Robust and Budget-Constrained Encoding Configurations

In-Memory Database Systems

- For in-memory database systems, memory consumption is a significant cost-driver, especially in cloud deployments.
- Our goal is a workload-driven selection of encoding schemes that exploits workload patterns to reduce memory consumption and improve runtime performance.

Encoding Selection

- To estimate sizes and query runtimes for a given encoding configuration, we use linear regression models that are robust, efficient to train, and can be applied to out-of-sample data (e.g., larger data sets).
- We propose integer linear programming to determine optimal encoding configurations as well as efficient heuristics for very large problems.
- We extend the linear programming model to incorporate robustness constraints that mitigate unexpected performance regressions and allow to avoid SLA violations.

Results

- The models accurately predict sizes and runtimes of arbitrary encoding configurations.
- For the Join Order Benchmark, TPC-H, and TPC-DS, optimized encoding configurations can improve runtime performance while decreasing memory consumption over state-of-the-art dictionary encoding.
- The proposed heuristics yield competitive performance and provide an efficient alternative without requiring solvers.

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