Dr Yidan Xue

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Education

DPhil Engineering Science, *University of Oxford* Jan 2023
Thesis: Modelling oxygen transport and tissue damage in the human brain.
Supervisor: Professor Stephen Payne. Submission: Aug 2022/Viva: Oct 2022.

BEng (Hons) Mechanical Engineering, *The University of Edinburgh* Jul 2019
Dissertation: Computational simulation and validation of flows in branching blood vessels.
Supervisors: Drs Dong-hyuk Shin and Rudolf Hellmuth. First Class Honours.
I completed the first two years of my undergraduate study (2015–2017) at Xiamen University, China.

Employment

Research Associate, *School of Health Sciences, The University of Manchester* Aug 2024 – Present
Research Associate, *School of Mathematics, Cardiff University* Jan 2024 – Jul 2024
EPSRC PDRA, *Mathematical Institute, University of Oxford* Oct 2022 – Dec 2023
Retained Lecturer in Mathematics, *Jesus College, University of Oxford* Jan 2023 – Sep 2023
Research Intern, *Institute of Mechanics, Chinese Academy of Sciences* Jul 2018 – Sep 2018
Research Intern, *School of Engineering, The University of Edinburgh* May 2018 – Jul 2018

Publications

Journal Articles:

1. Payne, S. J., **Xue, Y.**, Kuo, J.-F. and El-Bouri, W. K. 2025. Transit time mean and variance are markers of vascular network structure, wall shear stress distribution and oxygen extraction fraction. *Biomechanics and Modeling in Mechanobiology*, **24**, pp.1155–1167.
2. **Xue, Y.** 2025. Computing Stokes flows in periodic channels via rational approximation. *Proceedings of the Royal Society A*, **481**, 20240676.
3. **Xue, Y.**, Payne, S. J. and Waters, S. L. 2025. Stokes flows in a two-dimensional bifurcation. *Royal Society Open Science*, **12**, 241392.
4. **Xue, Y.**, Jabi, W., Woolley, T. E. and Kaouri, K. 2024. Modelling indoor airborne transmission combining architectural design and people movement using the VIRIS simulator and web app. *Scientific Reports*, **14**, 28220.
5. **Xue, Y.**, Waters, S. L. and Trefethen, L. N. 2024. Computation of two-dimensional Stokes flows via lightning and AAA rational approximation. *SIAM Journal on Scientific Computing*. **46**(2), pp.A1214–A1234. **[ESI Highly Cited Paper, SIAM Reproducibility Badge]**
6. **Xue, Y.**‡, Georgakopoulou, T.‡, van der Wijk, A.-E., Józsa, T. I., van Bavel, E.‡and Payne, S. J.‡ 2022. Quantification of hypoxic regions distant from occlusions in cerebral penetrating arteriole trees. *PLOS Computational Biology*. **18**(8), e1010166. ‡: co-first/co-senior authors.
7. Miller, C., Padmos, R. M., van der Kolk, M., Józsa T. I., Samuels, N., **Xue, Y.**, Payne, S. J. and Hoekstra, A. G. 2021. In silico trials for treatment of acute ischemic stroke: design and implementation. *Computers in Biology and Medicine*. **137**, 104802.

8. **Xue, Y.**, El-Bouri, W. K., Józsa, T. I. and Payne, S. J. 2021. Modelling the effects of cerebral microthrombi on tissue oxygenation and cell death. *Journal of Biomechanics*. **127**, 110705. **[Special Issue on Thrombus Mechanics]**
9. **Xue, Y.**, Hellmuth, R. and Shin, D. 2020. Formation of vortices in idealised branching vessels: a CFD benchmark study. *Cardiovascular Engineering and Technology*. **11**(5), pp.544–559. **[Cover Image]**

Submitted Articles/Preprints:

10. Padmos, R. M., Józsa, T. I., **Xue, Y.**, Payne, S. J. and Hoekstra, A. G. 2023. A Multi-Scale Model for Perfusion-Based Infarct Estimation in Acute Ischaemic Stroke Patients. submitted.
11. Jabi, W., **Xue, Y.**, Woolley, T. E. and Kaouri, K. 2024. 3D Topological Modeling and Multi-Agent Movement Simulation for Viral Infection Risk Analysis, submitted. Also available on arXiv: https://doi.org/10.48550/arXiv.2408.16417
12. Lin, F., Zakeri, A., **Xue, Y.**, MacRaild, M., Dou, H., Zhou, Z., Zou, Z., Sarrami-Foroushani, A., Duan, J. and Frangi, A. F. 2025. From Pixels to Polygons: A Survey of Deep Learning Approaches for Medical Image-to-Mesh Reconstruction. submitted. Also available on arXiv: https://doi.org/10.48550/arXiv.2505.03599
13. Mao, Y., Liu, Y., Zhai, M., Jin, P., Li, W., Dong, X., Chen, F., Wang, X., Wang, Y., Zhang, G., Li, H., Yang, Y., Zhang, H., Liu, J., Guo, Y., Wu, Y., **Xue, Y.**, Zhang, J., Frangi, A., Yang, J. 2025. Precision TAVR Quantification—AI-accelerated TAVR Planning Reduces Assessment Time by 80% in Bicuspid Aortic Stenosis, submitted.
14. Miller, C., Padmos, R., Konduri, P., Józsa, T. I., **Xue, Y.**, Arrarte Terreros, N., van der Kolk, M., Payne, S. J., Marquering, H., Majoie, C., Hoekstra, A. 2025. In silico trials of acute ischemic stroke: predicting the total potential for improvement to patient functional outcomes, submitted. Also available on arXiv: https://doi.org/10.48550/arXiv.2511.02088
15. Zhou, Z., Zakeri, A., Dou, H., **Xue, Y.**, MacRaild, M., Huang, J., Lin, F., Sarrami-Foroushani, A., Duan, J. and Frangi, A. F. 2025. Synthetic Anatomy: Deep Learning Models for Virtual Population Generation—A Review, submitted. Also available on medRxiv: https://doi.org/10.1101/2025.10.28.25338782

DPhil Thesis:

16. **Xue, Y.** 2022. *Modelling oxygen transport and tissue damage in the human brain*. DPhil thesis. University of Oxford.

Invited Talks

1. *Towards StressMAP: A TAVI deployment simulation workflow for stress-based surrogate modelling of pacemaker dependency*, The 10th Biennial Heart Valve Biology & Tissue Engineering Meeting, The Royal Society, London, UK, Sep 2025
2. *Mechanistic simulations in real-world systems for medical device innovation*, Simulation Workshop (5-min lightning talk), AI for Research: How Can AI Disrupt the Research Process, The University of Manchester, UK, Jun 2025
3. *Computation of 2D Stokes flows via lightning and AAA rational approximation*, Physical and Applied Mathematics Seminar, The University of Manchester, UK, Nov 2024
4. *Modelling physiological flows and transport at low Reynolds numbers*, CIMIM Seminar (inaugural talk), The University of Manchester, UK, Oct 2024
5. *A state-of-the-art epidemic simulator and web app for viral transmission in indoor spaces*, SIAM Conference on the Life Sciences, Portland, Oregon, US, Jun 2024

6. *Computation of two-dimensional Stokes flows via lightning and AAA rational approximation*, Computational and Applied Math Seminar, Peking University, China, May 2024
7. *Computation of physiological flows and transport at low Reynolds numbers*, Applied and Computational Mathematics Seminar, Cardiff University, UK, Feb 2024
8. *Computation of 2D Stokes flows via lightning and AAA rational approximation*, Numerical Analysis Group Internal Seminar, University of Oxford, UK, May 2023
9. *Modelling oxygen transport in the human cerebral microvasculature*, British Applied Mathematics Colloquium, Bristol, UK, Apr 2023

Selected Contributed Talks

10. *An automatic workflow for in-silico clinical trials of TAVI devices: From images to deployment and stress analysis*, 2025 MDIC Symposium on Computational Modeling & Simulation, Hyattsville, Maryland, US, Nov 2025
11. *Computation of 2D Stokes flows via lightning and AAA rational approximation*, Numerical Analysis in the 21st Century in honour of Nick Trefethen's retirement from Oxford, Oxford, UK, Aug 2023
12. *Modelling human cerebral tissue damage caused by acute ischaemic stroke*, 9th World Congress of Biomechanics (WCB), Taipei (online), Jul 2022

Teaching

University of Oxford, Mathematical Institute/Department of Engineering Science
One contact hour requires at least two hours of preparation and marking at Oxford.

Tutor, A1 Differential Equations 1, Oriel College, class size: 1–2, contact hours: 8	Fall 2023
Tutor, A7 Numerical Analysis, Jesus College, class size: 1–2, contact hours: 15	Spring 2023
Tutor, C5.6 Applied Complex Variables, MI, class size: 10–12, contact hours: 16	Spring 2023
Lead Tutor, B17 Biomechanics, EngSci, class size: 3–4, contact hours: 13	Spring 2022

Mentoring

Benjamin Nicholls-Mindlin, MSc MMSC project, **University of Oxford** 2023
Rational Stokes Methods for Tissue Engineering Applications, co-supervised with Professors Sarah Waters and Helen Byrne. The thesis received the second highest distinction.

Funding

(2024) **UK RS&IN Implementation Phase: Human Health (CERSIs)**, *UK CEiRSI - The UK's Centre of Excellence on In-silico Regulatory Science and Innovation - Pilot Phase*, University of Manchester Team Member & Technical Committee Member & Academic Rapporteur of Pilot 4. PI: Professor Alejandro Frangi.
(2022) **EPSRC Postdoctoral Research Associate**, Mathematical Institute, University of Oxford. *One-year postdoctoral position awarded to up to 5 Oxford DPhil graduates*.
(2018) **Summer Research Scholarship**, The University of Edinburgh.

Awards

(2019) **IMechE Best Student Prize**, The University of Edinburgh.
(2018) **3rd Year Class Medal for Mechanical Engineering**, The University of Edinburgh.

(2018) **Edinburgh Award**, The University of Edinburgh.
(2017/2018) **2+2 Student Scholarships**, The University of Edinburgh.
(2016) **1st Prize Scholarship for Academic Excellence**, Xiamen University.

Media

SIAM News (June 13, 2024) Epidemic Simulator and Web App Models Viral Transmission in Indoor Spaces.

Memberships

BSI Young Professionals Network, *Member* 2025 – Present
Society for Industrial and Applied Mathematics (SIAM), *Member* 2024 – Present
VPH Institute, *Member* 2020 – 2021, 2024 – Present
European Society of Biomechanics, *Member* 2023 – 2024

Service and Outreach

Outreach/Public Engagement:
Pint of Science (Manchester), *Organiser (with 4 others)* 2024 – 2025
'Tech Me Out' events: '*From Virtual Patients to Real Solutions: Medical Innovation on Tap*', '*Learning to Decommission: Robots in the Nuclear World*' and '*The Enzyme Engineers: Crafting Life's Tiny Machines*', 12 speakers, more than 160 attendees.
The Welsh Government, *Policy Modelling Group, Member* 2024 – 2025

Institutional Service:
The University of Manchester:
Christabel Pankhurst Institute, *Fire Marshal* 2025 – Present
UK CEiRSI, Pilot 4 on TAVI, *Academic Rapporteur* 2025 – Present
Recruitment Interview Panel, *Member* 2024

Cardiff University:
Vendor Selection Panel, *Member* 2024

University of Oxford:
Undergraduate Admissions Panel (Maths & Stats at Oriel College), *Member* 2023
Disability Advisory Service, *Non-Medical Support Worker* 2019 – 2020

Conference Organisation and Leadership

WCCM-ECCOMAS 2026, minisymposium, *Organiser (with Dongwei Ye and Elena Zappon)*, Munich, Germany, Jul 2026 (incoming)
UK CEiRSI In Silico Regulatory Airlock Panel Session, In-Silico Trials of TAVI Devices: Blood Flow Models Predicting Aortic Stresses and Valve Leakage, *Co-Lead*, Manchester (online), UK, Nov 2025 (incoming)
The 6th China-UK Forum of Young Scholars in Manchester "AI Applications Across Disciplines", *Invited Guest and Panel Judge*, Manchester (online), UK, Jun 2025
Virtual Imaging Trials in Medicine 2025, Innovative Computational Techniques in Medical Imaging, *Session Chair*, Manchester, UK, Jun 2025
Numerical Analysis in the 21st Century Conference, in honour of Nick Trefethen's retirement from Oxford, Numerical Methods for Differential Equations, *Session Chair*, Oxford, UK, Aug 2023

Journal Article Reviewer

Biotechnology and Bioengineering, Building Simulation, Cardiovascular Engineering and Technology, Computational Mechanics, IMA Journal of Numerical Analysis, Journal of Fluid Mechanics, Journal of Open Source Software, PLOS Computational Biology.

Referees

Professor Alejandro Frangi, School of Health Sciences/Department of Computer Science, The University of Manchester, a.frangi@manchester.ac.uk
Professor Stephen Payne, Institute of Applied Mechanics, National Taiwan University, stephenpayne@ntu.edu.tw
Professor Nick Trefethen, School of Engineering and Applied Sciences, Harvard University, trefethen@seas.harvard.edu
Professor Sarah Waters, Mathematical Institute, University of Oxford, waters@maths.ox.ac.uk