

Ashley Scillitoe

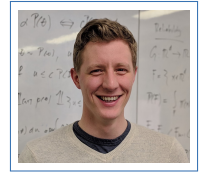
Postdoctoral researcher using data-driven methods to tackle problems in fluid dynamics, computational simulation, and engineering design.

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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, R² 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, L^AT_EX, HTML/CSS.
- CFD Tools Pointwise, Ansys Fluent, SU2, Solid-works, 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.

Relevant 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.