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Geometric Learning and Non-Euclidean Filtering in Finance

We introduce a method for incorporating relevant geometric information into a broad class of filtering and learning algorithms. Our central theorems illustrate how we may computably approximate the non-Euclidean filtering problem to arbitrary precision and how we can increase the accuracy of any learning algorithm by incorporating the relevant geometric information into a large class of filtering and machine learning algorithms. Our applications focus on exploiting the geometry of the stochastic volatility models and the shape of the forward-rate curve.