Dylan Rubini

ML & Multiphysics Engineer

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About Me

"*Multiphysics Engineer specialising in AI-accelerated computational modelling. Passionate about developing advanced numerical solutions to solve high-impact, complex, and multidisciplinary engineering challenges in the energy transition.*"

Professional Positions

Oct. 24–Now **Postdoctoral Fellow in Computational Multiphysics**, *University of Oxford*.

- *Projects*:
  1. Commercialization of machine-learning-accelerated platform for modelling aerochemical–catalytic interactions in novel catalytic turbomachine.
  2. *Collaboration with FLAIR lab:* Developing AI systems using multi-agent large language models (LLMs) to automate engineering simulation & design.
  3. *Collaboration with Carbon Xtract:* Multiphysics modelling of multiscale transport within nanomembrane CO_2 capture systems.

Education and Research

2020–2024 **PhD in Engineering Science (Scholarship)**, *University of Oxford Thermofluids*.

- *Big Picture:* Contributed to the aerothermal design, computational modelling, and tool development for a new class of supersonic turbomachines to decarbonise over 40 high-temperature industrial processes.
- *Part (I)*:
  1. Developed multi-fidelity machine-learning-assisted platform `ChemZIP` to accelerate multiphysics reacting flow modelling within industry-standard fluid solvers by several orders of magnitude.
  2. Developed novel *chemistry-guided* design optimisers for turbomachinery.
- *Part (II)*:
  1. Investigated the uniquely complex interplay between aerothermodynamics, chemistry & heat transfer using high- and low-fidelity simulations.
  2. Developed U-Tblock – a fully-featured, multi-zone, unstructured computational fluid dynamics solver for both GPUs and CPUs using a DSL.

2016–2020 **MEng in Engineering Science, 1st Class (>80%)**, *University of Oxford*.

- *Achievements*: top in cohort in 4th year thesis (**93%**) and scored **>80%** overall.
- *Relevant Electives:* Aerothermal Engineering I+II, Machine Learning I+II, Software Engineering, Electrochemistry, Hydraulics, Sustainable Energy.

Awards

2023–2024 **2x Best Paper Awards**, *Mechanical (ASME) & Propulsion (GPPS)* .

2024 **IAA Doctoral Impact Prize**, *EPSRC UKRI*.

2024–Now **Drapers Research Fellowship**, *St Anne's College*.

2024 **Commendation for PhD Thesis**, *Oxford Engineering Dept*.

2023–2024 **20k HPC Computing Grant**, *UKRI ARCHER2 access*.

2020 **IMechE Project Award**, *Institution of Mechanical Engineers*.

Industry Experience

Autumn 2024 **Mitsubishi Heavy Industries**, *Japan*, Placement.

- Predicting high-temperature corrosion rates in ammonia-fired boilers through coupled combustion, surface chemistry, and materials modelling.

2019–2024 **Coolbrook Oy**, *Finland*, Collaborator.

- Collaborated on designing, modelling and developing tools for a new class of high-speed turbomachines for gas heating.

Technical Skills

Languages 1 ***Expert:*** `Python`, `Fortran`, `Matlab`, `MPI` programming, Domain Specific Languages (*e.g.,* OP2), Bash scripting, git versioning, LaTeX

Languages 2 ***Familiar:*** `C/C++`, `Cuda`, `OpenMP` programming, Docker

ML libraries TensorFlow, Pymoo (optimisation), agentic LLMs (*e.g.,* LangChain)

Software

Fluids Ansys (multiphysics), Boxer (meshing), Icem (meshing), Tblock (CFD), OpenLB (CFD), SolidWorks (CAD), ParaView (post-processing)

Chemistry Rmg-Py (generating micro-kinetic models), Cantera (solving kinetics)

Publications and Talks

2020–2025 **Publications**, 7 journal publications (https://dylanrubini.github.io/).

2020–2025 **Talks**, 7 talks at global conferences, universities & industrial partners.

Supervision and Teaching

PhD Supervision

2023–Present Accelerating multiscale numerical modelling.

2024–Present Exotic compact, 3D–printed heat exchanger design.

University Teaching

Winter 2025 2nd year partial differential equations.

Winter 2025 2nd year heat transfer lab.

Certified Courses

OpenLB Developed custom lattice Boltzmann PDE solvers

Referees

Available upon request