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Forecasting and Estimation in the Data Market: An Active Learning Perspective

This work presents a novel active learning market framework that enhances both forecasting accuracy and parameter estimation quality in data-constrained environments—typical in many industrial and business applications. Traditional models often rely on full data access, but our approach prioritizes selective acquisition of high-value data, striking a balance between statistical efficiency and operational cost.

We develop both batch-mode strategies for one-time data acquisition and online adaptive methods that enable real-time decision-making. Our framework integrates market-based mechanisms—capturing willingness-to-pay and willingness-to-sell—to guide data selection, and applies exponential forgetting to adapt models efficiently over time.

Empirical evaluations in energy forecasting and demographic modeling scenarios demonstrate improved performance in both predictive accuracy and estimation stability, while significantly reducing data costs. The approach scales to multi-agent settings, making it versatile across sectors such as energy, finance, and industrial analytics.

This research contributes a statistically principled, cost-effective solution for optimizing data acquisition, supporting smarter decisions in real-world forecasting and modeling tasks—aligned with ENBIS goals of improving business and industrial statistics through innovative applications.

Special/ Invited session

Young Statistician

Classification

Both methodology and application

Keywords

Active learning, Data market

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