

RASHAD HAMIDI

PhD Researcher in Mathematical and Theoretical Physics - Durham University

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RESEARCH PROFILE & INTERESTS

Core Research Areas: Integrable Field Theory | String Theory | Quantum Field Theory

My primary research interests lie in the areas of integrable systems, string theory and quantum field theory. I am particularly focused on exploring integrable sigma models, their deformations, and their connections to higher-dimensional gauge theories, such as 4d Chern-Simons theory. My work involves studying the mathematical structures underlying these models, including quantum groups and Yang-Baxter equations, as well as investigating their physical applications.

Vision: My long-term research vision is to implement new technologies such as artificial intelligence, machine learning and quantum computing in theoretical physics research, and use them to discover new integrable field theories.

EDUCATION & ACADEMIC BACKGROUND

PhD in Mathematical and Theoretical Physics

Nov 2022 - Aug 2026

Durham University, Department of Mathematical Sciences - Durham, UK

Supervisor: Prof. Ben Hoare

Thesis: "Integrable Sigma Models with Twisted Quantum Affine Symmetry"

Focus: Integrable Field Theory, String Theory, Classical Integrability, Sigma Models, R-Matrix, Quantum Affine Symmetry, Yang-Baxter Equation, Integrable Deformations

MSc in Particles, Strings and Cosmology

Oct 2021 - Sep 2022

Durham University, Department of Mathematical Sciences - Durham, UK

Degree Achievement: Distinction

Supervisor: Prof. Nabil Iqbal

Thesis: "BTZ Black Hole: Holographic Duality, Entropy, and AdS₃/CFT₂"

BSc in Physics

Sep 2017 - Jun 2021

Birzeit University, Department of Physics - Birzeit, Palestine

Degree Achievement: Distinction

Supervisor: Prof. Abdallah Sayyed-Ahmad

Thesis: "Fractional Quantum Mechanics"

Pre-University Secondary Education:

- High School, Al-Fadiliyyeh Scientific High School (Tulkarm, Palestine) [2014-2017] - Grades: 10th-12th
- Elementary and Secondary School, Nur Shams Elementary School for Boys (Nur Shams Refugee Camp, Tulkarm, Palestine) [2006-2014] - Grades: 1st-9th

PUBLICATIONS & PREPRINTS

[1] Rashad Hamidi, Ben Hoare

"Twists of trigonometric sigma models"

JHEP 08 (2025) 090 | arXiv: [2504.18492](https://arxiv.org/abs/2504.18492) [hep-th] | DOI: [10.1007/JHEP08\(2025\)090](https://doi.org/10.1007/JHEP08(2025)090)

ACADEMIC APPOINTMENTS & WORK EXPERIENCE

AI Physics and Mathematics Trainer

Jun 2026 - Present

Mercor - Online (part time)

- Author advanced physics and mathematics problems with step-by-step solutions for model fine-tuning (SFT).
- Evaluate and rank model reasoning outputs, isolating mathematical fallacies and hallucinations.
- Design adversarial edge cases and evaluation rubrics to benchmark complex multi-step reasoning.

Teaching Assistant

Jan 2023 - May 2026

Durham University - Durham, UK (part time)

Modules taught: Discrete Mathematics, Maths for Engineers and Scientists, Analysis I, Single Math A, Single Math B, Mathematical Physics II, Special Relativity & Electromagnetism II.

Astronomical Observatory Tour Guide

Jan 2018 - Jun 2021

Birzeit University & Michel and Sanieh Hakim Observatory - Birzeit, Palestine (part time)

- Led engaging and educational guided tours of the observatory facilities for diverse audiences.
- Developed and delivered accessible presentations on astronomical concepts and celestial objects.
- Operated the main telescope to showcase planets, stars, nebulae, and galaxies during public nights.
- Assisted in planning, promotion, and execution of public outreach events (eclipse viewings, meteor showers).

HONOURS, AWARDS & GRANTS

UKRI STFC PhD Studentship

2022 - 2026

Durham University | UKRI / STFC - Full doctoral research studentship funded by the Science and Technology Facilities Council (STFC) and UKRI. (Sponsors: UK Research and Innovation (UKRI), Science and Technology Facilities Council (STFC), Durham University)

• MSc Degree with Distinction <i>Durham University - Awarded Distinction in MSc in Particles, Strings and Cosmology.</i>	2022
• Global Masters Scholarship <i>Durham University - Competitive international merit scholarship covering tuition and stipend. (Sponsors: Durham University, Scott Logic, Trevelyan College)</i>	2021 - 2022
• BSc Degree with Distinction <i>Birzeit University - Graduated with Distinction in Physics (Major) and Mathematics (Minor).</i>	2021
• Mosa Naser Scholarship for Physics (3) <i>Birzeit University Dept. of Physics - Awarded 3 consecutive academic years for top ranking academic performance in the physics department. (Sponsors: Birzeit University, Department of Physics)</i>	2018 - 2021
• Science Faculty Scholarship <i>Birzeit University Faculty of Science - Academic merit scholarship awarded by the Faculty of Science. (Sponsors: Birzeit University, Faculty of Science)</i>	2018 - 2019
• Paltel Group Scholarship <i>Paltel Group Birzeit University - Four-year university scholarship awarded for outstanding pre-university academic excellence. (Sponsors: Birzeit University, Paltel Group)</i>	2017 - 2021
• University Honor Scholarship (7 Semesters) <i>Birzeit University - Awarded for 7 semesters for holding top cumulative and semester GPA. (Sponsors: Birzeit University)</i>	2018 - 2021
• Dean's Honor Roll (8 Consecutive Semesters) <i>Birzeit University - Maintained Honor Roll distinction every single semester of undergraduate studies.</i>	2017 - 2021

RESEARCH GROUPS & AFFILIATIONS

• Ben Hoare Integrability Group <i>Durham University</i>	2022 - 2026
• Mathematical and Theoretical Physics Group <i>Durham University</i>	2022 - 2026
• High Energy Physics for Palestine Group (HEP4P) <i>(remote collaboration)</i>	2022 - Present
• Centre for Particle Theory <i>Durham University</i>	2021 - 2026
• Physics Club <i>Birzeit University</i>	2017 - 2021
• Astronomy Club <i>Birzeit University</i>	2017 - 2021

CONFERENCES & SYMPOSIA (GROUPED BY SERIES)

Integrability, Dualities and Deformations Conference [4 editions]	
• [Attendee] Wroclaw 2026 - Wroclaw, Poland <i>Sponsors: National Science Centre of Poland (Narodowe Centrum Nauki), University of Wroclaw</i>	Jul 2026
• [Poster] Stockholm 2025 - Stockholm, Sweden <i>Sponsors: Nordita, Stockholm University, UK Research and Innovation (UKRI), Isaac Newton Institute for Mathematical Sciences</i>	Sep 2025
• [Attendee] Swansea 2024 - Swansea, UK <i>Sponsors: Swansea University, The Royal Society, UK Research and Innovation (UKRI), Isaac Newton Institute for Mathematical Sciences</i>	Jul 2024
• [Attendee] Durham 2023 - Durham, UK <i>Sponsors: Durham University, UK Research and Innovation (UKRI)</i>	Jul 2023
Integrability in Gauge and String Theory [3 editions]	
• [Attendee] DESY Hamburg 2026 - Hamburg, Germany <i>Sponsors: DESY Hamburg</i>	Jun 2026
• [Attendee] King's College London 2025 - London, UK <i>Sponsors: King's College London</i>	Jul 2025
• [Attendee] ETH Zurich 2026 - Zurich, Switzerland <i>Sponsors: ETH Zurich</i>	Jun 2023
Integrability in Quantum Field Theory [1 edition]	
• [Attendee] Durham 2026 - <i>Sponsors: Durham University, London Mathematical Society, UK Research and Innovation (UKRI), Engineering and Physical Sciences Research Council (EPSRC), Isaac Newton Institute for Mathematical Sciences, Heilbronn Institute for Mathematical Research</i>	May 2026

SEMINARS & COLLOQUIA (GROUPED BY SERIES)

North British Mathematical Physics Seminars (NBMPs) [6 editions]	
• [Attendee] 75th - Durham University <i>Sponsors: Durham University, London Mathematical Society</i>	Nov 2025
• [Speaker] 74th - University of York <i>Sponsors: University of York, London Mathematical Society</i>	Jun 2025
• [Attendee] 72nd - Durham University <i>Sponsors: Durham University, London Mathematical Society</i>	Nov 2024
• [Attendee] 71st - University of York <i>Sponsors: University of York, London Mathematical Society</i>	Jun 2024
• [Attendee] 69th - Durham University <i>Sponsors: Durham University, London Mathematical Society</i>	Nov 2023
• [Attendee] 66th - Durham University <i>Sponsors: Durham University, London Mathematical Society</i>	Nov 2022
Physics Department Siminars [3 editions]	
• [Attendee] Meteorology - Birzeit University <i>Sponsors: Birzeit University, The University of Chicago</i>	Jun 2020

- **[Attendee]** Computational Multiphysics in Condensed Matter - Birzeit University Apr 2019
Sponsors: Birzeit University, Miami University
- **[Attendee]** Black Holes - Birzeit University Nov 2017
Sponsors: Birzeit University, Harvard-Smithsonian Center for Astrophysics

ADVANCED SCHOOLS & WORKSHOPS

Paths to Quantum Field Theory Workshop

- Durham 2023 - Durham, UK Aug 2023
Sponsors: Durham University, The Royal Society
- Durham 2022 - Durham, UK Aug 2022
Sponsors: Durham University, The Royal Society

Young Researchers Integrability School and Workshop

- Durham 2023 - Durham, UK Jul 2023
Sponsors: Durham University, Imperial College London, UK Research and Innovation (UKRI), University of Padua, European Research Council (ERC), Gauge Theories as an Integrable System (GATIS+), Universe | An Open Access Journal from MDPI, Physics | An Open Access Journal from MDPI

Hands-on Molecular Dynamics Workshop

- Birzeit 2019 - Birzeit University Jan 2019
Sponsors: Birzeit University, Palestinian-German Science Bridge

Palestinian Advanced Physics School

- Birzeit 2019 - Birzeit University Jul 2019
Sponsors: Birzeit University, Scientists for Palestine, The European Organization for Nuclear Research (CERN), Abdus Salam International Centre for Theoretical Physics (ICTP), German-Palestinian Science Bridge

Physics Without Frontiers Workshop

- Birzeit 2017 - Birzeit University Nov 2017
Sponsors: Abdus Salam International Centre for Theoretical Physics (ICTP), Birzeit University

COMPETITIONS & CERTIFICATION PROGRAMS

Competition: Durham Hackathon (DurHack)

- Durham University (Durham University, Atom Bank, Marshall Wace) Nov 2024

Competition: Pre-University Competitions

- Science Exhibition | Tulkarm (Al-Fadilyyah Secondary School) Apr 2015
- Physics Olympiad | Ramallah (Palestinian Ministry of Education) Mar 2015
- First Lego League (FLL) Robotics | Birzeit University (FIRST LEGO League, UNRWA, Birzeit University) Apr 2015
- First Lego League (FLL) Robotics | Birzeit University (FIRST LEGO League, UNRWA, Birzeit University) Mar 2014
- Intel ISEF | Ramallah (Intel, UNRWA) Mar 2012
- SyscoLab Competition | Ramallah (SyscoLab, UNRWA) Feb 2012
- SEEK Competition | Ramallah (Science Easy Experiment Kit (SEEK), UNRWA) Jan 2012

Certification: Access Program

- Ramallah [2014-2016, 2 years] | America-Mideast Educational and Training Services (AMIDEAST)

Certification: Science and Technology Entrepreneurship Program (STEP)

- Ramallah [2014-2015, 1 year] | Al-Nayzak

TECHNICAL & SCIENTIFIC SKILLS

- **Programming (main):** Python, Mathematica
- **Programming (familiar):** C, R, Matlab, Octave
- **Scientific Writing:** LaTeX, Jupyter Notebook, Mathematica Notebook, Markdown
- **Scientific Computing Skills:** Numerical Methods, Statistical Analysis
- **Electronics:** Arduino, Raspberry Pi, LabVIEW, NXT Robotics, SEEK Electronic Bag, Syscolab Electronic Bag, Sophene Electronic Bag
- **Astronomy:** Celestia, Stellarium, RSpec
- **Web Design:** HTML, CSS, JavaScript, TypeScript
- **Modeling:** Unity, Blender, Unreal Engine, AutoCAD
- **Languages:** Arabic: Native, English: Fluent

DEVELOPED APPLICATIONS & SCIENTIFIC DATASETS

Web Applications Portfolio: <https://xurashad.github.io/apps>

SCIENTIFIC APPLICATIONS

- **Particle Physics Visualizer** - A web app provides an interactive supersymmetric particles periodic table.
- **Interactive Periodic Table** - A web app provides an interactive periodic table with detailed information about each element.
- **Fractal Explorer** - A tool for generating the Mandelbrot and Julia sets with customizations.
- **Feynman Diagram Generator** - A tool for creating Feynman diagrams easily and intuitively, and exporting the diagrams as TikZ LaTeX code.
- **Graphing Calculator** - A tool for creating and visualizing mathematical graphs easily and intuitively.
- **Celestial Simulator** - A tool for simulating the solar system and visualizing the orbits of planets, moons, and other celestial bodies. It includes features such as time control, zooming, and information display about each object.
- **Earth Explorer** - An interactive 3D globe powered by CesiumJS and OpenStreetMap.

DATASETS GENERATORS

- **Fibonacci Sequence Generator** - A tool for generating and downloading the Fibonacci sequence in JSON format. For fast generation, it is recommended to generate the sequence up to the first 50,000 numbers, or the nth number up to 1,000,000. Limits can be unlocked.

- **Prime Sequence Generator** - A tool for generating and downloading the prime sequence in JSON format. For fast generation, it is recommended to generate the sequence up to the first 1,000,000 numbers. Limits can be unlocked.

PROFESSIONAL APPLICATIONS

- **Website Builder Pro** - A user-friendly professional app to build up websites without coding.
- **CV Builder Pro** - A user-friendly professional app to build up CVs without coding.
- **LaTeX Editor Pro** - A user-friendly professional app to write LaTeX documents without coding.
- **Office Suite Pro** - A user-friendly professional app that includes a word processor, a spreadsheet editor, and a presentation maker. It is designed to be a free and open-source alternative to Microsoft Office and Google Docs. It supports text formatting, tables, charts, image insertion, video streaming, PDF presentation, HTML page screening, python code execution, bash scripting, and more.

AI APPLICATIONS

- **AI Chatbot** - A multimodal LLM-based chatbot that can understand and generate text.
- **ArtForge AI Image Generator** - A multi-style AI image generator for AI-assisted art creation.

UTILITIES

- **Plagiarism Checker** - A tool for checking the originality of the text and detecting plagiarism.
- **Unicode Explorer** - A tool for searching the library of unicode characters.
- **Unicode Font Generator** - A tool for generating text in various Unicode font styles.
- **PDF Tools** - An all-in-one tool for PDF. It can be used for extracting pages from the PDF, convert image to PDF or PDF to image, and merge PDF documents.
- **Multimedia Base64 Converter** - A tool for encoding files to base64 and decoding base64 strings back to files.
- **QR Code Generator** - A tool for generating QR codes easily and quickly with customizations.
- **Image Editor** - Professional-grade image editor with crop, resize, rotate, flip, 12 filters, 10 adjustment sliders, freehand drawing, text overlays, and multi-format export.

GAMES

- **2048 Tile** - A game that requires sliding numbered tiles on the grid to combine them and create a tile with the number 2048.
- **Celestial Chess** - A strategic chess game set in a celestial theme.

Curated Scientific Datasets: <https://xurashad.github.io/datasets>

- **Fundamental & Supersymmetric Particles** - A dataset containing information about fundamental particles and their supersymmetric counterparts. Covers the Standard Model particle zoo alongside their SUSY partners - squarks, sleptons, gauginos, and more.
- **First 1M Prime Numbers** - A dataset of the first 1,000,000 prime numbers, from 2 to 15,485,863. Generated via an optimised Sieve of Eratosthenes. Useful for number theory research, cryptography benchmarks, and machine learning experiments.
- **Chemical Elements** - A comprehensive dataset of all chemical elements in the periodic table. Each entry includes physical properties, thermodynamic constants, electron configuration, and a Bohr model image.

COURSE-BASED & TECHNICAL PROJECTS

• "BTZ Black Hole: Holographic Duality, Entropy, and AdS3/CFT2"	<i>Particles, Strings and Cosmology (MSc Dissertation) (Summer 2022)</i>
• "Fractional Quantum Mechanics"	<i>Quantum Mechanics (Spring 2021)</i>
• "Computational Planetary Motion"	<i>Computational Physics (Fall 2020)</i>
• "Many Body Problem"	<i>Computational Physics (Fall 2020)</i>
• "Cellular Automata"	<i>Computational Physics (Fall 2020)</i>
• "Interactive Visualization of the Logistic Map"	<i>Computational Physics (Fall 2020)</i>
• "Stellar Spectroscopy of Rigil, Betelgeuse and Sirius"	<i>Astronomy (Spring 2020)</i>
• "Magnetic Fluids"	<i>Nanophysics (Fall 2019)</i>
• "Vantablack: Optical Coating and 3D Light Microscopy"	<i>Medical Physics (Spring 2019)</i>

COMPREHENSIVE ACADEMIC COURSEWORK

Durham University - MSc in Particles, Strings and Cosmology:

- **Quantum Field Theory:** Introductory Field Theory, Quantum Field Theory I, Quantum Field Theory II, Quantum Electrodynamics, Supersymmetry
- **General Relativity and Cosmology:** General Relativity, Cosmology I, Cosmology II, Neutrino Physics, Astroparticle Physics
- **Gauge Field Theory:** Group Theory, Standard Model, Renormalisation Group, Scattering Amplitudes, Non-Perturbative Physics
- **Superstring Theory:** Conformal Field Theory, String Theory
- **Phenomenology:** Quantum Chromodynamics, Flavour Physics and Effective Field Theories, Higgs Physics
- **Extra:** Introduction to AdS/CFT, Analytic loop integration

Birzeit University - BSc in Physics (Minor Mathematics):

- **Physics:** General Physics I--III, Modern Physics, Medical Physics, Astronomy, Vibrations and Waves, Optics, Analog Electronics, Mathematical Physics, Classical Mechanics I--III, Electromagnetic Theory I--II, Quantum Mechanics I--II, Thermal Physics & Statistical Mechanics, Computational Physics
- **Physics Labs:** General Physics Lab I--III, Modern Physics Lab, Analogue Electronics Lab, Advanced Physics Lab
- **Mathematics:** Calculus I--III, Foundations of Mathematics (Logic), Linear Algebra I--II, Ordinary Differential Equations, Partial Differential Equations, Numerical Methods, Abstract Algebra I, Mathematical Analysis I
- **Statistics and Computer Science:** Statistics I, Probability Theory, C Programming
- **Extra Scientific Courses:** General Chemistry I, General Biology I
- **Extra Scientific Labs:** General Chemistry Lab I, General Biology Lab I
- **Philosophy:** Modern and Contemporary European Civilisation, Modern and Contemporary Arab Thought

ACADEMIC REFEREES

- **Prof. Ben Hoare** (PhD supervisor)
Durham University | Email: ben.hoare@durham.ac.uk | Web: <https://www.benhoare.info/>
- **Dr. Ana Retore** (Groupmate & Collaborator)
DESY | Email: ana.retore@desy.de
- **Prof. Nabil Iqbal** (MSc supervisor)
Durham University | Email: nabil.iqbal@durham.ac.uk | Web: <https://www.nabiliqbal.com/>
- **Prof. Benoit Vicedo** (Colleague)
University of York | Email: b.vicedo@york.ac.uk
- **Prof. Hazem Abusara** (BSc professor)
Birzeit University | Email: habusara@birzeit.edu