Ketankumar M. Jadav

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Education

- **University of Oklahoma** — Norman, USA
  Ph.D. in Physics — August, 2024 - Present
  Homer L. Dodge Department of Physics and Astronomy — **GPA: 4.00/4.00**
- **Indian Institute of Science Education and Research Bhopal** — Bhopal, India
  BS-MS Dual Degree — July, 2018 - May, 2023
  Department of Physics — **CPI: 9.32/10**

Publications

- Sukanta Panda, Abbas Tinwala, and **Ketankumar Jadav** *One-particle irreducibility of Vilkovisky-DeWitt effective action*

Projects and Research Experience

◇ **University of Oklahoma**: Supervisor: Prof. Phillip Gutierrez. Jan, 2025 - Present
Measurement of Charge Asymmetry in Top + Charm Decay

- Investigating charge asymmetry in top + charm production as a probe of non-diagonal CKM matrix elements and proton structure.
- Generated and analyzed simulated events using MadGraph, Sherpa, and Powheg frameworks to study kinematic distributions and charge asymmetry at LO (22%) and NLO (20%) levels.
- Utilized C++, Python, and ROOT to study key observables including transverse momentum (pT), pseudorapidity (η), and missing transverse energy (MET).
- Exploring how non-diagonal CKM mixing leads to observable charge asymmetries, offering insights into quark flavor dynamics in the Standard Model and potential signatures of new physics.
- Upcoming focus: applying machine learning–based jet tagging and background filtering techniques to confirm charge asymmetry using LHC data.

◇ **University of Oklahoma**: May, 2025 - Present
ATLAS Inner Detector Upgrade: High and Low Voltage Flex Testing

- Contributed to quality assurance for the High-Voltage (HV) and Low-Voltage (LV) flexible circuits (flex) used in the upgraded ATLAS Inner Tracker (ITk).
- Performed electrical testing to identify flexes with abnormal resistance, linked to variations in copper layer thickness that affect detector performance.
- Applied machine learning algorithms for automated visual inspection and defect detection in flex circuits.
- Gained hands-on experience with detector hardware, data acquisition systems, and reliability testing - bridging instrumentation work with high-energy physics analysis.

◇ **IISER Bhopal**: Supervisor: Prof. Sukanta Panda. July, 2022 - April, 2023
Master's Thesis: Two-loop Vilkovisky-DeWitt effective action for scalar field minimally coupled with gravity.

- Studied quantum field theory in curved spacetime as a low-energy limit of quantum gravity relevant to early-universe physics.
- Extended the DeWitt–Vilkovisky covariant effective action formalism to the two-loop level for a minimally coupled scalar field.

- Derived the divergent part of the two-loop VDW effective action, showing proportionality up to κ^4 (where $\kappa = 1/M_P$).
- Performed mass renormalization within this framework, ensuring covariance and gauge invariance of the off-shell effective action.
- Provided a covariant, gauge-independent quantum correction method applicable to low-energy quantum gravity and early-universe models.

Participations

- **Poster Presentation in Annual In-House Symposium 2023** organized by Department of Physics IISER Bhopal.
- **The soft skill and career development workshop 2023** held by IISER Bhopal
- **IUCAA Summer School 2020** held by IUCAA Pune (Online Due to COVID-19)
- **National Science Camp (VIJYOSHI) 2018** held at IISER Bhopal by IISc Bengaluru, India

Achievements

- **All India Rank 188** in CSIR UGC NET Physics, June 2023.
- Selected for INSPIRE FELLOWSHIP from Govt. Of Gujarat, 2017 (Top 1 Percentage in class 12)
- International Silver Medal held by World Federation of Yoga and Culture 2013.
- National Gold Medal Open National Yogasan Championship 2012.
- National Silver Medal Open National Yogasan Championship 2011.
- National Bronze Medal 59th National School Games 2014.

Teaching Responsibility

- Grader for PHYS-2514 — Fall 2024
- Grader for PHYS-2514 — Spring 2025

Skills

Machine Learning: CNNs, TensorFlow, Keras
Programming: Python, C++, ROOT
Experimental: Cleanroom Procedures, Soldering
Software: LaTeX, Mathematica, Git, Origin
Languages: English, Gujarati, Hindi

OU Qualifiers

Passed all the Qualifiers on my very first attempt.

- ◇ Quantum Mechanics — Spring 2025
- ◇ Classical and Statistical Mechanics — Spring 2025
- ◇ Electrodynamics — Fall 2025