Syed Ahmar Shah

BEng, MSc, DPhil

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Profile

I am currently a Chancellor's Fellow in the Usher Institute of Population Health Sciences and Informatics, University of Edinburgh with a rich and diverse experience of biomedical and clinical engineering. **I have co-authored 15 peer-reviewed journal papers, 10 peer-reviewed conference papers and I am an inventor in 2 patent file applications.** I have completed my DPhil and MSc, both from the University of Oxford, in Biomedical Engineering. My experience includes intelligent algorithm development (including extensive signal processing and machine learning theory and implementation) and software development (developing digital health solutions). I have rich experience of collaborating with health care professionals allowing me to develop unique perspectives in applying engineering techniques to solve problems in healthcare (from conception to translation into clinical practice).

Work Experience

Jul 2018 – present: **Chancellor's Fellow in the Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, Edinburgh, UK**

Aug 2015 – Jul 2018: **Post-Doctoral Scientist in Experimental Neurology, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, UK**

- Part of the "Experimental Neurology" group working in the domain of Neuroscience focusing on movement disorders, using my Signal Processing, Machine Learning and Software Development skills to contribute in various exciting projects

June 2012-Aug 2015: **Post-Doctoral Research Assistant, Institute of Biomedical Engineering, University of Oxford, Oxford, UK**

- Develop smart algorithms for early warning of patient deterioration, both in and outside clinical settings
- Develop m-Health solutions to help improve both remote and self-management of patients with chronic conditions (COPD, Heart Failure and Hypertension)
- Supervising students working on various research projects

Jan - Aug 2011: **Honorary Researcher at the Paediatric Emergency Department, John Radcliffe Hospital, Oxford, UK**

- Project: A clinical trial using technology-assisted measurement of vital signs of 272 children with acute illnesses over a period of 8 months
- Tasks: Part of the team that developed the technology, trained the nurses to use the equipment, and ensured that the study could progress smoothly by addressing any technical issues with the use of equipment

July 2006- Aug 2007: **Electronics Engineer, GIK Institute, Pakistan**

- Laboratory Instructor and Teaching Assistant of a number of courses in undergraduate electronics engineering curriculum. My responsibilities included designing lab experiments, lecturing, marking papers and supervising and assessing various student projects.

June - July 2005: **Summer Internship in the department of research and development laboratory at RWR (Reengineering with Research), Pakistan**

- As a pilot project, simulated and implemented (hardware) a communication interface and a FIFO based system on Spartan FPGA

Education

2008- 2012: **DPhil** in Engineering Science, Linacre College**, University of Oxford,** UK

- Full scholarship funded by the "National Institute for Health Research", NHS through the Department of Engineering Science, Oxford
- An interdisciplinary project undertaken by a team of Clinicians, Statisticians and Engineers from two departments

2007- 2008: **MSc** in Biomedical Engineering, Linacre College**, University of Oxford,** UK

- Completed with Distinction
- Awarded the Noon Foundation and Sloane-Robinson Scholarship in recognition of exceptional talent and promise in the field of Biomedical Engineering

2002- 2006: **BS** in Electronics Engineering, **GIK Institute of Engineering Sciences and Technology,** Pakistan

- CGPA: 3.66/4.00, Rank: 8th in a batch of 200

2000- 2002: **GCE A level (University of Cambridge Local Examinations Syndicate)**

- Straight As (Physics, Chemistry, Mathematics)

Selected Publications/Patents

Involved in several inter-disciplinary projects over the years and published in different journals including Lancet, Brain, IEEE Transactions, Movement Disorders, and JMIR (visit Google Scholar or ResearchGate for a full listing)

- **S.A. Shah, et al.** ***Towards Real-Time, Continuous Decoding of Gripping Force from Deep Brain Local Field Potentials*****, IEEE Transactions on Neural Systems and Rehabilitation Engineering 26.7 (2018) 1460-468**
  This paper developed various classes of algorithms for decoding force from local field potentials recorded from the subthalamic nucleus of the Basal Ganglia in the Brain for Brain-Computer Interfacing.

- **McManus, Richard J., et al.** ***"Efficacy of self-monitored blood pressure, with or without telemonitoring, for titration of antihypertensive medication (TASMINH4): an unmasked randomised controlled trial."*** **The Lancet 391.10124 (2018): 949-959.**
  This lancet publication reported a 2-year multi-centred Randomized Controlled Trial comparing usual care vs self-monitoring vs telemonitoring in 1110 patients with treated but poorly controlled hypertension. I designed and built the telemonitoring system.
- **L.di Biase, J.S. Brittain, S.A. Shah, et al.** ***Tremor stability index: a new tool for differential diagnosis in tremor syndromes*** **Brain: a journal of neurology (2017)**
  This Brain publication proposes a new neurophysiological measure (that can be measured with an accelerometer) based on distribution of instantaneous frequency of tremor that can differentiate Parkinson's disease tremor from Essential Tremor with high diagnostic accuracy. In this project, I applied various feature selection techniques to identify the most important feature.
- **S.A. Shah, et al.** ***Exacerbations in Chronic Obstructive Pulmonary Disease: Identification and Prediction Using a Digital Health System*** **Journal of Medical Internet Research 19.3 (2017)**
  This study used data from a Randomized Controlled Trial to develop a systematic and reproducible approach to exacerbation identification using 'Finite-State Machines' and developed a robust algorithm able to predict COPD exacerbation, based on vital signs acquired from a pulse oximeter. This paper featured as one of the top 8 papers in 'The Best Digital Biomarkers Papers of 2017' by Karger Publishers. This is the only study that has reported the distribution of respiratory rate of COPD patients who are monitored remotely for a year.
- **C Velardo, S.A. Shah, et al.** ***Digital health system for personalised COPD long-term management*** **BMC medical informatics and decision making 17.1 (2017): 19.**
  A digital health system was designed to support patients suffering from chronic obstructive pulmonary disease in self-managing their condition. This system was used in a Randomized Controlled Trial comparing usual care with digital health system-based intervention. I co-led the technical development in this project.
- **S.A. Shah, et al.** ***Respiratory Rate Estimation during Triage of Children in Hospitals*****, Journal of Medical Engineering & Technology, 39(8), 514-524, November 2015**
  This study developed a novel algorithm that automatically estimates respiratory rate from pulse oximetry using a finger probe. The algorithm was validated on 205 children presenting to the Emergency Department at the John Radcliffe Hospital, Oxford, UK and at the time, it was the only study that has validated respiratory rate estimation using data collected from over 200 children in hospitals during routine triage.
- ***Determination of a signal frequency using AR models*****, Patent filed by Oxford University Innovation Limited, Oxford, on 08th December 2014 in United Kingdom (Application number: 1421786.3)**
- ***Methods and Systems For Determining Tremor Status*****, Patent filed by Oxford University Innovation Limited, Oxford, on 17th January 2016 in United Kingdom (Application number: 1700767.5)**

Teaching and Supervision

- Co-developed, organised and delivered a one-week intensive course on Android Programming for second year students in Engineering Science in University of Oxford (2015)
- Project Supervisor for a team of third year students in Engineering Science in University of Oxford who were developing a wellness application (2015)
- Project Supervisor for Erasmus Mundus Masters Student in Clinical Neuroscience, University of Oxford who was working on Local Field Potentials recorded using DBS Electrodes for Brain Computer Interfacing

Invited Talks and Awards

- Invited Speaker: "Application of Machine Learning to Develop Clinically Useful Algorithms", Warwick, UK (July, 2018)
- Invited Speaker: "Basal Ganglia Signals for Brain-Machine Interfaces", Rome-Oxford Basal Ganglia Workshop, Oxford, UK (August, 2017)
- Invited Speaker: "Decoding Force from Deep Brain Structures for Brain Computer Interfacing" at Institute of Science and Technology for Brain-Inspired Intelligence of Fudan University, Shanghai, China (May 2017)
- Invited Speaker: "HealthCare Apps: Opportunities and Challenges", BuzzWeekend Europe, Oxford (2014)
- Guarantors of Brain travel award to present a peer-reviewed conference paper in IEEE EMBC, Hawaii, USA worth £1000 (July 2018)
- Best Oral Presentation Award at Annual Scientific Meeting of RESPIRE, Porto, Portugal (May 2018)
- Excellence in Neural Engineering Award from National Science Foundation, USA, worth $1000 awarded for presenting a peer-reviewed paper at IEEE EMBC Conference, Orlando, USA (August 2016)
- NIHR Scholarship for DPhil awarded through the Department of Engineering Science, University of Oxford covering college and university fees and a living allowance (worth £90,000) spread over a period of 3 years.
- Noon Foundation, Oxford Scholarship awarded through the University of Oxford covering college and university fees (worth £16,000)
- Sloane-Robinson Scholarship awarded through the University of Oxford in recognition of exceptional talent and promise in the field of Biomedical Engineering (worth $10,000)