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Towards Sustainable DBMS: A Framework for Real-Time Energy Estimation and Query Categorization

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Abstract. Energy efficiency in database management systems (DBMS) is increasingly critical due to the rising computational demands of modern applications. Our work proposes a complete framework to analyze energy consumption. We developed a real-time monitoring framework that captures CPU and memory utilization during query execution and estimates energy consumption. We have implemented a query logging mechanism to track and analyze execution time. We propose an energy estimation model that computes power consumption using CPU utilization metrics and query categorization based on energy usage profiles. We studied the correlation between execution time and energy consumption using Pearson correlation. We propose a power-based classification of SQL query types, enabling more energy-aware optimization strategies. The result of our analysis highlights the opportunities for power-aware query optimization, making DBMS operations green computing and efficient.

Keywords: Energy-Efficient Computing, Database Management Systems (DBMS), Query Optimization, Power Consumption Analysis, Energy Estimation Model, Green Computing, Workload Profiling.

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Classification de Session: Foundations and Sustainability in Machine Learning