousness, and the Frankenstein Effect. [Link](#)
- [4] Thomas Riccio, Sophia Robot, An Emergent Ethnography. [Link](#)
- [5] James Moor, The Turing Test: The Elusive Standard of Artificial Intelligence. [Link](#)
- [6] M. Tegmark, Solid, Liquid, Consciousness. [Link](#)
- [7] David Hsing, Artificial Consciousness is impossible. [Link](#)

Thank you for your attention.