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Improving the sensitivity of KM3NeT to MeV-GeV neutrinos from solar flares

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The detection of MeV-GeV neutrinos from astronomical sources is a long-lasting challenge for neutrino experiments. The low flux predicted for transient sources, such as solar flares, would require a detector with both a large instrumented volume as well as a high density of photomultipliers (PMTs) to resolve the low-energy signature. We discuss how KM3NeT can play a key role in the search for these neutrinos.
KM3NeT is a Cherenkov neutrino telescope currently under deployment, located at the bottom of the Mediterranean Sea. It consists of two arrays of Digital Optical Modules (DOM): KM3NeT/ORCA and KM3NeT/ARCA, which are respectively optimised for the detection of GeV neutrinos for oscillation studies, and higher-energy astronomical neutrinos.
We present the predicted sensitivity of ORCA to the bright solar flare observed on September 10th, 2017.
We exploit the multi-PMT configuration of KM3NeT's DOMs to develop the techniques that allow disentangling of the MeV-GeV neutrino signature from the atmospheric and environmental background. Comparing data with neutrino simulations we identify the variables with discriminating power, and by applying hard cuts we are able to reject a large fraction of background.
We present a graph convolutional network approach to classify signal from background. To further improve the sensitivities compared to previous studies, we will make use of the Hierarchical Graph Pooling with Structure Learning algorithm and will use graph-structured data to reproduce the hit geometry on the DOM. This will allow for stronger constraints on the hits and reduce the fraction of background that survives the selection.

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