LLOYD FUNG

+44 7516285329 | lloyd.fung@imperial.ac.uk | Cambridge, UK| llfung.github.io

Employment (academic)

Imperial College Research Fellow, Aeronautics / I-X, Imperial College London **2024 -**

- Working with Prof. Luca Magri at Aeronautics
- Part of the 'AI in Science' program funded by Schmidt Sciences

Research Associate, Alan Turing Institute **2024 - 2024**

- Worked on the project 'Adjoint-accelerated Programmable Inference for Large PDEs' with Prof. Matthew Juniper and Prof. Hong Ge from Cambridge Engineering

Research Fellow, Peterhouse | DAMTP**,** U of Cambridge **2021 – 2024**

- Attached to the Mathematical Biology group at DAMTP, CMS
- Worked closely with Prof. Raymond Goldstein and Prof. Eric Lauga

Teaching Experience

Lecture

- Fluid Dynamics of Living Systems (Guest Lecturer, MMath, Mathematics, Cambridge) **Fall 2024**
  - Derivations of the Oldroyd-B model for visco-elastic fluids
- *Planned: Aerodynamics 3rd Year (MEng, Aeronautics, ICL)* **Fall 2025**
  - Lifting Line Theory, Turbulent Boundary Layer Theory

Research Project Supervisions (Lead supervision)

- *Ongoing:* MSc Thesis Project in Statistics (MSc, Mathematics, ICL) **2025**
  - Project on implementing EIV least square method in SINDy
- *Ongoing:* Major Individual Research Project (MSc, Aeronautics, ICL) **2025**
  - Project on benchmarking PINN against FEM in assimilating data from physical systems
- *Planned: UROP Project, funded via IX Moonshot Seed Fund (UG, Aeronautics / IX, ICL)* **2025**
  - Project that builds a Cart-Pole Pendulum system as a testbed for reinforcement learning
- Summer Research in Maths (UG summer research, Mathematics, Cambridge) **2022-2024**
  - 3 students (2 Males, 1 Female)
  - Projects on modelling sinking fibre suspensions, applying spherical harmonics to model orientational distributions of active particles and hydrodynamic interactions in colloids

Research Project Supervisions (co-supervision)

- *Planned: UROP Project (UG, Aeronautics, ICL)* **2025**
  - Project on Information flow in chaotic ODEs
- Final Year Individual Research Project (Meng, Aeronautics, ICL) **2019, 2021**
  - 2 students (1 Male, 1 Female)
  - Projects on modelling gyrotactic/phototactic micro-swimmers.
- Major Individual Research Project (MSc, Aeronautics, ICL) **2018-2020**
  - 4 students (3 Males, 1 Female)
  - Projects on macroscopic modelling gyrotactic micro-swimmer suspensions.

Tutorial / Supervision (small class, 1-5 students)

- Fluid IB (BA, Mathematics, Cambridge) **2022-2024**

Tutorial (big class, 100+ students)

- Hydrodynamic Stability (MSc, Aeronautics, ICL) **2018-2020**
- Fundamentals of Fluid Mechanics (MSc, Aeronautics, ICL) **Fall 2018**
- Mathematics 2nd Year (MEng, Aeronautics, ICL) **2017-2020**

Marking

- High-Performance Computing Exam (MEng / MSc, Aeronautics, ICL) **2020**

Admission

- Admission interview for UG Aeronautical Engineering at ICL **Fall 2024**
- Admission interview for UG Aeronautical Engineering at Cambridge (Peterhouse) **Fall 2022**

Education & Qualification

PhD Aeronautics Research, Imperial College London **2021 – 2024**

- Fully funded by the President's PhD Scholarship of Imperial College London

MEng Aeronautical Engineering, Imperial College London, 1st **2017 – 2021**

- Honoured in the Dean's List (top 10%) of the Faculty of Engineering for all academic years and as an Aeronautics Scholar.
- Funded by BeiShanTang Scholarship and Centaline Scholarship

Associate Fellow of the Higher Education Academy (AFHEA) **since Oct 2020**

Publications

9 referred publications (all first author): 4 JFM, 1 PRL, 1 PRSA, 1 PTRSA.

L. Fung, H. O. Caldag & M. A. Bees, *Foundation and challenges in modelling Dilute Active Suspensions*, submitted to Phil. Trans. Roy. Soc. A. [sub. Judice]

L. Fung, U. Fasel & M. Juniper, 2025, *Rapid Bayesian identification of sparse nonlinear dynamics from scarce and noisy data*, Proc. Roy. Soc. A 481(2307), 20240200.

L. Fung, A. Konkol, T. Ishikawa, B. Larson, T. Brunet & R. Goldstein, 2023, *Swimming, Feeding and Inversion of Multicellular Choanoflagellate Sheets*, Phys. Rev. Lett. 131, 168401.

L. Fung, 2023, *Analogy between Streamers in Sinking Spheroids, Gyrotactic Plumes and Chemotactic Collapse*, J. Fluid Mech. 961, A12.

L. Fung, R. N. Bearon & Y. Hwang, 2022, *A local approximation model for macroscale transport of biased active Brownian particles in a flowing suspension,* J. Fluid Mech. 935, A24.

L. Fung & Y. Hwang, 2022, *Instability of tilted shear flow in a strongly stratified and viscous medium*, IUTAM Laminar-Turbulent Transition, Sherwin S., Schmid P., Wu X. (eds), 379-389.

L. Fung, R. N. Bearon & Y. Hwang, 2020, *Bifurcation and stability of downflowing gyrotactic micro-organism suspensions in a vertical pipe*, J. Fluid Mech. 902, A26.

L. Fung & Y. Hwang, 2020, *A sequence of transcritical bifurcations in a suspension of gyrotactic micro-swimmers in vertical pipe*, J. Fluid Mech. 902, R2.

L. Fung & Y. Hwang, 2020, *Linear instability of tilted parallel shear flow in a strongly stratified and viscous medium*, JMST Advances 2, 37-51.

Invited Talks in Conference, Seminars or Workshops

I regularly give talks in APS DFD, BAMC, UK Fluid Network and other conferences.
Below highlights only the occasion when I was invited to speak.

May 2025 Mini-symposium at **SIAM DS25** (Denver)*, Fast Bayesian Identification of Nonlinear Dynamics in Scarce and Noisy Data*.

Oct 2024 **BioActive Fluid ECR Seminar**, *Continuum Modelling of Active Suspensions*

Aug 2024 **EPSRC National Fellowships in Fluid Dynamics Summer Programme (Leeds),** *Bayesian Data assimilation and Model Selection*

Oct 2023 **U of York Mathematical Biology Seminar**, *From sinking spheroids to chemotactic collapse*

Nov 2022 **Imperial Maths Fluid Dynamics Seminar**, *From sinking spheroids to chemotactic collapse*

July 2022 **DAMTP BioLunch (Cambridge)**, *Mechanics and Fluid Dynamics of Shape-shifting Multicellular Choanoflagellates*

May 2022 **Biofilm and BioActive Fluids ECR Workshop (Liverpool)**, *Modelling the Collective Behaviour of Gyrotactic Micro-Swimmers*

Jan 2022 **DAMTP Fluid Mechanics Seminar (Cambridge)**, *Singular plume in a dilute gyrotactic swimmer suspension*

Nov 2019 **U of Birmingham Applied Mathematics Seminar**, *Continuum Model for Collective Behaviour of gyrotactic micro-swimmers*.

June 2019 **U of Liverpool Applied Mathematics Seminar** (ad-hoc), *Continuum model of a suspension of gyrotactic micro-swimmers in a downflowing pipe*.

Jan 2019 **DAMTP BioLunch (Cambridge)**, *Continuum Model for Collective Behaviour of Micro-Swimmers*

Funding and Grant Applications / Scholarships / Fellowships

I have a long track record of writing successful proposals and/or fellowship applications.
All applications I was involved in are either successful or has reached the finalist stage.

Awaiting results

- Schmidt Sciences Community Initiative Fund (£21,934)
    - For the Model Discovery in Time-Series Data workshop
- LMS Travel Grant (£500)
    - For travelling to the SIAM DS25 conference

Successful

- IX Moonshot Seed Fund (£7,500) **2025**
- Imperial College Research Fellowship (est. £250,000 for 4 years) **2024-2028**
    - Including ¼ contribution from Schmidt Sciences for the AI in Science component
- IMA QJMAM Fund for Applied Mathematics (£651.02) **2022**
    - For attending the Microscale Ocean Bio-physics 6.0 conference in Majorca, Spain
- Peterhouse Research Fellowship, Cambridge (est. £150,000 for 3 years) **2021-2024**

Finalist

- EPSRC National Fellowship of Fluid Dynamics **2022**
  - Peer Review Score: 5/6,5/6,5/6
  - On using symbolic ML to model micro-swimmers and their collective behaviour
- EPSRC Grant (co-authored) **2021**
  - Peer Review Score: 6/6,6/6,5/6
  - Co-authored a grant on the continuum modelling of active suspension based on my PhD

Summer schools, workshops and conferences I've organised

Lead Organiser

- *Planned: Model Discovery in Time-Series Data, London.* **2025**
- Mini-Symposium at the British Applied Math. Colloquium, Newcastle. **2024**

Co-Organiser

- T. J. Pedley 80th Birthday Conference, Cambridge. **2022**
- EuroMech Colloquia 598: Coherent structures in wall-bounded turbulence, London. **2018**

Contributions to the Community

Organising Special Interest Group

- Co-op member of the BioActive Fluids Special Interest Group Committee
  - Represents the ECR section of the SIG
  - Part of a community-wide effort to publish a themed issue in the Philosophical Transaction of Royal Society A

Organising Seminar Series

- Organiser of the DAMTP Biolunch Seminar Series
- Organiser of the BioActive Fluids ECR Seminar Series

Refereeing for Grant Applications and Academic Journals

- Regularly review for the Journal of Fluid Mechanics, Physical Review Fluids and Water Resource Research, with 11 reviews since 2022.
- Reviewer for the National Biofilms Innovation Centre 5th Proof of Concept funding call.

Professional membership & Affiliation

- Associate member of the Institute of Mathematics and its Application
- Member of the American Physics Society
- Member of the Society for Industrial and Applied Mathematics
- Active Member of the BioActive Fluids Special Interest Group and the UK Fluids Network
- Associate Fellow of the Higher Education Academy (AFHEA)

Teaching Interest

Computational Methods for Science and Numerical Methods

- (Introduction to / Advanced) Computation
  - in MATLAB, Python or JULIA
- Numerical Analysis
- Numerical Ordinary/Partial Differential Equations

    - ODE solvers like Runge-Kutta and adaptive time-stepping
    - Finite Difference for PDEs
    - Stability and convergence
- Finite Elements method
- Boundary Elements method
- High-Performance Computing
    - in C or FORTRAN

Machine Learning

- Computational Linear Algebra
- Linear and nonlinear optimisation
    - Regression
    - Backpropagation
    - Newton's method and BFGS
    - Adam, Stochastic Gradient Descent and other gradient methods
- Neural Networks
    - Activation Functions and Single Layer Perceptron
    - (Deep) Feed-forward Neural Networks
    - Backpropagation
    - Convolutional Neural Networks
    - Recurrent Neural Networks
    - Autoencoder
- Application of Neural Networks
    - In PyTorch, JAX or Lux.jl
- Statistics and Machine Learning in Time-Series Data
    - Long Short-term Memory
    - Echo State Networks
- Scientific Machine Learning and AI for Sciences
    - Symbolic Regression / Symbolic model discovery
    - Neural ODEs and Universal Differential Equations
- Inference, information theory and digital twinning
    - Inverse Problems
    - Bayesian Statistics
    - Information theory
    - Kalman Filter

Fundamental Mathematics

- Calculus and Applications
- Linear Algebra

Fluid Mechanics

- Fluid Dynamics
- Hydrodynamic Stability and Bifurcation theory
- Turbulence Modelling

Biophysics

- Mathematical Biology
- Biological Physics and Fluid Dynamics