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Applications of Information Field Theory in Astroparticle Physics

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Information Field Theory (IFT) offers a powerful framework for the analysis of experimental data. The fundamental objective of IFT is the reconstruction of continuous fields from noisy and sparse data. By combining Bayesian probabilities with computational techniques from quantum field theory and statistical mechanics, IFT allows for efficient inference in high-dimensional problems.
In this talk, we discuss the application of IFT in the context of astroparticle physics. First, we present its use for the calibration of the newly installed radio detector upgrade of the Pierre Auger Observatory, the world's largest cosmic-ray observatory. By analyzing data from drone flights, the radio response patterns are calibrated using IFT. Second, we present a novel application of IFT to infer properties of the Galactic magnetic field using the arrival directions of ultra-high-energy cosmic rays in a simplified toy model.

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