SAMEER JAIN

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RESEARCH INTERESTS

- Focus on the non-perturbative aspects of hadrons structure using distribution functions (DFs) to better understand quark-gluon dynamics.

- Utilize machine learning techniques to enhance data analysis, model fitting, and simulation accuracy in high-energy physics and hadron structure research.

- Apply advanced machine learning techniques to explore fundamental physics and string phenomenology, uncovering deeper insights and advancing theoretical models of hadron structure.

EDUCATION

Dr. B. R. Ambedkar National Institute of Technology (NITJ)   *July 2024*
Master of Science, Physics   **Rank 1 | CGPA: 8.51**
Relevant Coursework: Particle physics, Quantum field theory, Atomic and molecular spectroscopy, Plasma physics, Nuclear physics, Computational techniques, Quantum mechanics

Jiwaji University   *June 2022*
Bachelor of Science   **Percentage: 72.8%**
Relevant Coursework: Classical Mechanics, Electrodynamics, Thermodynamics, Statistical Mechanics, Quantum Mechanics, Solid State Physics, Calculus, Linear Algebra, Complex Analysis

RESEARCH EXPERIENCE

Deciphering twist-3 GPDs in LFQDM [1]   *Feb 2024 - Nov 2024*
Supervisor: Dr. Harleen Dahiya   NITJ

· Obtained explicit expressions of twist-3 generalized parton distributions (GPDs) using the light-front quark-diquark model (LFQDM).

· Results demonstrated consistency with previous studies, affirming the accuracy of the findings in the context of twist-3 effects in hadronic physics.

· Employed advanced computational techniques to explore the internal dynamics of hadrons, focusing on the role of sub-leading twist contributions.

Unraveling subleading twist GTMDs of proton using LFQDM [2]   *June 2023 - Oct 2024*
Supervisor: Dr. Harleen Dahiya   NITJ

· Conducted analytical calculations for subleading twist generalized transverse momentum distributions (GTMDs) in the proton using the light-front quark-diquark model (LFQDM).

· Utilized Mathematica for computational analysis, verifying and extending hand calculated results to explore the proton's internal quark dynamics.

· Presented this research as part of my Master's thesis defense, contributing to advancing the understanding of proton structure within the framework of Quantum Chromodynamics (QCD).

Molecular Dynamics: Simulation of Solar System   *May 2023 - July 2023*
Supervisor: Dr. Sharat Chandra   IGCAR

- *Investigated Three-Body Problem Dynamics*: Led a comprehensive exploration into the dynamics of the three-body problem within molecular dynamics simulations. Analyzed the influence of initial conditions on system behavior, enhancing the understanding of dynamical systems.
- *Fortran Code Development*: Created a robust Fortran codebase from scratch on a Linux-based OS, demonstrating strong programming skills in computational physics. Implemented and optimized numerical algorithms, including Verlet and velocity Verlet, for simulating complex molecular dynamics scenarios.
- *High Accuracy and Communication*: Achieved close alignment with experimental observations, with a maximum error margin of 10%, showcasing the accuracy and reliability of the computational model. Presented project results clearly and effectively, highlighting the precision and reliability of the developed computational model.

PUBLICATIONS

[1] S. Jain, S. Sharma, and H. Dahiya, "Deciphering twist-3 chiral-even gpds in the light-front quark-diquark model," *Phys. Rev. D*, vol. 110, p. 094 030, 9 Nov. 2024. DOI: 10.1103/PhysRevD.110.094030. [Online]. Available: https://link.aps.org/doi/10.1103/PhysRevD.110.094030.

[2] S. Sharma, S. Jain, and H. Dahiya, "Unraveling subleading twist gtmds of proton using light-front quark-diquark model," *Phys. Rev. D*, vol. 110, p. 074 025, 7 Oct. 2024. DOI: 10.1103/PhysRevD.110.074025. [Online]. Available: https://link.aps.org/doi/10.1103/PhysRevD.110.074025.

PRESENTATIONS

POSTERS
"Study of the Sub-leading twist GTMD $E_{21}^{\nu}(x, p_{\perp}, \Delta_{\perp}, \theta)$ for proton in light-front quark-diquark Model"
National Science Day (NITJ)   *Feb 2024*

ACHIEVEMENTS

Gold Medal, Master of Science in Physics, Dr. B. R. Ambedkar National Institute of Technology	*2024*
Mukhyamantri Medhavi Vidyarthi Yojana (MMVY), awarded by Government of Madhya Pradesh	*2019-2022*
Pratibhashali Vidhyarthi Protshahan Yojna (PVPY), awarded by Government of Madhya Pradesh	*2018*

REFERENCES

- **Dr. Harleen Dahiya**,
  Associate Professor, Computational High Energy Physics, Department of Physics, Dr. B.R. Ambedkar National Institute of Technology, Jalandhar, Pincode: 144008, Punjab, India.
  Email: dahiyah@nitj.ac.in

- **Dr. Sharat Chandra**,
  Scientist at Indira Gandhi Centre for Atomic Research and Professor, Computational solid state Physics, Homi Bhabha National Institute, India.
  Email: sharat@igcar.gov.in

- **Dr. Arvind Kumar**,
  Associate Professor, Computational High Energy Physics, Department of Physics, Dr. B.R. Ambedkar National Institute of Technology, Jalandhar, Pincode: 144008, Punjab, India.
  Email: kumara@nitj.ac.in

SKILLS/HOBBIES

Programming Languages Fortran, Mathematica, LaTeX
Hobbies Music, Stories

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