

International Workshop

Shaping the Future of AI and Health

Inaugural Oxford-Québec-France workshop in the series “Shaping the Future of AI”.

Date: 8-10 September 2024

Venue: Maison Française d’Oxford (Oxford, UK)

Partners for the event: Maison Française d’Oxford, French Embassy in the UK, Délégation du Québec à Londres, IVADO, University of Oxford and University of Montreal

Number of invitees: 20-25 in total (from Canada, France and UK), with invited PhD students and post-docs

Conveners:

Prof Catherine Regis (Université de Montréal, IVADO and MILA)

Prof Lionel Tarassenko (University of Oxford, Reuben College)

Prof Pascal Marty (Maison Française d’Oxford – CNRS-MEAE)

Context

This event is the inaugural Oxford-Québec-France workshop in the series “Shaping the Future of AI”, which builds on comparative and interdisciplinary perspectives to explore key societal opportunities and challenges related to the development and deployment of AI.

The UK and France are the top two countries in Europe for AI research; across the Atlantic, Canada is second only to the US in this domain. In all three countries, there is a strong drive to apply the latest AI algorithms to the field of healthcare. The Maison Française d’Oxford (MFO) has strong links with the University of Oxford and French research centres of excellence. It is also developing a partnership with Québec institutions.

It is therefore timely for it to organise this invitation-only workshop bringing together leading AI researchers from Oxford, Québec, and France to share the latest developments in the application of AI to healthcare.

The event will be held at the MFO. As the MFO is a multi-disciplinary research centre, the workshop will focus not only on algorithms and clinical applications, but also on key ethical and legal questions.

The workshop will address three main issues:

- **Fundamental Research at the Intersection of AI and Health**
- **Embedding AI in Clinical Settings**
- **Challenges and Opportunities for Responsible AI**

Programme

Sunday 8th September

Visit of St John's College, Oxford University. Meet at 03:30pm at the Maison Française d'Oxford (2-10 Norham Rd, Oxford OX2 6SE) **or at 04:00 pm** in front of St John's College (St Giles, Oxford OX1 3JP) for the visit.

Monday 9th September

- 08:00 – 08:30 Breakfast
- 08:30 – 08:45 **Opening remarks:** Embassy of France to the United Kingdom; Délégation Générale du Québec à Londres; Maison Française d'Oxford; University of Oxford
- 08:45 – 10:45 **First session: Fundamental Research at the Intersection of AI and Health**
Session chaired by Prof. Lord (Lionel) Tarassenko (Oxford University, President of Reuben College)

Dr. Pierrick Coupé (CNRS and Univ of Bordeaux, CNRS unit LABRI, Bordeaux)

Title: Artificial Intelligence for Big Data Analysis of Brain MRI

Abstract: In this talk, I will introduce advanced methods for brain segmentation and computer-aided diagnosis of brain pathologies. I will begin by unveiling groundbreaking advancements in the quantitative analysis of cerebral MRIs, showcasing a novel brain segmentation method powered by collective artificial intelligence. Next, I will demonstrate our user-friendly, open-access platform, which integrates sophisticated MRI analysis tools. This platform, used by 10,000 users worldwide, has automatically processed 500,000 MRIs since its launch. Finally, I will present our recent Big Data studies on lifespan modelling, highlighting new insights into various neurodegenerative diseases and demonstrating how lifespan modelling can enhance computer-aided diagnosis and prognosis.

Prof. Guillaume Lajoie (Université de Montréal /Mila)

Title: Foundation Models for Neuroscience: Uncovering Universal Neural Patterns for Many Uses

Abstract: In this talk, I will present recent progress toward building AI foundation models for neuroscience. Much like large language models have done for text, neuro-foundation models aim to capture general and universal patterns of neural activity from different acquisition modalities, across brain regions, tasks, and even species. The learned representations can then be used to fine tune for varied tasks from diagnostic assistance, to machine learning tools for neuro-technology. I will discuss how such foundation models are poised to assist various areas of healthcare.

Prof. David Clifton (Royal Academy of Engineering Chair of Clinical Machine Learning, University of Oxford)

Title: Generative Medical AI and the Role of the University

Abstract: In a world in which the large AI multi-nationals dominate the creation of next-generation capabilities, what is the role of the University? This short presentation will make the case for the unique contributions to the field for which University research is particularly well-suited, acting as a complement to the massive-scale investment of industry in generic AIs.

10:45 – 11:00 Break
11:00 – 13:00 First session continued

Prof. Guillaume Dumas (Université de Montréal/Mila)

Title: *Social Neuro-AI for Inter-Personalized Psychiatry*

Abstract: *Precision medicine faces a significant challenge in mental health: addressing stakeholders needs by integrating cutting-edge technologies with existing scientific knowledge across biological, behavioral, and social scales. Scientific Machine Learning (SciML) tackles this challenge by incorporating domain-specific scientific knowledge into algorithms, combining hypothesis-driven and data-driven computational methods. Neuroinspired Artificial Intelligence (NeuroAI) further enhances this approach by embedding brain mechanisms into algorithms, providing a computational sandbox to better understand cognition in health and disease. We argue that human cognition emerges from the dynamic interplay between biological foundations and social contexts. Therefore, it is crucial to model developmental, interpersonal, and cultural processes alongside neurobiological mechanisms. We propose Social Neuro-AI as a novel paradigm that integrates these multidimensional factors, enabling the development of more inter-personalized, predictive, and ethically aligned AI systems for psychiatry. This approach has the potential to improve patient outcomes but also support the design of preventive and adaptive mental health systems.*

Prof. Alison Noble (Technikos Professor of Biomedical Engineering, University of Oxford)

Title: *Leveraging AI to Simplify Ultrasound*

Abstract: *In this talk I will discuss how the emergence of machine learning-based image analysis is changing medical ultrasound, using examples from my group's research on fetal ultrasound video and multi-modal imaging to highlight recent technical advances and clinical translational opportunities. I will also highlight how research is no longer just about the algorithm but depends on effective collaboration of inter-disciplinary research teams to progress the understanding of AI technology acceptance and adoption in existing and novel clinical settings.*

Dr. Laurence Watier (Inserm - CESP, U1018); Institut Pasteur, Paris, and University of Versailles-Saint Quentin

Title: *Healthcare Data in France and The BactHub Project*

Abstract: *Large, high-quality databases are key to the development of AI. After a description of the French national healthcare database (SNDS), its pitfalls and the administrative procedures for accessing it, an illustration focusing on the study of care pathways using state sequence analysis will be presented. The final part of the talk will illustrate how clinical data warehouses can be used to enrich SNDS database, through the BactHub project "Impact of individual exposure to antibiotics on bacteremia caused by resistant bacteria".*

13:00 – 14:00 Lunch

14:00 – 16:00 **Second session: Embedding AI in Clinical Settings**
Session chaired by Dr. Katia Wehbe (French Embassy, Science Attaché for life science, medical sciences and health)

Prof. Charis Antoniades (Professor of Cardiovascular Medicine, University of Oxford, and Consultant Cardiologist, Oxford University Hospitals)

Title: *Using AI to interrogate CT images: Predicting future cardiovascular events*

Abstract: AI is being used for interpretation of multi-dimensional clinical/patient data and has many applications in medical imaging: for improving the workflow in image processing (automated segmentations, etc), improving accuracy in image interpretation (see things we cannot see), helping with prioritization (fast exclusion of “normal” to allow focus on “abnormal”), fast quantification of structures (e.g. automated calcium score, coronary plaque analysis, etc) or even fast diagnosis and future risk prediction (guided therapies). Technologies that use coronary CT angiograms to quantify the degree of coronary inflammation (e.g. fat attenuation index score), provide important input in AI-driven prognostic models together with atherosclerotic plaque burden and clinical risk factor data, leading to extremely powerful tools for cardiovascular risk prediction and management of patient care. The large ORFAN international programme aims for 250k cardiac CT scans linked with lifelong outcomes data and is being used to train and validate novel imaging biomarkers for early diagnosis and future prediction of a wide range of cardiometabolic diseases.

Prof. Raphaël Porcher (Professor of Biostatistics at Paris Cité University - PR[AI]RIE (PaRIS Artificial Intelligence Research Institute))

Title: Potential of artificial intelligence for healthcare: from digital therapeutics to the development of new drugs

Abstract: Artificial intelligence (AI) has many potential applications for healthcare. For instance, devices incorporating AI algorithms have shown comparable performance as professionals to interpret pathology slides, dermoscopic images, MRIs or CT scans. Some of those algorithms are already incorporated in commercial imaging softwares. Beside those prominent examples, AI can also have important applications for digital therapeutics, and to help drug development, from very early phase to clinical trials. In this talk, we will review the specific issues raised by digital therapeutics and their evaluation, as well as how AI can enhance drug development and the related research perspectives.

Prof. Nadia Lahrichi (Polytechnique Montréal)

Title: AI Tools to Optimize Planning in the Operating Room

Abstract: In this talk, I will introduce a novel approach to scheduling specialties to operating rooms, a problem commonly known as master surgical planning. To optimize resources utilization, we integrate the patient case mix, which involves selecting patients from the wait list, assigning them to the operating list, and scheduling their surgery dates. Each patient has unique requirements, such as ICU beds, surgical beds and surgery time. Our findings demonstrate that, contrary to existing literature, integrating these elements leads to superior outcomes from a systems perspective. We achieve optimal use of operating rooms and beds while improving surgery wait times. Our methodology uses a clustering algorithm to group patients for each specialty and a mathematical programming approach to solve the optimization model. The results we present are based on data from a partner hospital involved in the project.

16:00 – 16:15

Break

16:15 – 18:15

Second session continued and wrap-up of Day One

Dr. Michalis Papadakis (CEO and co-founder of Brainomix)

Title: Transforming stroke treatment with AI-powered medical imaging

Abstract: Originating as a spin-out from the University of Oxford, Brainomix specializes in the creation of AI-powered software technologies to enable precision medicine, delivering best-in-class solutions to drive better treatment decisions for conditions where imaging defines the disease profile, including stroke and lung fibrosis.

Up to 80% of eligible stroke patients remain untreated. Brainomix has developed the Brainomix 360 Stroke platform to ensure more patients receive the right treatment in a timely manner. The Brainomix 360 Stroke platform seamlessly integrates within the hospital system and uses AI to automatically analyze brain CT scans of stroke patients in real time, helping front-line physicians with diagnosis and treatment decisions.

Brainomix is the market leader in stroke AI in Europe, with widespread clinical adoption in more than 30 countries worldwide and nationwide installations in Hungary, Wales and Poland. More than 60 publications have validated the performance and clinical value of the Brainomix 360 Stroke platform, including studies that have shown stroke networks using the technology treat 50 more patients with mechanical thrombectomy. This growing body of studies has led the National Institute for Health and Care Excellence (NICE) to endorse the clinical use of Brainomix 360 Stroke in NHS England.

Prof. Marie-Pascale Pomey (Université de Montréal)

Title: *How to Integrate Patient Partners in AI Development and Patients in the Clinic When AI is Mobilized?*

Abstract: *In recent years, numerous patient partner engagement initiatives have been carried out in Quebec in support of various digital health initiatives. This presentation will recount different projects and present assessments of the added value of co-constructing with patient partners in the fields of AI and digital health.*

One of the areas that has been most investigated is the importance of involving patients at the clinical level when AI is used in decision-making. Indeed, in practice, it is necessary on the one hand to develop clinical algorithms with patient partners and on the other hand to establish a discussion with patients so that they understand how AI is mobilized to help them make informed choices that meet their values.

Dr. Thomas Guyet (INRIA, Lyon)

Title: *Optimizing Care Pathways using AI tools*

Abstract: *One objective of health regulatory agencies is to continuously improve care and its organization. France is engaged in transforming its health system into a pathway-based system, where care is organized according to treatment guidelines as care pathways. This raises the challenge of designing such care pathways. Medical data warehouses contain information about care delivered to patients, providing a longitudinal view of patients' care trajectories. The development of artificial intelligence techniques, particularly machine learning (ML) and natural language processing (NLP), offers an opportunity to leverage these massive datasets to propose evidence-based guidelines. In this presentation, we will introduce a methodology based on AI tools to support clinicians in describing, analyzing, and optimizing care pathways. We will then discuss some limitations related to this methodology. An ongoing study on lung cancer surgery conducted at the Greater Paris University Hospitals will illustrate our methodology.*

18:15 – 19:00

Drinks

19:15

Dinner at Reuben College (during coffee: discussion and reflection on the first day of the workshop and exchanging ideas for the next workshop)

Tuesday 10th September

08:00 – 08:30

Breakfast

08:45 – 10:45

Third session: Challenges and Opportunities for Responsible AI

Session chaired by Prof. Catherine Regis (Université de Montréal and MILA)

Prof. Pierre-Luc Déziel (Université Laval)

Title: *Designing Responsible AI Tools for Medical Imaging: Introducing PACS AI*

Abstract: *This presentation will use PACS AI as a case study to assess the challenges and opportunities of developing responsible AI for medical imaging. PACS AI is a custom platform developed by a team of physicians, data scientists, and legal experts at the Canadian Institute for Advanced Research (CIFAR) to deploy AI models*

on images stored in a hospital's Picture Archiving and Communication System (PACS). Specifically, the presentation will focus on the privacy impact assessment conducted in recent months to discuss key components and design features of the platform related to the use and communication of personal health information. We will identify solutions and best practices that will be implemented to ensure PACS AI respects patients' privacy expectations and rights.

This presentation is partially based on the following article: Theriault-Lauzier P, Cobin D, Tastet O, Langlais EL, Taji B, Kang G, Chong A-Y, So D, Tang A, Gichoya JW, Chandar S, Déziel P-L, Hussin JG, Kadoury S, Avram R, A responsible framework for applying artificial intelligence on medical images and signals at the point-of-care: the PACS-AI platform, *Canadian Journal of Cardiology* (2024), doi: <https://doi.org/10.1016/j.cjca.2024.05.025>.

Dr. Catherine Bourgain, Research Director at Inserm (in sociology of sciences and biomedicine), Head of Cermes3 (Villejuif)

Title: AI and the work, expertise, experience and meanings in/of healthcare

Abstract: The transformative potential of the multiple forms of AI is strong in a large number of biomedical contexts, including the analysis and processing of a variety of signals for diagnosis or prognosis (e.g. images, molecular data...), decision making (algorithms for risk estimation, treatment choice), optimization of care trajectories and biomedical work...

In all these usages, AI technologies are part of pre-existing professional and social contexts, which they profoundly reshape. This talk argues that our reflections on responsible AI must include a consideration for these properly socio-technical dimensions. Taking into account the impacts of AI on the work of caregivers (reorganization, new practices, new professions, etc.) and patients, on their expertise (including the conditions for transmitting this expertise) and experience, and more generally on what it means to care or to be cared for, is crucial. These ideas will be illustrated with results from ongoing socio-ethnographic studies in the field of genomic medicine.

Prof. Angeliki Kerasidou (Associate Professor, Ethox Centre, and Research Fellow, Wellcome Centre for Ethics and Humanities, University of Oxford)

Title: Trust in AI in healthcare: is it important, is it relevant, is it necessary?

Abstract: Trust is often discussed as a central issue in the context of data driven health research and innovation, including AI. From trust in the institutions and companies that develop AI tools, to trust in the technology itself, there has been a lot of attention on how to secure, engender and maintain trust. Others, on the other hand, maintain that trust is irrelevant when it comes to AI. AI tools, and even the institutions and companies that develop them are not the type of 'agents' that can participate in trust relationships. Instead of aiming for trust and trustworthiness, more attention needs to be given to building reliance.

Drawing from theoretical literature on trust, and also from empirical studies investigating end-users' (patients and healthcare professionals) views and perceptions regarding trust in AI, I will try to clarify what trust and reliance mean in this context. I will suggest that being able to trust or rely on AI might mean different things for different end-users, which reflects their relationship and epistemic standing towards this technology. I will close by suggesting that understanding what trust in AI means and for whom has important practical and policy implications.

10:45 – 11:00

Break

11:00 – 13:00

Third session continued and **wrap-up**

Dr. Mireille Régnier, présidente du COERLE (Operational Committee for the Evaluation of Legal and Ethical Risks), le comité d'éthique d'Inria

Title: *A few thoughts on Ethics and AI*

Abstract: *As AI takes hold of our society, there is a growing demand for AI ethics. Discourses and recommendations are being built around shared values, in the Western world and beyond. The hierarchy of values, and consequently ethical choices, may vary from one field to another. Philosopher Thierry Ménissier distinguishes between Computer ethics, Robot ethics, Digital ethics and Usage ethics. We argue that a new ethical principle must emerge: that of differentiation between man and machine. We will deal with four examples: Bias of algorithms, chatbots, Information Warfare and AI and Justice.*

Dr. Caroline Green (Early Career Research Fellow, Institute for Ethics in AI,
University of Oxford)

Title: *AI in the care of people with dementia: Benefits and ethical challenges*

Abstract: *Trends in demographic ageing are leading to an increasing number of older people living with dementia. AI offers opportunities for people living with dementia and their carers to support independent living for longer and a higher quality of care. However, AI also poses unprecedented ethical challenges in this domain. Drawing on a social model of dementia and the UN Convention on the Rights of People with Disabilities, this talk will discuss implications of AI on pressing topics for dementia care, including mental capacity assessments, supporting independence and autonomy and beating social isolation and loneliness.*

Prof. Catherine Régis (Université de Montréal, IVADO, Mila)

Title: *Exploring the Role of Human-Centered AI (HCAI) Approaches in Healthcare*

Abstract: *HCAI focuses on furthering human values and ensuring human usability. Combining these normative and technical desires must be done through a well-crafted interactive process of defining appropriate norms through regulation with a more context sensitive strategy that allows understanding, responding, and adapting to such desires at a practical level, that is within healthcare institutions. This presentation will explore what such interactive process could look like and why, more broadly, it is important to connect norms with context in AI good governance approaches in healthcare. Some concrete illustrations of Canadian experimentation with that respect will be given as well.*

This presentation is partially based on the following paper: M. Da Silva, J.-L. Denis and C. Régis, "Good Governance Strategies for Human-Centered AI in Healthcare: Connecting Norms and Context" in C. Régis and al. (editors), Human-Centered AI – A Multidisciplinary Perspective for Policy-Makers, Auditors, and Users, CRC Press (London), 2024, 342 p.

13:00 – 14:00

Lunch

14:00 – 14:30

Concluding remarks from Professors Marty, Régis and Tarassenko

14:30 – 17:00

Visit - AI in healthcare ecosystem of the region (labs in University of Oxford and local spin-out company: IBME, Institute of Biomedical Engineering, Prof David Clifton and Prof Alison Noble labs, on the medical campus or Brainomix company lab).