Dept. Electronic, Electrical & Systems Engineering, University of Birmingham
Edgbaston, Birmingham, B15 2TT, UK
b.jelfs@bham.ac.uk
beteje.github.io
bethjelfs
beteje

Beth Jelfs

My research focusses on adaptive signal processing especially statistical signal processing and signal characterisation. At the core of all my research is the belief that understanding more about the nature of signal generation mechanisms can aid and inform our choice of machine learning algorithms. I have worked on the theoretical foundations of this approach and have applied my work to a wide range of problems particularly with reference to biomedical and neural applications.

Education

PhD Electrical & Electronic Engineering
April 2010
Imperial College London, UK

Thesis: Collaborative Adaptive Filtering for Machine Learning

Awarded Engineering & Physical Sciences Research Council Doctoral Training Award

MEng Electronic & Software Engineering
July 2005
University of Leicester, UK

1st Class Honours

Awarded British Computer Society's prize for best graduating student

Research Experience

Assistant Professor in Signal Processing & Data Analysis
April 2022 – Present
Dept. Electronic, Electrical & Systems Engineering, University of Birmingham, UK

My research focuses on adaptive signal processing algorithms for signal characterisation and machine learning. Current projects include:

- Integration of machine learning with novel biomarkers for prostate cancer diagnosis & prognosis;
- Study of neural responses during stroke rehabilitation & the effects of virtual reality;
- Brain connectivity changes after cochlear implant.

Lecturer (Assistant Professor)
March 2021 – March 2022
Vice-Chancellor's Research Fellow
March 2017 – March 2021
School of Engineering, RMIT University, Australia

Research projects involved development of signal processing algorithms for a variety of applications including:

- Development of time-varying delay estimation algorithms;
- Image processing & machine learning for tracking cell/tissue responses;
- Path-prediction for high-altitude balloons.

Research Fellow
June 2015 – October 2016
Postdoctoral Fellow
August 2013 – May 2015
Dept. Electronic Engineering, City University of Hong Kong, Hong Kong

Coordinated project "Fingers Working in Coordination: Hierarchy of EEG, EMG and Kinematics" funded by the Hong Kong Research Grant Council.
Developed a project as part of the Centre for Biosystems, Neuroscience, and Nanotechnology on computational methods for neural synchronization & information transfer.

Postdoctoral Research Associate
Dept. Medical Physics & Bioengineering, University College London, UK
June 2011 – June 2013

Responsible for designing the signal processing aspects of project "Integrating monitoring & modelling for real time tracking of cerebral circulation & metabolism" funded by Wellcome Trust Project Grant.

Postdoctoral Research Assistant
Dept. Chemistry & Dept. Physics, University of Oxford, UK
June 2010 – June 2011

Developed statistical signal processing techniques to study nanopore technology and the accuracy of classification for DNA sequencing.

Grants & Awards

Collaborative Research Agreement
University of South Australia & Trinity College Dublin
2022–Ongoing

Goal: Automated prostate cancer diagnosis and prognosis.
Role: Development of image processing and machine learning software to be licensed for use in conjunction with a tissue biomarker developed by collaborators.

Ideation Challenge
SmartSat Cooperative Research Centre
2020

Goal: Development of a vision based attitude estimation system for high altitude platforms.
Role: Successfully lead a project to rapidly conceive and produce a minimum viable product. This has been invited to be developed into a more complete system in a subsequent project.

Project for the Defence Artificial Intelligence Centre
Trusted Autonomous Systems Defence Cooperative Research Centre
2020-2021

Goal: Performance assessment for a self-organising low-cost, high altitude balloon constellation for persistent surveillance and communications.
Role: Development of a simulation platform to allow assessment of performance based on real and simulated data.

Maxwell Eagle Endowment Award
RMIT University
2020

Goal: Using machine-based learning to develop prognostics of CAR T cell outcomes in older patients.
Role: Developing image processing and predictive machine learning algorithms.

Capability Development Fund
RMIT University
2019

Goal: High throughput platform for tracking cellular response.
Role: Creating efficient image processing algorithms for development of high volume machine learning architecture.

Global Connections Fund Bridging Grant
Australian Academy of Technology Sciences and Engineering
2017–2018

Goal: Development of a wireless portable device to monitor muscle fatigue in collaboration with PLUX Wireless Biosignals a Portuguese SME.
Role: Successfully designed new algorithms to assess muscle status in real time.

Scheme for Teaching and Learning Research
RMIT University
2017

Goal: Developing the framework for problem based learning workshop style education.
Role: Design of framework.

Vice-Chancellor's Research Fellowship
RMIT University
2017–2021

Goal: To investigate the use of time-varying algorithms in the assessment of biomedical data for machine learning applications.
Role: Sole investigator, project design, management and dissemination of results.

Research Exchange Project
BayChina
2015
Collaboration with Neuroscientific Theory Group at TU München.

Best Student Paper Award
International Symposium on Neural Networks
2010
For paper "Modelling of Brain Consciousness based on Collaborative Adaptive Filters".

Academic Research Collaboration Project
British Council and DAAD
2008
Collaboration with TU München and the Max-Planck-Institute for Dynamics and Self-Organization.

International Travel Grant
Royal Academy of Engineering
2007
Awarded to attend IEEE International Conference on Acoustics Speech and Signal Processing.

Teaching Experience

Lecturer, Computer and Network Security
RMIT University
2021
Delivery & redesign of teaching materials for the computer security aspects of a technical elective for 4th year undergraduate and taught masters with ~ 50 students.

Tutor, Engineering Computing
RMIT University
2021
Delivering C++ tutorials as part of a core 2nd year undergraduate engineering course with ~ 200 students.

Lecturer, Signals & Systems 1
RMIT University
2019–2020
Offshore course taught at School for Higher and Professional Education, Vocational Training Council, Hong Kong.

Course Coordinator, Biomedical Signal Analysis
RMIT University
2018–2021
Design and delivery of a core 3rd year undergraduate course in biomedical engineering and technical elective for electronic engineering with ~ 50 students.

Guest Lecturer, Brain Machine Interface: Technology, Culture, and Society
City University of Hong Kong
2014–2015
Lecturing on BMI Technology & Neural Computation for a university elective with ~ 200 students.

International Transition Team Graduate Teaching Assistant
City University of Hong Kong
2013–2015
Providing English language support including student tutorials, proofreading of academic papers & preparation of teaching materials.

Tutor, Communications I
Imperial College London
2006–2008
Teaching study groups of ~ 30 students for a core 1st year undergraduate course in electronic engineering.

Service to Field

Associate Editor
Encyclopedia BRAIN
2021
Responsible for sourcing and reviewing content on signal & image processing

Steering Committee Member
SmartSat Cooperative Research Centre
2020–2022
AI4Space Research Network: to progress research and development in AI applied to space systems and technologies.

Special Session Organiser
APSIPA Annual Summit & Conference
2020
Multidimensional Biomedical Signal and Image Processing.

Special Session Organiser
APSIPA Annual Summit & Conference
2018
Emerging Technologies for Healthcare.

Vice-Chancellor's Fellows Advisory Group
RMIT University
2017–2022
Liasing with Research & Innovation Office to provide improved procedures for fellows.
Organising events to promote the fellows' research and collaboration between fellows.

Organising committee
"enGENEious" conference, Oxford, UK
2012
Student & Post-doc lead conference on microbial engineering.

Public Engagement & Invited Talks

Research Seminar
Bionics Institute, Australia
2021
Talk on surrogate data and what to do when we don't know the ground truth.

Engaging for Impact
RMIT University, Australia
2020
Talk on Tissue Image Processing for Innovation in Healthcare with Precision Medicine session.

Biomedical Engineering Dept.
Shantou University, China
2019
Invited lecture series on biomedical signal processing.

Bioinformatics Network Symposium
RMIT University, Australia
2019
Talk on Machine Learning for High Throughput Cell Imaging.

Pint of Science
London, UK
2013
Event manager for science festival for the general public.

UCL Outreach
University College London, UK
2011–2013
Lead demonstrations and talks with school children for events including:
- Medical Physics Masterclass;
- Women in Engineering Taster Day;
- University Challenge Event.

Doctoral Training Centre
University of Oxford, UK
2011

Talk on DNA Nanopore Sequencing.

Faculty of Computer Science
University of Applied Sciences
Schmalkalden, Germany
2008

Talk on Signal Modality Characterisation Using Collaborative Adaptive Filters.

Professional Associations

Asia-Pacific Signal & Information Processing Association (APSIPA)
2018–present

Member
- Chair Biomedical Signal Processing & Systems Technical Committee

Institute of Electrical and Electronics Engineers
2006–present

Member
- Member of Women in Signal Processing Empowerment, Awareness and Visibility Subcommittee
- Affiliate member of Bio Imaging and Signal Processing Technical Committee
- Member of Signal Processing Society
- Member of Engineering in Medicine and Biology Society