AUM RAWAL

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Personal Profile

A highly passionate and self-driven MSc Mathematical Physics graduate looking to pursue a PhD in Mathematics. Extremely interested to pursue research in "Applications of Differential geometry in Physics", and "Twistor Theory", which was further amplified by scoring distinction in most math courses. Well experienced in mathematical research and presentation.

Education

- **THE UNIVERSITY OF EDINBURGH** *September 2023 - August 2024*
  MSc Mathematical Physics UK
  - Grade: MERIT
  - Relevant Modules :
    Differential Geometry, Geometry of General Relativity, Quantum Field theory, Topics In Mathematical Physics, Problem solving in Theoretical Physics, General Relativity, Symmetries of Particles and Fields
- **THE UNIVERSITY OF DEBRECEN** *September 2019 - July 2022*
  BSc Physics Hungary
  - Grade: 4.91/5
  - Relevant Modules:
    Linear Algebra, Measure and Integral Theory, Modern Analysis, Calculus, Multivariable calculus, Fourier Analysis, Probability and Statistics, Quantum Mechanics, Classical Mechanics 1 & 2, Special Relativity 1 & 2, Supersymmetry in QM (Dissertation)

Projects and Research

- **Global Solutions of General Relativity** *May 2024 - August 2024*
  Tools, Skills: Research and Presentation skills, Mathematical reasoning, critical thinking, time management, LaTeX
  - MSc dissertation, *Supervisor* - Prof. James Lucietti
  - Did an extensive research on Penrose and Hawking-Penrose Singularity theorems, wrote a dissertation and conducted a presentation.
  - Started by understanding the geometry behind general relativity and performing local calculations, which lead to RayChaudhuri's equation.
  - Explored topological restrictions of a causal spacetime and carefully worked through some important theorems. In many cases, an intuitive proof was provided to help navigate through some highly-involved mathematics. Finally, gave a proof of the Penrose Singularity theorem with a unique presentation style.
  - Developed strong research and presentation skills along with strengthened understanding of general relativity, especially of singularities.
- **Antenna Simulation** *January 2020 - April 2021*
  Tools: MATLAB, Open-EMS, Python
  - Undergraduate research project, *Supervisor* - Prof. Adam Kardos
  - Developed simulations of antennas for cube satellites designed for weather prediction. Main task was to amend parameters to achieve the most efficient antenna which was later constructed by the other team.
  - Implemented Open-EMS tools on MATLAB for creating simulations for different antennas, achieving creative problem solving skills, programming skills, and developed teamwork. Enhanced my ability to apply scientific and mathematical theory to quantitative data.
- **Broken and Unbroken Supersymmetry in Quantum Mechanics** *January 2022 - July 2022*
  Tools, Skills: MATHEMATICA, Linear Algebra, Quantum Mechanics, LaTeX
  - BSc dissertation, *Supervisor* - Dr. Lévai Géza
  - Used concepts of Supersymmetry to understand symmetry of ground state wave functions.
  - Did a thorough research on maths behind supersymmetry, especially linear operators of the theory. Used different examples to show cases of unbroken and broken supersymmetry.
  - Extensively used Linear Algebra, and Quantum Mechanics.
  - Developed strong research skills and time management. Also learned using Mathematica to solve system of equations.

Publication

- **Oblate Distorted Harmonic Oscillator Symmetry** *January 2022 - September 2022*
  Tools, Skills : Independent research, Academic writing
  - Conducted an independent research to comprehend nuclear structure using symmetries of oblate harmonic oscillator.
  - Published in International Research Journal for Research **https://doi.org/10.22214/ijraset.2022.47051**
  - Mathematical reasoning, Nuclear physics

Experience

- **Private Tutor** *September 2023 - present*
  Self employed Edinburgh, London; UK
  - Working as a private tutor for students in their final year of high school, A levels and GCSE.
  - Preparing regular lessons and also focusing on problem solving. Occasionally also set up sample question papers
  - Improved relation building skills, comprehensibility and science communication

Skills

- **Programming Languages:** C, C++, Python, Matlab, Mathematica, Linux, LaTeX
- **Higher Mathematics:** Algebraic Topology, Gauge theory, Category theory, Differential geometry
- **Research Skills:** Exceptional skill in analysing research literature.; rigorous and thorough when working through mathematical proofs; consistency and discipline for developing research projects

Courses

- Currently undertaking university sponsored courses by Scottish Mathematical Society Training Centre (**SMSTC**) - *Topological Quantum Field Theory, Conformal Field Theory, Algebraic topology, Differential topology*
- Learning Machine Learning Specialization by Stanford on Coursera
- Self learning maths and physics through following books - *General Relaativity - R. Wald, Topology - Munkres, Visual Complex analysis - Tristan Needham*

Honours and Awards

- **Stipendium Hungaricum Scholarship** *September 2019*
  Government of Hungary and India
  - A fully funded scholarship to complete my undergraduate degree
  - An academic merit based award
- **Nationwide 1st Rank** *April 2021*
  HACKATOM, ROSATOM
  - A 30 hour long coding competition organised by ROSATOM (nuclear fusion company)
  - Successfully worked in a team to achieve first rank and rewards.
  - Solved real-world problems concerning nuclear reactor using strong research and computational skills.
  - Improved collaboration and ability to focus for long hours
- **Silver medal** *November 2022*
  University Physics competition
  - Lead a team of 4 people to solve a real life physics problem and prepare a report within 48 hours.
  - Achieved silver medal
  - Developed report writing skills, ability to work under pressure, and leadership skills
- **Outstanding performance** *April 2019*
  Joint Entrance Examination, Government of India
  - One of the most competitive exams in India
  - Scored 99.19 percentile
  - Developed strong problem-solving skills, and working under pressure

Leadership Experience

- **Team Leader** *2020 - 2021*
  AIESEC
  - Was working as a team leader at AIESEC. Had to manage a team of 5 with administration of the organisation.
  - AIESEC saw a significant increase in student enrollment rate under my leadership
  - Helped a client of AIESEC manage his life and ensured his safe return from Italy during COVID
  - Developed strong management and administrative skills
- **Quantum computing project** *Feb 2024 - May 2024*
  The University of Edinburgh
  - Organised team meetings and ensured fair task allotments
  - The team successfully created a quantum computing simulator and scored A
  - Developed strong interpersonal, and scientific communication skills

Volunteer Experience

- **Team member (outreach)** *November 2021 - February 2022*
  AIESEC
  - Part of the AIESEC outreach team
  - Helped university students get internships through AIESEC

References

1. **James Lucietti**
   Personal Chair of Mathematical Physics,School of Mathematics
   University of Edinburgh
   Email: j.lucietti@ed.ac.uk
   Relationship: [Thesis Advisor, Professor]
2. **Jose Figueroa-O'Farrill**
   Personal Chair, School of Mathematics
   University of Edinburgh
   Email: j.m.figueroa@ed.ac.uk
   Relationship: Professor
3. **Levai Geza**
   Scientific advisor, Deputy director
   ATOMKI nuclear research institute, Debrecen, Hungary
   Email: levai@atomki.hu
   Relationship: Thesis advisor