

# Rashid Mubashir Talha

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## § EDUCATION.

### **Postgraduate Diploma Programme in Mathematics (ICTP, Italy, 2025–).**

- Fully funded programme. Expected graduation: August 2026.
- Additional coursework: General Relativity I (Prof. M. Mirbabayi)

### **Bachelor of Science in Mathematics (NUST, Pakistan, 2021–2025).**

- CGPA: 3.99/4.0. Ranked 1st in the cohort.
- Thesis: Ehresmann Connections on Fiber Bundles (supervised by Prof. Tooba Feroze)
- Additional coursework: Quantum Field Theory.

### **Diploma of Higher Education (University of Warwick, UK, 2017–2020).**

- Integrated joint degree for mathematics and physics, leading to an award of DipHE before transferring.
  - Additional coursework: Commutative Algebra, Representation Theory, Lie Groups & Algebras, Statistical Physics, Gauge Theories in Particle Physics, General Relativity.
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## § ADDITIONAL QUALIFICATIONS.

- IELTS Academic: 8.5 Bands (August 2024).
  - GRE Math Subject Test: 88<sup>th</sup> percentile (November 2023).
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## § AWARDS & ACHIEVEMENTS.

- President's Gold Medal, NUST (2025). Highest-ranking graduate in the cohort.
  - Rector's Gold Medal, NUST (2025). Best final-year project and thesis in BS Mathematics.
  - High Achiever Award, NUST (2025). Exceptional performance in extra-curricular academic initiatives.
  - 1st Position, NUST Mathematics Olympiad (2024). Individual participation; cash prize of PKR 25,000.
  - 1st Position, National Mathematics Quiz Competition, NUML. Consecutively in 2023 and 2024.
  - Academic Excellence Scholarship, NUST (8-time recipient). Highest GPA in the cohort each semester.
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## § ACADEMIC PROJECTS.

### **Ehresmann Connections on Fibre Bundles (Final Year Project, 2024–2025).**

Conducted a review of the theory of connections and curvature on vector bundles. Generalised to Ehresmann connections on fibre bundles, and studied the Yang–Mills connections as an important special case. Discussed applications to mathematical physics, general relativity and machine learning. Supervised by Dr Tooba Feroze.

### **Physics Informed Neural Networks (PINNs) for Fluid Profile in Aneurysms (2024).**

Constructed a physics informed neural network (PINN) for the simulation of Navier–Stokes PDEs to obtain the pressure distribution along the medial and transverse plans in thoracoabdominal aneurysms. The results agreed with the flow profiles numerically obtained through traditional CFD modelling.

### **Adaptive Mesh Refinement (AMR) for Tsunami Propagation with Coriolis Effects (2024).**

Used implicit mesh refinement techniques to investigate the influence of Coriolis force on the accuracy of shallow water equations in the context of Tsunamis. This extends the work of Berger and LeVeque (2024). Joint work with Hina Irum and Dr M. Asif Farooq from SNS.

### **Acoustic Modelling Tools with Latest Oceanographic Data Retrieval (2023).**

Developed a robust, modular, modern python CLI for data discovery, analysis and acoustic modelling. The software was integrated with KRAKEN and BELLHOP. Fully funded project supervised by Dr M. Asif Farooq, NUST, Pakistan. Findings were presented at the annual IBCAST conference (2024).

### **Behaviour of the Multipole Solutions of the 5th order mKdV equation (2022).**

Studied the construction of multiple-pole solutions of the 5th order modified KdV PDE and reproduced the results from Zhao Zhang et al, 2021. Supervised by Dr Ahmad Javid, NUST.

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## **§ PUBLICATIONS.**

- Development of oceanographic acoustic modelling tools for streamlined transmission loss analysis. International Bhurban Conference on Applied Sciences and Technology (IBCAST 2024), 694–700.  
DOI: 10.1109/IBCAST61650.2024.10877176
- Application of computational fluid dynamics and physics informed neural networks in predicting rupture risk of thoracoabdominal aneurysms with fluid-structure interaction analysis. Chin. J. Phys. (2025).  
DOI: 10.1016/j.cjph.2025.02.015

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## **§ PRESENTATIONS & CONFERENCES.**

- Attended ‘Workshop on Approaches to Quantum Gravity in de Sitter space’ (ICTP, October 2025)
- Invited to deliver a presentation at the weekly graduate mathematics seminar (NUST, 2024).
- Member of the organising committee for the conference on ‘Recent Trends in Mathematics’ (NUST, 2024).
- Invited to deliver an introductory talk titled ‘Gravity and its Quantisation’ to undergraduate students. Hosted by the NUST Physics and Astronomy Society (NUST, 2023).

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## **§ LINGUISTIC AND COMPUTING SKILLS.**

- Programming & scientific computing: Python, C, Mathematica, R, MATLAB, SQL, L<sup>A</sup>T<sub>E</sub>X; Linux.
- Languages: Urdu (native), English (fluent).

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## **§ EXTRA-CURRICULAR ACTIVITIES.**

- Departmental representative, NUST Student Forum (2024).
- Organizer, Fund raising and enrichment workshops at the Noreen Zindagi Orphanage (2024).