Contribution ID: **110**　　　　　　　　　　　　　　　　　　　Type: **Short Talk**

Event vertex reconstruction with deep neural networks for the DarkSide-20k experiment

Wednesday, 19 May 2021 18:06 (13 minutes)

While deep learning techniques are becoming increasingly more popular in high-energy and, since recently, neutrino experiments, they are less confidently used in direct dark matter searches based on dual-phase noble gas TPCs optimized for low-energy signals from particle interactions.

In the present study, application of modern deep learning methods for event ver- tex reconstruction is demonstrated with an example of the 50-tonne liquid argon DarkSide-20k TPC with almost 10 thousand photosensors.

The developed methods successfully reconstruct event's position withing sub- cm precision and are applicable to any dual-phase argon or xenon TPC of arbi- trary size with any sensor shape and array pattern.

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Session Classification: Artificial Intelligence

Track Classification: Offline Computing