Improving Dielectron Identification in Quark Gluon Plasma using Artificial Neural Networks by Anamitra Paul

Abstract: The time-of-flight (TOF) detector in the STAR detector at the Relativistic Heavy Ion Collider (RHIC) has greatly improved our ability to study dielectron (e+e-) production in collisions between gold ions. However, background from misidentified light hadrons in certain kinematic regions shows detector responses similar to that of an electron, making electron or positron identification more challenging. We present a study comparing shallow and deep neural network classifiers for electron identification using data from the Time Projection Chamber (TPC) and TOF detector at STAR. Hyperparameter optimization for determining the optimal neural network architecture is presented, and these optimized networks are then compared to each other. We find that deep neural networks provide a greater improvement in the sample purity rates of p+p collisions compared to shallow networks and cut-based methods. Such improvements in the purity rates will furthermore reduce backgrounds from misidentified electrons and positrons in dielectron spectra.