

CURRICULUM VITAE



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Education and Employment Background

DPHil in Engineering Science, Wolfson College, University of Oxford, United Kingdom (2013-2017)
Research Assistantship, University of Malaya & University of New South Wales (2012-2013)
Bachelor Degree in Biomedical Engineering, 1st Class Honours (CGPA: 3.92), University of Malaya, Malaysia (2008-2012)

Research Interest

My research interest is to understand human physiology, particularly the cerebral blood flow and metabolism, and cardiovascular diseases, through mathematical modelling. My work involves developing mathematical model based on mechanical properties of human tissues using continuum mechanics such as poromechanics and hyperelastic modelling.

My research on cerebral blood flow and metabolism aims to understand the occurrence of brain oedema (or brain swelling) after brain stroke treatment, which affects 30% of stroke patients. This would require the modelling of brain fluid transport and mechanical properties involving multiple models at different scales (i.e. cells, tissues, and organs scales) to describe the system and integrating the model with medical imaging data (i.e. MRI). This research is in collaboration with Associate Professor Stephen Payne from University of Oxford and Dr Dean Chou from National Central University, Taiwan.

Meanwhile, my research on cardiovascular diseases is in collaboration with Associate Professor Lim Einly from University of Malaya. This research aims to investigate the effect of the changes in mechanical properties of aorta lumen (i.e. blood vessels transporting blood from the heart to other organs) and heart myocardium wall (i.e. heart muscle) towards the efficacy of blood transport. The changes of mechanical properties are due to cardiovascular diseases such as myocardial infarction (i.e. heart attack) and aortic dissection (i.e. aorta vessel tearing).

Research Grants

1. Development of brain tissue swelling predictive tools for ischaemic stroke patient post-treatment (RDU 1703310: RM21000) – 20/09/2017 to 19/09/2019

Research Experience

Doctorate Research, October 2013 – March 2017

Department of Engineering Science, University of Oxford, United Kingdom

- Developing a mathematical model to understand **brain** ischaemia-reperfusion injury leading to tissue swelling and microvessels compression
- Using **poroelastic** theory, capillary filtration, and the Donnan equilibrium to understand the occurrence of brain tissue swelling and the function of AQP4 in the formation of brain oedema
- Validation of the model by developing **3D finite element** geometry from patient MRI images

Research Assistantship, July 2012 – September 2013

Department of Biomedical Engineering, University of Malaya, Malaysia

- Working on left ventricular modelling using **finite element analysis** to study the heart mechanics during a complete cardiac cycle
- Developing constitutive model of the material properties of left ventricle using solid mechanics of **hyperelastic materials**
- Simulating cardiac cycle using fluid-structure interaction (**FSI**) simulations to investigate the interaction between blood flow and ventricle wall motion

Adjunct Associate Lecturer, April 2013 – June 2013

Graduate School of Biomedical Engineering, University of New South Wales, Australia

- Visiting researcher to learn the development **electrical propagation** model of left ventricle
- Simulating cardiac cycle to investigate the interaction between electrical propagation and ventricle wall motion using COMSOL

Publications and Workshops

Journal Papers (All ISI-Index Publication)

- **M. J. Mohamed Mokhtarudin**, S. J. Payne (2017). The study of the function of AQP4 in cerebral ischaemia-reperfusion injury using poroelastic theory. *Int. J. Numer. Meth. Biomed. Eng.* 33(1)
- **M. J. Mohamed Mokhtarudin**, S. J. Payne (2015). Mathematical model of the effect of ischemia-reperfusion on brain capillary collapse and tissue swelling. *Math. Biosci.*, 263, 111-120

Conference Papers

- **M. J. Mohamed Mokhtarudin**, A. Shabudin, S. J. Payne (2017, September), 2D finite element analysis of cerebral tissue swelling occurrence in brain ischaemia-reperfusion injury. (Eds.). Paper presented at International Medical Device and Technology Conference 2017 (iMEDiTEC), Johor Bahru (Johor), Malaysia.
- **M. J. Mohamed Mokhtarudin**, S. J. Payne (2016, September), Investigating the Importance of Ionic Concentration on Ischaemic Cerebral Tissue Swelling using Donnan Equilibrium. (Eds.). Paper presented at MEIbioeng 16, University of Oxford (Oxford), United Kingdom.
- **M. J. Mohamed Mokhtarudin**, S. J. Payne (2015, July). The study of the function of AQP4 in cerebral ischaemia-reperfusion injury using poroelastic theory. P. Nithiarasu, E. Budyn (Eds.). Paper presented at 4th International Conference on Computational & Mathematical Biomedical Engineering, Ecole Normale Supérieure de Cachan (Paris), France.

Workshops and Summer Schools

- EMS-ESMTB Summer School Mathematical Biology of Tissue Mechanics, Leiden, Netherlands (25th-29th July, 2016).
- 7th Summer School on Biomechanics of Soft Tissues: Multiscale Modeling, Simulation and Applications, Graz University of Technology, Austria, 4th – 8th July 2016.