Welcome

Newton Fund Research Links Workshop

Advanced Imaging Techniques for Pulmonary Disease

in partnership with

University of Edinburgh, Edinburgh, Scotland, UK
Tiangong University, Tianjin, China
21-23 May 2021

Presentation recording available from
https://blogs.ed.ac.uk/nfrlw/

Introduction

Newton Fund Researcher Links Workshop

- **Support international development-relevant research;**
- **Contribute to capacity building of early career researchers;**
- **Establish new research links or significantly develop existing links, with the potential for longer-term sustainability.**

Workshop Background

- **Pulmonary disease has become the world's fourth leading cause of death. Early detection and diagnosis is very important for alleviating the progression of pulmonary disease;**
- **Chest imaging techniques are closely related to disciplines of bioengineering, physics engineering and informatics. Interdisciplinary communication to promote the resolution of chest imaging problems.**

Workshop Aims

- **Seek opportunities for knowledge exchange, cooperation and collaboration of scientists from both medical and engineering fields between China and UK in the field of lung health;**
- **Provide a platform for the participants to exchange ideas in research directions, research content, innovations, and research methods;**
- **Keynote presentations by the senior researchers will report their research on healthcare image and offer mentoring advice for the early career researchers.**

Workshop Agenda

Friday 21 May 2021

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UK time	China time	Presenter	Presentation title
9.00-9.15	16.00-16.15	Dr Jiabin Jia Dr Qi Wang	Opening remark
9.15-10.15	16.15-17.15	Prof. Sotirios Tsaftaris	Keynote: Building “big” AI that can do more with less
10.15-11.15	17.15-18.15	Prof. Richard Bayford	Keynote: Bioimaging
11.15-11.35	18.15-18.35	Dr Yanzhen Liu	The clinical application of artificial intelligence aided diagnosis in pulmonary nodules
11.35-12.30	18.35-19.30	Break	
12.30-12.50	19.30-19.50	Dr Eyjolfur Gudmundsson	Effects of visually scored pleuroparenchymal fibroelastosis severity on lung function and survival in IPF patients
12.50-13.10	19.50-20.10	Dr Xiaoyan Chen	Can lung EIT benefits from deep learning?
13.10-13.30	20.10-20.30	Dr Mary Neal	Dynamic ^{19}F-MRI of inhaled perfluoropropane for imaging pulmonary ventilation
13.30-13.50	20.30-20.50	Dr Qiang Wang	Fluorescence lifetime endomicroscopic imaging based ex-vivo lung cancer classification using deep learning

Saturday 22 May 2021

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UK time	China time	Presenter	Presentation title
7:20-7:40	14:20-14:40	Dr Dong Liu	Shape-driven electrical impedance tomography
7:40-8:00	14:40-15:00	Dr Fu Zhang	Study on electrical impedance imaging based on multi-frequency sinusoidal excitation
8.00-8.20	15.00-15.20	Dr Rui Li	Deep learning for electrocardiogram signal processing and analysis
8.20-8.40	15.20-15.40	Dr Wenli Zhou	Lung Cancer: A medical oncologist's perspective
8.40-9.00	15.40-16.00	Break	
9.00-10.00	16.00-17.00	Prof. Zhiyong Yuan	Keynote: Radiotherapy technique and its clinical application
10.00-11.00	17.00-18.00	Dr Zhanqi Zhao	Keynote: Clinical application of chest EIT
11.00-11.20	18.00-18.20	Dr Mohsen Khadem	Towards autonomous endomicroscopy in distal Lung

Sunday 23 May 2021

Click here to join the meeting

UK time	China time	Name	Presentation title
9.00-9.20	16.00-16.20	Dr Weiwei Du	A study on lung nodule segmentation from computed tomography images
9.20-9.40	16.20-16.40	Dr Bartłomiej (Bartek) Papiez	Complex motion modelling with application to medical image analysis.
9.40-10.00	16.40-17.00	Dr Jiabin Jia	Image-guided mechanical ventilation control system

10.00-10.20	17.00-17.20	Dr James McLaughlan	Photoacoustic imaging with photothermal therapy and gold nanorods for a new approach to lung cancer management
10.20-10.40	17.20-17.40	Dr Yixin Ma	The electrical property variation of electrolyte solution caused by HIFU radiation
10.40-11.00	17.40-18.00	Dr Qi Wang	Exploring respiratory motion tracking through electrical impedance tomography (EIT)
11.00-11.10	18.00-18.10	Dr Jiabin Jia Dr Qi Wang	Closing remark

Participants list

Dr Jiabin Jia
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Dr Jiabin Jia is a Senior Lecturer in Electronic Engineering, specialising in Agile Tomography research in the Institute for Digital Communications, School of Engineering, The University of Edinburgh. His research areas include electrical impedance tomography, industrial multiphase flow dynamics, acoustic Tomography, medical imaging. The research in Dr Jia's group takes an approach of synergistic integration of physics, modelling, optimization and design, to provide innovative sensing solutions for various challenging problems. So far, he has been awarded research funding more than £500k as PI and £2M as Co-I. Dr Jia maintains close collaborations with industrial companies. A number of technological breakthroughs were developed, patented and licensed for commercialisation to the industrial companies. More than 40 peer-reviewed journal has been published based on his research outcomes. Dr Jia is an IEEE Senior Member and Associate Editor of Measurement Journal.

Dr Qi Wang
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Dr. Qi Wang is a professor in Department of Biomedical Engineering, Tiangong University. She is also the deputy director of Electrical Tomography Institute in Tiangong University. She received her Ph.D degree in Control Science and Engineering from Tianjin University in 2012. She was a visiting scholar at the Agile Tomography Lab in the University of Edinburgh. Her research interests include image reconstruction and processing in medical imaging, especially chest electrical impedance tomography. She awarded 5 research grants by external funding bodies as a PI and published about 30 papers in leading journals.

Professor Sotirios A. Tsaftaris
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Professor Sotirios A. Tsaftaris, or Sotos, (http://tsaftaris.com; https://vios.science/; @STsaftaris), obtained his PhD and MSc degrees in Electrical Engineering and Computer Science (EECS) from Northwestern University, USA in 2006 and 2003 respectively. He obtained his Diploma in Electrical and Computer Engineering from the Aristotle University of Thessaloniki, Greece.

Currently, he is Canon Medical/Royal Academy of Engineering Research Chair in Healthcare AI, and Chair in Machine Learning and Computer Vision at the University of Edinburgh (UK). He is also a Turing Fellow with the Alan Turing Institute. Previously he was an Assistant Professor with IMT Institute for Advanced Studies, Lucca, Italy and Director of the Pattern Recognition and Image Analysis Unit at IMT (2011-2015). Prior to that, he held a joint Research Assistant Professor appointment at Northwestern University with the Departments of Electrical Engineering and Computer Science (EECS) and Radiology Feinberg School of Medicine (2006-2011).

He is an Associate Editor for IEEE Transactions on Medical Imaging and IEEE Journal of Biomedical and Health Informatics. He was tutorial chair for ECCV 2020. He was Doctoral Symposium Chair for IEEE ICIP 2018 (Athens). He served as area chair for CVPR 2021, IEEE ICME 2019, MICCAI 2020/2018, ICCV 2017, MMSP 2016, and VCIP 2015. He has also co-organized workshops for CVPR (2019), ICCV (2017), ECCV (2014), BMVC

(2015, 2018), and MICCAI (2016, 2017) and delivered tutorials to ICASSP (2019) and MICCAI (2020).
He has received the best paper award (STACOM 2017), twice the Magna Cum Laude Award (ISMRM in 2012 and 2014) and was a finalist for the Early Career Award (Society for Cardiovascular Magnetic Resonance, SCMR, in 2011 and 2019).
He has authored more than 140 journal and conference papers particularly in interdisciplinary fields and his work is (or has been) supported by the National Institutes of Health (USA), EPSRC & BBSRC (UK), the European Union, and several non-profits and industrial partners.
His research interests lie in machine learning, computer vision, image analysis (medical image computing and in particular cardiovascular MR image analysis), and image processing.
Dr. Tsaftaris is a Murphy, Onassis, and Marie Curie Fellow. He is also a member of IEEE, ISMRM, SCMR, and IAPR.

Professor Richard Bayford
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Professor Richard Bayford MSc, PhD (FInstP, FInstIPEM, FRSB, SMIEEE, SFHE) is the Head of Biophysics at the Middlesex University Centre for Investigative Oncology, Head of the Biophysics/Engineering group, Professor of Biophysics and Engineering, Middlesex University and visiting professor, Department of Electrical and Electronic Engineering, University College London. Bayford's expertise is in biomedical imaging, bio-modelling, electrical impedance tomography (EIT), nanotechnology, deep brain stimulation, tele-medical systems, instrumentation and biosensors. He pioneered the first reconstruction algorithm to image impedance changes inside the human head. He has worked as PI on many EPSRC, EU and industrial sponsored research projects.
He has a broad research interest covering the areas of the development of bio-models, novel algorithms and instrumentation to image impedance changes in the human head and neonate lung function, development of new multimodality instrumentation for Nanoparticles imaging and therapy, deep brain stimulation, modelling, medical signal processing, tele-medical systems, novel sensors on silicon for bio-medical applications and lab-on-a-chip for bio-makers. He has published over 300+ journal papers in the above research fields, served as the programme committee member for many international journals and conferences, and supervised over 25 PhD students. From 2008 to 2013 RB served as the editor-in-chief for Physiological Measurement journal. He attracted over £12M funding from EPSRC, BBSRC and other funding agencies. He was awarded an H2020 grant as coordinator for 5.5MEuros (www.craldproject.org) and recently award £1.8M from the EPSRC for further research on lung. He has been guest editor on three special issues and co-organizer of three conferences on biomedical applications of EIT. He has been Editor-in-Chief of the IoP Physiological Measurements journal, is a member of the editorial board of the International Journal of Biomedical Imaging, has severed as chairs the Publication committee for IPEM and severed as EFOMP Vice Chair publication and communication.
PATENTS: (WO/2010/058178) Method and apparatus for performing deep brain stimulation with an electrical field, (WO/2010/052503), Richard Harold Bayford, Ivan Maurice Roitt, Thomas William Rademacher, Andreas Demosthenous, Raymond Kruse Iles, Less, Detection of cancer with

electrical impedance tomography, US 9125583 B2 2015, PCT/GB2009/051493, (61/867,904 : US) A Flexible, Wearable Device for the Acquisition of Data for Electrical Impedance Tomography (EIT) of Lung Function.

Professor Zhiyong Yuan
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Professor Zhiyong Yuan, Executive Director, Department of Radiotherapy, Tianjin Medical University Cancer Hospital. The main research is the clinical application of stereotactic body radiation therapy (SBRT): presided over the establishment of the first cyberknife treatment team in China, and successfully carried out the treatment of more than 6000 patients， and achieved significant clinical effects in the treatment of early lung cancer。He led the team to publish more than 40 papers, more than 30 SCI papers, and received more than 10 related National Natural Science Foundation projects. As the initiator, he organized and established the China Cyberknife Clinical Collaboration Group. The group members come from more than 20 domestic tertiary A hospitals that carry out this work. Currently, it has conducted 7 national conferences and is responsible for training about 18 domestic hospitals.

Dr Zhanqi Zhao
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Dr Zhanqi Zhao received his Ph.D. from Ludwig Maximilians University Munich, Germany in 2013. Since 2008 he works on optimization of mechanical ventilation and clinical applications of electrical impedance tomography. Up to now, he has published >70 SCI journal publications (>50 as first, corresponding or senior author). Since 2015 He leads the clinical research of chest EIT in Chinese community and involved in more than 90% of the relevant clinical studies in China. He is affiliated with the Fourth Military Medical University, China and Furtwangen University, Germany. Besides, he is a member of the International EIT steering committee and serves at the moment as consultant for Dräger Medical and eResearchTechnology Germany.

Dr Yanzhen Liu
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Dr Yanzhen Liu, a radiologist at Tianjin Chest Hospital, graduated from Tianjin Medical University with master's degree in Medicine. She is mainly engaged in imaging diagnosis and research of lung and cardiovascular diseases, and has extensive clinical experience.

Dr Joseph Jacob
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Dr Joseph Jacob qualified in medicine from Imperial College London. He then worked for Médecins Sans Frontières for 2 years in Sudan and India, before undertaking radiology training at Kings College Hospital, London and Auckland City Hospital, New Zealand.
In 2016, Dr Jacob completed a MD(Res) at Imperial College London under Professor David Hansell at the Royal Brompton Hospital, and in 2018, was awarded a 5-year Wellcome Trust Clinical Research Career Development Fellowship. His current research, based at the Centre for Medical Image Computing at University College London and the UCL Respiratory department relates to the use of computer-analysis of CT imaging in various lung diseases, with a primary focus on fibrosing lung diseases.
Dr Jacob has co-authored over 75 papers, won national and international awards for his work, and was awarded the National Heart and Lung Institute prize for the best thesis of 2017. Two of his papers on computational lung image analysis were listed amongst the five most important imaging papers of 2016 at the American Thoracic Society conference in 2017.

Dr Eyjolfur Gudmundsson
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Dr Eyjolfur Gudmundsson acquired his Ph.D. in medical physics at the University of Chicago in 2019. His doctoral thesis work with Dr. Samuel Armato at the University of Chicago was on the computer-aided diagnosis, segmentation and image analysis of malignant pleural mesothelioma.
Eyjolfur's current research as a postdoctoral research scholar with Dr Joseph Jacob's group at the Centre for Medical Image Computing at University College London focuses on the computerised image analysis of established and early lung fibrosis on CT scans.

Professor Xiaoyan Chen
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Xiaoyan Chen, Professor of Tianjin University of Science and Technology, graduated from Tianjin University with Ph.D (2009), worked as a Post-doctor at Tianjin University (2009.5-2015.5). She had been in RPI, USA with Dr. Johnathon from Sep.2009 to Feb.2010 and in Kent, UK with Yong Yan from Sep-Dec.2012. She has researched electrical impedance tomography technology in monitoring lung ventilation for many years. She is in charge of the TUST-EIT lab and guides young researchers and graduate students to improve the electrical data acquisition hardware platform, to study the traditional and novel reconstruction algorithms with the prior structural information. Recently, her research team is focus on the novel methods through deep learning network models.

Dr Mary Neal
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Dr Mary Neal, Postdoctoral Research Associate at the Newcastle Magnetic Resonance Centre, Newcastle University, UK. Though her role spans a variety of multi-nuclear MRI applications, Dr Neal's primary research focus is 19F-MRI of inhaled perfluorinated gas for imaging pulmonary function, with a current interest in dynamic imaging. She is centrally involved in ongoing patient studies designed to assess the efficacy of 19F-MRI techniques for quantitative ventilation assessment in patients with COPD and asthma.

Dr Qiang Wang
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Dr. Qiang Wang is a postdoctoral researcher within the Translational Healthcare Technologies group in the Centre for Inflammation Research, the Queens Medical Research Institute, at The University of Edinburgh, where he works in a large interdisciplinary team to push forward the translation of cutting-edge imaging modalities into clinical utilisations. His current research focuses on maximising the information retrieved from the large-scale datasets collected by a custom-built, ultra-sensitive, in-vivo in-situ fluorescence lifetime imaging endomicroscopy (FLIM) for better bedside decisions by clinicians and more precise treatments for patients.

Dr Dong Liu
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Dr Dong Liu (Senior Member, IEEE) received the Ph.D. degree in applied physics from the University of Eastern Finland, Kuopio, Finland, in 2015. Since 2016, he has been with the Department of Modern Physics, University of Science and Technology of China, Hefei, China, where he is currently a Research Professor. His research interests broadly include applied inverse problems and medical imaging. He currently focuses primarily on the development of stationary and nonstationary algorithms for inverse problems that arise in a variety of biomedical and engineering applications including but not limited to electrical impedance tomography.

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Dr Fu Zhang was a jointly trained Ph.D. student by Hunan University and Harvard University. He is now a lecturer in Department of Electronics, Hunan Normal University. His Major Research includes Bioelectrical signal analysis and wearable smart sensor design. He has published more than 10 high-qualified articles in the field of bioelectrical impedance measurement in Physiological. Measurement, IEEE Transactions on Instrumentation and Measurement, IET Science, Measurement & Technology, Circuits, Systems, and Signal Processing et al.

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Dr Rui Li is an assistant professor of computer science and engineering with Hunan University, China. He received his Ph.D. degree in computer science from Hunan University, China. He was a visiting scholar with the Nagoya University, Japan, from 2012 to 2013. His research interests include intelligent medical and healthcare, machine learning, embedded and real-time systems. He has published more than 20 papers in premier conferences and journals of related areas such as TBME, TODAES, FGCS, Neurocomputing, IJCNN, MobiQuitous, etc.

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Dr Wenli Zhou received her MD&Ph.D. from Second Military Medical University, China in 2012. Attending physician in the Oncology Department of Shanghai Changzheng Hospital. She has been engaged in the research of lung cancer, breast cancer, gastric cancer and other diseases for many years. She has a very high academic status and is a member of many cancer research institutions. She devoted herself to scientific research, and currently presided over a number of National Natural Science Foundation of China projects and published many SCI papers.

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Dr Mohsen Khadem is a UKRI Fellow and Lecturer at the School of Informatics at the University of Edinburgh. Previously, he was a Post-Doctoral Researcher at the Wellcome/EPSRC Centre for Interventional and Surgical Sciences, University College London. He received his Ph.D. in Electrical and Computer Engineering from the University of Alberta, Canada in 2017, M.Sc. in Biomechanics from the Sharif University of Technology, Iran, in 2013, and B.Sc. in Mechanical Engineering from Shiraz University, Iran, in 2010. His research focus is on Surgical Robotics and Image-guided Therapies, Continuum, and Flexible Robots, and Applications of Control Theory in Robotics.

Dr Weiwei Du
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Dr Weiwei Du received doctor's degree from Kyushu University in 2008. From 2008 to 2018, she was an assistant professor at Kyoto Institute of Technology. From 2019 to present, she is an associate professor. From 2020, she is a PH. D. supervisor. She visited the University of Chicago as a visiting researcher supported by overseas dispatch of young faculty members and international exchange promotion fund of Kyoto Institute of Technology at 2013 and Sep. 2014, respectively. Her research interests medical image processing, machine learning and pattern recognition. Now, she is a member of MII (Medical Imaging and Information Sciences, Japan), IEICE (the Institute of Electronics, Information and Communication Engineers) and IEEE.

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Dr Bartłomiej (Bartek) W. Papież, graduated in Electrical Engineering from the AGH University of Science and Technology in Kraków (Poland) in 2009. He completed a PhD at the University of Central Lancashire in 2012, and subsequently joined the Biomedical Image Analysis Laboratory at the University of Oxford. Between 2012 and 2017, he worked as a post-doctoral research fellow at the Oxford Cancer Imaging Centre focusing on cancer image analysis. In 2013, he was awarded a prestigious Young Scientist Award by the Medical Image Computing and Computer Assisted Intervention Society. In 2015, he was elected to an EPA Cephalosporin Junior Research Fellow at Linacre College. He is a lecturer in Information Engineering at Lady Margaret Hall. In 2018, he was awarded Rutherford Fund Fellowship at Health Data Research UK at the Big Data Institute in Oxford. In 2021, he was awarded Senior Research Fellowship in Population Health. He is mainly focused on the development of accurate, thus complex and realistic but still computationally efficient, models of organ motion that could enable reliable quantitative cancer image analysis.

Dr James R McLaughlan
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Dr James R. McLaughlan is an associate professor with a joint position held between the Faculties of Engineering, and Medicine & Health at the University of Leeds. He has a background in medical physics with a research focus on developing new technologies for the non-invasive identification and treatment of disease. He undertook a PhD at the Institute of Cancer Research (ICR), investigating the optimisation of therapeutic ultrasound for cancer therapy using cavitation. After which he became a postdoctoral research fellow at Boston University, where investigated the use of light absorbing nanoparticles for photoacoustic imaging. He moved to the University of Leeds in 2010 to work in a large multidisciplinary team working on an EPSRC Healthcare Partnerships grant entitled “Engineering Therapeutic Microbubbles”, where he developed ultrasound technologies for the in vivo delivery of chemotherapy agents. These studies have successfully undergone pre-clinical trials and are currently being developed for ‘first in man’ applications.

During this second postdoctoral position in 2013, he was awarded a Leverhulme Early Career Research Fellowship to develop the use of ‘nanobombs’ (molecular-targeted gold nanoparticles) exposed to both light and sound for the detection and treatment of cancerous cells at depth within breast tissue.

In 2018 he was awarded an EPSRC UKRI Innovation Fellowship to help translate his novel non-invasive diagnostic and therapeutic approach for using Head and Neck cancer-targeted nanoparticles in conjunction with light and sound towards the clinic. Although his primary focus is on oncology, he was recently awarded a UKRI grant to develop the use of lung ultrasound imaging for monitoring COVID patients.

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Dr Yixin Ma received the M.S. and Ph.D. degrees in electrical engineering and instrumentation from Tianjin University, Tianjin, China, in 1996 and 1999, respectively.

From 1999 to 2000, she was a post-doctoral research fellow at the Institute of Mechanics, Chinese Academy of Science. From 2001-2004, she was a research fellow with University of Leeds, UK. From 2004-2007, she was an engineering research fellow with the Institute of Cancer Research, UK. From 2008, she is an associate professor with the Department of Instrument Science and Engineering, Shanghai Jiao Tong University, Shanghai, China.

Her current research interests include electrical impedance tomography and its application and biomedical devices.