Zaurayz Kashan Shah

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About

Physics graduate from NUST, Pakistan, with research experience in QCD sum rules, heavy baryon decays, and collider-related phenomenology. Trained in quantum mechanics, and nuclear/particle physics, with internship experience at the National Centre of Physics focusing on quantum field theory. Motivated to pursue graduate research in high energy physics, with particular interest in particle phenomenology and quantum field theory.

Education

National Universiy of Science & Technology, BS in Physics — Nov 2021 – Oct 2025

- **Elective Coursework:** Particle Physics, Atomic & Nuclear Physics, General Relativity

Experience

Partnerships, Commnuity Growth & Visual Design, ImagineArt Inc – Delaware, USA — April 2025 – Present

- Strategized and executed a $300,000 markting budget on influencer marketing leading to 2000% boost in impressions.
- Collaborated on design work for social campaigns to ensure synergy between the content team and product team.

Research Intern - Theoretical High Energy Physics, National Center of Physics – Islamabad, Pakistan — Oct 2024 – June 2025

- Applied QCD sum rules to calculate form factors governing $\Omega_{ccb}^{+} \to \Xi_{cc}^{++}\ell\bar{\nu}_{\ell}$ semileptonic decay.
- Conducted analytical and numerical work on heavy quark systems, drawing connections with LHCb experimental results.
- Developed skills in independent research, data analysis, and technical scientific writing within a high-energy physics framework.

Research Intern - Quantum Field Theory, National Center of Physics – Islamabad, Pakistan — Aug 2024 – Oct 2024

- Studied core quantum field theory concepts (Dirac spinors, Feynman rules) and applied them to a QED scattering calculation.
- Performed a full analytic derivation of the matrix element for $e^{+}e^{-} \to \ell^{+}\ell^{-}$, evaluated spinor traces using gamma-matrix identities, and carried out spin averaging to obtain the differential/total unpolarized cross section.
- Prepared a detailed, step-by-step technical report emphasizing explicit trace evaluation, pedagogical clarity, and rigorous algebraic simplification.
- Skills gained: perturbative QED techniques, operator and spinor manipulation, analytic calculation, and technical scientific writing.

Projects

Semileptonic Decays of the Triply Heavy Omega Baryon — Final Year Project

- Applied QCD sum rules and quantum field theory techniques to model weak semileptonic baryon decays.
- Performed analytical derivations and numerical analysis of form factors and decay widths.
- Strengthened expertise in theoretical modeling, problem-solving, and scientific reporting with applications to particle physics phenomenology.
- Tools Used: Mathematica, FeynCalc

Airflow Bottlenecks and Pressure Losses in Carburetor Conversions: Weber 32/36 DGEV in a Toyota 7K Independent Project

- Analyzed volumetric airflow demand and pressure losses in carburetor–manifold systems using fluid dynamics principles.
- Modeled adapter plate geometries (sharp-step vs. tapered) using contraction coefficients and loss factors.Showed that tapered transitions significantly reduce pressure drop, optimizing airflow and engine efficiency.
- Tools Used: CAD

Technologies

Languages: Python, Mathematica.

References

Dr. Faisal Munir Bhutta – FYP Supervisor faisal.munir@sns.nust.edu.pk
Dr. Ali Paracha – Course Instructor aliparacha@sns.nust.edu.pk