Daniel Kelshaw

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Availablilty for internship programme: Present – 12/2024 in/danielkelshaw ∧ github.com/danielkelshaw

Education

Imperial College London: PhD in Machine Learning, Supervisor: Prof. Luca Magri. **10/2021 – 03/2025**
The University of Manchester: MEng Aerospace Engineering, First Class Honours, Top in Class. **2016 – 2021**

Research Experience

NASA Jet Propulsion Lab, *Machine Learning Research Intern* **07/2021 – 10/2021**
- Applied Gaussian Process regression for geospatial-temporal prediction of global vegetation structure.
- Developed a framework to ensure consistency across sequential frames of data, reducing computational complexity.

European Space Agency, *Machine Learning Research Intern* **07/2021 – 10/2021**
- Researched the application of implicit neural representations for learning directly from point clouds.
- Produced differentiable representation of the Bennu asteroid using LiDAR measurements.

MindFoundry: Oxford University Spin-out, *Machine Learning Research Intern* **04/2021 – 07/2021**
- Developed geospatial models for local demographics, employing uncertainty-aware approaches (GPs, LGCPs).
- Established framework for optimisation of electric vehicle charge-point placement, in collaboration with Oxfordshire council.

Dyson, *Machine Learning Research Intern* **06/2019 – 06/2020**
- Developed differentiable simulators for aerodynamic design optimisation of turbomachinery components.
- Designed and optimised components currently in production, reducing cost and improving performance significantly.

BAE Systems, *Machine Learning Research Intern* **06/2018 – 09/2018**
- Applied deep learning methods for structural health monitoring, increasing aircraft availability on a global scale.

Publications

Daniel Kelshaw, Luca Magri. 'Manifold-Augmented Eikonal Equations: Geodesic Distances and Flows on Differentiable Manifolds'. *NeurIPS 2023 Workshop on Symmetry and Geometry in Neural Representations*, October 2023.

Daniel Kelshaw, Luca Magri. 'Short and Straight: Geodesics on Differentiable Manifolds'. *arXiv preprint*, May 2023.

Daniel Kelshaw, Luca Magri. 'Physics-Informed Convolutional Neural Networks for Corruption Removal on Dynamical Systems'. *NeurIPS 2022 Workshop on Machine Learning and the Physical Sciences*, November 2022.

Daniel Kelshaw, Georgios Rigas, Luca Magri. 'Physics-Informed CNNs for Super-Resolution of Sparse Observations on Dynamical Systems'. *NeurIPS 2022 Workshop on Machine Learning and the Physical Sciences*, November 2022.

Daniel Kelshaw, Steffen Mauceri, Steven Lu, Liang Xu, Sassan Saatchi. 'Gaussian Processes for Prediction and Uncertainty Quantification of Global Vegetation Structure from Active Satellite Sensors'. *American Geophysical Union*, November 2021.

Selected Talks

Daniel Kelshaw, Luca Magri. 'Data-driven modelling and control for fluid mechanics'. *Newton Institute workshop on 'The mathematical and statistical foundation of future data-driven engineering'*, May 2022.

Daniel Kelshaw, Luca Magri. 'Dealing with faulty sensors: a physics-informed convolutional neural network approach for recovering solutions to governing equations'. *IACM Computational Fluids Conference*, April 2023.

Daniel Kelshaw, Luca Magri. 'Super-resolution of sparse spatial-observations of Navier-Stokes: a physics-informed convolutional neural network approach'. *Leeds Fluids Institute: Workshop on data-driven methods in fluids*, December 2022.

Daniel Kelshaw, Luca Magri. 'Extracting Navier-Stokes solutions from noisy data with physics-constrained convolutional neural networks'. *American Physical Society, Division of Fluid Dynamics*, September 2022.

Select GitHub Repositories

danielkelshaw/**riemax**: JAX library for Riemannian geometry, providing the ability to operate on manifolds directly.
danielkelshaw/**kolsol**: differentiable pseudo-spectral solver for partial differential equations, notably Navier-Stokes.
magrilab/**pisr**: code for physics-informed super-resolution of sparse observations on dynamical systems.

Technical Skills

Languages / Frameworks: Python, Jax, PyTorch, XLA, C++, Julia.