Deep Switching State Space Model for Nonlinear Time Series Forecasting with Regime Switching

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Abstract

We study the problem of modeling and inference of time series when the dynamics is nonlinear with stochastic regime switching behaviors and identification of the regimes is important. In this setting, standard statistical modeling and deep learning approaches suffer from either a severe modeling misspecification or lack of interpretation. We propose a deep switching state space modeling framework (DS3M) that can produce efficient inference with meaningful interpretation. We apply this method to perform short- and long-term forecasting on a number of simulated and real data sets in various disciplines of healthcare, economics, traffic, meteorology and energy. Our experiments show that DS3M achieves competitive forecasting accuracy compared to several state-of-the-arts and reasonable regime identifications.