ADITHYA PRADEEP

UNIVERSITY OF OXFORD, OX1 1TE

+447867090829 │ adithya.nair@stx.ox.ac.uk

EDUCATION

Doctor of Philosophy- Engineering Science (Topology and Soft Matter)
University of Oxford

Master of Science – Applied Physics and Applied Mathematics
Columbia University

PUBLICATIONS AND PATENTS

- Locking Metastable Topological Domains in Nematic Liquid Crystal Pi Cells. Advanced Functional Materials (2025): e12550. (Featured as Editor's Choice)
- Advanced Image-Integrated Smart Windows using Printed Electrochromic Polymer-Dispersed Liquid Crystal Droplets. Advanced Optical Materials (2025): e01586.
- Operating Temperature Regulation in Push-Pull Azobenzene-Doped Liquid Crystal Light-Driven Devices using UV Absorber. Dyes and Pigments (2025): 113145.
- Uniform Polycrystalline Si Films Obtained via the Fiber-laser-based Spot-Beam-Annealing Method. SID Symposium Digest of Technical Papers. Vol. 54. No. 1. (2023).
- Fiber-Laser Processing of Si and IGZO Films for Advanced AMOLED Displays on Gen 8 Substrates. SID Symposium Digest of Technical Papers. Vol. 53. No. 1. (2022).
- Composition design and nanoindentation studies on Mg-Ca-Zn metallic glass. Metallurgical and Materials Transactions A 53.4 (2022): 1419-1429.
- Fiber-laser crystallization of Si films for advanced displays via the spot-beam annealing method. Laser Applications in Microelectronic and Optoelectronic Manufacturing (LAMOM) XXVII. Vol. 11988. (2022).
- Cu-Zr-Ti-Al metallic glass: Thermodynamic prediction, synthesis, and biocorrosion studies. Physica B: Condensed Matter 609 (2021): 412918.
- Corrosion characteristics of zinc coated SS304 stainless steel. Materials Today: Proceedings 28 (2020): 1210-1215.
- An experimental case study on corrosion characterization of Cu46Zr40Ti8. 5Al5. 5 metallic glass. Journal of Non-Crystalline Solids 524 (2019): 119654
- Phase separated metallic glass for Flexible electrodes. Korean Patent Application.
- Systems and Methods for sequential lateral solidification.
- Control and Manipulation of Skyrmions in Liquid Crystals, Nature Materials (Under Review)
- From Millimeters to Microns: A Hybrid Strategy for Reconfigurable Liquid-Crystal Patterning, Small Methods (Under Review)

- Termination Control Between Collinear Segments in 3D Laser-written Photonic Circuits (Optica Conference Paper)
- Optimizing Coupling Efficiency Across Gaps in 3D Laser-Written Photonic Integrated Circuits, APL Photonics (Under Review)
- Laser Speckle Free Real-Time Sub-Rayleigh Imaging with Liquid Crystal Coherence Modulator, Light Science and Applications (Under Review)
- Chiral–Ionic Control for Simultaneous Color and Transparency in Reflective Displays, Advanced Materials (Under review)

PRESENTATIONS

- Controlling Topological Domains in Liquid Crystals through Structured Polymerization, International Liquid Crystal Conference (ILCC, 2024)
- Control and manipulation of topological solitons and detection (MRS, Fall 2025)
- Optics of Detection and Creation of Topological Skyrmions in Liquid Crystals, 21st Optics of Liquid Crystals, (OLC, 2025)
- Topological Defects in Liquid Crystals, British Liquid Crystal Conference, Oxford (BLCS 2024)
- Unravelling Topological Domains in Liquid Crystals, Materials Research Society (MRS, Fall 2023)
- Spatial Patterning of Polymerizable Liquid Crystals, British Liquid Crystal Conference, Birmingham (BLCS 2023)
- Topological Defects in Liquid Crystals, Photonics Day, Oxford (2023)
- Metallic Glass-Novel material for bio implant applications, 7th National Undergraduate Research Competition (UGSRC, 2019)
- Corrosion characterization of Zinc coated SS304 Stainless Steel, 2nd International Conference on Recent Advances in Materials & Manufacturing Technologies (IMMT, 2019)
- Impressions on the performance and the emission characteristics of Biodiesel blends, Advances in Engineering & IT (AEIT, 2019)
- AI Enabled Object Avoidance System for Smart Vehicles, International Conference on Modelling Simulation & Intelligent Computing (Mosicom, 2020)
- IR clear: Unexpected Object Avoidance System using AI- based Infrared Technology, 4th Research Colloquium on Advances in Engineering & IT (AEIT, 2019)

ACCOMPLISHMENTS

- Marie-Curie COFUND, University of Lille, France- for work on magnesium based nano composites for orthopedic applications.
- Finalist, The Rhodes Scholarship (2022).
- Winner- DeepTech Enterprise, QuantumDice- tackle real-world problems using combinatorial optimisation techniques.

- Best Paper Award, 4th Research Colloquium on "Advances in Engineering & IT" for "LR clear: Unexpected Object Avoidance System using AI enabled Infrared Technology."
- Winner (1st place), 2018 National Innovator competition for "Autonomous Flying Drone to Clear Fog and Smog" in Robotics and Electronics.
- National Finalist, 7th National Undergraduate Research Competition, "Metallic Glass, a novel material for Bio-implant applications" [ResearchID3964].
- Winner (1st place), National Mathematics Olympiad 2014.
- Winner (1st place), International Physics Olympiad 2016.
- Merit Scholarship Award, Highest GPA in batch (January 2018).
- Merit Scholarship Award, Highest GPA in batch (January 2019).
- Merit Scholarship Award, Highest GPA in batch (January 2020).
- Merit Scholarship Award, Examination, distinction in the qualifying exam (August 2016).
- Carnegie Mellon University, Dept. of Materials Science and Engineering, scholarship for academic excellence and potential (February 5, 2020).
- Merit Scholarship Award, Examination, excellent grades in the 12th board exams.
- National Finalist, 4th Research Colloquium on "Advances in Engineering & IT," "Impression on the performance and Emission Characteristics of Biodiesel Blends."
- Finalist, 3rd Research Competition at American University in the Emirates.
- Honorable mention, Seoul National University, successful completion of new alloy compounds for propeller protection (project by DSME South, Korea).
- Selected talk, 2nd International Conference on Recent Advances in Materials and Manufacturing Technologies (IMMT), 20–22 November 2019.
- Winner (1st place), Science Foundation Examination.
- Winner (1st place), The Green Olympiad, Ministry of Environment and Forests.
- Winner (state 1st), Dr. Homi Bhabha Bal Vaidnyanik Competition (Science Talent Search Examination).
- Gold Medal, University of New South Wales Macmillan Competition, Science.
- Gold Medal, University of New South Wales Macmillan Competition, English.
- Gold Medal, University of New South Wales Macmillan Competition, Mathematics.
- Winner (2nd place), 11th National Cyber Olympiad.
- Winner (3rd place),2nd National Cyber Olympiad.
- 4th place, BAJA SAE, design category.

WORK HISTORY

Science Undergraduate Laboratory Intern- Princeton   Jun 2020-Jul 2020

- Communicated with various researchers about observations in cosmic ray acceleration and got introduced to plasma astrophysics.
- Learned about the neutral beam heating to inject accelerated ions into the plasma.
- Represented taskforce for vertical displacement events of plasma on ITER walls by coupling method simulations.
- Developed future solutions to improve plasma withholding capacity under permanent magnets in ITER.
- Learned the basics of OMFIT to understand the numerical calculations of tokamak plasma discharges and other interpretive analysis.

Research Intern- Seoul National University   Aug 2019-Jan 2020

- Developed and did research on metallic glasses and high entropy alloys for suitable structural materials
- Accomplished the project of "Resettable Liquid Metal Harmonic Drive" for Samsung Electronics.
- Diagnosed and completed the project "Propeller thin film coating" for DSME, South Korea successfully.
- Created a Magnesium Calcium composite for bio-implant applications.
- Applied machine learning for designing composites and metallic glasses and figured out probable alloy compositions.
- Created titanium-based metallic glasses for high corrosion resistance in various body fluids.
- Planned, prepared, and participated in weekly meetings and seminars held at Seoul National University on the topic of propeller coating and modeling of the glasses.
- Presented in four seminars regarding the calculations of thermodynamic models of metallic glasses.

Student Intern- BITS Pilani   Aug 2016-Jun 2020

- Presented in four seminars regarding the calculations of thermodynamic models of metallic glasses.
- Conducted research for testing and analyzing the feasibility, design, operation, and performance of equipment, components, and systems on metals that undergo a huge amount of corrosion.
- Presented on different projects that require not just the knowledge of mechanical engineering but also fields like material science and aerospace.
- Used thermodynamic modeling for the calculation of various amorphous forming regions and predicted the compositions of the suitable glasses.
- Developed new methods and explained the mechanisms to clear the visibility in airport areas through the use of drones.
- Created a new infrared sensor for detection of objects in an autonomous vehicle system.

- Implemented the use of independent air suspensions for changing the ground clearance of autonomous vehicles.
- Created a biodiesel blend for greater performance and emission characteristics of I.C. engines.
- Designed and manufactured a BAJA car and competed in the SAE 2017 held in Indore, India.
- Led the team on the design of a high-speed car to be showcased in Hockenheim, Germany in 2021.
- Manufactured a Formula 6 car for the Student Formula 6 competition held at Hockenheim, Germany.

Teaching Assistant- University of Oxford   Nov 2022-present

- Led first-year lab where students built a microcontroller-based musical box from discrete modules
- Taught embedded C on the MCU: GPIO, timers, PWM tone generation, and interrupt-driven state machines
- Implemented LED and photodiode pair as a light-controlled input for mode selection and tempo control
- Guided design of a non-inverting op-amp audio path with correct mid-rail bias, gain setting, and bandwidth targets
- Supervised transistor driver stages for stable current delivery to speaker and LEDs
- Covered analog front-end basics: RC filters, coupling and decoupling capacitors, impedance matching
- Trained students on oscilloscope and function generator use to verify duty cycle, frequency, phase, and noise
- Ran systematic debugging checklists for wiring faults, grounding, probe loading, and saturation issues
- Ensured safe power-up procedures and taught current limiting with bench supplies and series resistors
- Reviewed and approved final assemblies: enclosure, power switch, volume control, speaker wiring, and light sensor placement
- Assessed functionality against rubric: correct tune playback, responsive light control, clean output with minimal distortion
- Provided written feedback on code structure, measurements, and design rationale in pro-forma reports.

Teaching Assistant- Columbia University   Jan 2022-May 2022

- Teaching Assistant to Prof. William E. Bailey, Columbia University working on magnetic thin films, spintronics, and racetrack memory concepts.
- Led weekly recitations on stress and strain tensors, principal values, invariants, and Mohr's circle

- Reviewed generalized Hooke's law for isotropic and crystalline materials, built stiffness and compliance matrices, and converted between tensor and engineering notation
- Ran problem sessions on elastic waves and sound velocity, connecting moduli to measurable wave speeds
- Taught plasticity fundamentals: yield criteria (von Mises and Tresca), flow rules, and work hardening with multiaxial examples
- Guided tutorials on dislocation mechanics and slip systems in FCC, BCC, and HCP crystals, including Frank–Read sources and critical resolved shear stress
- Covered strengthening mechanisms: solid solution, precipitation, grain size (Hall–Petch), and strain hardening, linking microstructure to mechanical response
- Coached fracture and fatigue analysis: Griffith energy balance, stress intensity factors, R curves, S–N data interpretation, Paris law fitting, and life prediction
- Introduced time-dependent deformation and creep models, including Norton law fitting and activation energy estimation from temperature data
- Held office hours, prepared detailed solution sets and grading rubrics, and provided targeted feedback on derivations, units, and significant figures
- Developed small MATLAB or Python exercises for tensor transforms, curve fitting of stress–strain data, and visualization of material response curves

Intern- NPCC Engineering Pvt. Limited   Jun 2017-Aug 2017

- Completed a project to determine the optimum design of pressure vessels and materials for the offshore oil and gas industry.
- Worked on a major Saudi Aramco project as part of the Mechanical Static Department.
- Studied design codes for static vessels in NEL (an EPC company in the upstream oil and gas field).
- Gained familiarity with ASME Section VIII.
- Provided design input requirements for vessel design.
- Conducted a comparative study of vessel thickness variation across different metals.
- Read and interpreted blueprints, technical drawings, schematics, and computer-generated reports for static mechanical structures in the oil and gas industry.

SKILLS

Programming and AI: Python, MATLAB, C, Java; scientific computing; computer vision for microscopy; classical ML and shallow neural nets; experiment automation with Bayesian optimization.
Modeling and simulation: COMSOL Multiphysics; Lumerical FDTD and INTERCONNECT; beam-propagation modeling; simple FDTD; Lattice Boltzmann for soft-matter flows; Q-tensor and Landau–de Gennes workflows

Optics and photonics: Polarization analysis (Jones and Mueller); interferometry and digital holography; phase retrieval and unwrapping; speckle statistics and coherence control; sub-Rayleigh imaging and MTF budgeting; PSF and OTF; spectroscopy line-shape fitting

Soft matter and quantum: Director-field reconstruction from POM; defect and winding-number mapping; micro rheology; $S(q)$ and $g(r)$; single-photon statistics $g^2(\tau)$, HBT, homodyne and heterodyne, ODMR and PL fitting; QFT fundamentals including renormalization and EFT.

Data and imaging: ImageJ and Fiji; particle tracking and MSD; DDM and PIV; image registration, denoising, deconvolution; time-series and spectral analysis.

Characterization: XRD; NMR spectroscopy; SEM; TEM; polarized optical microscopy; digital holographic microscopy.

Electronics and instrumentation: Oscilloscopes; function generators and AFGs; lock-in detection; photodiodes and LED drivers; NI-DAQ and serial control; LabVIEW basics; op-amp filters and amplifiers; BJT and MOSFET drivers; PWM, ADC, DAC; PCB bring-up and debugging; optical alignment and safe lab practice.

Personal Details

Alternative Email Address: adithyapn15@gmail.com, adithya.nair@eng.ox.ac.uk
Date of birth: 15/10/1997
Contact no: +447867090829