

## Annual Report 2019

### SUNY at Buffalo QuarkNet Center

**Mentors: Profs. Ia Iashvili, Avto Kharchilava and Salvatore Rappoccio**

SUNY at Buffalo (UB) has joined QuarkNet in early 2006. Mentors of the group are UB experimental High Energy Physicists (HEP), Profs. Ia Iashvili, Avto Kharchilava and Salvatore Rappoccio. The group has sponsored its 13<sup>th</sup> annual QuarkNet Summer Workshop at UB during August 19-20. This year we had 6 teachers taking part in the Workshop: two lead teachers, Larry Hiller and David McClary, who have been with the center since its inception, two returning teachers, Tom Kenyon, Sami Cirpili, and two new teachers, Joel May and Orlando Buria.

The workshop began with dedicated, general presentations on particle physics, the CMS experiment and the LHC by Profs. Ia Iashvili and Avto Kharchilava. Prof. Iashvili also presented the latest results on the Higgs boson properties measured by the CMS and ATLAS Collaborations. Prof. Kharchilava gave talk on the latest results from the IceCube neutrino experiment and gravitational waves in the context of the Multi-Messenger Astrophysics. We had a fellow from QuarkNet central, Mr. Nathan Unterman visiting UB during the Workshop who offered several new ideas for cosmic data analysis with e-Lab. The data were collected with the QuarkNet standard CRMD brought by Mr. Larry Hiller from his school.

Earlier this year, on March 30<sup>th</sup>, UB QuarkNet center participated in the CMS Masterclass. Twelve high school students, including one international student from Canada (City Honors, Cheektowaga Central, Kenmore West and Glenforest Secondary, Mississauga, ON) were divided in groups to analyze  $Z \rightarrow ee/\mu\mu$ ,  $W \rightarrow ev/\mu\nu$  events using CMS event display. Different groups analyzed different sets of data and compared their findings. At the end of the data analysis session, students combined results to measure relative fraction of Z events compared to W events, ratio of  $W^+$  over  $W^-$ , and to check lepton universality. They have created distributions of various quantities. Students also “discovered” the Higgs boson,  $J/\Psi$  and  $\Upsilon$  resonances. Finally, students shared their findings with other participating QuarkNet centers through a videoconferencing.



Photo: Summer 2019 QuarkNet Workshop at the UB Physics Department, 08/20/2019.



Photo: QuarkNet Masterclass at the UB Physics Department, 03/30/2019.