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Reverse table reconstructions for low energy neutrinos in IceCube
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IceCube is a neutrino detector formed from a km^3 of ice beneath the South Pole instrumented with over 5000 optical sensors (DOMs). When a neutrino interacts in the ice, secondary charged particles emit Cherenkov light, some of which is detected by DOMs and recorded as a charge-time distribution across the detector. From this, we reconstruct the primary neutrino's energy and direction. Current reconstructions simulate interactions in the ice and the DOMs' responses thereto, but this is computationally expensive since most photons emitted are not detected. In this talk, we show initial results from a new reconstruction that aims for higher accuracy and better computational efficiency than current reconstructions for $\mathcal{O}(\infty - \infty\prime\prime)$ GeV neutrinos. Our method works in the reverse from current methods: We simulate light coming from DOMs and record in tables information about the light at space-time coordinates in the ice. In this way, we only simulate photons that would be detected. We use these "reverse" tables and an efficient event model to arrive at the expected charge-time distribution for a hypothesis. Compared with the recorded distribution, we assign a likelihood to the hypothesis, and by tuning the model parameters, we find a maximum-likelihood hypothesis.

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