

Dylan Rubini

ML & Multiphysics Engineer

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About Me

"Multiphysics Engineer specializing in machine-learning-accelerated computational modelling. Passionate about developing advanced numerical methods and software to solve high-impact industrial challenges in energy transition and sustainability."

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 turbomachinery environments.
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 CO₂ 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 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 mark in 4th year project (**93%**) and scored **>80%** overall.
 - *Relevant Electives*: Aerothermal Engineering I+II, Machine Learning I+II, Software Engineering, Electrochemistry, Hydraulics, Sustainable Energy.

Awards and Achievements

- 2023–2024 **2x Best Paper Awards**, *ASME + GPPS*.
- 2024 **Letter of Commendation for PhD Thesis**, *Oxford Engineering Dept.*
- 2024–Now **Drapers Junior Research Fellowship**, *St Anne's College*.
- 2024–Now **Competitive IAA Doctoral Impact Prize**, *University of Oxford*.
- 2023–2025 **20k Computing Grant**, *UKRI ARCHER2 HPC access*.
- 2020 **Prestigious IMechE Project Award**, *Institution of Mechanical Engineers*.

Industry Experience

- Autumn 2024 **Mitsubishi Heavy Industries**, *Japan*, 2-Month Placement.
- Predicting high-temperature corrosion 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), Shell scripting, \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)

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.

Publications and Talks

2020–2024 **Publications**, 7 journal publications (dylanrubini.github.io).

2020–2024 **Talks**, 7 talks at conferences, universities & industry.

General Software

General Git, Visual Studio Code, Sublime Text, CorelDraw, Inkscape, Overleaf
HPC Facilities ARCHER2, Advanced Research Computing Facility
OS Linux (Ubuntu & CentOS), macOS, Windows

Certified Courses

OPENLB Developed custom lattice Boltzmann PDE solvers

Referees

Available upon request