Computational and Data Enabled Science Seminar
Seminar

Multivariate Quantile Function Forecaster

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Abstract: We propose Multivariate Quantile Function Forecaster (MQF^2), a global probabilistic forecasting method constructed using a multivariate quantile function and investigate its application to multi-horizon forecasting. Prior approaches are either autoregressive, implicitly capturing the dependency structure across time but exhibiting error accumulation with increasing forecast horizons, or multi-horizon sequence-to-sequence models, which do not exhibit error accumulation, but also do typically not model the dependency structure across time steps. MQF^2 combines the benefits of both approaches, by directly making predictions in the form of a multivariate quantile function, defined as the gradient of a convex function which we parametrize using input-convex neural networks. By design, the quantile function is monotone with respect to the input quantile levels and hence avoids quantile crossing. We provide two options to train MQF^2: with energy score or with maximum likelihood. Experimental results on real-world and synthetic datasets show that our model has comparable performance with state-of-the-art methods in terms of single time step metrics while capturing the time dependency structure.

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Mathematics
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