

Curriculum Vitae

Alexander James Elliott

Experience

November 2021 – present: Cranfield University – 75th Anniversary Research Fellow, *Developing accurate, reduced-order models for nonlinear vibrations: a machine learning approach*

Currently, I am a 75th Anniversary Research Fellow at Cranfield University, leading a project entitled Developing accurate, reduced-order models for nonlinear vibrations: a machine learning approach. This project will build upon his experience and expertise in nonlinear dynamics, complex structural vibrations, and machine learning. The overarching aim of his research is to provide engineers with accurate tools for capturing, understanding, and controlling nonlinear vibrations, allowing them to develop next-generation, hyper-efficient engineering structures.

December 2020 – October 2021: University of Glasgow – Research Assistant, *Risk Evaluation Fast Intelligent Tool (RELIANT) for Covid-19*

I was involved in a Covid-19 project, which aimed to provide a fast tool to evaluate the risk of the disease spreading in various environments. My role built upon and expanded the skill set I developed across my previous research positions, developing reduced-order models for fluid particles in air. These models were developed in conjunction with a number of research teams, contributing directly to both a final toolkit, and several collaborative research outputs.

December 2018 – October 2021: University of Glasgow – Research Assistant, *Multiphase Flow-Induced Fluid-Flexible Structure Interaction in Subsea Applications (MUFFINS)*

I am currently working as a Research Assistant as part of the MUFFINS project. I am leading the design, execution, and post-processing of a series of large-scale experiments investigating slug flow-induced vibrations in flexible pipes. The role requires numerical simulations of the fluid-structure interactions to be undertaken; the results of these will advise the design of a complex experimental structure. The experiments are to be undertaken in conjunction with industrial partners, requiring a large amount of organisational work to ensure compliance with their facilities and to guarantee safe and successful outcomes for all parties.

November 2019 – August 2020: University of Glasgow – Research Assistant, *MultiFlowMetII*

As part of the Horizon 2020 MultiFlowMetII project, I am led the statistical analysis and presentation of a number of data investigating the performance of multiphase flow meters. I developed a comprehensive Python framework for analysing the data, as well as efficiently and clearly presenting the key results and trends. Furthermore, my role also required me to interpret the results for interesting and informative trends, and then to present these internally to the consortium and publically, as peer-reviewed journal papers and in workshops. This included complex uncertainty calculations aimed at establishing international standards for multiphase flow.

October 2015 – August 2019: University of Glasgow – PhD Candidate, *Accurate Approximations for Nonlinear Vibrations*

I have completed my PhD in Mechanical Engineering, entitled *Accurate Approximations for Nonlinear Vibrations*. My research primarily focused on the development, improvement, and validation of modelling techniques for mechanical structures that exhibit changes in their behaviour at higher amplitudes. Achievements from this project are summarised as follows:

- Multiple papers published in peer-reviewed, *Nonlinear Dynamics*; further papers to be submitted for review,
- Findings presented at the International Modal Analysis Conference, the International Symposium on Modal Analysis, and the International Nonlinear Dynamics Conference,
- Developed knowledge of mathematical and engineering software, including Matlab, Mathematica, and Abaqus, as well as complex analytical methods.
- Contributed significant improvements to the results, understanding, and applicability of both analytical and numerical techniques.
- Presented work to non-expert audiences in the Institution of Mechanical Engineers competition, *Speak Out for Engineering*, and the University of Glasgow's *Science Slam VI*. A video of my Science Slam presentation can be found [here](#).

October 2015 – August 2019: University of Glasgow – Engineering and Mathematics Tutor

Education

September 2014 to August 2015: University of Glasgow, MSc Sustainable Energy - *Merit*

October 2011 to June 2015: University of Warwick, BSc Mathematics – *Upper Second-Class Honours*

September 2004 to June 2011: Sir John Lawes School, Harpenden

A Level: Mathematics – A*, Further Mathematics – A*, Geography – A*, Physics – A

GCSE: 9 A*s and 3 As

Publication highlights

Thesis:

Elliott, A. J., *Accurate Approximations for Nonlinear Vibrations*. PhD Thesis, 2019.

Journal:

A. J. Elliott, A. Cammarano, S. A. Neild, T. L. Hill, D. J. Wagg, *Using frequency detuning to compare analytical approximations for forced responses*, *Nonlinear Dynamics* (2019).

A. J. Elliott, A. Cammarano, S. A. Neild, T. L. Hill, D. J. Wagg, *Comparing the direct normal form and multiple scales methods through frequency detuning*, *Nonlinear Dynamics* (2018).

I. Tartaruga, A. J. Elliott, T. L. Hill, S. A. Neild, A. Cammarano, *The effect of nonlinear cross-coupling on reduced-order modelling*, *International Journal of Non-Linear Mechanics* (2019).

A. J. Elliott, G. Falcone, D. van Putten, T. Leonard, K. Haukalid, B. Pinguet, *Investigating reproducibility in multiphase flow metrology: Results from an intercomparison of laboratories*, *Flow Measurement and Instrumentation* (2021).

O. S. Osundare.; Falcone, G.; Lao, L.; Elliott, A. J., *Liquid-Liquid Flow Pattern Prediction Using Relevant Dimensionless Parameter Groups*. *Energies* (2020).

A. J. Elliott, M. Torabi, N. Karimi, *Thermodynamics analyses of porous microchannels with asymmetric thick walls and exothermicity: an entropic model of microreactors*, *Journal of Thermal Science and Engineering Applications* (2017).

A. J. Elliott, M. Torabi, N. Karimi, S. Cunningham, *On the effects of internal heat sources upon forced convection in porous channels with asymmetric thick walls*, *International Communications in Heat and Mass Transfer* 73 (2016).

Conference:

Elliott, A. J., G. Hunt, A. Cammarano, G. Falcone, *Towards a coupled fluid-structure model for slug flow in a flexible riser*, in: *Proceedings of Medyna 2020*, 2020.

Elliott, A. J., A. Cammarano., *Investigating the approximation of higher-order nonlinear behaviour into non-intrusive reduced-order models*, in: *Proceedings of Medyna 2020*, 2020.

Elliott, A. J., I. Tartaruga, A. Cammarano, P. S. Dobson, and S. A. Neild, *Investigating reduced order models for nanoscale nonlinear structures*, in: *Proceedings of ISMA2018*, 2018.

A. J. Elliott, A. Cammarano, S. A. Neild, *Investigating Modal Contributions Using a Galerkin Model*, in: G. Kerschen (Ed.), *Conference Proceedings of the Society for Experimental Mechanics Series*, Springer (2018) 199-210.

A. J. Elliott, A. Cammarano, S. A. Neild, *Comparing analytical approximation methods with numerical results for nonlinear systems*, in: G. Kerschen (Ed.), *Conference Proceedings of the Society for Experimental Mechanics Series*, Springer (2017) 37-49.