Postgraduate Research Symposium

Programme

21 July 2020

School of Biomedical Engineering & Imaging Sciences

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Welcome

Lindsay Munroe, Student Organiser

Dr Enrico De Vita, PGR Coordinator

We are delighted to welcome you to the 2020 School of Biomedical Engineering & Imaging Sciences Postgraduate Research Symposium. Our aim is to provide a forum for exchanging and discussing ideas with other postgraduates and leading thinkers in the field. Postgraduate research students from across the School will showcase their latest research through power pitches, short talks and poster sessions. A panel of journalists and academics will be debating the exciting and highly relevant topic of what good science communication looks like.

For the first time ever, the symposium will be virtual. We have been working hard to ensure you are able to access research and engage with researchers to the same degree as in previous years.

We would like to thank all participants for contributing their time and effort and making this symposium possible. Finally, we hope you have an inspiring and enjoyable day.

With warm regards,

Lindsay Munroe
on behalf of the Student Organising Committee

Our annual PGR Symposium is traditionally scheduled for the Autumn, but as we've been working remotely for so long, we decided to create an opportunity to get together before the summer break, to celebrate the amazing research carried out in the School by our tireless PGR students.

As with every previous PGR Symposium, the first online School PGR Symposium has been wholly designed and organised by volunteer PGR students in every minor and major detail. I have been very fortunate to have had the chance to assist them in the process. They overcame physical distance and a tight schedule and were able to put together a diverse and exciting programme with national and international speakers, panellists, and most importantly a chance for many PGR students to present and discuss their work.

On behalf of the School, I welcome you all to the first online BMEIS School PGR Symposium.

Dr Enrico De Vita

Acknowledgements

The Organising Committee (A–Z)

Amer Ajanovic
PhD student

Yannick Brackenier
PhD student

Mariana Da Silva
PhD Student

Dr Enrico De Vita
PGR Coordinator

Georgia Doumou
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Sarah McElroy
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Aidan Michaels
PhD student

Lindsay Munroe
PhD Student

Julie Sigurdardottir
PhD student

Tianrui Zhao
PhD student

Additional Support

The Committee would like to thank all of the many people who have contributed to the success of this student-led PGR Symposium. Special thanks go to Julia Schnabel and Michelle Ma for their invaluable advice and support.

Schedule

	Live Event 1	
BST	**TOPIC**	**SPEAKER**
13.30 – 15.05	Introduction and Welcome	Professor Sebastien Ourselin, *Head of the School of Biomedical Engineering & Imaging Sciences, King's College London*
	Student oral presentation session A	*Please refer to p. 12 for presentation titles and presenters' names*
	Public Engagement	Professor Alexander Hammers, *Public Engagement Academic Lead* Faysal Farah, Elsa-Marie Otoo, Suzette Lust*, PhD students*
	The EXPLORER Total Body PET Scanner: a Journey	Professor Ramsey Badawi, *Professor of Radiology and Biomedical Engineering, UC Davis*
	Poster Session *(on Teams channel)*	
15.10 – 15.30	1 - minute poster pitches (in two streams)	*Please refer to p. 13-15 for presentation titles and presenters' names*
15.30 – 16.10	Interactive poster discussion	
	Live Event 2	
16.10 – 18.00	*Photoacoustic Imaging for Surgical and Interventional Guidance*	Dr Muyinatu Bell, *Assistant Professor & PULSE Lab Director, Johns Hopkins University*
	Student oral presentation session B	*Please refer to p. 12 for the titles and presenters' names*
	Panel discussion: *Improving the Signal-to-Noise Ratio in Science Communication: Disseminating Reliable Science in the Era of Fake News*	Dr Antonio de Marvao, *Fellow in Advanced Cardiovascular Imaging (CMR and CT), Royal Brompton Hospital* Susan Watts, *Science Journalist* Dr Mahmoud Bukar Maina, *Postdoctoral Fellow, Sussex Neuroscience* Moderated by Dr Jorge Cardoso, *Senior Lecturer in Artificial Medical Intelligence, King's College London*
	Prize giving and closing	Professor Julia Schnabel, *Director, CDT in Smart Medical Imaging*

Housekeeping

The symposium will be run entirely using Microsoft Teams software (you can use the web app, or download the desktop app). There will be three sections:

1) MS Teams Live Event 1

A streaming event with invited and proffered talks and a moderated Q & A. You can join Live Event 1 here.

2) Poster Sessions

Part A: A series of 1-minute poster pitches delivered in two streams, hosted in a 20-minute MS Teams meeting.
Stream 1 (link here, then click on Join meeting) will focus on *Imaging Chemistry and Biology* themes.
Stream 2 (link here, then click on Join meeting) will focus on *Biomedical Engineering and AI* themes.

Part B: Poster presenters will be available for discussion about their work during the rest of the poster session. To speak with the presenter, follow this link, then navigate to the relevant poster channel (e.g. P102 or P204) and click on Join meeting.
These poster channels will be accessible from Friday 17 July.

NB: For the poster session, you will need to log into MS Teams using your King's College London email address (please note: external attendees will be sent joining instructions via email; Imperial College London students from the CDT in Smart Medical Imaging should use their King's email addresses to join).

3) MS Teams Live Event 2

A streaming event with invited and proffered talks and a moderated Q & A. You can join Live Event 2 here.

Q & A

The Q & A is an opportunity to ask questions to individual speakers, or to the panelists in the case of the panel discussion.

The Q & A will be open during the keynote speaker sessions, student presentations and the panel discussion, and may be closed from time to time to stem the flow of questions.

The symposium producers will monitor the incoming questions and control which ones get published. Any inappropriate or offensive questions or comments will be dismissed.

Published questions will be fed to speakers at the end of their presentation.

Once the allotted time is up or the speaker has exhausted questions, published questions will be removed from the Q & A board to make space for questions for the next speaker.

We apologise in advance if your question is not asked.

Housekeeping

Online Town

We invite you to network with other attendees in the Symposium's Online Town room, which will be open from 13.00 on 21 July until the end of the event. There is no need to register in advance, just click on the link to join!

Twitter

The Twitter hashtags for the event are #BMEISPGR #Symposium, used together. A member of our team will be tweeting from the @KingsImaging Twitter page - likes and retweets from the audience would be greatly appreciated.

Professor Ramsey Badawi

Professor of Radiology and Biomedical Engineering, UC Davis

The EXPLORER Total Body PET Scanner: a Journey

Significant accomplishments are rarely achieved without a great deal of failure along the way, and the EXPLORER Total-Body PET program is no exception. This talk will recount how Dr. Badawi came to be part of the EXPLORER story, and will describe some of the steps and mis-steps that finally culminated in the creation of this new and exquisitely sensitive tool for performing in vivo pixel-level assays of biomarker concentrations in the living human body. Some of the initial results from the first year of operation of the EXPLORER scanner will also be presented.

Biography

Ramsey Badawi, Ph.D. is Professor, Chief of Nuclear Medicine and Vice-Chair for Research in the Department of Radiology, and Professor of Biomedical Engineering at UC Davis. He also serves as co-director of the Biomedical Technology Program at the UC Davis Comprehensive Cancer Center. Ramsey first started work in PET in 1991 when he joined Professor Michael Maisey's team setting up the first clinical PET service in the UK at Guy's and St Thomas' Hospital. He obtained his PhD in PET Physics there under the supervision of Professor Paul Marsden in 1998. After a postdoctoral fellowship at the University of Washington, Seattle under the mentorship of Professor Tom Lewellen, he joined the Dana Farber Cancer Institute in Boston in 2000, where he helped to set up their first clinical PET service. In 2004 he joined UC Davis. Ramsey's lab developed the world's first dedicated breast PET/CT scanner, and a low-cost ultra-high resolution scanner for mouse extremities that matched the highest resolution achieved for in vivo PET imaging. He is currently developing a high-performance pre-clinical MRI-compatible PET scanner. Since 2005 he has been working with Professor Simon Cherry to build EXPLORER, the world's first total-body PET scanner, which was finally funded in 2015 and completed in 2018. Drs. Badawi and Cherry currently co-direct the EXPLORER Molecular Imaging Center, which houses this remarkable device.

Dr Muyinatu Bell
Assistant Professor & PULSE Lab Director, Johns Hopkins University

Photoacoustic Imaging for Surgical and Interventional Guidance

Similar to lightning and thunder, photoacoustic imaging produces an acoustic response after optical transmission, but on a significantly smaller scale within the human body. The Photoacoustic and Ultrasonic Systems Engineering (PULSE) Lab leverages this concept to sense critical structures – like blood vessels and nerves – that are otherwise hidden by tissue. Our immediate and long-term goals are to eliminate surgical complications caused by incorrect targeting or accidental injury to critical structures and to pair photoacoustics with robotics to reduce reliance on harmful ionizing radiation. In this talk, I will describe our novel light delivery systems that attach to surgical tools to deliver light to surgical sites. I will also introduce how we learn from the physics of sound propagation in tissue to improve image quality, using state-of-the-art deep learning methods. These methods hold promise for robotic tracking tasks, visualization and visual servoing of surgical tool tips, and assessments of relative distances between the tool tip and nearby critical structures (e.g., major blood vessels and nerves that if injured will cause severe complications, paralysis, or patient death). Surgeries and procedures that have great potential to benefit from these techniques include neurosurgery, cardiac catheter-based interventions, liver surgery, spinal fusion surgery, hysterectomies, and biopsies.

Biography

Muyinatu Bell is an Assistant Professor of Electrical and Computer Engineering, Biomedical Engineering, and Computer Science at Johns Hopkins University, where she founded and directs the Photoacoustic and Ultrasonic Systems Engineering (PULSE) Lab. Dr. Bell earned a B.S. degree in Mechanical Engineering (biomedical engineering minor) from Massachusetts Institute of Technology (2006), received a Ph.D. degree in Biomedical Engineering from Duke University (2012), conducted research abroad as a Whitaker International Fellow at the Institute of Cancer Research and Royal Marsden Hospital in the United Kingdom (2009-2010), and completed a postdoctoral fellowship with the Engineering Research Center for Computer-Integrated Surgical Systems and Technology at Johns Hopkins University (2016). She is Associate Editor-in-Chief of IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control (T-UFFC), Associate Editor of IIEEE Transactions on Medical Imaging, and holds patents for short-lag spatial coherence beamforming and photoacoustic-guided surgery. She is a recipient of multiple awards and honors, including MIT Technology Review's Innovator Under 35 Award (2016), the NSF CAREER Award (2018), the NIH Trailblazer Award (2018), the Alfred P. Sloan Research Fellowship (2019), the ORAU Ralph E. Powe Jr. Faculty Enhancement Award (2019), and Maryland's Outstanding Young Engineer Award (2019). She most recently received the inaugural IEEE UFFC Star Ambassador Lectureship Award (2020) from her IEEE society.

Panelists

Panel speakers

Dr Antonio de Marvao
Fellow in Advanced Cardiovascular Imaging (CMR and CT), Royal Brompton Hospital

Dr Antonio de Marvao is an MRC Chain-Florey Clinical Lecturer in Cardiology at Imperial College London and a senior fellow in advanced cardiovascular imaging (CT and MRI) at the Royal Brompton Hospital, where he specialises in the care of patients with inherited cardiac conditions. His research focuses on the mathematical modelling of the heart, using cardiovascular MRI and artificial intelligence techniques, to understand the genetic and physiological mechanisms that underpin cardiovascular disease. He has applied AI algorithms in medical imaging analysis, computer assisted diagnosis and outcome prediction to the study of inherited and acquired cardiovascular conditions, such as pulmonary hypertension and cardiomyopathies.

Dr Mahmoud Maina
Postdoctoral Fellow, Sussex Neuroscience

Mahmoud Bukar Maina is a Postdoctoral Fellow in Sussex Neuroscience and has a PhD in Neuroscience from the University of Sussex, UK. His research focuses on understanding the basic mechanism that triggers and/or drives neurodegeneration in neurodegenerative diseases, with special interest on the role of Tau protein and amyloid-beta. When he is not in the Lab, he can be found somewhere passionately promoting and communicating science. Mahmoud has nearly a decade of experience in science communication in Africa and the UK. He is the founder of Science Communication Hub Nigeria and African Science Literacy network and serves as the Outreach Director for TReND in Africa

Susan Watts
Science Journalist

Susan Watts works in journalism and communications as a writer, broadcaster, chair and speaker on science, technology, environment, medicine and health issues in their political, social and economic context. Most recently, Susan has been Head of Communications at two research council institutes, Rothamsted Research and the MRC London Institute of Medical Sciences (LMS), where she advised the institute directors on strategy, ran media operations and led outreach programmes, alongside researchers. She is currently back at LMS until December 2020 to cover parental leave. Her current projects include chairing debates/discussions and "masterclass" workshops on science communications and engagement.
Susan is a trustee of the Scottish Association for Marine Science in Oban, and a physics graduate of Imperial College London. She began her career in print journalism, including New Scientist and the Independent newspaper. Susan was at the forefront of broadcast science and technology journalism in the UK for nearly two decades on the BBC's Newsnight programme (1995-2013), where, as science editor, she helped to shape some of the most significant national debates.

Moderator

Dr Jorge Cardoso
Senior Lecturer in Artificial Medical Intelligence, King's College London

M Jorge Cardoso (he, him, his) is Senior Lecturer in Artificial Medical Intelligence at King's College London, where he leads the AMIGO team and a research portfolio on big data analytics, quantitative radiology and value based healthcare. Jorge is also the CTO of the new London Medical Imaging and AI Centre for Value-based Healthcare.

Prior to King's, Dr Cardoso was a Lecturer at UCL, Technical Lead of the Quantitative Radiology Initiative at the National Hospital for Neurology and Neurosurgery (NHNN), and Engineering Lead of the Neuro-oncology Flagship Programme at UCL, Institute of Healthcare Engineering. He has more than 12 years expertise in advanced image analysis, big data, and artificial intelligence, and co-leads the development of Project MONAI, a deep-learning platform for artificial intelligence in medical imaging. He is also a founder of BrainMiner, a medtech startup aiming to bring quantitative biomarkers and predictive models to neurological care.

Student Presentation Sessions

Student Presentation Session A

TITLE	SPEAKER
Radiolabelling and In Vivo PET Imaging of 89Zr-Labelled PANC1 Small Extracellular Vesicles.	Azalea Khan
Rapid Automated PET Image Quality Assessment by Deep Learning.	Jessica Hopson
Whole-Heart T2-Mapping at 3T PET-MR Scanner for Quantitative Assessment of Cardiac Sarcoidosis.	Alina Psenicny
A Freeform Reflector Design of a Novel Vision-based Array Tactile Sensor.	Jian Hu

Student Presentation Session B

TITLE	SPEAKER
Placental Characterisation Using T2 Relaxometry and Gaussian Process Regression in Congenital Heart Disease.	Johannes Steinweg
Assessment of Whole Skeletal Bone Marrow Involvement in Suspected Myeloma Patients with Dual energy Computed Tomography (CT).	Renyang Gu
Deformation of Tissues Using a Single Microbubble Exposed to Ultrasound.	James Bezer

Poster Sessions

Posters – Stream 1: *Imaging Chemistry and Biology*

TITLE	PRESENTER	NO.
The Relationships Between Genotype and Phenotype in Cardiac Electromechanical Function	Richard Burns	P101
Drug Delivery to the Brain with Ultrasound and Microbubbles	Sophie Morse	P102
Molecular Imaging of Collagen in Cardiac Remodelling	Nadia Chaher	P103
Targeted Magnetic Resonance Imaging of Atherosclerosis	Hannah Perry	P104
Investigating the Effects of Flow Cell Interactions on Vascular Cell Extra-Cellular Matrix and the Consequences for Aortic Dilatation and Aneurysm in Bicuspid Aortic Valve disease	Suzette Lust	P105
Carbon-11 Carboxylation of Trialkoxysilane and Trimethylsilane Derivatives Using [11C]CO2	Federico Luzi	P106
Back to Basics with Radiobiology - Are Radionuclide Therapies Affected by the Cell Cycle?	Jordan Cheng	P107
Modelling Left Atrial Flow and Blood Coagulation for Risk of Thrombus Formation in Atrial Fibrillation	Ahmed Qureshi	P108
Nanoscale Microfluidic Reactions: Towards Stoichiometric Carbon-11 radiolabelling for PET	Fraser Edgar	P109
Repeatability of 18F-FDG Uptake in Healthy Tissue Using PET/CT Imaging in Patients with Non-Small Cell Lung Cancer	Afnan Malaih	P110
An Indirect Labelling Approach to Track the Therapeutic CAR T-cells with Dual PET and Fluorescence Imaging	Christopher Davis	P111

Posters – Stream 2: *Biomedical Engineering and Artificial Intelligence*

TITLE	PRESENTER	NO.
Improved Sensitivity at High Specificity for Signal Discrimination in CMOS Intraoperative Probes by Deep Learning	Joshua Moo	P201
Syn-Net for Synergistic Deep-Learned PET-MR Reconstruction	Guillaume Corda	P202
3D T2 Mapping with Dictionary-Based Matching in Simultaneous PET/MR: a Preliminary Study in Prostate Cancer Patients	Elisa Roccia	P203
Genomic Modelling with Graphical Neighbour Information	Robert O'Shea	P204
Direct Saturation Control for Magnetization Transfer Imaging at 7T	David Leitão	P205
Deep Learning for Automatic Spleen Length Measurement in Sickle Cell Disease Patients	Zhen Yuan	P206
Neural-Network Dose-Prediction for Rectal Spacer Stratification in Dose-Escalated Prostate Radiotherapy	Christopher Thomas	P207
Improved Precision of 1.5T Quantitative Cardiac MR Perfusion	Sarah McElroy	P208
Non-Invasive Light Focusing through Scattering Media with a Photoacoustic Guide-Star	Tianrui Zhao	P209
3D Isotropic-Resolution Motion Compensated Simultaneous Liver T1, T2 and fat fraction mapping	Giorgia Milotta	P210
Investigating Neural Network Visualization Methods for MRI-based Classification of Alzheimer's Disease	Mariana Da Silva	P211

Posters – Stream 2: *Biomedical Engineering and Artificial Intelligence*

TITLE	PRESENTER	NO.
Cytoarchitecturally Accurate Parcellation of the Cerebral Cortex: a Deep Learning Approach	Logan Williams	P212
Specific Absorption Rate (SAR) Sensitivity to Head Movement in a Parallel Transmit (pTx) Coil at 7T	Amer Ajanovic	P213
Tractography of Hypothalamus-Mediated White Matter Tracts in the Neonate Reveals Anatomical Topography In Vivo and Structural Change in the Perinatal Period, a Study from Developing Human Connectome Project	Julie Sigurdardottir	P214
Deep-Learning-Based Segmentation of the Vocal Tract and Articulators in Real-Time Magnetic Resonance Images of Speech	Matthieu Ruthven	P215
Qualitative Analysis of Motion Correction Using Deformable Slice-to-Volume Registration for Fetal Cardiovascular MRI	M.P.M. van Poppel	P216

Final thoughts

Postgraduate Research in the School of Biomedical Engineering & Imaging Sciences

We trust you will thoroughly enjoy this exciting portfolio of research presentations from our PhD students, along with our invited keynote speakers' presentations and expert panel discussions. The depth and breadth of the research to be presented in so many disciplines, from imaging chemistry, biology, physics and deep learning, through to surgical and interventional engineering and AI, is a great testament to the unique position our School holds in advancing healthcare technologies as a truly multidisciplinary endeavour. Each project is part our School's overall mission to engineer better health for patients across the globe.

This symposium is an impressive effort to step into the virtual conference world, an increasingly popular format for research symposia, truly opening the stage to greater levels of international contribution and collaboration. We especially thank our keynote speakers and our invited panellists for their participation in the event.

Finally, we would like to express our great appreciation to the student organising committee and our CDT staff who worked so hard to make this event possible, with special thanks to Dr Enrico De Vita for coordinating and assisting the committee in delivery of this first ever online BMEIS PGR Symposium. Well done, and thank you to all!

Professor Sebastien Ourselin
Head of the School of Biomedical Engineering & Imaging Sciences

Professor Andrew Reader
PGR Lead, School of Biomedical Engineering & Imaging Sciences

EPSRC Centre for Doctoral Training in Smart Medical Imaging

The EPSRC Centre for Doctoral Training (CDT) in Smart Medical Imaging is a flagship PhD programme run jointly between King's and Imperial College London, with an overall funding of 10 cohorts of around 15 students each, and many more aligned PhD students across the School of Biomedical Engineering & Imaging Sciences, as well as at Imperial College London. The CDT has originally launched the School's PGR symposium in 2014, and has proudly partnered and supported it each year ever since. The spirit of the CDT is thus very much embedded in the symposium, empowering our PhD students to show-case their own work, organise and lead on this exciting event. We are very much looking forward to this first virtual edition which has been so carefully set up during lockdown by the students, for the students.

Professor Julia Schnabel
Director, CDT in Smart Medical Imaging

Professor Nick Long
Deputy Director, CDT in Smart Medical Imaging

Dr Claudia Prieto
Associate Director for Research Training, CDT in Smart Medical Imaging

Final thoughts

Centre for Doctoral Training in Surgical & Interventional Engineering

The CDT Surgical & Interventional Engineering (SIE) are pleased to be helping with the organisation of the Symposium for another year and we are excited about the opportunity to deliver it in a new, virtual format.

The CDT is supported by King's Centre for Doctoral Studies, and incorporates studentship funded by the Guy's & St Thomas' NHS Foundation Trust BRC and generous industrial support.

The programme's research portfolio focuses on four major themes covering the development of smart instrumentation for manipulation and sensing, navigation technologies for surgical planning, computational modelling, and big data analysis to guide interventions and surgery. The four themes link via the creation of integrated systems combining novel hardware and software.

CDT SIE provides a unique experience for students who can obtain a first-hand understanding of the translational pipeline and how their work can be integrated within on-going endeavours to accelerate first-in-human evaluation of algorithms and devices. The key differentiator of the programme is that it is fully embedded within an NHS active hospital. Within the hospital, the CDT has a unique setting which allows for benefits such as access to ward, giving students the opportunity to interact with patients and clinicians but equally important, the CDT's entire research laboratories are present within this NHS environment.

Dr Christos Bergeles
Deputy Director, Centre for Doctoral Training in Surgical & Interventional Engineering

King's College London

School of Biomedical Engineering & Imaging Sciences
www.kcl.ac.uk/bmeis

Centre for Doctoral Training in Smart Medical Imaging
www.imagingcdt.com

Centre for Doctoral Training in Surgical & Interventional Engineering
www.surgerycdt.com

Follow the #BMEISPGR #Symposium hashtags on Twitter for updates about the event!