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Can You Hear the Shape of a Jet?

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The identification of interesting substructures within jets is an important tool to search for new physics and probe the Standard Model. In this talk, we present SHAPER, a general framework for defining computing shape-based observables, which generalizes the N-jettiness from point clusters to any extended shape. This is accomplished by minimizing the p-Wasserstein metric between events and parameterized manifolds of energy flows representing idealized shapes, implemented using the dual-potential Sinkhorn approximation for efficient minimization. We show how this geometric language of observables as manifolds can be used to easily define novel event and jet-substructure observables with built-in IRC safety that are useful for physics analyses, generalizing the notion of an event shape. We then demonstrate the SHAPER framework by performing example jet substructure analyses using these new shape-based observables.

Primary author: GAMBHIR, Rikab (MIT)

Co-authors: Mr DOGRA, Akshunna (Imperial College); Prof. BA, Demba (Harvard); THALER, Jesse (MIT)

Presenter: GAMBHIR, Rikab (MIT)

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