Jillur Rahman

PhD Candidate, TUDa

Elite Master in Theoretical and Mathematical Physics (TMP)

Darmstadt, Germany

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J-Rahman

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Skills

Statistics / Physics / Math. Modelling 13+ yrs.

Public Speaking / Teaching / Communication 13+ yrs.

C/C++ 6+ yrs.

Python 8+ yrs.

MPI / OpenMP / Intel Intrinsics (AVX) 5+ yrs.

Data Science / Machine Learning 2+ yrs.

Quantitative Finance $\ll$ 1 yr.

German B1.1

English Polyglot

Hindi/Urdu/Assamese/Bengali

Quick Look

As a theoretical physicist, I am passionate about decoding the unknown: to divine the laws of nature using mathematics and empirical intuition. Academically, I have studied an array of subjects, ranging from the nature of quantum field theories near black holes to the cosmology of dark matter using efficient original simulations. I have also explored diverse fields beyond my main area of expertise, ranging from computational chemistry, psychological modelling, robotics, ML, to even finance.

My love for learning, problem-solving and analytical thinking is at the core of my professional identity. I seek new opportunities in the industry, where I can apply my mathematical and computational skills to solve engaging problems.

Work Experience

Doctoral Candidate **10/2018 - present**

Department of QCD (Prof. Dr. Guy D. Moore)
Theory Center, Institute for Nuclear Physics,
Technische Universität Darmstadt

Abstract. *The "axion" is a DM candidate which emerges out of an unrelated minimal extension of the SM. We studied the dynamics and spectrum of emergent topological artefacts in the early universe (a network of cosmic strings and domain walls), and followed their decay into axions and later structures clumped by gravitation, using scalable numerical tools, implemented in highly parallel code, and strived for a more accurate and robust assessment of the axion's properties, such as mass, etc.*

Skills: HEP, HPC, C, C++, Matlab, Mathematica, Python, Data Vis., HDF5, Git, Linux

Research Associate | T.A. | Theoretical Physics Tutor **10/2018 - 09/2023**

Department of QCD (Prof. Dr. Guy D. Moore)
Theory Center, Institute for Nuclear Physics,
Technische Universität Darmstadt

Duties. Apart from research, I have assisted in teaching advanced courses on

- Theoretical Particle Physics (WiSe 2020/21), and
- Statistical Mechanics (WiSe 2018/19)

I had to create homework sets and solns., host bi-weekly office-hours, mentor students, and offer tutorial classes. I have also supervised several master's students in an unofficial capacity (e.g. helped with their thesis projects where possible).

Skills: Theor. Physics, Pedagogy, Mentoring, Project Management, Vimscript, LaTeX

Web Developer **03/2018 - 09/2018**

Department of Experimental Medical Physics
Ludwig-Maximilians-Universität (LMU) München

Duties. I helped the department redesign and maintain the website of their Chair and the internal wiki. Here: `https://www.med.physik.uni-muenchen.de/`.

Skills: CMS, Fiona, HTML, CSS, JavaScript, Interpersonal Communication

Research Assistant | Master's Thesis Project **10/2017 - 09/2018**

Department of Theoretical AstroParticle Physics and Cosmology (Prof. Dr. Stefan Hofmann)
LMU München and Technische Universität München

Abstract. *An event horizon glues two globally hyperbolic spacetimes that appear different to quantum information carriers. One side, they evolve unitarily in a static background, while on the other side, an accretive Hamiltonian dissipates information in the dynamical background. We devised a strategy to study this boundary with probe fields, finding that, even at a classical level, a local source can deposit an effective charge distribution at the boundary which dynamically interacts with the fields. The boundary thus interacts as an effective dynamical field.*

Publication by same team building upon this work: 10.1103/PhysRevD.104.125007.

Skills: GR, Cosmology, Research, Teaching, Mathematica, Python, R, LaTeX

Education

2024 - 2026

M.Sc. in Financial Engineering

WorldQuant University (online)

2018 - 2024

Doctoral Research

Technische Universität Darmstadt

PhD Thesis: *"QCD Axion, The Dark Matter: Cosmolg. Investigations"*

2015 - 2018

Elite Master in Theoretical and Mathematical Physics (TMP)

LMU München and TU München

Master's Thesis: *"On Boundary Effective Field Theory (near an EH)"*

2012 - 2015

B.Sc. in Physics, Mathematics and Electronics

Christ Univeristy, Bangalore, India

2010 - 2012

Science Studies under Assam Higher Secondary Education Council (AHSEC)

SSA, Guwahati, India

Relevant Courses

- Certificate Program in Quant. Finance and Risk Management [Ongoing; enrolled at IIQF]
- Financial Derivatives: A Quant. Finance View [Ongoing]
- Algo. Trading in Python
- Deep Learning on HPC Systems
- Proficiency Training in HPC
- Lie Algebras, Differential Geometry, Math. Stat. Physics, etc.

References

Can be procured on request.

Find Me Online

(https://linkedin.com/in/J-Rahman)

Teaching Assistant — **10/2016 - 03/2017**

Ludwig-Maximilians-Universität München

Duties. My responsibilities included the correction of homework submissions as well as conducting tutorial lessons for a course on mathematical methods in physics given by Prof. Dr. Jan von Delft in the Winter Semester 2016-17.

Skills: Theoretical Physics, Mathematics, Pedagogy, Communication, LaTeX

Research Fellow/Intern — **04/2014 - 08/2014**

Science Academies' Summer Research Fellowship 2014
Indian Institute of Astrophysics (IIAP), Bangalore, India

Abstract. *Under the supervision of Prof. Dr. Rajat Chaudhuri, IIAP, Bangalore, and jointly sponsored by the Indian Academy of Sciences (Bangalore), Indian National Science Academy (New Delhi) and the National Academy of Sciences (Allahabad), my project focused on finding approximate solutions (eg. SCF, CI etc.) to many-body quantum (non-Hydrogen-like) systems in different basis sets using a quantum chemistry package called GAMESS, while checking for size extensivity and consistency.*

Skills: Quantum Chemistry, GAMESS, Fortran, Python, Bash, Linux, LaTeX

Achievements/Awards

- **Bavarian State Scholarship for Bright International Students**
  LMU München — Oct. 2016 - Jan. 2017
- **All India Rank: 715 (top 8%), IIT Joint Admission for Masters Test (Physics)**
  JAM Test (Physics), India — 2015
- **Top 3, Mathematical Modelling, Convergence 2014, Intercollegiate Math. Fest**
  Christ University, Bangalore, India — Aug. 2014
- **Science Academies' Summer Research Fellowship 2014**
  Bangalore, India — Apr.-Aug. 2014

Conferences/Workshops

- **QuantMinds International 2023**
  Intercontinental O2, London — Nov. 2023
- **Quant Insights Conference 2023**
  Online Conference hosted by The CQF Institute — Nov. 2023
- **Advancements in Axion Physics 2023**
  Online Conference/Workshop — Oct. 2023
- **Strong and Electro-Weak Matter Conference 2022**
  Institut de Physique Théorique, Saclay, Sorbonne Université, Paris — Jun. 2022
- **Topological Aspects of Strong Correlations and Gauge Theories**
  Online Program from ICTS, Bangalore — Sep. 2021
- **Strong and Electro-Weak Matter Conference 2021**
  Special Online Edition — Jun.-Jul. 2021
- **MIAPP 2020 Axion Cosmology Workshop**
  Munich Institute for Astro- and Particle Physics (MIAPP) — Feb.-Mar. 2020
- **Arbeitstreffen Kernphysik 2019**
  Schleching — Feb. 2019
- **Summer School: Between Geometry and Relativity**
  Erwin Schrödinger International Institute for Mathematics and Physics — Jul. 2017
- **Seminar: Emergent Geometry (with Prof. Dr. Stefan Hofmann)**
  LMU München — Apr. 2017
- **Winter Seminar 2016 & 2017: Mathematical Foundations of Physics**
  LMU München — Feb. 2016 & Feb.-Mar. 2017