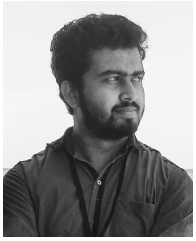

Prachurjya Pran Hazarika

Research Scholar in Experimental High Energy Physics
under the guidance of Prof. Sourabh Dube
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Research Work

Analysis

2020-Present (ongoing)

Search for Vector Like Leptons in Run3 data
I am developing the analysis tools to search for the 'vector-like leptons' (singlet and doublet) in a final state containing exactly two leptons with the same sign. The analysis strategy is being developed in the 2018 dataset, corresponding to an integrated luminosity of 59.8 fb^{-1} at a center-of-mass energy of 13 TeV. This is part of a broad search for VLLs in the multilepton final state, where I am focusing on the e-like and μ-like scenario, and expanding the phase space of the search to the 2LSS final state. I am planning to explore the Run3 data.

Service work for CMS

2023-Present (Ongoing)

MC contact position in the EGamma group
Every Physics Object Group (POG) in CMS requires an MC contact person whose job is to act as link between the generator group and the corresponding POG. I became the MC contact for the EGamma group in May 2023. My tasks include cloning of MC requests from previous ones (if they exist), or prepare new requests starting with gridpacks.

2023-Present (Ongoing)

Validation of the DNN Photon ID for Run3Summer23
The DNN based photon ID was trained with the Run3Summer21 MC for the barrel and endcap regions of CMS separately. I am validating the same ID in Run3Summer23, specifically focusing on its performance in the forward region.

2021

Photon Particle Flow ID Development for Run3
The Particle Flow algorithm is used in CMS to correlate between the basic elements from all the detector layers to reconstruct and identify each final state particle. These final state particles are given a Particle Flow ID. The PFID for photons is defined using some selections on the photon reconstruction variables. I developed a neural network based ID which can replace the cut-based photon PFID. This is ID ends up giving better efficiency for photons than the current cut-based ID, and is implemented in CMSSW_12+ framework.

Master's Thesis

2018-2019

A Study on the Potential of Detection of NSI in Neutrino-Oscillation Experiments
A phenomenological study on the Non-Standard Interactions (NSI) in neutrinos and the consequences of NSI on neutrino oscillations and neutrino detection experiments, by using Super-Kamiokande as an example. (Thesis submitted in partial fulfillment for the Masters Degree.)

Education

Present	**PhD in Physics**, IISER-Pune, Maharashtra, India, 411008 Member of the CMS Collaboration. Currently in 9th semester (August-December, 2024)
2017-2019	**MSc in Physics**, Tezpur University, Assam, India, 784028 First class, first rank holder (gold medalist) with CGPA 8.92
2014-2017	**BSc in Physics**, Jorhat Institute of Science and Technology, Jorhat Affiliated to Dibrugarh University, Assam, India, 786004 First class, second rank with percentage 90.64

Collaborations

2020-Present	**CMS Collaboration**, at the Large Hadron Collider, CERN, Geneva

Talks and Conferences

February, 2024	**Frontier Topics in Collider Physics** [1] Held at IISER Pune on 14th to 17th February, 2024. Discussions were held on EFTs for interpreting collider data, unconventional signatures such as collimated objects, disappearing tracks, inward moving objects, slow moving objects etc. and how to deal with them using ML or specialized detectors.
December, 2023	**Phoenix 2023** [2] Held at IIT Hyderabad from 18th to 20th December, 2023. There were several discussion sessions on dark matter models, search proposals for multiple BSM higgs models in HL-LHC and recent anomalies in CMS and ATLAS searches.
August, 2023	**India-CMS collaboration meeting 2023** [3] Held at Centre for High Energy Physics (CHEP), IISc Bangalore from 12th to 13th August 2023, where I caught up with new detector-level upgrades for Run3 and status updates on ongoing searches in Run2 data.
May, 2023	**HSF-India Software Training Event** [4] Held at TIFR Mumbai from 1st to 5th May, 2023, organized by TIFR, along with the High Energy Physics Software (HSF) foundation. The workshop covered basic C++, scientific python, GPU programming, basics of machine learning using tensorflow and JAX.
January, 2022	**India-CMS collaboration meeting 2022** [5] Held online from 6th to 11th January, 2022. I presented my work on the DNN photon ID development, which is part of the service work for CMS.

Outreach

February, 2024	**YouTube video on Women in Science** Edited an interview of some of the women working in the Experimental HEP group in IISER Pune under the guidance of Prof. Sourabh Dube.
October 19, 2022	**Introduction to EHEP for high school students** A talk in Assamese on introduction to the standard model and experimental particle physics, intended for 9th and 10th standard students from my high school.
December 18, 2021	**Talk on a brief introduction to Experimental High Energy Physics at JIST** Online talk on Experimental High Energy Physics for 3rd year B.Sc. students in Department of Physics, Jorhat Institute of Science and Technology.

Achievements and Awards

2020	**JEST 2020** : Qualified with all India rank 631
	INSPIRE-DST Fellowship : Valid from 26th November, 2020
2019	**CSIR-NTA NET, December 2019** : Qualified lectureship (India) with rank 046
	SLET, 2019 : Qualified lectureship (within N-E India)
	Gold Medal in M.Sc. Physics from Tezpur University, India

Skills

Technical Skills	Expert in C++, ROOT and python. Experienced in machine learning using tensorflow, scientific python. Basic knowledge of HTML, CSS, GPU programming (CUDA).
Languages	Fluent in English, Hindi and Assamese (mother tongue).
Co-curricular	Painting in different media - oil, acrylic and digital. Expert in Adobe Photoshop. Moderate skills in video editing and VFX (Adobe Premiere Pro and After Effects). Good with acoustic/electric guitar. Science writing and outreach in Assamese/English.

Declaration

I hereby declare that all the information furnished above is true to the best of my knowledge and belief.

Prachurjya Pran Hazarika
July 17, 2024
Pune, India

References

[1] Frontier topics in collider physics. https://indico.cern.ch/event/1345230/, February 2024.

[2] Phoenix 2023. https://indico.cern.ch/event/1313315/, December 2023.

[3] India-cms collaboration meeting 2023. https://indico.cern.ch/event/1300632/, August 2023.

[4] Hsf-india software training event. https://indico.cern.ch/event/1254939/, May 2023.

[5] India-cms collaboration meeting 2022. https://indico.cern.ch/event/1108755/, January 2022.