# QuarkNet Annual Report 2018
# University of Florida

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The UF QuarkNet Center held a 2-day workshop at the University of Florida Physics Department on Aug.25 and 26. Six local teachers participated including two new recruits, one of whom, Ms. Fye, had participated in the International Teacher Week at CERN this past summer and was very excited to join. The two lead teachers, Ms. Bar David and Ms. McDilda, similarly were enthused having participated in the QuarkNet data camp at Fermilab in July.

The August UF workshop was a beta test of a new neutrino-themed workshop developed and led by Ken Cecire that went very well. Prof. Acosta gave an introductory lecture about the properties of the neutrino and some of the experiments that contributed to our understanding of it. The participants were led through several activities, one of which was to construct coupled pendula to demonstrate the coupling from one oscillator to another over time, which is essentially what is happening quantum mechanically when neutrinos oscillate from one flavor to another. The other activities had to do with the analysis of data recorded by the MINERvA neutrino experiment. One data sample was used to measure the lifetime of the muon by measuring the time difference from when a muon stopped in the experiment to when an electron was emitted from its decay. Another data sample was used to probe the size of the nucleus by studying the transverse momentum spread in the inverse beta decay reaction $\nu + n \rightarrow \mu + p$. Momentum should be conserved, but participants found a spread of a couple hundred MeV due to the Fermi motion of the nucleons inside the nucleus (due to the Uncertainty Principle). In both activities, the participants had to recognize the signatures of the particles in the provided web-based event display of the MINERvA open data.

The agenda and activity links for the workshop are available here:
https://quarknet.i2u2.org/content/neutrino-data-workshop-prototype-uf
Some photos taken during the workshop are included below: