PROJECT REPORT

OPTIMIZING RESOURCE AND QUERY MANAGEMENT IN SCHEMA-BASED MULTI-TENANT DATABASES USING XGBOOST CLASSIFICATION IN POSTGRESQL

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ABSTRACT

Schema-based multi-tenant databases, essential for modern Software as a Service (SaaS) applications, frequently suffer from the 'noisy neighbor' problem, where a single tenant's resource-intensive queries degrade system-wide performance. While existing research has proven machine learning effective for passive performance prediction, a significant gap remains in implementing autonomous mitigation actions, especially within this specific architecture. This research addresses this gap by developing an autonomous optimization system for PostgreSQL. Using performance data collected from pg_stat_statements under simulated workloads, a machine learning model is trained to classify queries by their performance risk in real-time. A core 'Decision Engine' then leverages these predictions to automatically terminate any query identified as a disruptive 'noisy neighbor'. The system's effectiveness will be quantitatively evaluated by comparing throughput and latency in controlled baseline versus optimized scenarios. This study presents a practical solution that moves beyond passive prediction to active intervention, demonstrating an effective method to mitigate the 'noisy neighbor' problem and ensure fairer resource allocation.

Keyword: multi-tenant database, noisy neighbor, query optimization, machine learning, PostgreSQL