

# **Seminarium Szkoły Doktorskiej NCBJ**

**Thursday, 4 November, 9:00**

**<https://www.gotomeet.me/NCBJmeetings/phd-seminar>**

**Speaker:**

**Maitrayee Mandal (Szkoła Doktorska NCBJ)**

**Title:**

**Detection of Tau Neutrinos at the Super-Kamiokande Experiment**

**Abstract:**

The Super-Kamiokande experiment (SK) is the famed water Cherenkov detector which discovered the oscillation of atmospheric neutrinos. As a result of the oscillation of atmospheric muon neutrinos, tau neutrinos are expected to appear. Therefore, direct detection of tau neutrinos in the flux of atmospheric neutrinos provides unambiguous confirmation of the phenomenon of neutrino oscillation. In 2018, SK excluded the hypothesis of no tau appearance with a significance level of  $4.6\sigma$ .

SK used machine learning techniques of neural networks (NNs) to classify the tau charged-current interactions from the interactions of the atmospheric muon and electron neutrinos. My research involves upgrading the NN for better classification. In particular, the signatures to classify these interactions are expected to be seen in neutrons, which are copiously produced in the particle showers arising from the tau and atmospheric neutrino interactions. So far, information related to neutrons has not been used at SK for discerning tau neutrinos.

The prospect of expanding the NN with new inputs pertaining to neutron captures is under consideration, owing to the enhanced detection of neutrons with the recent addition of gadolinium in SK. Preliminary results show that this additional information shall improve the NN classification, and hence, the detection of tau neutrinos.