# **Application**



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# Ideas for Advocacy for the User Community

I am passionate about expanding accessibility to APS resources for PhD students, undergraduates, and early-career researchers. To support this, I would advocate for more training workshops and mentorship programs focused on proposal writing, beamtime applications, and experiment design, helping new users confidently engage with the APS. Additionally, I would promote outreach initiatives to encourage participation from a more diverse range of institutions, including those with limited synchrotron experience, fostering a broader and more inclusive user community. This includes developing essential software infrastructure to enable users to process their datasets remotely.

I have experience in ESRF and Diamond Light Source, and I am eager to leverage this knowledge to enhance the APS user experience. To further support users, I propose establishing regular feedback channels—such as surveys and open forums—to ensure APS management remains responsive to evolving needs. I would also encourage practical challenges or proposal-writing competitions, giving early-career researchers opportunities to practice and refine their skills in a supportive environment. By promoting knowledge-sharing platforms and advocating for more user-led training opportunities, I aim to strengthen the APS community and empower its next generation of researchers.

### Interests

- Imaging techniques for material science and biomedical research, including synchrotron X-ray imaging, tomography, and diffraction and radiography
- Both *in situ* and *ex situ* experiments to study materials for various applications (electronics and aerospace), biological tissue, and manufacturing processes
- Enhancing beamline capabilities to support advanced manufacturing and promoting more interdisciplinary collaboration
- Advocating user accessibility to cutting edge imaging resources and fostering communication between APS users and management
- Data analysis, image reconstruction, and deep learning techniques for processing large-scale imaging datasets
- Mentoring and teaching skills, including guiding students, leading tutorials, and supervising projects
- Promoting training opportunities in proposal writing, experimental design and beamtime applications to assist new users to navigate the APS process

# **Current Position**

2025- Present: Postdoctoral Appointee, Argonne National Laboratory, Illinois

- Develop and execute advanced material characterisation experiments at the Advanced Photon Source
- Utilise characterisation techniques such as high energy diffraction, tomography, radiography and small angle scattering
- Collaborate with internal and external researchers to design, implement, and analyse synchrotron-based investigations

# **Education and Employment History**

### Education

#### Core education

# 2019-2024: Fully funded PhD Studentship by the Department of Mechanical Engineering (Completed), University College London, UK

Completed Thesis: Multi-scale additive manufactured embedded sensors for self-cognitive metal parts Supervisors: Professor Peter.D Lee and Professor Manish. K Tiwari

#### 2018-2019: Career break: Took a planned educational break to manage personal bereavement

Provided tutoring in Mathematics and Physics, and assisted A-level student with university personal statements, improving their academic performance and application success

# 2015-2018: Bachelor of Engineering with Honours in Mechanical Engineering (BEng), University of Exeter (First Class), UK

Completed Thesis: Designing, implementing, and simulating an aircraft controller using Monte Carlos simulations (diagonally dominant backstepping)

Supervisor: Professor Prathyush P Menon

#### Other education

### Jun 2023: Team Coders Project, University College London

- Analysed and studied medical imaging for extracting quantitively measures about the disease process in Alzheimer's
- Performed standard data cleaning and visualisation techniques
- Demonstrated disease progression modelling with event-based models

### Jul 2022: Medical Imaging Summer School, University College London

- Imaged the brain using diffusion magnetic resonance imaging
- Deployed deep learning for image segmentation to map the trajectory of white matter bundles in the brain
- Presented summer project to an audience of 75 researchers

#### Jul 2022: Nanobiotechnology, University of Cambridge

- Designed a functional device using bio nanoelement
- Presented how nanobiotechnology is used to address current challenges in the field of medicine and biosensing
- Reported alternative analytical strategies based on cost analysis and communicated strategies to a range of stakeholders

#### Dec 2021: Henry Royce Student Sandpit, Manchester University

- Produced a multidisciplinary research proposal in a team of 6 to monitor and restore Mary Rose's ship
- Proposed research and funding proposal to a panel of various stakeholders

#### **Employment History**

#### 2024- 2024: Research Associate, Heriot Watt University and Leonardo, Edinburgh

The Prosperity Partnership Project "Smart Products Made Smarter" is a large multidisciplinary project involving Heriot-Watt University, University of Edinburgh and Leonardo. Key project goals include:

- Incorporated diagnostic and monitoring tools to optimise the printing and bonding process to efficiently manufacture complex optical systems
- Printed additive manufactured components for optics (laser polishing, ultra-short, pulsed laser welding
- Investigated parameter control and a processing window for novel lase chassis design
- Computationally modelled and optimised the manufacturing process for a laser chassis

#### 2017- 2023: **Private Tutor**

- Taught students Maths A level which includes core, statistics, mechanics, and further mathematics
- Evaluated student's style of learning and provided appropriate techniques for students
- Created prep tests which monitored student's progress to indicate difficult topics

#### Jul 2016- Sep 2020: The Cooperative (Food), Customer Assistant, London

- Provided customer service and managed designated stock replenishment tasks
- Enhanced operational continuity to help meet the store's needs during busy periods by offering support to different departments
- Decommissioned old stores and opened new stores, cashed up the tills, took stock counts
- Dealt with insurance claims by taking stock counts and liaising with insurance companies

#### Jul 2017- Aug 2017: Malthurst, Limited and Accounting, Accounting and Marketing Intern, Epping

- Produced data on Excel of EBITDA which was used to create software packages for potential partnerships
- Authored financial due diligence reports to advise private equity clients
- Rotated on the risk advisory desk. Created mathematical models to optimise hedging options for clients
- Liaised with target management to analyse and understand financials at a granular level
- Managed a virtual trading book and regularly delivered stock pitches to traders

#### **Honours and Activates**

#### Honours

Awards and Prizes

Nov 2023: MAPP Scientific Image Competition Commended Prize, Sheffield, United Kingdom

Awarded by MAPP Scientific Image Competition, supported University of Sheffield, for "Hybrid printing" (Award: £30)

June 2023: UCL Poster Competition Honorary Poster Presenter, London, United Kingdom

Awarded by UCL Doctoral School, supported by University College London, for "Surface metrology analysis"

Aug 2022: Early Careers Travel Bursary, London, United Kingdom

Awarded by ImagingBioPro Network for attendance at BioMedEng Conference supported by UCL Institute of Health Care Engineering (Award: £300)

Jul 2022: Medical Imaging Summer School Best Project Presentation, London, United Kingdom

Awarded by UCL Institute of Health Care Engineering Medical Imaging Summer School, supported by University College London, for "Tractography: modelling connections in the human brain, and improvements offered by deep learning" (Award: £100)

June 2022: UCL Cross-Disciplinary Image Competition, London, United Kingdom

Awarded by UCL Doctoral School, supported by University College London, for "Optical imaging of oxidised additive manufactured coated titanium" (Award: £200)

Dec 2021: Henry Royce Student Sandpit Best Project, Manchester, United Kingdom

Awarded by Henry Royce Institute, supported by the Engineering and Physical Science Research Council, for "Preservation of the Mary Rose ship using chitin nanofibers" (Award: £100)

Sep 2021: UCL Figure Competition, London, United Kingdom

Awarded by UCL Doctoral School, supported by University College London, for "Surface roughness of additive manufactured Ti-6AI-4V" (Award: £75)

Aug 2021: Bionanotechnology Summer School Best Project, Cambridge Advance Online, United Kingdom Awarded by Cambridge Advance, supported by Cambridge University, for "Nanosensor for monitoring wear and failure for biomedical orthopaedic implants"

Publication and Reviews

#### Published

[1] Soundarapandivan G, Leung CLA, Johnston C, Chen Bo, Khan RHU, **Bhatt A**, Atwood R, Lee PD, Fitzpatrick ME (2023): *In situ* monitoring the effects of Ti-6AI-4V powder oxidation during laser powder bed fusion additive manufacturing. Volume 190, 104049, *Journal: International Journal of Machine Tools and Manufacture,* https://doi.org/10.1016/j.ijmachtools.2023.104049 (Impact Factor: 14)

[2] **Bhatt A**, Huang Y, Leung CLA, Soundarapandivan G, Marussi S, Shah S, Atwood R, Fitzpatrick ME, Tiwari MK, Lee PD (2023): Characterisation of surface roughness and its amplification during multilayer laser powder bed fusion additive manufacturing. Volume 77, 103809, *Journal: Additive Manufacturing*, https://doi.org/10.1016/j.addma.2023.103809 (Impact Factor: 11)

### Submitted

[1] **Bhatt A**, Chen W, Wu Z, Hocine S, Brennan P, Assender H, Snell R, Todd I, Lee PD, Tiwari MK (2023): Embedding multilayer strain sensors laser powder bed fusion for self-cognitive titanium alloy parts. *Submitted to Materials Today* (Impact Factor: 24.2) Manuscript In-Preparation

[1] **Bhatt A**, Lee PD, Tiwari MK (2023): Additive manufactured self-cognitive metal parts. *In preparation for submission* Journal Reviewer

[1] Additive manufacturing (Impact Factor: 11). *Paper review (2023)*[2] Additive manufacturing (Impact Factor: 11). *Paper review (2024)* 

# Activities

Outreach and Public Engagement Events

Nov 2022: Volunteer at MechEng Night, University College London

- Designed and 3D printed a CT Covid-19 and healthy lung model to demonstrate hierarchical phase-contrast tomography
- Presented 3D printed lung model to an audience of over 1000 people

### 2019-2022: MAPP QRM Presenter, Imperial College London, and Sheffield University

- Demonstrated optical and X-ray imaging techniques for quantifying surface roughness and waviness
- Proposed and developed a novel surface topology matrix that accurately describes surface features

# 2015- 2019: Robogals Training Manager, SEMA (President), Exeter University

- Developed new workshop material suitable for primary school children to teach students how to engineer Mindstorm robots (both programming and building)
- Educated children on how to integrate colour and sound sensors into their design and build battle bots
- Ensured all volunteers received extensive training in order to understand how the robots work and were equipped with the necessary
  information to supervise young girls during school workshops
- Encouraged and motivated students to implement, design and program the robots using the skills learnt during the workshops

# Supervision and Mentoring

# 2022-Present: Jingwen Liu "Efficiency of hybrid biomaterials for cartilage replacement in human joints" Responsibilities included:

- Provided training for compression testing methods, differential scanning calorimetry and thermogravimetric analysis
- Aided in PhD experimental and project planning for final thesis
- Demonstrated reconstruction techniques and stress-strain modelling for micro-CT imaging

# 2022-Present: Wenqing Chen "High resolution 3D printing for haptics and antibacterial scaffolds"

Responsibilities included:

- Organised training for high-resolution nozzle manufacturing, direct-write printing and optical image analysis
- Conducted analysis for high-resolution optimisation of sensor design using g-code, MATLAB, and python
- Supported PhD transfer report project and experimental planning

# 2017- 2018: Peer Mentor, Exeter University

Acted as a one-to-one peer mentor for 20 students within the College of Engineering Mathematics and Physical Sciences (CEMPS) as part of the peer-assisted learning (PAL) initiative. Responsibilities included:

- Arranged and held meetings with a mentee to help with the transition into university life, both socially and academically
- Explained course elements to mentee, but also provided feedback to the peer mentoring scheme organisers to ensure an improved experience for future mentees
- Improved planning and organisational skills through the creation of session plans, ensuring that sufficient core content is covered during one-to-one meetings

# 2022- 2023: In2scienceUK

Mentored a group of 6 high school students from disadvantaged backgrounds to give them insights into STEM careers, and research and boost their skills and confidence. Responsibilities included:

- Planned feedback sessions for students to expand their professional development through CV clinics, interview panels and industrial placements
- Taught students how to format and produce a design brief, design specification, and CAD drawings
- Hosted student engineering challenge session, encouraging and supporting students through problems

# Teaching experiences

# 2024- 2024: Post Graduate Teaching Assistant, Heriot Watt University

Lead tutor for a third-year undergraduate programming module B29XM. Responsibilities include:

- Taught the fundamentals of MATLAB to undergraduate students
- Demonstrated tutorials to implement the Ising Model in MATLAB
- Conducted and designed Monte Carlos simulations for students to implement in MATLAB

#### 2020- 2022: Python Instructor, Code First Girls, University College London, Bank of America

Code First Girls is a Not-for-Profit Social Enterprise that trains women in IT skills and helps companies develop more female-friendly recruitment policies. Instructing an 8-week-long course, students will deploy be able to build, deploy and maintain a database. Teaching students the following:

- Instructed an 8-week introduction to Python courses for 100+ students
- Helped students learn the fundamentals of programming through problem-solving in Python
- Assisted students in building and deploying web applications using high-level programming languages

#### 2020- 2021: SQL and Data Visualization Instructor, Bath University, Barclays

- SQL coding and database management techniques
- Data manipulation with SQL programming language
- Database design and data Visualisation

#### 2019- 2023: Post Graduate Teaching Assistant, University College London

Modules: Introduction to Thermodynamics and Fluid Mechanics (MECH0005), Mechanical Engineering and Fluid Mechanics (MECH0004), Mechanics of Solid and Structures (MECH0013). Responsibilities included:

- Prepared and delivered lecture tutorial style tutorials for 60 students
- Designed and demonstrated tutorials for 167 students
- Marked, prepared and peer-reviewed exam scripts for 119 students