

**'Navigating the AI revolution in PNT'****A Royal Institute of Navigation Event****Delivered in partnership with the Cambridge Wireless Location SIG**10th July 2024**Venue: Bradfield Centre, 184 Cambridge Science Park, Milton Road, Cambridge, CB4 0GA****AGENDA**

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| 13:30 | Registration and networking over tea and coffee |
| 14:00 | Welcome from Cambridge Wireless Olu Orugboh, Founder & CEO, Synergy Solutions & Chair of the Cambridge Wireless Board. |
| 14:05 | Introduction from our Chair, Ramsey Faragher, Royal Institute of Navigation, AI Working Group Chair & Cambridge Wireless SIG Champion |
| 14:15 | 'Reacting, Fast and Slow'
Professor Neil Lawrence, The DeepMind Professor of Machine Learning, University of Cambridge. Senior AI Fellow, The Alan Turing Institute & Visiting Professor of Machine Learning, University of Sheffield
What is fundamental to our intelligence? In this talk building on the ideas in The Atomic Human I argue that the external world is key to our intelligence, and how that world is filtered before we perceive it. This leads to the Eisenhower illusion, where we feel ourselves in charge but we are in fact reliant on fast reacting systems. |
| 14:45 | Q&A |
| 14:50 | 'Coding design choices in Forsberg's new Orion optical navigation engine; AI vs Data Science.'
William Shepherd, Technical Sales Manager & Nathan Daniels, Forsberg Services |
| 15:10 | 'Learning robust localisation for autonomous vehicles with vision, LiDAR, and radar'
Matt Gadd, Staff Software Engineer, OXA
Matt will talk about multi-experience, route following as a simple framework for mobile autonomy, and the challenges that sensors face in variable conditions. He will then present a swathe of systems they have developed using deep learning techniques to solve these problems, all focused on hardening underlying localisation stacks which use vision, LiDAR, and radar. |
| 15:30 | Refreshment break |
| 16:10 | 'The Need for Large, Centralised Benchmark Datasets in PNT'
Téo Bloch, Senior Data Scientist, Telespazio UK Ltd
This talk will discuss the benefits of centralised, open benchmark datasets in PNT and how this should be a priority for trust building, rather than other popular topics (e.g., explainable AI). |
| 16:30 | 'Improving the PNT performance with AI techniques: benefits and challenges'
Dr Ivan Petrunin, Centre for Autonomous and Cyberphysical Systems, Cranfield University
Continuing development in the area of autonomy, in particular, drone operations and advanced air mobility, sets tighter requirements for the performance of the PNT solutions required in these systems and their robustness. AI is seen as a powerful tool able to bring the PNT system performance to a new level, however, a careful approach is required to balance the accuracy and reliability of such a solution, especially for operation in diverse conditions. In this talk we share views on improvements that AI can bring to the PNT system performance and discuss challenges and lessons learnt using several examples of multi-sensor navigation systems. |
| 16:50 | Panel Session with all speakers,
Chaired by Ramsey Faragher, Royal Institute of Navigation, AI Working Group Chair & Cambridge Wireless SIG Champion |
| 17:20 | Closing remarks and event closes |

With the permission of the speakers, presentations will be available upon request after the event.

The Royal Institute of Navigation

The Royal Institute of Navigation - <https://rin.org.uk>

The Royal Institute of Navigation (RIN) is a learned society with charitable status and aims to advance the art, science and practice of navigation. Formed in 1947, its aims have always been threefold:

- To unite in one body those interested in navigation
- To advance the art, science and practice of navigation
- To promote knowledge in navigation and its associated sciences, including positioning, timing, tracking and conduct of a journey, whether on, in, over or under land, sea, air or space

Our vision is to be an inclusive group of diverse disciplines working together for a more navigable world. Navigation encompasses the science, the technology and the practice of getting from A-B on land, in the air, on seas and rivers, and in space. The RIN exists to study, to practice and to inform the public about one of the broadest and most diverse subjects in the world. In 2007, in recognition

Cambridge Wireless

Cambridge Wireless - www.cambridgewireless.co.uk / www.cambridgewireless.co.uk/groups/location

CW is the leading international community for companies involved in the research, development and application of wireless and mobile, internet, semiconductor and software technologies. With an active community of over 1000 businesses ranging from major network operators and device manufacturers to innovative start-ups and universities, CW stimulates debate and collaboration, harnesses and shares knowledge, and helps to build connections between academia and industry. CW's 20 Special Interest Groups (SIGs) provide its members with a dynamic forum where they can network with their peers, track the latest technology trends and position their organisations in key market sectors. The CW team organise major conferences and competitions along with intimate industry networking events and dinners.

The **Location Special Interest Group (SIG)** purpose is to promote and further the adoption of location as a value-added facility for a range of applications. Location Based Services are not about position – they are primarily about the use of location and position information as a value-add to service or product the end-user buys. This group is led by the following Industry Champions;

- David Bartlett, u-blox UK - www.u-blox.com
- Bob Cockshott, Positioning, Navigation, Timing and Quantum, KTN - <https://ktn-uk.org>
- Dr Ramsey Faragher, Royal Institute of Navigation, AI Working Group Chair
- Ben Tarlow, Qualcomm Technologies International - www.qualcomm.com

Profile of speakers

Professor Neil Lawrence, The DeepMind Professor of Machine Learning, University of Cambridge. Senior AI Fellow, The Alan Turing Institute & Visiting Professor of Machine Learning, University of Sheffield -

<https://www.cst.cam.ac.uk/people/ndl21>

Neil Lawrence is the inaugural DeepMind Professor of Machine Learning at the University of Cambridge. He has been working on machine learning models for over 20 years. He recently returned to academia after three years as Director of Machine Learning at Amazon. His main interest is the interaction of machine learning with the physical world. This interest was triggered by deploying machine learning in the African context, where 'end-to-end' solutions are normally required. This has inspired new research directions at the interface of machine learning and systems research, this work is funded by a Senior AI Fellowship from the Alan Turing Institute. Neil is also visiting Professor at the University of Sheffield and the co-host of Talking Machines.

William(Bill) Shepherd RD BEng CEng FIET FRSA MRIN, Technical Sales Manager, Forsberg Services Ltd -

<https://forsbergpnt.com>

William (Bill) Shepherd RD CEng FIET MRIN is a professional electronics engineer with a technical background in the development of sensor systems' hardware, software and firmware. Will's last role was as CEO of a startup business focused upon the development of trustworthy AI. In parallel to his civilian career, Will was a Royal Navy Reserve Officer for nineteen years.

Nathan Daniels, Forsberg Services Ltd - <https://forsbergpnt.com>

Nathan Daniels is a graduate engineer starting a development project at Forsberg PNT in pursuit of a PhD in Artificial Intelligence related to optical navigation. Nathan holds an MSci degree from Lancaster University, and specialises in artificial intelligence and computer vision. Nathan is the founder of an AI consulting startup focused on the fintech and fitness sectors.

Matt Gadd, Staff Software Engineer, OXA - <https://oxa.tech/>

Matt is a Senior Research Associate in the Mobile Robotics Group (MRG) and Oxford Robotics Institute (ORI), Stipendiary Lecturer in Engineering Science at St Hilda's College (previously at Keble College), and a Staff Software Engineer at Oxa. As a postgraduate student at the University of Oxford he read for a doctorate in the Department of Engineering Science. Before arriving in the United Kingdom, he was an undergraduate student at the University of Cape Town, South Africa, where he studied Mechatronics Engineering.

Téo Bloch Senior Data Scientist, Telespazio UK Ltd - <https://telespazio.co.uk/en/>

Téo has a PhD in Space-Physics and Machine learning, providing four years of experience in complex data-science projects. Following this, he worked as a data scientist using remote sensing data for applications related to food-security analyses. Within Telespazio, Téo works to integrate machine learning into infrastructure, navigation, environmental and quality control applications.

Dr Ivan Petrunin, Reader in Signal Processing for Autonomous Systems, Centre for Autonomous and Cyber-Physical Systems, Cranfield University- <https://www.cranfield.ac.uk/centres/centre-for-autonomous-and-cyberphysical-systems>

Dr Ivan Petrunin received an MSc in the design of electronic equipment from the National Technical University of Ukraine, in 1998, and a PhD in Applied Signal Processing from Cranfield University, in 2012. He is currently a Reader (Associate Professor) in Signal Processing for Autonomous Systems, leading the Signal and Autonomy research group within the Centre for Autonomous and Cyber-Physical Systems. His expertise covers areas of signal processing and artificial intelligence with application to cognitive communication, radars, resilient navigation and timing solutions for ground and aerial systems, and several other application areas. Ivan's research in this area has a particular emphasis on the enhancement of performance and safety of operations by developing and employing techniques based on Artificial Intelligence.