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Direct reconstruction of neutrinos in IceCube

The upcoming Upgrade for the IceCube neutrino observatory will in 2022-23 deploy seven new strings featuring multi-PMT optical modules and new calibration devices, enhancing the sensitivity to $O(1-100)$ GeV neutrinos used in atmospheric neutrino oscillation measurements. Precision reconstruction of neutrino energy and direction is essential to maximising the sensitivity of these oscillation analyses. Here a likelihood-based reconstruction algorithm where each hypothesis is generated by optimised simulations running on GPUs is presented. This method can achieve greater accuracy than existing algorithms as well as mitigating technical challenges applying previous methods to the new detector hardware.

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