

**Emerging Learning
Techniques for
Robotics**



Hamlyn Symposium
Workshops 2019

Workshop: Emerging Learning Techniques for Robotics

Code: WAPM12 | Wednesday, 26th June

Royal Geographical Society

Co-Chairs and Organisers:

Xiao-Yun Zhou, The Hamlyn Centre, Imperial College, UK

Guang-Zhong Yang, The Hamlyn Centre, Imperial College, UK

Sponsored by:



Accredited by the Royal College of Surgeons of England for up to 12 CPD points

08:30-09:00 Registration and Coffee

09:00 Opening: Welcome & Introduction

Guang-Zhong Yang, The Hamlyn Centre, Imperial College London, UK

09:10 Robotics & Napoli: The Art of Work & Play

(Keynote) Bruno Siciliano, Università di Napoli Federico II, Italy

09:40 Neurotech: Windows to Your Soul

Aldo Faisal, Imperial College London, UK

10:10 AI-as-a-Medical-Device: What the latest FDA proposals mean for putting AI into the hands of clinicians

Tim Ensor and Joe Corrigan Cambridge Consultant, UK

10:40-11:15 Coffee Break

11:15 Purposive Learning from Humans

(Keynote) Gordon Cheng, Technical University of Munich (TUM), Germany

11:45 MRI Brain Tumor Segmentation and AI-assisted Annotation Tool

Wenqi Li, Nvidia, USA

12:15 From Imaging to Radiomics: Learning with Features

Karim Lekadir, Universitat Pompeu Fabra, Spain

12:45 Poster Session & Networking

13:10-14:00 Lunch Break

14:00 Machine Learning for Cardiac Image Analysis

Wenjia Bai, Imperial College London, UK

- 14:30** **Robotic Perception with Vision and Tactile Sensing**
Shan Luo, University of Liverpool, UK
- 15:00** **Bayesian Models for Reconstruction and Outlier Detection with Neural Networks**
Ender Konukoglu, ETH Zurich, Switzerland
- 15:30-15:45** **Coffee Break**
- 15:45** **The State-of-the-Art in Machine Learning for Robot Manipulation**
Edward Johns, Imperial College London, UK
- 16:15** **Visibility Metrics and Their Application for Visually Lossless Image Compression**
Nanyang Ye, University of Cambridge, UK
- 16:45** **Learning for 3D Shape Instantiation**
Xiao-Yun Zhou, Imperial College, UK
- 17:10** **Closing Remarks**



Keynote Speaker:

Gordon Cheng, Technical University of Munich (TUM), Germany

Title:

Purposive Learning from Humans

Biography:

Professor Cheng (b. 1968) researches the fundamental understanding and construction of cognitive systems. He studies ways to combine widely diverse capabilities in multipurpose high-performance robots and develops natural communication mechanisms in order to improve the application friendliness of robots.

Professor Cheng studied information sciences at Wollongong University (Australia) and was awarded a doctorate in systems engineering in 2001 at the department of systems engineering of the Australian National University. He founded the department of humanoid robotics and computational neuroscience at the Institute for Advanced Telecommunications Research in Kyoto (Japan), where he was Department Head from 2003 to 2008. In addition, from 2007 to 2008 he was a project manager at the National Institute of Information and Communications Technology (Japan) and the Japan Science and Technology Agency, where he was responsible for the Computational Brain project (2004-2008). Since 2010, Professor Cheng has been conducting research and teaching at TUM as full professor of cognitive systems. He is coordinator of the Center of Competence Neuro-Engineering in the department of Electrical and Computer Engineering and speaker of the newly established Elite Master of Science program in Neuroengineering (MSNE) of the Elite Network of Bavaria.



Keynote Speaker:

Bruno Siciliano, Università di Napoli Federico II, Italy

Title:

Robotics & Napoli: The Art of Work & Play

Biography:

Bruno Siciliano (M'91–SM'94–F'00) was born in Naples, Italy, in 1959. He received the Laurea and Research Doctorate degrees in electronic engineering from the University of Naples, Naples, in 1982 and 1987, respectively. He is currently Professor of Control and Robotics and Coordinator of PRISMA Lab with the Department of Electrical Engineering and Information Technology, and Director of the Interdepartmental Center for Advances in Robotic Surgery and the Coordinator of the Laboratory of Projects of Robotics for Industry and Services, Mechatronics and Automation, University of Naples Federico II, Naples, Italy.

He has delivered more than 150 keynotes and has authored or coauthored more than 300 papers and seven books. Mr. Siciliano is a Fellow of the American Society of Mechanical Engineers and the International Federation of Automatic Control. He is a recipient of numerous international prizes and awards. He was the President of the IEEE Robotics and Automation Society from 2008 to 2009. Since

2012, he has been on the Board of Directors of the European Robotics Association. His book “Robotics” is among the most adopted academic texts worldwide, while his edited volume Springer Handbook of Robotics received the highest recognition for scientific publishing: 2008 PROSE Award for Excellence in Physical Sciences & Mathematics. His research team got 16 projects funded by the European Union for a total grant of Million Euro in the last ten years, including an Advanced Grant from the European Research Council.



Speaker:

Wenjia Bai, Imperial College London, UK

Title:

Machine Learning for Cardiac Image Analysis

Biography:

Wenjia is a lecturer jointly at Data Science Institute and Department of Medicine, Imperial College London. His research focuses on developing novel image computing and machine learning algorithms for medical image analysis and applying the algorithms to clinical research. Currently, he is actively involved in the UK Biobank Imaging Study and UK Digital Heart Project. Wenjia is in close collaboration with Prof. Daniel Rueckert and the Biomedical Image Analysis Group from Department of Computing, Prof. Paul Matthews, Dr Declan P O'Regan from Faculty of Medicine, Prof. Steffen Petersen from Queen Mary University London, Dr Andrew Kings, Dr Martin Bishop from King's College London.

Previously, Wenjia worked as a research associate at Biomedical Image Analysis Group, Department of Computing, working with Prof. Daniel Rueckert. Prior to that, he did his D.Phil at Wolfson Medical Vision Laboratory, Department of Engineering Science, University of Oxford, under the supervision of Prof. Sir Michael Brady.



Speaker:

Tim Ensor, AI Commercial Director, Cambridge Consultants, UK

Title: *AI-as-a-Medical-Device: What the Latest FDA Proposals Mean for Putting AI into the Hands of Clinicians*



Biography:

Tim Ensor is Commercial Director for Cambridge Consultant's Artificial Intelligence capability. Tim works with clients across many sectors to help them achieve business impact with world-changing AI technology innovation. Tim has had a string of commercial leadership roles working in fields including telecoms, logistics, energy and logistics. He has a first-class Electronic Engineering degree from Bath University, UK and an MBA from Cambridge University.

**Speaker:**

Aldo Faisal, Imperial College London, UK

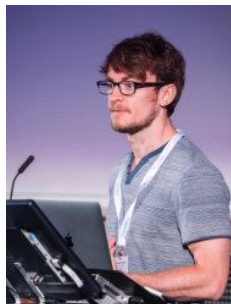
Title:

Neurotech: Windows to Your Soul

Biography:

Dr. Aldo Faisal is the Director of the Behaviour Analytics Lab at the Data Science Institute (London) and Associate Professor (UK: Reader) for Neurotechnology at the Dept. of Bioengineering and Dept. of Computing at Imperial College London. He is an Associate Group Head at the MRC London Institute of Medical Sciences and an honorary senior fellow of the FMRIB Center at Oxford University. He obtained his Ph.D. in Neuroscience from the University of Cambridge in 2006. After being elected Junior Research Fellow at Cambridge (Dept. of Engineering) he moved on to establish his laboratory at Imperial College London in 2009.

Dr. Faisal's lab combines cross-disciplinary computational and experimental approaches to investigate how the brain learns and controls goal-directed movements and how to restore them in disease. Dr. Faisal has published more than 100 research papers and patents in science and engineering, Scientific American voted his research on gaze-based control as the 1st of 10 most transformative ideas of 2015. Aldo serves as an Associate editor for Nature Scientific Data and PLOS Computational Biology, and has acted as conference chair, area chair, program chair, organising committee in key conferences in the field (e.g. KDD, NIPS, IEEE BSN, NEUROTECHNIX), in 2016 he was elected into the Global Futures Council of the World Economic Forum

**Speaker:**

Edward Johns, Imperial College London, UK

Title:

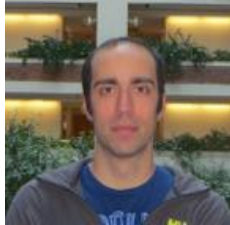
The State-of-the-Art in Machine Learning for Robot Manipulation

Biography:

Edward Jones is a Lecturer (Assistant Professor) and Royal Academy of Engineering Research Fellow at Imperial College London. His research lies at the intersection of robotics, machine learning, and computer vision.

He received a BA (2006) and MEng (2007) in Electrical and Information Engineering from Cambridge University, and a PhD (2014) in vision-based robot localisation from the Hamlyn Centre at Imperial College. Following his PhD, he spent a year as a postdoc at UCL working with Gabriel Brostow. In 2014, he then returned to Imperial College as a founding member of the Dyson Robotics Lab with Andrew Davison, where he took up a Dyson Fellowship and led the lab's robot manipulation team. In 2017, he was awarded a Royal Academy of Engineering Research Fellowship for his project "Empowering Next-Generation Robots with Dexterous Manipulation: Deep Learning via Simulation". He was then

appointed as a Lecturer at Imperial College in 2018, and founded the Robot Learning Lab. He is director of the Robot Learning Lab, where they are developing the next generation of robots empowered with artificial intelligence, for assisting us all in everyday environments.



Speaker:

Ender Konukoglu, ETH Zurich, Switzerland

Title:

Bayesian Models for Reconstruction and Outlier Detection with Neural Networks

Biography:

Ender Konukoglu did his B.S. and M.S. degrees at Bogazici University / Electrical and Electronics Engineering Department in 2003 and 2005. He got his PhD from University of Nice Sophia Antipolis working at INRIA Sophia Antipolis Mediterranean under the supervision of Prof. Nicholas Ayache in 2009. After the PhD he worked as a post-doctoral researcher at Microsoft Research in Cambridge between 2009 and 2012. Between 2012 and 2016 He worked at Athinoula A. Martinos Center for Biomedical Imaging and Harvard Medical School as an Instructor in Radiology and Assistant in Neuroscience. He was a member of the Laboratory for Computational Neuroimaging.

In August 2016 he started as an Assistant Professor (tenure-track) of Biomedical Image Computing at ETH-Zurich. He is a member of the Computer Vision Laboratory at the Department of Information Technology and Electrical Engineering.

His research focuses on developing computational methods for analysing medical images. The goals are to:

- extract semantic information,
- perform quantitative measurements and
- perform population comparisons

to aide diagnosis, treatment and clinical research.



Speaker:

Karim Lekadir, Universitat Pompeu Fabra, Spain

Title:

From Imaging to Radiomics: Learning with Features

Biography:

**Speaker:**

Wenqi Li, Nvidia, USA

Title:

MRI Brain Tumor Segmentation and AI-assisted Annotation Tool

Biography:**Speaker:**

Shan Luo, University of Liverpool, UK

Title:

Robotic Perception with Vision and Tactile Sensing

Biography:

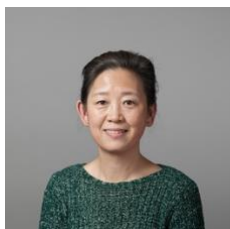
Shan Luo is a Lecturer (Assistant Professor) in Robotics at the Department of Computer Science, University of Liverpool. He is doing research on machine learning and computer vision algorithms with applications in robotics, e.g., robot perception, object recognition & localisation, and multimodal sensing fusion. He is responsible for the smARTLab which is a state-of-the-art robotics laboratory at the University of Liverpool.

**Speaker:**

Nanyang Ye, University of Cambridge, UK

Title:

Visibility Metrics and Their Application for Visually Lossless Image Compression

Biography:**Speaker:**

Xiao-Yun Zhou, Imperial College, UK

Title:

Machine/Deep Learning for 3D shape instantiation

Biography:

Xiao-Yun is a PhD student work in the Hamlyn centre for robotic surgery with her supervisors Prof. Guang-Zhong Yang (you probably know him as the editor of science robotics) and Dr. Su-Lin Lee. Her research interest is to bring machine intelligence - deep learning, machine learning and 3D computer

vision into surgery, with main focus on pre-operative disease diagnosis, intra-operative 3D navigation, and robot-assisted surgery automation.