Ashley Scillitoe

Postdoctoral researcher using data-driven methods to tackle problems in fluid dynamics, computational simulation, and engineering design.

Additional contact details available upon request
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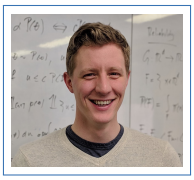
ascillitoe.com



Experience

Academic

2018-present **Postdoctoral Fellow**, *Data-Centric Aeronautics, The Alan Turing Institute*, UK.

- Exploring data-driven turbulence modelling, with machine learning used to learn the flow physics in high fidelity simulations, in order to augment computational models.
- Using dimension reduction techniques to design temperature probes, and to obtain rigorous manufacturing tolerances for turbomachinery blades - in collaboration with Rolls-Royce.
- Created rapid flowfield estimation frameworks using deep learning and dimension reduction.
- Exploring strategies for fusing experimental measurements and simulation data for the NASA wing junction experiment.

2019-present **Developer**, *Effective Quadratures*, UK.

Developing state-of-the-art regression capabilities in equadratures; an open source python library using polynomials for surrogate modelling, sensitivity analysis, and uncertainty quantification.

2017-2018 **Research Associate**, *University of Cambridge/Rolls Royce plc*, UK.

- Worked with Rolls Royce to extend their high fidelity Computational Fluid Dynamics (CFD) capability for gas turbine design.
- Built upon PhD work to extend the Rolls-Royce CFD code for compressible LES.
- Implemented a turbulence modelling uncertainty quantification framework in the code.

2013-2017 **PhD - Towards Predictive Eddy Resolving Simulations for Gas Turbine Compressors**, *University of Cambridge*, UK.

Supervised by Professor Paul Tucker, awarded December 2017.

- Examined the application of LES to modern gas turbine compressors.
- A novel self-adaptive smoothing scheme, advanced sub-grid scale models, unsteady boundary conditions and other extensions were coded into the Rolls-Royce CFD software.
- This code was used to run high fidelity LES to study the complex flow physics in compressors.
- The LES results were used to inform the development of compressor specific turbulence models.

2011 **Research Assistant**, *University of Manchester*, UK.

Built upon MEng dissertation work. Designed a static thrust test rig and data acquisition system. CAD and rapid prototyping (SLA) used frequently.

2010-2011 **MEng Dissertation - Propulsion System Design and Optimisation for a Novel Autonomous Hexrotor MAV**, *University of Manchester*, UK.

Concerned with design and optimisation of variable pitch propulsion systems for a novel rotary MAV, which was patented by the research group.

Teaching

2019-present **Workshop Leader**, *Effective Quadratures*, UK.

Prepare and run workshops on statistics and machine learning for engineers at the Culham Centre for Fusion Energy, Rolls-Royce, NPL, McLaren Automotive, Siemens, R^2 Data Labs and others.

2020-present **Mentor**, *Google Summer of Code*, Worldwide.

Mentor students on open source code development projects as part of GSoC.

2017-2019 **PhD/Undergrad Project Supervision**, *University of Cambridge*, UK.

Supervised numerous undergraduate projects, and co-supervised PhD projects.

2014-2018 **Undergraduate Lab Senior Demonstrator**, *University of Cambridge*, UK.
Assisted in preparing and running 4th year CFD and 3rd year Flow Visualisation laboratories.

2016-2018 **Undergraduate Supervisor**, *University of Cambridge*, UK.
Supervised the 2nd year ThermoFluids course for Downing, Wolfson and Robinson colleges.

Funding Obtained

2019-2021 **Microsoft Azure cloud computing grants**, $23,000.

2017 **EPSRC tier 2 HPC resource grant**, *£17,000*, via EPSRC RAP proposal.

2014-2017 **EPSRC tier 1 HPC resource grants**, *£26,000*, via UK Turbulence Consortium.

Conference Organisation

2020, 2021 **Programme Committee**, *CFDML Workshop at ISC 2020 and 2021*, Virtual.

2015 **Deputy Coordinator**, *Fluids Energy Turbo Expo 2015*, Cambridge, UK.

Industry

2011-2012 **Aerodynamics Intern**, *AgustaWestland Ltd*, Yeovil, UK.
A one year internship split between two departments:
- **4 Months - Wind Tunnel Test Department**
  - Supported drag reduction testing for the AW159. Assisted with instrument calibration, model checks, preparation and rigging, tunnel operation, data acquisition and analysis.
  - Responsible for the production of all related test schedules, health and safety documentation, and final test reports.
- **8 Months - Fuselage Aerodynamics Department**
  - Used CFD to investigate the application of exhaust shrouds on aircraft ventilation systems. Produced an in-depth design guide, and acted as Fuselage Aerodynamics consultant to Hyde Engineering Ltd for the design of two new aircraft cooling systems.

2010 **Systems Engineering Summer Intern**, *Thales Air Defence Ltd*, Belfast, UK.
Created a Matlab/Simulink identification platform to identify black-box mathematical models of dynamical systems. This was then used to analyse and pre-process flight trial data.

Education

2008-2013 **MEng (Hons) Aerospace Engineering - 1st Class**, *University of Manchester*, UK.
Graduated top of class with an 84% average. Elected student representative.

2001-2008 **Fortismere School**, London, UK.
A levels Maths (A), Physics (A), Chemistry (B), Geography (B).
GCSEs 10 (7A, 2B, 1C) including Maths (A) and English (A) .

Computing Skills

Languages HPC in Fortran with MPI/OpenMP/Coarrays, C++, Python, Bash, LaTeX, HTML/CSS.

CFD Tools Pointwise, Ansys Fluent, SU2, Solidworks, Paraview.

Other Tools Git, Travis CI, Matlab, Inkscape, Gimp, MS Office, SGE (OGE) cluster config.

Interests and Hobbies

STEM Ambassador Participate in events at local schools to inspire children in Engineering subjects; including a careers day and a six month competition to design and build hand launched gliders.

Societies Active Affiliate of RAeS and AIAA.

Sport Competitive road cyclist, ski mountaineer, and qualified swimming teacher.

Relevent Publications

Please see ascillitoe.com for a complete list of publications.

Journal Papers

2021 **Scillitoe, A.**, Seshadri, P., Girolami, M. "Uncertainty Quantification for Data-Driven Turbulence Modelling with Mondrian Forests". *J. Comput. Phys.*; 430(1):110116.

2020 Liu, Y., Tang, Y., **Scillitoe, A.**, Tucker, P. G. "Modification of Shear Stress Transport Turbulence Model Using Helicity for Predicting Corner Separation Flow in a Linear Compressor Cascade". *ASME. J. Turbomach.*; 142(2):021004.

2020 Trojak, W., Watson, R., **Scillitoe, A.**, Tucker, P. G. "Effect of Mesh Quality on Flux Reconstruction in Multi-Dimensions". *J. Sci. Comput.*; 82(3):1-36.

2019 **Scillitoe, A.**, Tucker, P. G., Adami, P. "Large Eddy Simulation of Boundary Layer Transition Mechanisms in Gas-Turbine Compressor Cascades". *ASME. J. Turbomach.*; 141(6):061008.

2016 **Scillitoe, A.**, Tucker, P. G., Adami, P. "Numerical Investigation of Three-Dimensional Separation in an Axial Flow Compressor...". *ASME. J. Turbomach.*; 139(2):021011.

Conference Proceedings

2021 **Scillitoe, A.**, Seshadri, P., Wong, C. Y., "Instantaneous Flowfield Estimation with Gaussian Ridges". *Proc. of AIAA Scitech Forum.*

2020 **Scillitoe, A.**, Ubald, B., Seshadri, P., Shahpar, S. "Design space exploration of stagnation temperature probes through dimension reducing subspaces". *Proc. of ASME Turbo Expo.*

2020 Seshadri P., Duncan, A., **Scillitoe, A.** "Bayesian polynomial chaos". *Proc. of Machine Learning for Engineering... at NeurIPS.*

2020 Tyacke J., **Scillitoe, A.** "Separated flow prediction and assessment using LES and machine learning". *Proc. of ICNAAM.*

2020 Trojak, W., **Scillitoe, A.**, Watson, R. "Effect of Flux Function Order and Working Precision in Spectral Element Methods". *Proc. of AIAA Scitech Forum.*

2019 **Scillitoe, A.** "Using Machine learning to predict and understand turbulence modelling uncertainties". *Proc. of Frontiers of Uncertainty Quantification in Fluid Dynamics.*

2017 **Scillitoe, A.** and Tucker P. G. "Large Eddy Simulation of boundary layer transition and corner separation in a gas-turbine compressor cascade". *Proc. of UKTC Annual Review.*

2016 **Scillitoe, A.**, Tucker, P. G., Adami, P. "Numerical Investigation of Three-Dimensional Separation in an Axial Flow Compressor...". *Proc. of ASME Turbo Expo.* **Nominated for "ASME Turbo Expo Best Compressor Paper" award.**

2015 **Scillitoe, A.**, Tucker, P. G., Adami, P. "Evaluation of RANS and ZDES Methods for the Prediction of Three-Dimensional Separation in Axial Flow Compressors". *Proc. of ASME Turbo Expo.* **Nominated for "ASME Turbo Expo Best Compressor Paper" award.**

Under Preparation/Review

2021 **Scillitoe A.**, Seshadri, P., Wong, C. Y., Duncan, A. "Polynomial ridge flowfield estimation". *Under preparation for Phys. Fluids.*

2020 Wong, C. Y., Seshadri, P., **Scillitoe A.**, Duncan, A., Parks, G. "Blade Envelopes Part I: Concept and Methodology". *Submitted to ASME. J. Turbomach.*. arXiv:2011.11636.

2020 Wong, C. Y., Seshadri, P., **Scillitoe A.**, Duncan, A., Parks, G. "Blade Envelopes Part II: Multiple Objectives and Inverse Design". *Submitted to ASME. J. Turbomach.*. arXiv:2012.15579.