

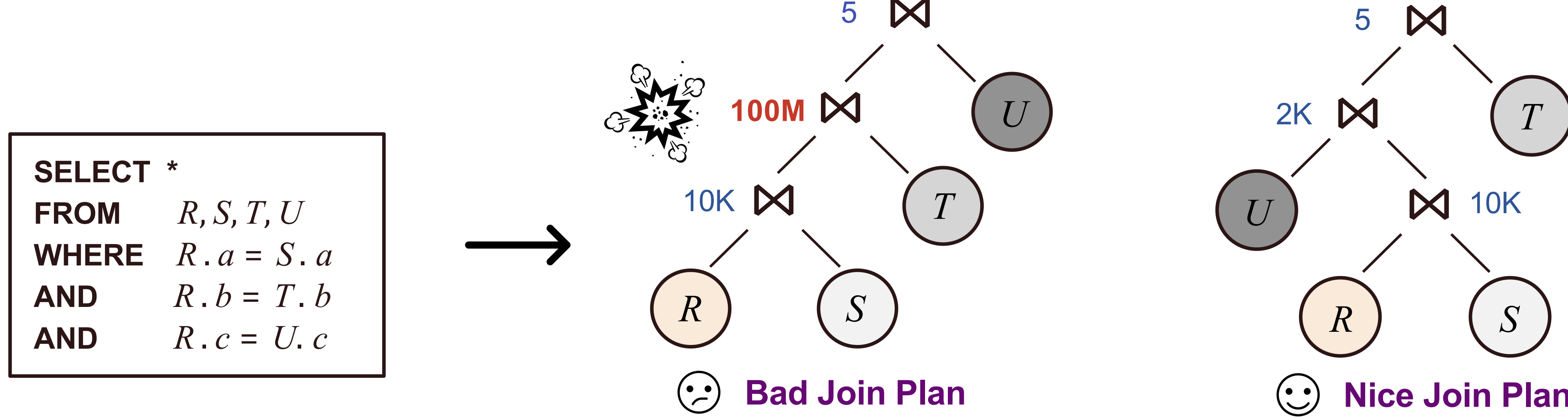


CWI

Robust Predicate Transfer with Dynamic Execution

Yiming Qiao, Peter Boncz, Huanchen Zhang

The Long-Standing Join Order Problem in Analytical Databases



Goal: choose the join plan with minimum intermediate result size

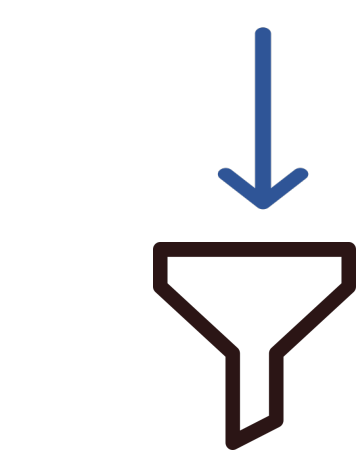
Past Research focuses on

- Cardinality Estimation
- Plan Enumeration

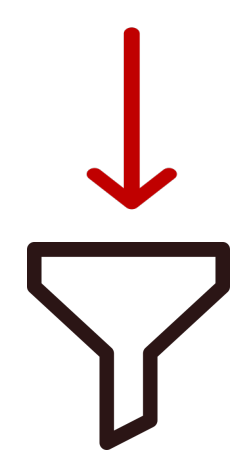
Both remain challenging problems.

Runtime Filter, Predicate Transfer, and Robust Predicate Transfer

WHERE $R.a = S.A = R.a \subseteq S.a$ and $R.a \supseteq S.a$
AND $R.b = T.b$
AND $R.c = U.c$

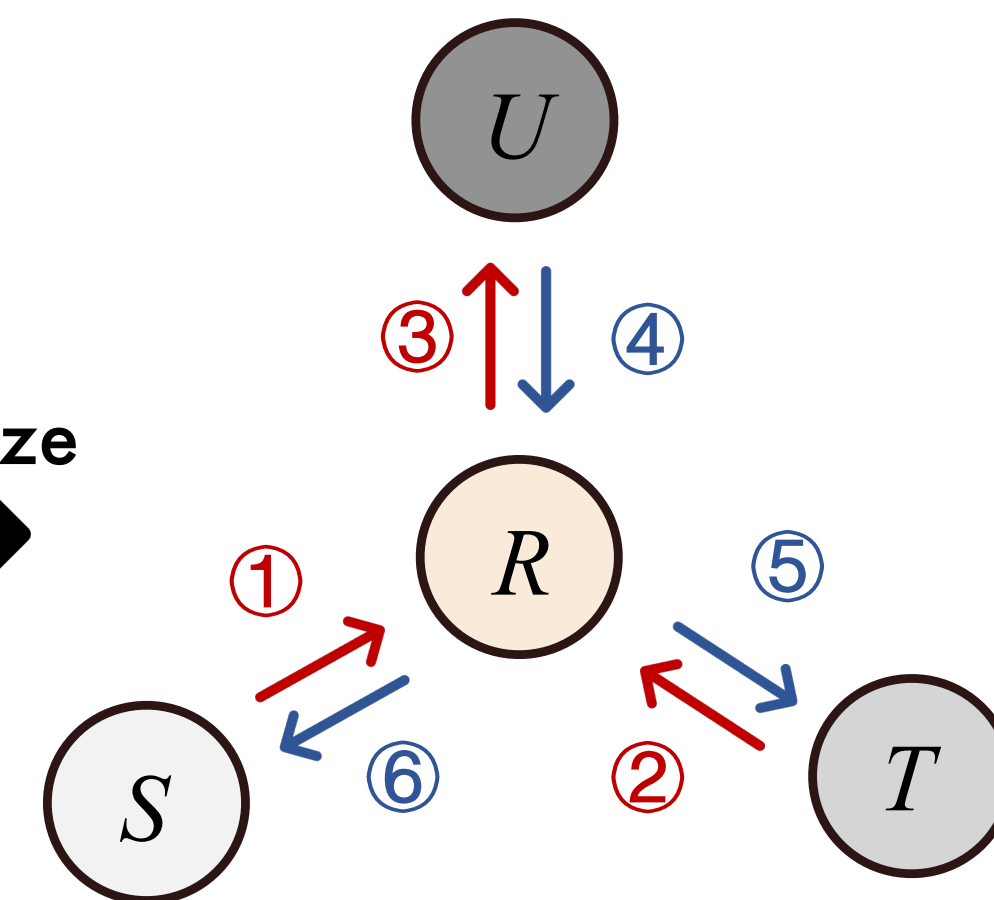


Bloom Filter



Bloom Filter

Generalize



Bloom Filter Transfer of RPT

Before joins, they reduce table sizes by transferring **Bloom filters**, which has two passes:

Forward Pass is from the Leaves to the Root

Backward Pass is from the Root to the Leaves

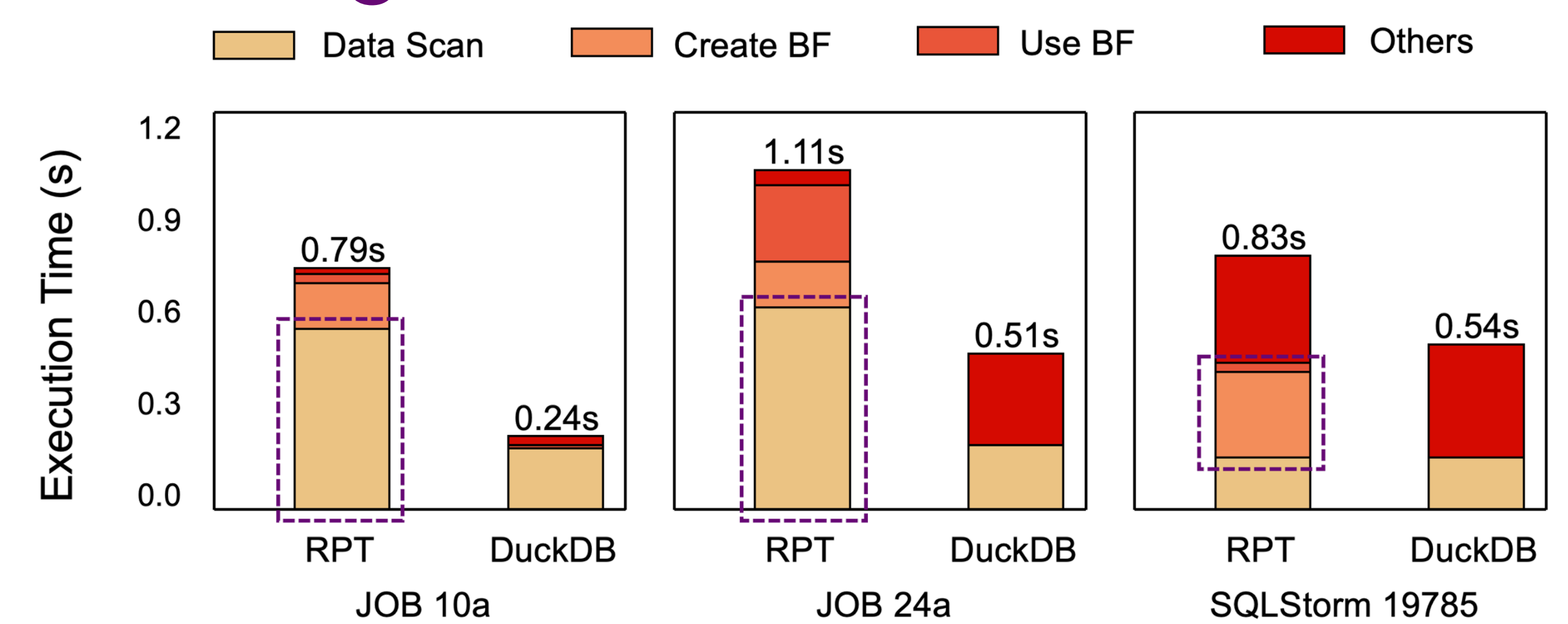
Both passes operate on the same join tree, generated by the Largest Root first heuristic.

However, They Can Cause Performance Regressions Due to ...

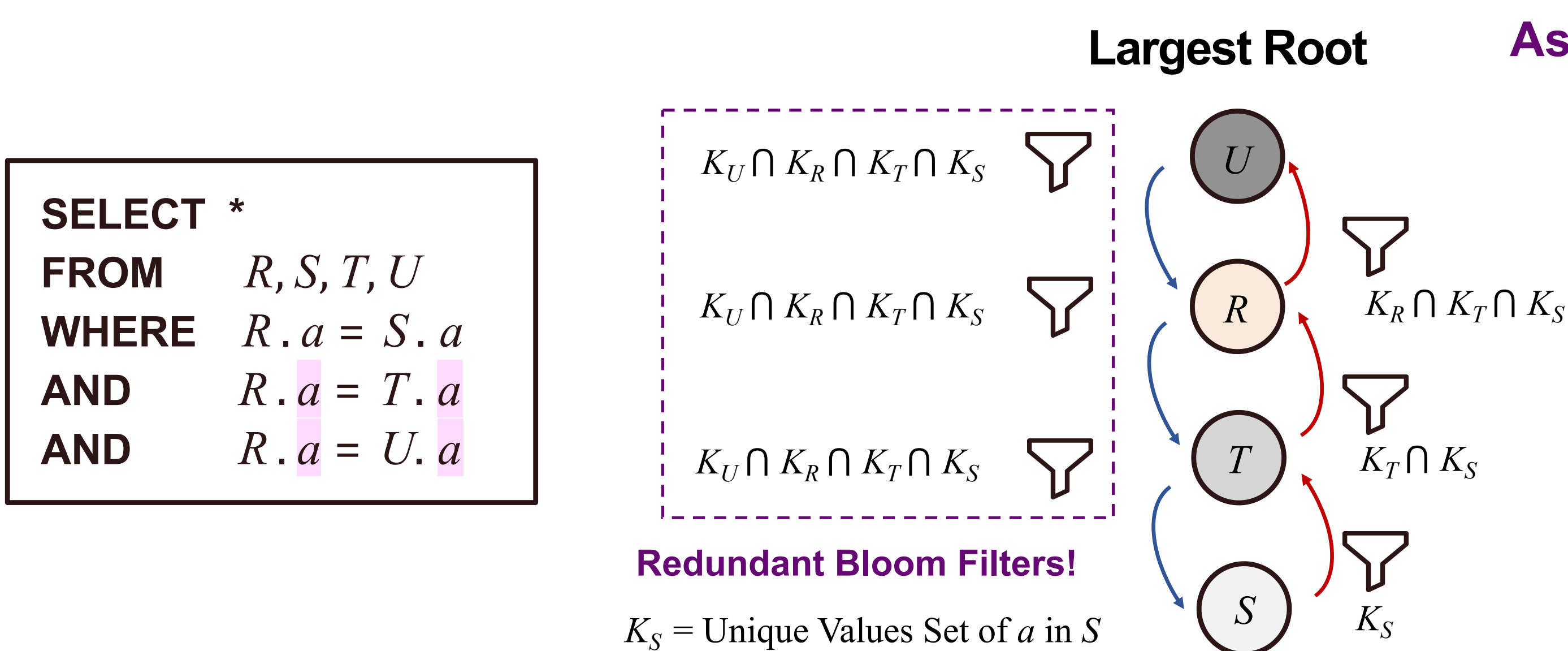
Transfer Plan Redundancy: Symmetric passes over the same join tree can introduce redundant filter transfers.

Transferred Filter: Operates at the row level, without awareness of the underlying storage format (e.g., row groups).

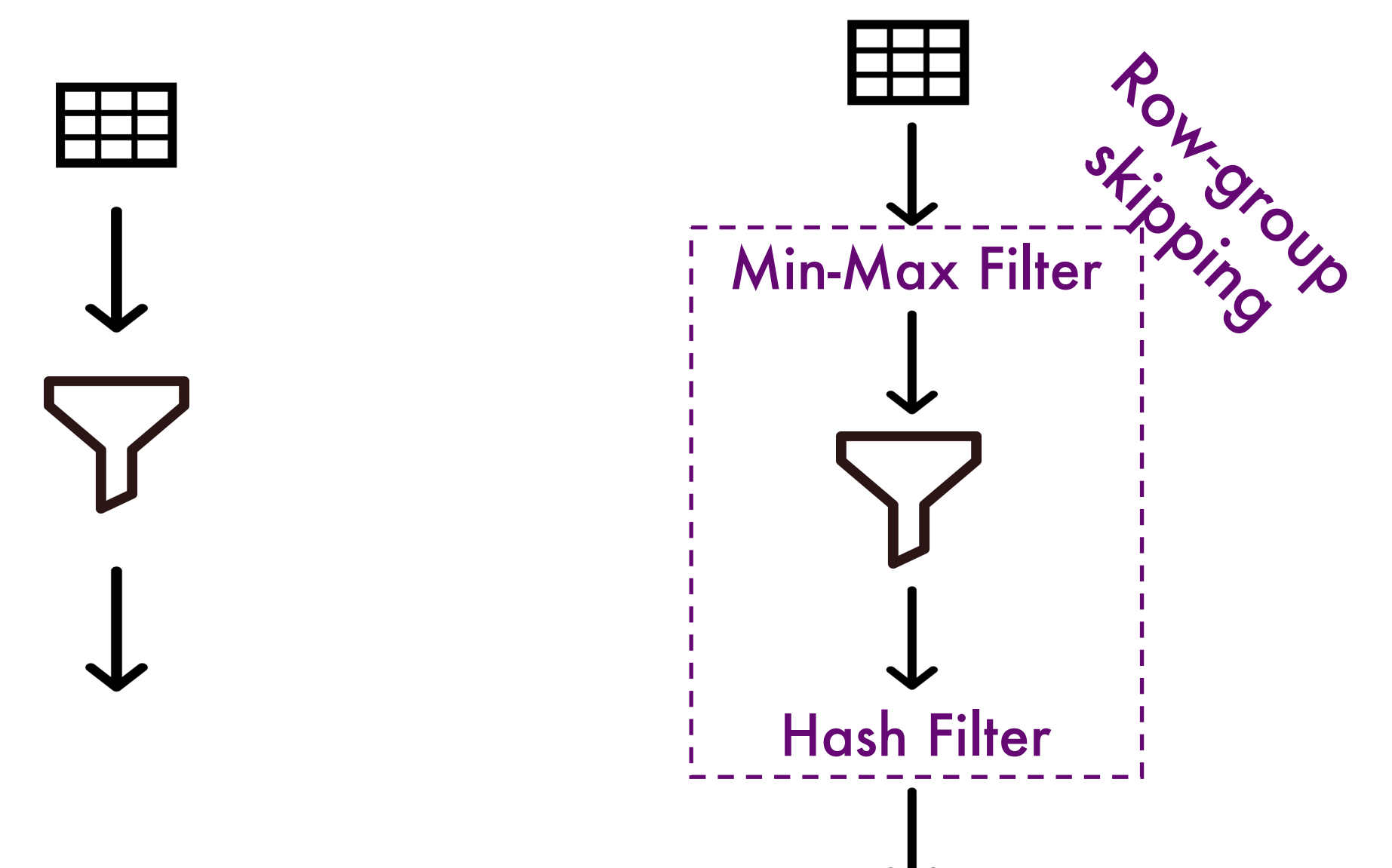
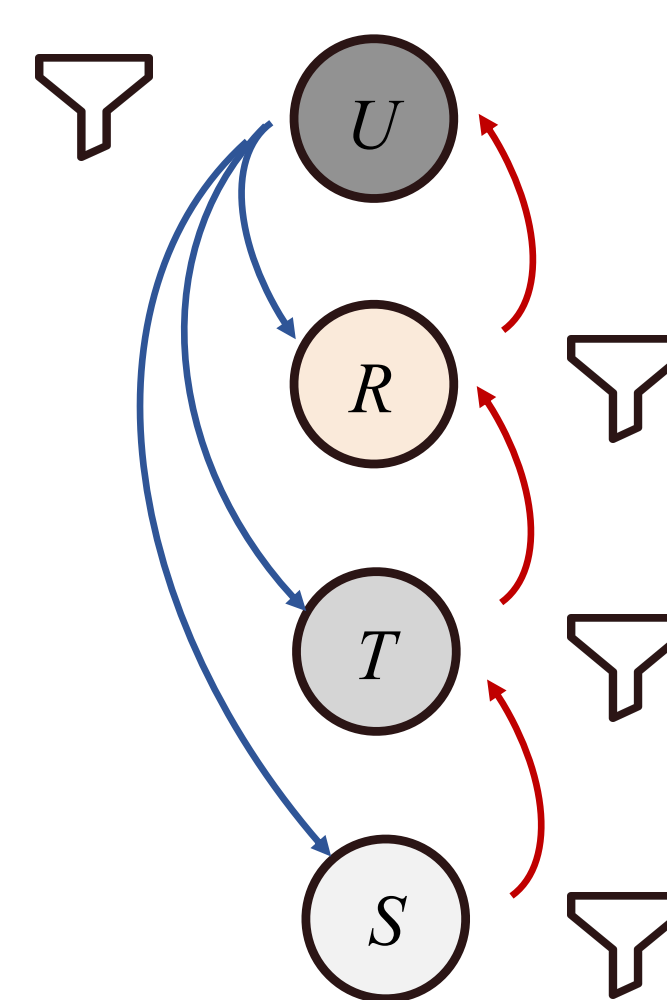
Static Execution: Follows a fixed transfer plan and cannot recognize non-reducible query tables.



We Investigate: How to Transfer, What to Transfer and When to Stop



Asymmetric Transfer Plan



How to Transfer: A deep, chaining tree is ideal for forward pass (to collect information); whereas a wide, broadcast tree is best for backward pass (to distribute information).

What to Transfer: Cascade filters, from lightweight to heavyweight and from approximate to precise.

Speedup Distribution Comparison

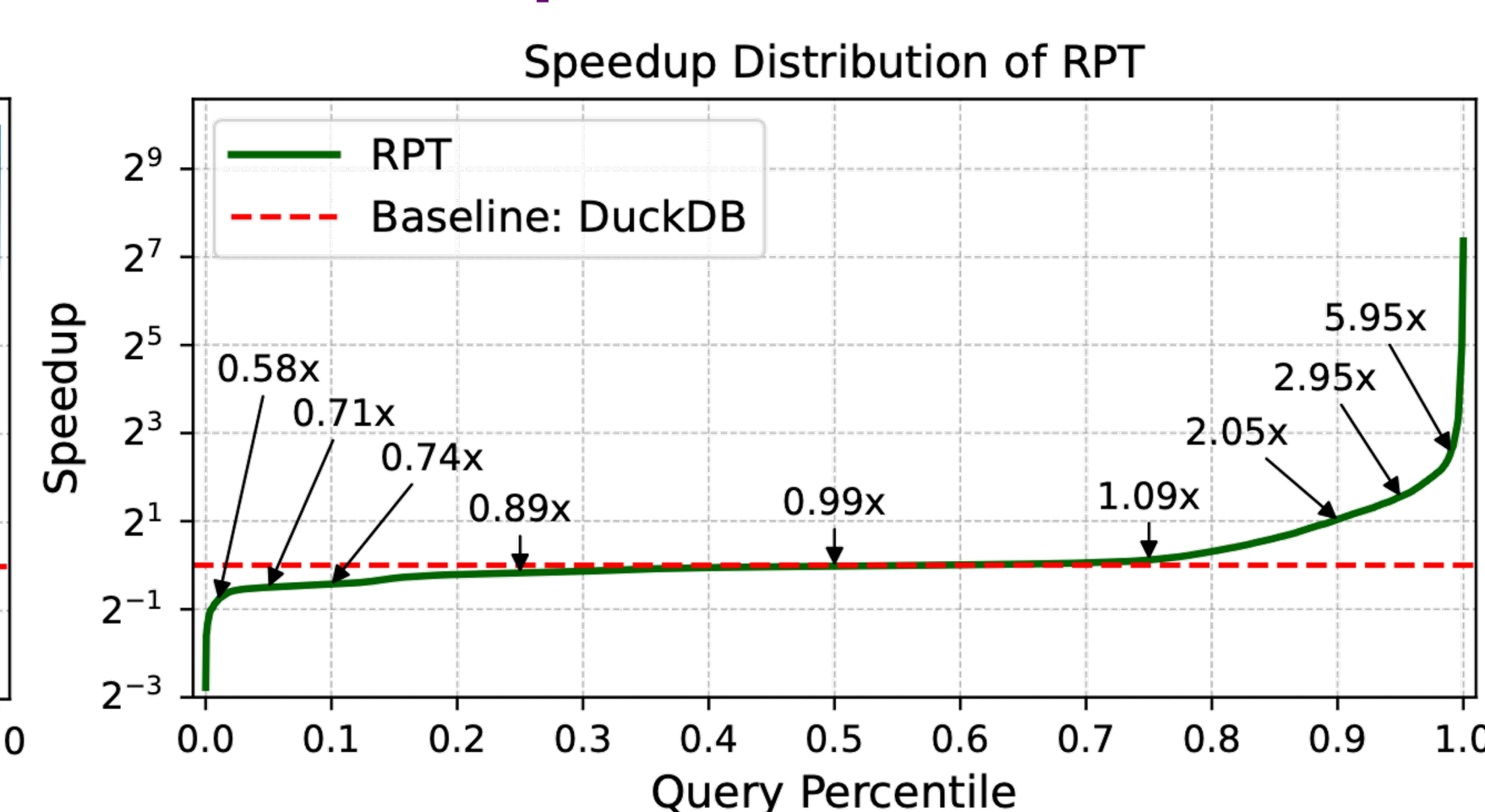
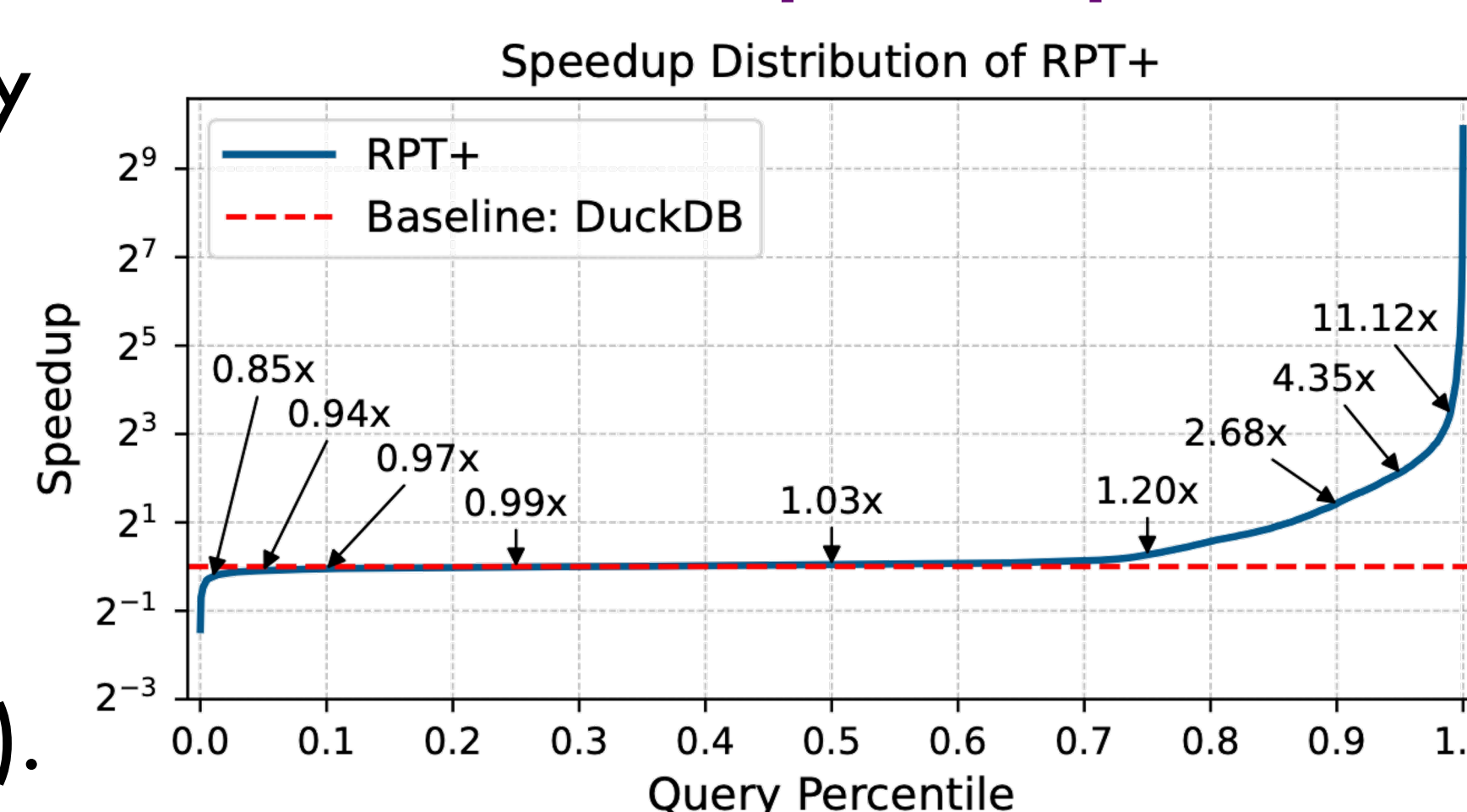
Goal: collect "Information" from efficiently filtered tables only

A Table is **efficiently filtered** if and only if:

Filterable: It has at least one user-defined predicate.

Selective: Its predicates are selective.

When to Stop: Runtime statistics indicate little filtering benefit; we stop the transfer through the **dynamic pipeline** (see paper).

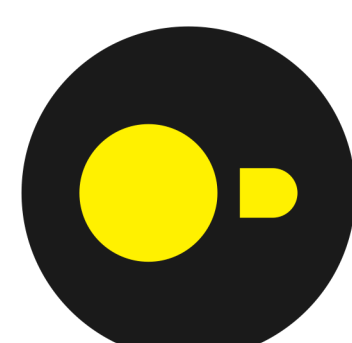


Preview: We Release Extensions for DuckDB, PostgreSQL, and DataFusion



DuckDB Extension

×



PostgreSQL Extension

×



Apache DataFusion Extension

×

