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Education

- **Unviersity of Catania** — Catania, Italy
  Erasmus Mundus MSc Nuclear Physics S4 — *Feb 2024 – July 2024*
- **Unviersity of Caen** — Caen, France
  Erasmus Mundus MSc Nuclear Physics S3 — *Sep 2023 – Jan 2024*
- **Unviersity of Sevilla** — Sevilla, Spain
  Erasmus Mundus MSc Nuclear Physics S1, S2 — *Oct 2022 – June 2023*
- **COMSATS University** — Islamabad, Pakistan
  Bachelor of Science in Physics — *Feb 2017 – Sep 2021*

Research Experience

- **Axions in Dense Quark Matter** — Unviersity of Catania
  Master Thesis under the supervision of Prof. Marco Ruggieri — *Feb 2024 – July 2024*
  - Investigated the effective action of QCD axions in dense quark matter.
  - Explored axion interactions in color-superconducting phases, symmetry breaking, and potential applications to compact stellar objects such as axion capture and neutron star cooling.
  - Calculated axion mass, topological susceptibility, and self-coupling in various superconducting phases.
- **The Diffusion of Pulsars in the $P - \dot{P}$ Diagram** — University of Caen
  M2 internship student under the supervision of Dr. Marco Antonelli — *Sep 2023 – Jan 2024*
  - Focused on pulsar evolution and diffusion in the $P - \dot{P}$ diagram, by analyzing the stochastic models of timing noise by developing Python routines.
  - Obtained analytical and numerical Power Spectral Densities (PSDs) that can be contrasted to future long-baseline timing noise observations.
- **Generic Polynomial Inflationary Potentials and Cosmological Perturbations** — COMSATS University
  Bachelor Thesis under the supervision of Dr. Muhammad Moosa — *June 2020 – August 2021*
  - Studied hybrid inflation models with chaotic polynomial potentials under slow-roll approximation.
  - Addressed plausibility of the model with Planck data bounds by incorporating fermionic radiative corrections.
  - The obtained scalar and tensor perturbations set the stage for the formation of large-scale structures after inflation ends.

Projects

- **Effects of Projectile Breakup on Elastic Scattering for $^{11}Li +^{208} Pb$ Reaction near Coulomb Barrier Energies**
  - Analyzed TRIUMF data for the $^{6}Li +^{208} Pb$ reaction using ROOT and compared with NRV data. Observed reduced elastic cross sections and enhanced ^{9}Li fragment yield in $^{11}Li +^{208} Pb$ near the Coulomb barrier.
- **Stellar Classification: Feature correlation analysis and relevance for star type predictions**
  - Used linear and logistic regression to predict stellar properties and classify spectral types, with neural networks enhancing nonlinear feature analysis and overall accuracy.
- **Conway's Game of Life and Variants**
  - Developed in Python using the Moore neighbourhood scheme to implement variants of the Game of Life (Immigration Game, Rainbow Life, High Life), highlighting the role of initial conditions in cellular automata and discrete dynamical systems.

Work Experience

- **Generations Now** California, USA
  Automation Expert (Remote) *Aug 2024 – Present*
  - **Duties included:** Development of workflows, API integrations, Meta and Google Ads.
- **Profit for Contractors** Ottawa, Canada
  Processor Developer (Remote) *Aug 2022 – Dec 2023*
  - **Duties included:** Automation of workflows, integrated CRM sytems, and operation optimisation.
- **Wizenoze** Amsterdam, Netherlands
  Physics Curriculum Curator *Jan 2022 – Dec 2022*
  - **Duties included:** Analysing global physics curricula, preparing educational content and improving student engagement.
- **Spectra Magazine** Lahore, Pakistan
  Writer and Editor *Dec 2018 – Sep 2020*
  - **Duties included:** Writing articles related to physics and mathematics to enhance public understanding of Science in Pakistan.

Skills

- **Programming Languages**: Python, C++, Mathematica, SQL, Cypher (GQL), HTML, CSS
- **Technologies**: Microsoft Office, Git, Linux, ROOT, Geant4

Scholarships and Awards

- **Erasmus Mundus Joint Masters Degree in Nuclear Physics**: Awarded by Erasmus+ European Union Programme through competition.
- **Merit Scholarship for High School**: Awarded by Rise College for Science Pakistan.
- **Spring School on Symmetry and Measurement in Quantum Field Theory**: Awarded by the Mathematics Department of the University of York, England.

References

Prof. Marco Ruggieri
Professor of Physics
University of Catania
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Dr. Marco Antonelli
CNRS Researcher
LPC Caen
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