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SPECTER: Efficient Evaluation of the Spectral EMD

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The Energy Mover's Distance (EMD) has seen use in collider physics as a metric between events and as a geometric method of defining infrared and collinear safe observables. Recently, the spectral Energy Mover's Distance (SEMD) has been proposed as a more analytically tractable alternative to the EMD. In this work, we obtain a closed-form expression for the Riemannian-like p = 2 SEMD metric between events, eliminating the need to numerically solve an optimal transport problem. Additionally, we show how the SEMD can be used to define event and jet shape observables by minimizing the metric between event and parameterized energy flows (similar to the EMD), and we obtain closed-form expressions for several of these observables. We also present the SPECTER framework, an efficient and highly parallelized implementation of the SEMD metric and SEMD-derived shape observables. We demonstrate that the SEMD and SPECTER provide nearly thousand-fold compute time improvements over evaluation of the EMD.

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Classifica Sessioni: Novel Techniques

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