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Pushing Intelligence at the Edge: Edge-centric Inferential Analytics

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Abstract

Real-time inferential analytics support exploratory (hypotheses formulation), diagnostic (why is it happening), predictive (when is likely to happen) and descriptive (what is happening now) data analysis via predictive statistical models e.g., multivariate linear & quartile regression over live data. The derived and incrementally updated predictive models, mainly regression and time-series forecasting models, are used in such analyses supporting analysts/applications in terms of:
(i) Real-time prediction of new/unseen data (regression)
(ii) Investigation how observed data fit such models (function estimation) and
(iii) Forecasting of future data trends of incoming data.

Real-time inferential analytics are materialized after contextual data are transferred from sensing devices and data sources to the Cloud aiming to build global on-line models over all observed data. Then, analysts/applications issue arbitrary regression & exploratory queries over such models for real-time data exploration, on-line prediction, and adaptive knowledge extraction. This refers to query-driven predictive analytics, which has been adopted in large-scale distributed computing systems. This talk will narrate real-time, edge-centric inferential modeling and analytics methodologies introducing the fundamental mechanisms for (i) predictive models update and (ii) diverse models selection in distributed computing. The objective of this methodology is the time-optimized model caching and selective forwarding at the network edge adopting Optimal Stopping Theory, where communication overhead is significantly reduced as only inferred knowledge and sufficient statistics are delivered instead of raw data obtaining high quality of analytics. Novel model selection algorithms will be discussed to fuse the inherent models' diversity over distributed edge nodes to support inferential analytics tasks to end-users/analysts, and applications in real-time.