

10th Annual QuarkNet Report

Purdue University Northwest QuarkNet Center

2024

This is a brief report on the QuarkNet activities held at the Purdue University Northwest Center for High Energy Physics, under the auspices of PNW QuarkNet Center.

We had a remarkably successful QuarkNet Masterclass held at PNW on March 8, 2024. We had 80 high school students from Munster, Crown Point and Wheeler (Valpo), who came to PNW campus to attend a one-day workshop to analyze data from the Large Hadron Collider, delivered to CMS. In order to prepare them for this, their teachers did particle physics training outside of their regular curriculum. These teachers are a part of the Summer QuarkNet workshop at PNW. Following this I visited each school, sometimes more than once to give them a presentation on the topic of high energy physics and prepare them for the data analysis.

For the teachers workshop, we devoted 5 Saturdays in the Fall of 2024 as opposed to a typical weeklong summer participation. The program had enrollment from 6 high school teachers from Northwest Indiana, including Munster, Merrillville, Valparaiso and our latest addition from a former PNW student, now at HAST (Hammond Academy of Science and Technology). The teachers were supported with stipends by the QuarkNet funding awarded from University of Notre Dame.

The 2024 workshop was designed to expose the teachers and new PNW students hired in the high energy physics program to the topics of AI (Artificial Intelligence) in their conceptual form, the focus on the neutrino program in the USA, and the need for statistics in data analysis, in addition to interactive Cosmic Ray Muon Detector studies, especially since we have 2 new teachers this time. To this end we had Mr. Daniel Hautzinger, Dr. Quamar Niaz, Dr. Gokarna Aryal and Dr. Biswaranjan Behera who gave excellent presentations in a very engaging manner. Mr. Ken Cecire, the QuarkNet Coordinator visited us and educated us on the available QuarkNet resources, teacher responsibilities and World Data Day analysis. Dr. Adam Rengstorf, the Chair of Chemistry and Physics department also visited us.

Another important element during the workshop were the excellent presentations by our own research group members, including our students. Sam worked at Fermilab the entire summer on Phase 2 Pixel Upgrade Testbeam work at the Meson Testing Facility, analysis of the data, and certifying tracker data quality delivered to the CMS experiment by the LHC. Montana had a summer internship on Quantum Computing, another very interesting topic. Dr. Atanu Pathak, the postdoc of the group was the Level 3 convener of the Tracker Data Quality Monitoring group until he transitioned to the Level 2 Alignment and Calibration Database group. They all presented their work.

The teacher's were dedicated to creating new lesson plans on some very basic yet important high energy physics concepts. The goal is that each one will present the topic next year and incorporate

whatever might be possible in the curriculum. In summary, I believe it was a successful workshop. I would like to thank PNW and the QuarkNet program at Notre Dame for their support.

List of teachers who attended the program.

1. Larry Hautzinger - **Lead Teacher** - lrhautzinger@munster.us (Munster High School)
2. Ronda Waters - **Lead Teacher** - rwaters@cps.k12.in.us (Crown Point High School)
3. Keith Kozut - kakozut@munster.us (Munster High School)
4. Tim Klamo - tklamo@cps.k12.in.us (Crown Point High School)
5. Dan Kenning - dkenning@union.k12.in.us (Wheeler High School, Valparaiso)
6. Yassmeen Odeh - yassmeenodeh2@gmail.com (HAST, my former PNW physics major)

For any questions, please contact Dr. Neeti Parashar (parashar@pnw.edu).