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Thursday Evening Program
'Dining with Dinosaurs'
Information Booklet, Trinity Term 2022

Henry Kissinger and Eric Schmidt (former Google CEO) wrote in a recent book that AI - machines that can perform tasks requiring human-level intelligence - has become a reality. During Trinity Term, our academic programme on Thursday evenings will focus on whether AI can be a force for good in today's world.

We have an extraordinary programme of talks, the centrepiece of which is the visit from DeepMind on 12th May to attempt a real-time Turing test, during which the audience will be the judge of whether the test has been passed or not.

We begin with a fascinating talk on deep fakes; the videos which will be shown in this talk are not to be missed. We will then meet walking robots and find out whether AI can be used to design new medicines. We will also be considering how AI can impact the developing world. On 9th June, in a joint event with Linacre College, the world-famous Professor Rosalind Picard from the MIT Media Lab will deliver the Tanner Lecture in the University Museum.

Our programme is not just about talks and the conversations that follow over dinner. Students from all backgrounds are invited to take part in a one-day datathon (date TBC), looking at a healthcare application of wearables. Mindful of Reuben's passion for environmental change, we will also be running a hackathon in the summer vacation during which students will learn how to automate the classification of cloud formations. The Trinity Term series will finish with a trip in August to Bletchley Park, where the Enigma code was broken, and the National Museum of Computing.

- AI & ML Fellows

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AI for Good Event Overview - Trinity Term 2022

Thursday Night Seminars, 18:00 - 19:00, Museum of Natural History
Followed by Dining with Dinosaurs

Please note that bookings for these events must be made through InkPath, and the events will appear on InkPath once we are ready to take bookings. We expect you to arrive promptly at 18:00 for the seminar, and we can't guarantee late entrance unless you've let us know in advance.

All events are on Thursday evenings, except for:

- Week 1 and Week 6 seminars and dinners, which will be held on Wednesday evenings instead.
- The visit to Bletchley Park (exact date in August TBC)
- The Datathon: Human activity recognition from wearables data, 11th June
- The Hackathon: Machine Learning for Environmental Science (July, date TBC)

Week 1 (Wednesday) 27th April	**Deep Fakes: AI for Good or Bad?** David Clifton (Reuben) Priority guest booking for part-time and remote students
Week 2 5th May	**AI for Walking Robots** Ioannis Havoutis (Reuben)
Week 3 12th May	**The Turing Test Live: Human-like Dialogue with State-of-the-Art AI Models** Jonny Godwin and Michael Henry Tessler (DeepMind)
Week 4 19th May	**Thinking about Thinking Machines** Lionel Tarassenko and Jonny Pugh (Reuben)
Week 5 26th May	**AI for Affordable Prenatal Care, Including Resource-Constrained Settings** Ana Namburete (Department of Computer Science, Oxford)
Week 6 (Wednesday) 1st June	**AI for Drug Discovery** Charlotte Deane (Department of Statistics, Oxford)
Week 7 9th June	**The Tanner Lecture: Emotion, AI, and Human Values** Rosalind Picard (MIT Media Lab)
Week 8 16th June	**Personal Perspectives on AI&ML-related Career Paths** Ani Calinescu and Lei Clifton (Reuben)
Week 9 23rd June	**Student led event** Followed by food and drink in the GCR

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Deep Fakes: AI for Good or Bad?

Wednesday 27th April, 18:00, Museum of Natural History

Reuben's Oxford Computer Consultants AI&ML Fellow, David Clifton, will introduce everything you need to know about "GANs" in the modern world, touching on the three pillars of human endeavour through the ages: art, science, and manga. This will be a comfortable tour through a part of modern machine learning that touches everyone's lives, in one way or another, even down to "deepfake" footage of world leaders being used for various nefarious purposes. This talk is aimed at the general Reubenite and presupposes no knowledge of mathematics. Indeed, the old Oxford joke is that if you're not good at maths, then you do deep learning.

David Clifton

David Clifton is Professor of Clinical Machine Learning in the Department of Engineering Science of the University of Oxford. He is a Research Fellow of the Royal Academy of Engineering, Visiting Chair in AI for Healthcare at the University of Manchester, and a Fellow of Fudan University, China. He runs the Computational Health Informatics Lab within the Department of Engineering Science, which has sites in Oxford (at the Institute of Biomedical Engineering) and China (in the Oxford Suzhou Centre for Advanced Research).

David holds an EPSRC "Grand Challenge" fellowship for "future leaders in healthcare", and was jointly awarded the inaugural Vice-Chancellor's Prize for Innovation, for interdisciplinary research.

AI for Walking Robots

Thursday 5th May, 18:00, Museum of Natural History

As in many other areas, AI has had a tremendous impact on walking robots. In this talk I will introduce you to the exciting field of robots with legs and showcase some of the applications we've been working towards in my lab. I will tell you a bit about traditional control approaches and contrast with how reinforcement learning (RL) has shaped our current, latest and greatest, legged locomotion methods. Last, I will demonstrate how all these come together on a real quadruped robot.

Ioannis Havoutis

Ioannis Havoutis is a Lecturer in Robotics at the Oxford Robotics Institute and one of the two leads of the Dynamic Robot Systems (DRS) group. His research targets the combination of machine learning with dynamic whole-body motion planning and control, for legged robots in challenging domains. His main interests lie both in the locomotion and manipulation aspects of autonomous robots.

From 2015 to 2017, Ioannis was a postdoctoral researcher at the Robot Learning and Interaction Group at the Idiap Research Institute, Switzerland. He holds a PhD in Informatics (2011) and MSc in Artificial Intelligence (2007) from the University of Edinburgh.

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The Turing Test Live: Human-like Dialogue with State-of-the-Art AI Models

Thursday 12th May, 18:00, Museum of Natural History

In 1950, Alan Turing proposed a method for evaluating whether a machine exhibits intelligent behaviour. The Turing Test is one in which a human judges a natural language conversation between another human and a machine. If the judge cannot discern that the conversation is between a human and a machine (i.e., the conversation is human-like and natural), the machine is to be regarded as 'thinking'. Recent advances in AI language models have demonstrated impressive results, with AIs now capable of engaging in human-like conversation and dialogue. In this talk we explain how language models get their abilities, ask how we can ascertain whether they understand language, and point to exciting use cases in some of the languages of science: protein folding and genomics. We will also put some of our language models to the Turing Test in a live demonstration.

DeepMind

Jonathan Godwin

Jonathan is a Senior Research Engineer at DeepMind. At DeepMind he has focused on machine learning for science, including medical imaging, fluid mechanics and quantum chemistry. Prior to DeepMind he worked on natural language processing. He has first author publications in Nature, ICLR and ICML, an MSc from UCL and BSc from the University of Bristol.

MH Tessler

MH is a Research Scientist at DeepMind. His research focuses on language understanding: how humans make sense of ambiguous, vague, and context-sensitive language and how we can build machines that can do the same. Prior to coming to DeepMind, he was a Postdoctoral Scholar at MIT in the Department of Brain and Cognitive Sciences where he studied human cultural transmission. He received his PhD from Stanford in the Department of Psychology and his bachelor's degree in Mathematics from the University of Virginia.

DeepMind

What is DeepMind?
AI could be one of humanity's most useful inventions. DeepMind are a team of scientists, engineers, ethicists and more, committed to solving intelligence, to advance science and benefit humanity. Like the Hubble telescope that helped us look deeper into space, these tools are already expanding human knowledge and making positive global impact. Their long term aim is to solve intelligence, developing more general and capable problem-solving systems, known as artificial general intelligence (AGI).

Thinking About Thinking Machines

Thursday 19th May, 18:00, Museum of Natural History

Four centuries ago, the French philosopher Descartes wrote: “I think therefore I am”. If AI “thinks”, who are we?

In this interactive talk, we will consider three main issues:

- What is machine intelligence? We will revisit the Turing test, and will argue that Turing was only proposing an operational definition of machine intelligence.
- Can we move beyond the Turing Test? Artificial General Intelligence (AGI) requires machines that are capable of doing “things for themselves”. Is this goal possible?
- What are the characteristics, if any, of human beings which could not be reproduced in a thinking machine?

The framework and background material for the talk will be provided by an electrical engineer who has been developing machine learning algorithms and applications for the past three decades (Lionel) but a philosopher (Jonny) will be on hand to make sure that our thinking is informed by relevant developments in his field. Everyone attending this talk (and the dinner afterwards) will be encouraged to come and think for themselves.

Lionel Tarassenko

Lionel was one of the first in Oxford to carry out research in machine learning, when the topic was still called ‘artificial neural networks’. He published papers in the late 1980s on special-purpose neural network hardware (effectively analogue GPUs). He was then amongst the first to apply machine learning to real-world problems in the 1990s, designing the control system for a microwave oven and winning a British Computer Society Medal in 1996 for the automated analysis of sleep disorders.

He worked with Rolls-Royce for fifteen years; his group’s award-winning machine learning software is now in the engine health monitoring systems for the Trent 500, 900 and 1000 jet engines. He then switched his attention to patient monitoring, another safety-critical application, and the Visensia system which he designed with one of his spin-out companies was the first machine learning system to obtain FDA regulatory approval. He still runs a biomedical signal processing and machine learning group on the medical campus and, in his spare (?) time, thinks about the philosophical implications of intelligent, or thinking, machines.

Jonathan Pugh

Dr. Jonathan Pugh is Parfit-Radcliffe Richards Senior Research Fellow and Manager of Visitors Programmes for the Oxford Uehiro Centre for Practical Ethics, University of Oxford and a fellow at Reuben College. He is on secondment to the UK Pandemic Ethics Accelerator, harnessing expertise to rapidly integrate ethical thinking into policy-making. Jonathan’s research interests lie primarily in issues concerning personal autonomy in practical ethics, particularly topics pertaining to informed consent.

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AI for Affordable Prenatal Care, Including Resource-Constrained Settings

Thursday 26th May, 18:00, Museum of Natural History

The abundance of data created by an increasingly digitised medical system promises new insights into human physiology and tools for diagnostic support. Machine learning-based methods show great potential in deriving predictive biomarkers from medical images but have yet to see widespread clinical adoption due to major bottlenecks. We have built the first population atlas of the fetal brain from clinical ultrasound data, depicting spatial and temporal in-utero maturation, and revealing previously undescribed structural features. Our tools enable neurodevelopmental assessment from early pregnancy and deployment in resource-constrained settings. I will describe some of the challenges of deploying our tools in these settings.

DEPARTMENT OF COMPUTER SCIENCE

Ana Namburete

Ana Namburete is an Associate Professor in the Department of Computer Science at the University of Oxford, a Tutorial Fellow at Pembroke College, and holds a Royal Academy of Engineering Research Fellowship and is a PI at Oxford's Wellcome Centre for Integrative Neuroimaging. Her research focuses on machine/deep learning with applications to human brain imaging. Following a postdoctoral fellowship funded by a Grand Challenge Explorations grant from the Bill and Melinda Gates Foundation, she established the Oxford Machine Learning in NeuroImaging (OMNI) laboratory. She has served as a Program Chair of the Medical Image Understanding and Analysis (MIUA) conference (2020 and 2021). In 2020, she was awarded a Springboard Award from the Academy of Medical Sciences.

AI for Drug Discovery

Wednesday 1st June, 18:00, Museum of Natural History

Fuelled by the success of machine learning in a wide range of domains, from image recognition to protein structure prediction, many people are exploring whether AI can revolutionise drug discovery. In this talk I will focus on early stage drug discovery from designing novel compounds to screening libraries of compounds against a specific protein target. One key challenge is to move from a 2D description of the compounds and the proteins to a far more realistic 3D one, as most existing machine learning methods either do not account for the 3D structure at all or struggle to capture meaningful spatial information from it.

Charlotte Deane

DEPARTMENT OF STATISTICS

Professor Charlotte Deane is Professor of Structural Bioinformatics in the Department of Statistics at the University of Oxford and Chief Scientist of Biologics AI at Exscientia. She is also a co-director of the Systems Approaches to Biomedical Research Centre for Doctoral Training which she founded in 2009. She served on SAGE during the COVID-19 pandemic, and acted as UK Research and Innovation's Covid-19 Response Director.

At Oxford, Charlotte leads the Oxford Protein Informatics Group, who work on diverse problems across immunoinformatics, protein structure and small molecule drug discovery; using statistics, AI and computation to generate biological and medical insight. Her work focuses on the development of novel algorithms, tools and databases that are openly available to the community.

The Tanner Lecture: Emotion, AI, and Human Values

Thursday 9th June, 17:00, Museum of Natural History

Computers, robots, and wearable technologies are increasingly designed with the abilities to sense, recognize, and respond intelligently to human emotion. In some cases, robots are created in the image of their maker, and appear to have emotions. Are emotions the last thing that separates machines from being human? What are ways that "Emotion AI" can be used for good, and are there cases where we want to see its use banned? This talk will demonstrate some of the latest advances in affective technologies, suggesting values to consider for its use in improving human lives.

Rosalind Picard

Professor and director of Affective Computing Research at the MIT Media Lab, Rosalind Picard wrote the book Affective Computing, which outlines how to give machines the skills of emotional intelligence, and is credited for launching the field of Affective Computing. The author of over 350 peer-reviewed scientific publications, and inventor on over 100 patents, Picard co-founded two companies that have taken affective computing inventions to market: Empatica, providing the first AI-based smart watch cleared by FDA, used for monitoring neurological and physiological events, and Affectiva, now part of Smart Eye, enabling measurement of facial and vocal expressions. Picard serves as MIT's faculty chair for MindHandHeart, a campus-wide wellbeing initiative, and as chief scientist and chairman for Empatica. She has received numerous honours and awards including one of the highest for an engineer: election to the National Academy of Engineering, recognizing her "contributions to wearable and affective computing."

Professor Picard's talk will be followed by a response from Lionel Tarassenko and Tom Fletcher.

Tom Fletcher CMG

Tom is the Principal of Hertford College, Oxford University.

Tom served as the foreign policy advisor to Prime Ministers Blair, Brown and Cameron, before becoming British Ambassador to Lebanon (2011-15) and a Visiting Professor at NYU (2015-20). He is the author of the bestselling Naked Diplomacy: Power & Statecraft in the Digital Age (2016) and Ten Survival Skills for a World in Flux (Harper Collins, February 2022). Forthcoming publications include his first novel, The Ambassador (Canelo, August 2022).

He led reviews of the modernisation of the FCO (2016); future of the UN (2017) and the future of learning (2019). He is a former chair of the international board of the UK's Creative Industries Federation, adviser to businesses, academies and NGOs, and a member of the Global Tech Panel. He writes for the NYT, Prospect, Foreign Policy, The National and others, is a regular interviewee on BBC, Sky, CNN and has been profiled by the BBC, Arab News and more. His Foundation for Opportunity supports good people doing good things in public life.

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Personal Perspectives on AI&ML-related Career Paths

Thursday 16th June, 18:00, Museum of Natural History

It will be an evening of dialogue and conversation, started from short talks by Lei and Ani, and then moving to a panel discussion. The audience will be warmly invited to ask questions and join the conversation.

Lei will talk about how she uses both AI and medical statistics in her work (with not a mathematical equation in sight). Those who have met Lei won't be surprised to hear that she will share her experiences and (often unorthodox) views on career choice, illustrated by watercolour paintings jointly produced with her two sons.

Ani will talk about how she uses AI & ML in her work, and about her career path.

BIG DATA INSTITUTE

Lei Clifton

Lei Clifton is a Senior Researcher based in the Big Data Institute (BDI) at the Nuffield Department of Population Health (NDPH). She is also Team Leader and principal medical statistician of the Translational Epidemiology Unit (TEU), and leads a programme of research in translational epidemiology, where her work includes using AI in the context of medical statistics. This collaborative research aims to expand medical statistics to incorporate recent advances in Machine Learning in a way that is helpful to epidemiologists in understanding and improving public health.

Lei was awarded a PhD in Statistical Signal Processing in 2007 from UMIST (now the University of Manchester), after completing her BSc and MSc degrees in Electrical Engineering at the Beijing Institute of Technology, China.

Anisoara Calinescu

DEPARTMENT OF COMPUTER SCIENCE

Ani Calinescu is Associate Professor of Computer Science in the Department of Computer Science. She has a 5-year (MSc equivalent) Computer Science degree from the Technical University of Iasi, Romania, and a DPhil in Engineering Science from the University of Oxford.

Ani's main research area is Modelling and Reasoning about Complex Systems. Her research interests are fundamentally interdisciplinary, and include: complex systems and complexity metrics; supply chains and financial systems; agent-based modelling; IoT-based Digital Twins; systemic risk. Her recent work includes applying Machine Learning techniques to identify behavioural patterns in supply chain and financial market data; and building, validating and calibrating large-scale agent-based models of complex systems. She is currently a Co-Investigator on a 5-year UKRI-funded grant on Robust Agent-Based Modelling at Scale, with major industrial collaborators.

Reuben College Datathon
Human activity recognition from wearables data

Saturday 11th June, 9:30-5:30, Reuben Common Room

This datathon will offer you an opportunity to begin acquiring skills, or expand existing capabilities, in machine learning, applied in thjs case to a healthcare dataset. **It is intended that there should be two groups of students taking part in the datathon: those with little or no knowledge of coding, and those with previous experience** (python, in this case) who want to apply their coding skills to an interesting dataset. We therefore expect students from all four of the University's academic Divisions to be interested in taking part in the datathon, which will be run on Saturday 11th June in the Reuben Graduate Common Room (with lunch and dinner provided).

Millions of people worldwide are now regular users of smartwatches with activity trackers which use in-built accelerometers (e.g. Fitbit and Apple Watch). This enables analyses of human movement and physical activity levels at the population scale, which are of great value for epidemiological studies such as understanding the relationship between activity and sleep and how they may predict future health status.

Technical challenges remain in the processing and analyses of activity tracker data. Current approaches include the development of activity recognition using machine learning models that translate the accelerometer readings into activity labels (e.g. walking, running, sitting). Most of these models are developed using labelled data collected in a lab setting, which have a number of limitations such as very short measurements, a limited set of pre-specified activities, and the absence of hybrid movements.

In this one-day datathon, you will have the opportunity to develop a machine learning activity recognition model using unique accelerometer data collected in a free-living setting. The data were collected from ~150 subjects who wore an accelerometer for 24 hours along with a wearable camera during the daytime, making it the largest labelled accelerometer dataset collected in natural everyday environments. You will be encouraged to think about and comment on potential ethical issues associated with these data.

PROPOSED TIMETABLE:

9.30am – Introduction to wearables in health - Aiden Doherty
10am – Machine learning of activity data - Shing Chan
10.30am – Hands-on python tutorial on machine learning of human activity recognition
12pm – Lunch & methods brainstorming
12.45pm – Group work to innovate and implement (with support of tutors)
5pm – Dinner and group presentations of results
5.30pm – Close – Aiden Doherty

The datathon will be led by Professor Aiden Doherty, who is a world-leading expert in this field, and supported by graduate students who are familiar with the dataset.

Sign up to the Datathon on Inkpath here.

Reuben College Hackathon and Lectures on Clouds and Climate

Date TBC - July

This hackathon will focus on the interface of climate science and machine learning and introduce students to the automated analysis of satellite imagery that can be used across disciplines.

Searching for clouds that dominate climate model uncertainty...

Clouds play a key role in the climate system via their role in the hydrological cycle and by modulating Earth's radiation budget. Clouds scatter radiation back to space, cooling the Earth system, but also interact with outgoing infrared radiation emitted from the surface, warming the Earth system. The net effect of clouds is to cool Earth by about ten times as much as the warming radiative effects of man-made CO2. Even a small response of clouds to a changing climate could have significant effects, termed cloud feedbacks. Unfortunately, clouds are difficult to represent in climate models as many key processes occur on scales that cannot be explicitly resolved. For example, droplets form at about 10-6 meters and small clouds may only be 100s of meters deep and wide – while current climate models have a typical resolution of around 100 kilometres. Hence, clouds remain the key uncertainty in current climate models.

Recent work in Reuben Fellow Philip Stier's Climate Processes Group in the Department Physics, based on machine learning (gradient boosting decision trees, neural networks & k-means clustering), showed that clouds in current climate models respond very differently to their environmental controls than observations suggest, which could significantly limit climate models' ability to accurately represent the response of clouds in a changing climate. In this hackathon we will try to identify the type of clouds dominating these climate model uncertainties from satellite observations (as shown above), combining labelling of cloud regimes in satellite datasets with supervised and unsupervised machine-learning based cloud classification techniques.

No prior knowledge required.

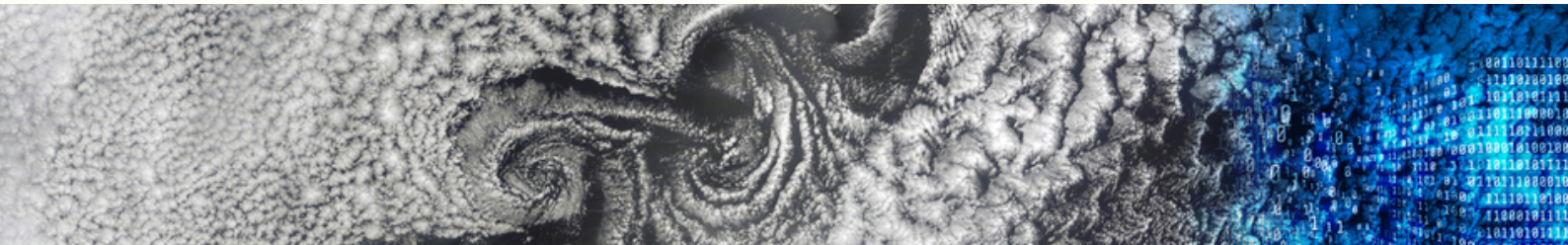
Day 1
9:30 Introduction to clouds and climate – Philip Stier (Physics, Reuben)
10:00 Introduction to the hackathon and the underlying datasets – Alyson Douglas (Physics)
10:30 Hands on tutorials on clouds and climate grouped by interests:

- No programming experience or background
- Python & ML beginners
- Python & ML experts

12:30 Lunch

Days 2-4
Independent work as time allows
11:00 Daily virtual office hour with tutors

Day 5
11:30 Presentation of results by each group.
12:30 Group lunch and discussions: what have we learned overall?



Visit to Bletchley Park and the National Museum of Computing

Date TBC - August

Bletchley Park, located outside Milton Keynes, is a country house and estate that became the principal centre of Allied code-breaking during the Second World War. The team at Bletchley Park devised automatic machinery to help with decryption, culminating in the development of Colossus, the world's first programmable digital electronic computer.

Photo credit: Wikipedia user DeFacto

Photo credit: Bletchley Park

Immersive films, interactive displays, museum collections and faithfully recreated WW2 rooms will guide you on a journey to discover the past at Bletchley Park. Exhibitions, set within beautifully restored historic buildings, tell the story of this once top-secret operation. Find out more about the brilliant minds and complex machines that made this vital work possible, and discover the global impact Bletchley Park had on the outcome of WW2.

The National Museum of Computing is located on the Bletchley Park Estate, and is home to the world's largest collection of working historic computers. Displays include a functioning Colossus Mark 2 computer, and a reconstruction of the Turing-Welchman Bombe, which was used to help break the Enigma code. The museum also includes the world's oldest working digital computer, and examples of machines continuing the history of the development of computing from the 1940s to the present day.

Photo credit: Wikipedia user Pratyeka

More info

Make sure to book onto this trip on InkPath in advance if you'd like to attend. Partners and families are welcome. Costs of the trip are covered by the AI&ML: Theme Fund, making it free to attend, and coach travel will be provided.