

# Did Turing Dream of Electric People?

Where did the dream go wrong?

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# Turing's dream

- Turing's seminal "Intelligent Machinery" report in 1948 [1]:
  - Unorganised machines
  - Building a "thinking machine"
- He took as inspiration human intelligence
  - Particularly focused on the cortex
  - Modelling the cortex to develop intelligence

Yet after 60 years, we still don't have human-level computational intelligence





# Forgotten dreams

- Cristianini [2] provides a perspective on the state of “machine intelligence”
  - Strong results in ‘data-driven AI’
  - Statistical machine learning
  - Pattern recognition
  - Fuelled by an abundance of data
  - Yet techniques “emulate” vs. “understand” [2:467]
- His proposition
  - We should focus on “a simple and general understanding of intelligent behaviour in **natural and artificial systems**” [2:469]
  - Use a broader reference point for intelligent behaviour which includes **artificial agents**

# Questions

- Have we forgotten Turing's dream?
  - Have we produced a “Tower of Babel” [2:469] with no clear purpose?
  - Or is it just taking longer to understand?
- Should we abandon human intelligence as our reference point?
  - Is it correct to provide a wider definition of intelligence which includes agents?
  - Or are we just focusing on the wrong things?



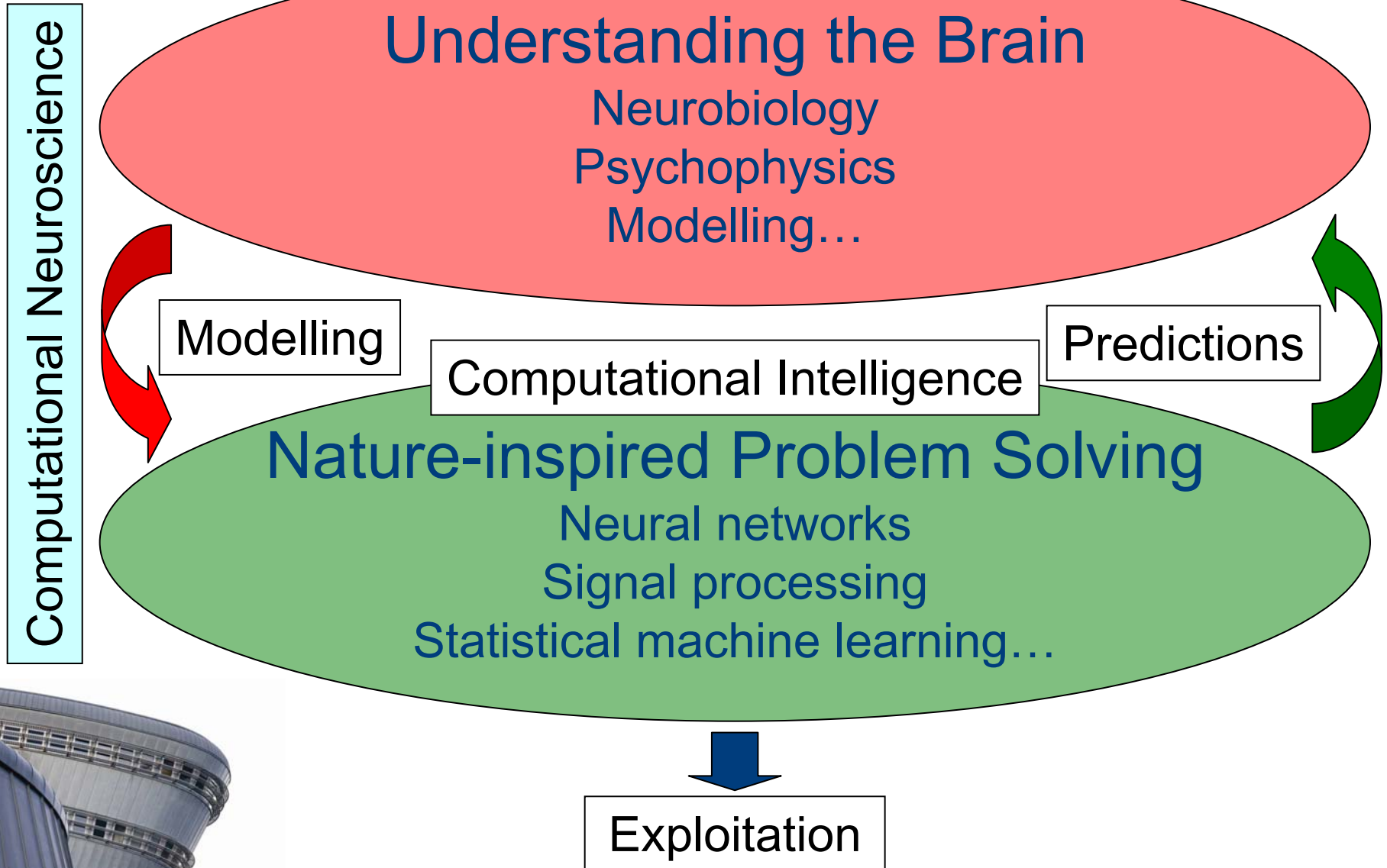


# Keeping the dream alive

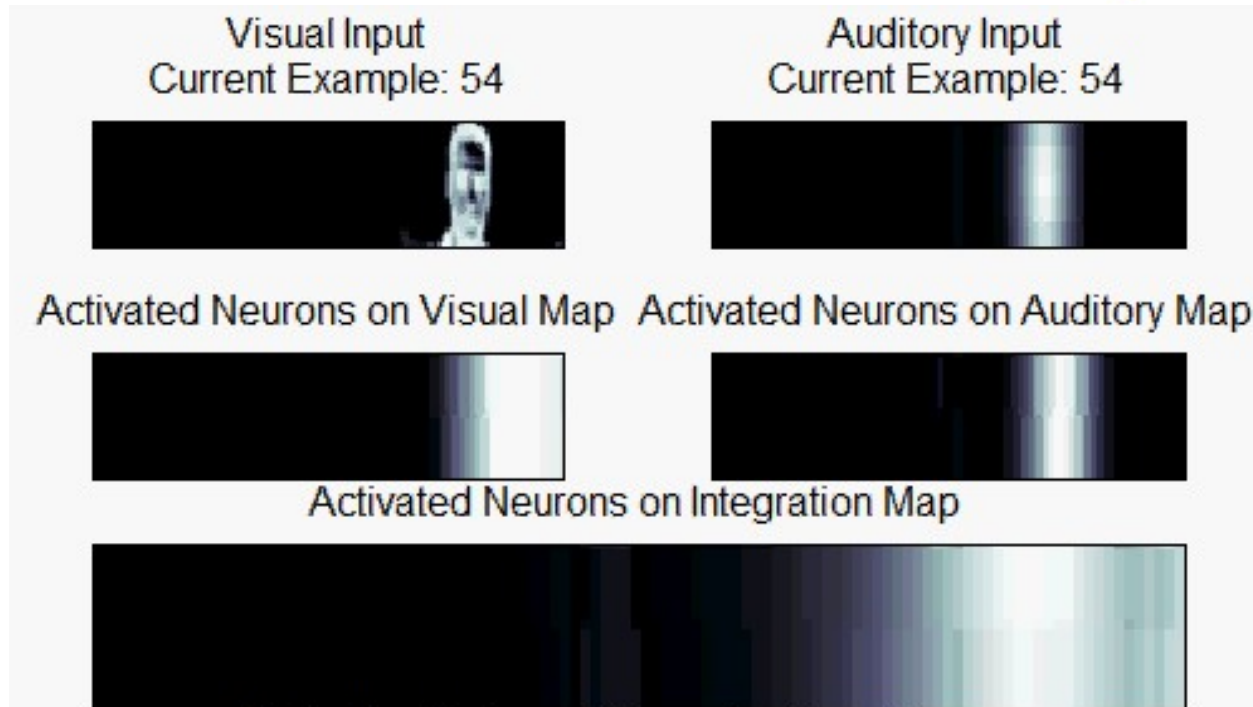
- Wider definition of intelligence is helpful
  - Not only artificial agents
  - Other aspects of biological systems (cf. cognition in the immune system [3])
- But why should we focus on the cortex?
  - Turing dismissed “circuits required for quite definite purposes” [1:12] – subcortical function
- Subcortical structures are essential
  - They **develop** (self-organisation), **adapt** (conditioning), **discriminate** (albeit crudely), operate **rapidly**, are **multisensory**
  - Closely connected to sensory inputs and motor outputs
  - Interact with the cortex (afferent and efferent)
- Can subcortical structures help us bridge the gap?
  - Between **neuroscience** and **intelligent machines**



# Motivation



# Exploitation: taster

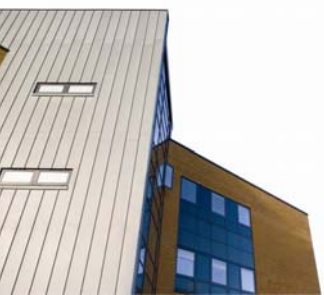


- ## Real-time visual and auditory integration:
- Rapid facial localisation
  - Sound localisation (interaural level difference)
  - Integration: real-time speaker localisation
  - Motivated from a model of the superior colliculus



# References

- [1] A. M. Turing, “Intelligent machinery,” National Physical Laboratory, Tech. Rep., 1948. [Online]. Available: [http://www.alanturing.net/turing\\_archive/archive/I/I32/L32-001.html](http://www.alanturing.net/turing_archive/archive/I/I32/L32-001.html). [Accessed 09/07/2010.]
- [2] N. Cristianini, “Are we there yet?” Neural Networks, vol. 23, no. 4, pp. 466–470, 2010.
- [3] I. R. Cohen and D. Harel, “Two views of a biology-computer science alliance,” in Proceedings of the 2009 Workshop on Complex Systems Modelling and Simulation (CoSMoS 2009), S. Stepney, P. Welch, P. S. Andrews, and J. Timmis, Eds. Luniver Press, 2009, pp. 1–8.





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Thank you

Questions?

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# Abstract



Despite many advances in computational intelligence, it is clear that we have yet to achieve Turing's dream of "intelligent machinery" – machines with human-level understanding. A broader reference point for intelligent behaviour which encompasses artificial agents is now being advocated (Cristianini 2010). In this seminar, I will prompt discussion by asking some key questions, which include "have we forgotten Turing's dream?" and "should we abandon human intelligence as our reference point?" And of course, I will also provide my own opinion as to what I think the way forward might be.

In preparation for the seminar, participants are asked to read Cristianini's article:

N. Cristianini, "Are we there yet?" *Neural Networks*, vol. 23, no. 4, pp. 466–470, 2010.

You may also like to brush up your Turing:

A. M. Turing, "Intelligent machinery," National Physical Laboratory, Tech. Rep., 1948. [Online]. Available: [http://www.alanturing.net/turing\\_archive/archive/II/I32/L32-001.html](http://www.alanturing.net/turing_archive/archive/II/I32/L32-001.html). [Accessed 09/07/2010.]

