

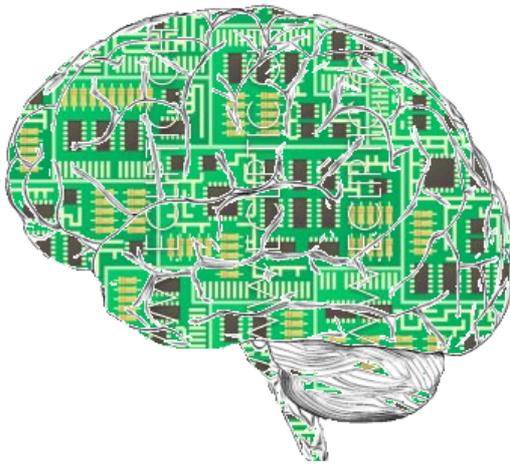


# *The Human Mind Project*

## Computers and Minds

***Being Human* festival of the humanities**

**November 21<sup>st</sup>, 2014  
University of Edinburgh**



***The Human Mind Project* highlights the contribution of the arts and humanities to the study of human nature, and the importance of a comprehensive, interdisciplinary approach to understanding the mind, integrating science and the humanities.**

As part of the *Festival of the Humanities*, the fourth public event of *The Human Mind Project* brings together leading academics to discuss the current state of the art of research at the interface of philosophy, computational neuroscience, robotics and artificial intelligence. “Computers and Minds” is a one-day event featuring a specialist workshop with presentations by leading academics on computational theories of mind, the cognitive neuroscience of self-consciousness and body awareness, and the implications of the latest advances in artificial intelligence for understanding the human mind. The workshop will be followed in the early evening by a public event, with a presentation by Sethu Vijayakumar on “Robots that Learn: The Future of Man or the ‘Man of the Future’?” including a demonstration on robotics, and a lecture by Andy Clark entitled ‘Being and Computing: Are You Your Brain, and Is Your Brain a Computer?’.

### **Scientific Organization**

Mattia Gallotti (University of London) and Sanjay Modgil (King's College London)

Many thanks to the *Institute for Advanced Studies in the Humanities* (IASH) and to the School of Philosophy, Psychology and Language Sciences at the University of Edinburgh for their generosity in hosting the academic workshop and for organizational support.

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   @BeingHumanFest #BeingHuman14

[beinghumanfestival.org](http://beinghumanfestival.org)



Arts & Humanities  
Research Council



## PROGRAMME

### *The Institute for Advanced Studies in the Humanities (IASH)*

9.30 *Registration and Coffee*

9.45 *Welcome Addresses*

**Barry Smith**

Director of the *Institute of Philosophy*, London, and Director of *Being Human* festival of the Humanities

**Colin Blakemore**

Professor of Neuroscience and Philosophy, London and Project Leader of *The Human Mind Project*

*Morning Session*

*Chair: Sanjay Modgil*

King's College London

10.00 **Murray Shanahan**

Professor of Cognitive Robotics, Imperial College London

*Are We on the Road to Human-Level Artificial Intelligence?*

10.45 *Discussion*

11.00 *Coffee Break*

11.30 **Frances Egan**

Professor of Philosophy, Rutgers University

*Understanding Computational Models of Mind*

12.15 *Discussion*

12.30 *Lunch Break*

*Afternoon Session*

*Chair: Mattia Gallotti*

University of London

- 13.30     **Aaron Sloman**  
          Honorary Professor, University of Birmingham  
          *Disembodied Motionless Intelligence*
- 14.15     *Discussion*
- 14.30     *Coffee Break*
- 15.00     **Anil Seth**  
          Professor of Cognitive and Computational Neuroscience, University  
          of Sussex  
          *Mind the Body*
- 15.45     *Discussion*
- 16.00     *General Discussion*
- 16.15     *End of Academic Workshop*

***David Hume Tower***  
***Faculty Room North***

*Chair: **Shamil Chandaria***  
*Institute of Philosophy, London*

- 17.00     **Sethu Vijayakumar**  
          Professor of Robotics, University of Edinburgh  
          *Robots that Learn: The Future of Man or the 'Man of the Future'?*
- 18.00     *Discussion*
- 18.15     **Andy Clark**  
          Professor of Philosophy, University of Edinburgh  
          *Being and Computing: Are You Your Brain, and Is Your Brain a  
          Computer?*
- 19.00     *Discussion*
- 19.30     *Reception*

## Directions

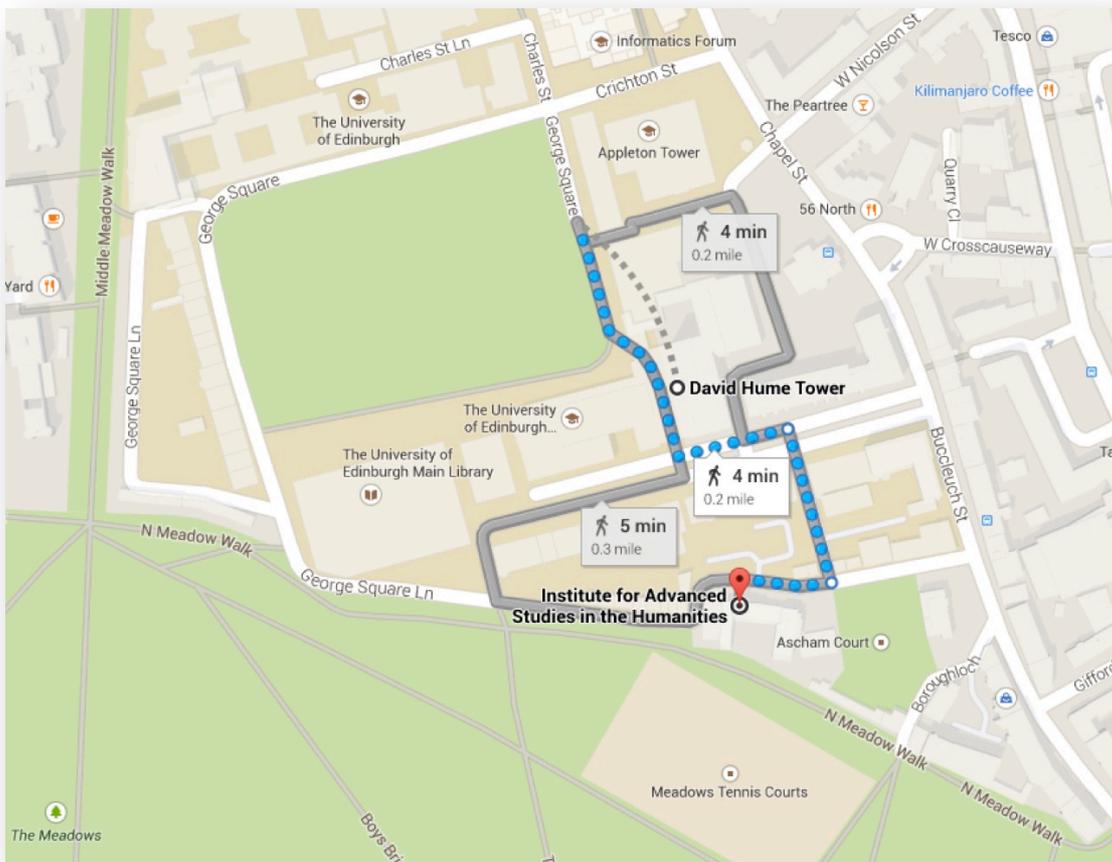
“Computers and Minds” will take place in two different University of Edinburgh venues.

The Academic workshop will be held in the *Institute for Advanced Study in the Humanities* (IASH), located in Hope Park Square, Edinburgh EH8 9NW.

The *Institute* is at 1-5 Hope Park Square, off Meadow Lane and overlooking the Meadows. The main entrance is at 2 Hope Park Square. There is no vehicular access to the Square; entry is from Meadow Lane, under the archway and then to the right. If you are arriving by taxi you should ask the driver to bring you to Meadow Lane.

The public lectures by Sethu Vijayakumar and Andy Clark will be held in the Faculty Room North, David Hume Tower, George Square, Edinburgh EH8 9JX.

**For those who registered to attend the academic workshop via Eventbrite, please write to the organizers if you have special dietary and/or access requirements ([info@humanmind.ac.uk](mailto:info@humanmind.ac.uk)).**



## Abstracts

### **Andy Clark**

*Being and Computing: Are You Your Brain, and Is Your Brain a Computer?*

There's more to minds than brains alone. Biologically evolved intelligence makes the most of brain, body, and world. This talk looks at the resulting complexity, and highlights some of the unexpected advantages of solutions that span multiple levels of organization (neural, bodily, worldly) and that take shape at multiple time-scales (evolution, development, learning). I end by asking how we should conceive of the role of the biological brain in these complex ecologies.

### **Frances Egan**

*Understanding Computational Models of Mind*

The so-called *computational theory of mind* claims that mental processes are computational processes. After explaining how this claim should be understood, I consider the popular view that it is just a metaphor to speak of the mind as a computer. I argue that this view is mistaken: computationalism, if true, implies that the human mind is a computer in the same sense that iPads and hand calculators are computers. I then consider how computational explanations of cognitive processes are constrained by our commonsense conception of ourselves, and how computationalism puts pressure on the very conception of mind.

### **Anil Seth**

*Mind the Body*

The brain is not just a machine to think with, and the body is not just a machine to move with. We are “beast machines” with our intelligence, and our conscious experiences, being deeply rooted in our specific physiology. In particular, the experience of *embodied selfhood* rests critically on how the brain perceives its body, both from the outside (exteroception), and from the inside (interoception). In this talk I will develop a view of embodied selfhood through the lens of ‘predictive processing’, by which perception is construed as a process of (active) inference on the causes of sensory signals. I will introduce a model of *interoceptive inference* which says that subjective feeling states (emotions) arise from actively inferred predictive models of the causes of interoceptive signals. The model also predicts that embodied selfhood is grounded in active inference of those signals “most likely to be me” across interoceptive and exteroceptive domains. I will present some recent evidence illustrating this view, including a novel version of the ‘rubber hand illusion’ incorporating visual feedback of heartbeat signals via augmented reality. These ideas and findings guard against naïve computational theories of mind, brain, and consciousness, which push the body into the background. At the same time they also bring new relevance to some old ideas in AI that are typically associated with cybernetics and predictive control.

### **Murray Shanahan**

*Are We on the Road to Human-Level Artificial Intelligence?*

Recent progress in fields such as machine learning and computer vision has revived interest in the prospect of so-called strong artificial intelligence, or human-level artificial general intelligence. But

the field of AI has experienced several such periods of excitement in the past. Although each of those periods produced useful technology, none of them seemed to bring us much closer to the goal of human-level AI. Is there any reason to think things are different this time? In this talk I will overview some of the current technological trends in AI, and ask what else might be needed to take us all the way to human-level intelligence. I will conclude with some speculations about the implications for human society if we were to succeed.

## **Aaron Sloman**

### *Disembodied Motionless Intelligence*

This is about AI as science (explanation and modelling), not engineering. In the early days of AI several prominent researchers grossly underestimated the difficulties of the tasks, and their failed predictions about timescales were erroneously interpreted as failures of AI, and computational theories of mind. That provoked a stream of rival fashions claiming to have the answer, e.g. based on neural nets, evolutionary computation, "behaviour-based" design, subsumption architectures, embodiment, enactivism, situated cognition, morphological computation, dynamical systems, autopoiesis, Bayesian learning, deep learning, use of "Big Data", (not all in that order), and probably others. Some of the ideas had already been thought of long before suitable computers were available and were discussed by Marvin Minsky in "Steps Toward Artificial Intelligence" in 1962 -- half a century ago. All those fashions ignore complexities in what needs to be explained, so that each tries to explain too little -- focusing only on problems for which the fashion is suited. My presentation will identify a class of sub-problems involving "offline intelligence" uses of intelligence without performing any visible actions, though the long term consequences for future actions may be profound. Examples include making mathematical discoveries, such as the discoveries leading to Euclid's Elements, perhaps the most important book ever written. Others include wondering whether, wondering why, trying to remember, composing a poem, enjoying a poem, designing a building, debugging a design, trying to understand why someone is late, and many more. There are also unconscious examples, such as deriving grammar based language understanding from pattern based language understanding, then extending the grammar-based version to handle exceptions: a difficult software engineering feat performed unconsciously by children. But I think there are many more, including toddler theorems discovered and used, without anyone noticing (though Piaget noticed some). A key methodological step is adopting virtual-machine functionalism as a key part of the research framework. This is part of the very long term Turing-inspired Meta-Morphogenesis project, which needs much help.

## **Sethu Vijayakumar**

### *Robots that Learn: The Future of Man or the 'Man of the Future'?*

What is your science fiction fantasy: A personal robot butler doing your household chores autonomously or going to the surgeon to buy a new bionic part to augment your body's capabilities? Today, robots are increasingly making the journey from industry floors to our homes – examples include self-driving vehicles (on road and underwater), prosthetic devices, surgical assistants and service robots for drilling, mining and cleaning. Professor Sethu Vijayakumar will explore the scientific challenges in the exciting domain of 'interactive, autonomous robotics' and show some of the cutting edge research that is aimed at making robots as versatile, safe, reactive and adaptive as us humans. He will illustrate the spills and thrills of working with some of the world's most sophisticated anthropomorphic robots like the SARCOS DB, HONDA ASIMO, the iLIMB Hand, the

KUKA robot arm and the NAO footballers through interactive demonstrations and videos. In the field of robotics, the science fiction of truly embodied artificial intelligence has never been this close to science fact and he will illustrate how the tremendous progress in data driven machine learning is fuelling the progress.