Turbo-charging Query Optimization using Modern Hardware

**Keywords:** Query Optimization, Plan Enumeration, Search Algorithm, GPU

**Problem:** Analytical DBMS engines incorporate a crucial component called as *query optimizer* to pick an efficient query plan for execution. In order to select the *best* plan, different systems use different techniques such as dynamic programming, genetic algorithms and machine learning to name a few. Due to the exponential nature of the problem, these techniques are typically inefficient for complex queries.

**Project:** The goal of the project is to leverage modern hardware, specifically GPUs, to generate query plans. Few attempts which leverages GPUs are done in [1,2]. The efficient parallelization of the algorithms used by the query optimizer will allow optimizing queries with large number of tables. The student needs to design parallel versions of established algorithms that are optimized for the GPU memory hierarchy and evaluate their performance.

**Plan:**
1. Choose a representative sample of conventional and state-of-the-art algorithms. Implement the algorithms for CPUs and evaluate their performance and scalability.
2. Develop GPU hardware-oblivious versions of the algorithms.
3. Optimize the algorithms to make use of GPU hardware characteristics such as the shared memory and coalescing.
4. Evaluate the performance of the implemented GPU-assisted query optimization techniques

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**Duration:** 1 Semester

**References**