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Machine learning applications for Ortho-Positronium tagging in liquid scintillator for the PROSPECT experiment BLAINE HEFFRON, University of Tennesse Knoxville/Oak Ridge National Laboratory, DIEGO VENEGAS VARGAS, University of Tennessee Knoxville/Oak Ridge National Laboratory, PROSPECT COLLABORATION — PROSPECT is an above-ground detector for reactor antineutrinos, identified via the inverse beta decay (IBD) interaction.The IBD process provides a unique space-time correlated signal pair consisting of a positron energy deposition and a delayed neutron capture in the liquid scintillator (LS). The correlation between prompt and delayed pulses/signals provides an excellent handle for background suppression. We investigate a way to further recude the background further by tagging a subset of positrons, which are hard to distinguish from electrons by their interaction in LS. Before a pair annihilation takes place, there exists the possibility of a positron and an electron forming a bound state known as Positronium. Formation of an Ortho-Positronium (o-Ps) state, the spin-triplet state of Positronium, will introduce a delay in the photon emission time distribution of the prompt signal, thus providing a tool to discriminate between pair annihilation and o-Ps decay events. We present a summary of the machine learning techniques applied along with preliminary results regarding our ability to discriminate o-Ps decay events.

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