# Project Proposal: Query Processor and Optimizer

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## Title

Query Processor and Optimizer

## Abstract

Efficient query processing is a cornerstone of database management systems, balancing performance and resource utilization. This project aims to develop a query processor and optimizer that parses SQL-like queries, constructs computation graphs, generates execution plans, and estimates operational costs. Leveraging Bison and Flex, we will build a parser to translate queries into a structured format. The system will then produce optimized execution plans, inspired by PostgreSQL and SQLite, incorporating basic optimizations such as selection pushdown and join reordering, as outlined in Silberschatz et al.'s "Database System Concepts." Cost estimation will rely on simplified table statistics and operation complexity. By integrating systems-level tools with database theory, this project will deliver a functional prototype that demonstrates query transformation and cost-aware optimization within a constrained timeline.

## Weekly Work Plan

Week 1: **March 17–23, 2025 (Proposal Submission)**

- Finalize project scope and objectives.
- Research query processing and optimization (Silberschatz Ch. 13–14).
- Draft and submit proposal.
- Set up Bison and Flex for SQL-like grammar.
- Implement parser to generate abstract syntax tree (AST).

- Convert AST to basic computation graph for simple queries.

Week 2: **March 24–30, 2025 (Parser and Computation Graph)**

- Generate initial execution plans (e.g., relational algebra).
- Develop basic cost estimation model (I/O and CPU costs).
- Test with single-table and join queries.

Week 3: **March 31–April 6, 2025 (Execution Plan and Cost Estimation)**

- Implement selection pushdown and join reordering optimizations.
- Compare costs of optimized vs. unoptimized plans.
- Test with diverse queries and debug.

Week 4: **April 14–15, 2025 (Finalization and Submission)**

- Polish code and validate results.
- Write final report and prepare demo.
- Submit by April 15, 2025.