



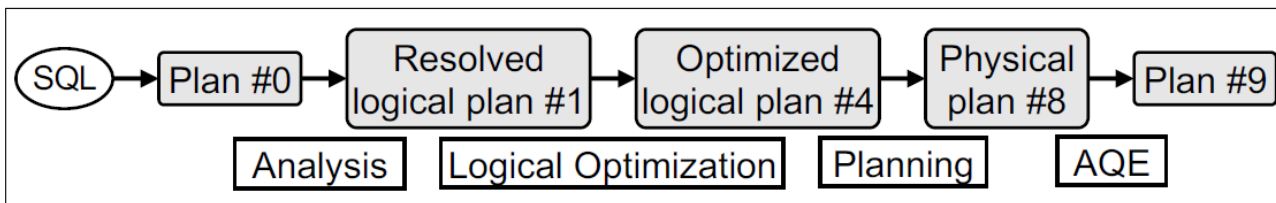
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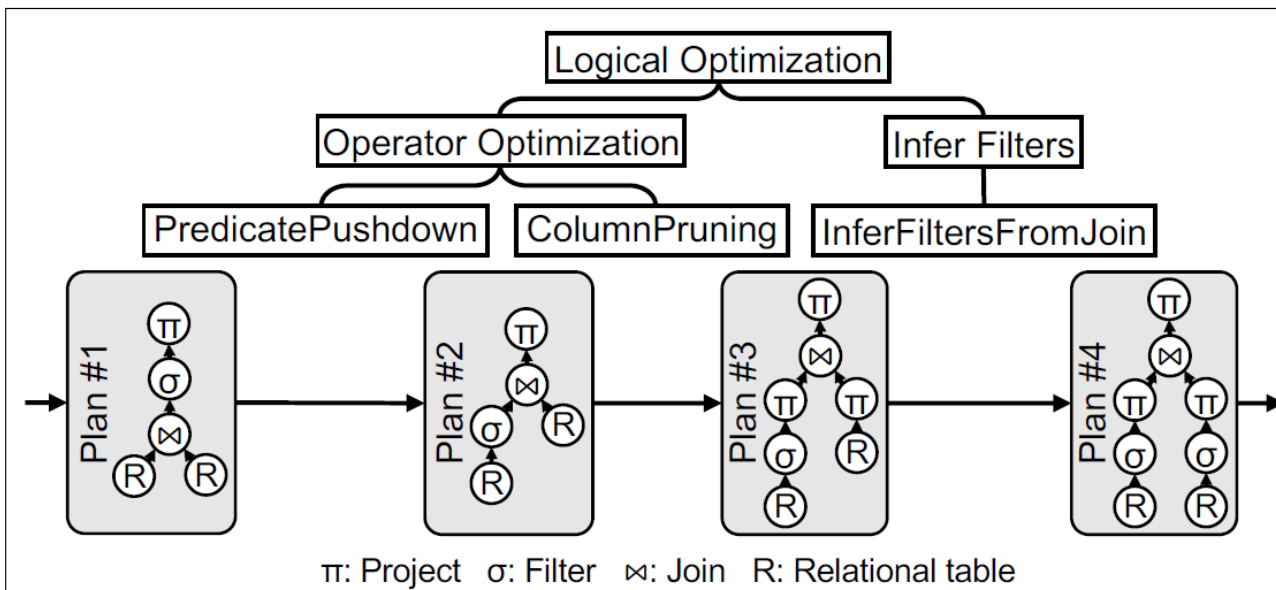
可视查询优化分析

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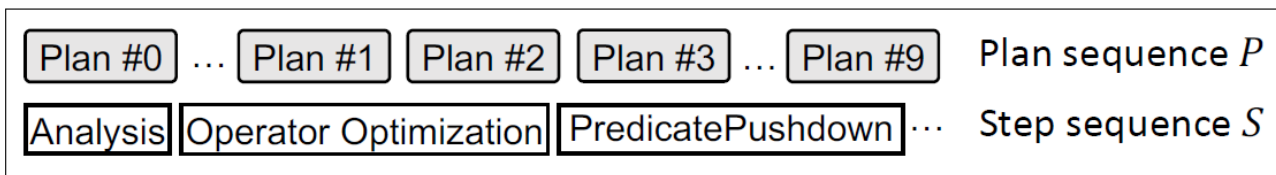




(a) Query optimization overview in Apache Spark



(b) Optimization step hierarchy example



(c) Query optimization trace

Collect from the log

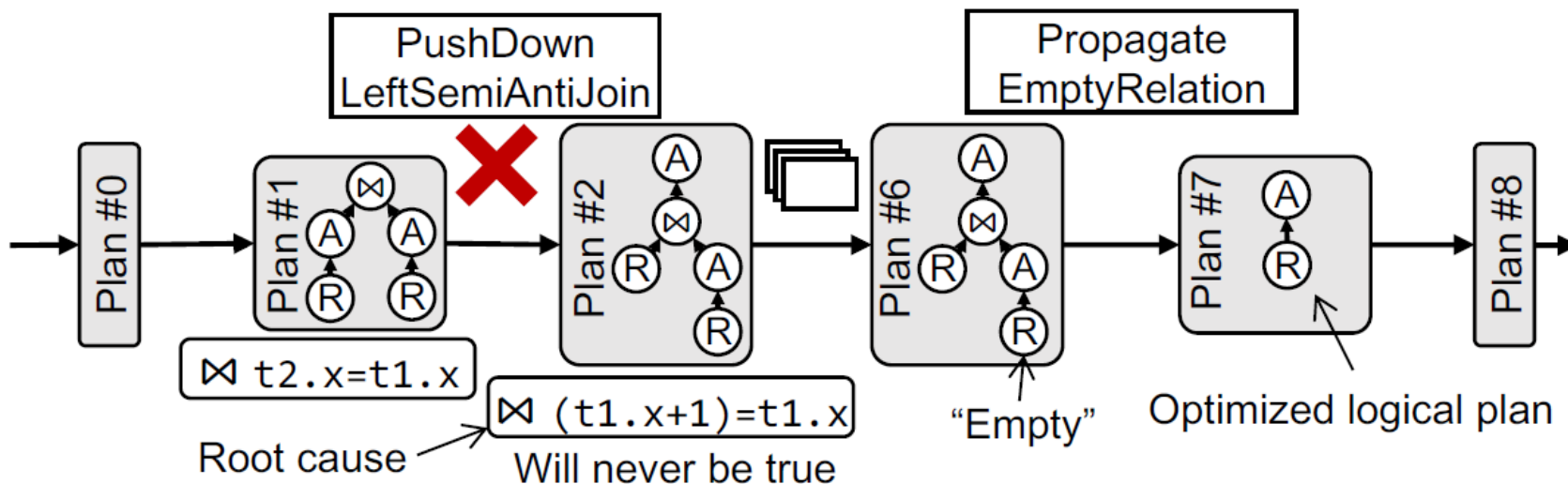
```
val t1 = Seq(1, 2, 3).toDF("x").distinct()
```

```
SELECT * FROM (SELECT x + 1 AS x FROM t1) AS t2
LEFT ANTI JOIN t1 ON t1.x = t2.x
```

(a) Creation of data source *ids* and SQL query

t2	t1
2	1
3	2
4	3

(b) Expected join logic



(c) The steps that rewrite the join condition and remove “empty” relation

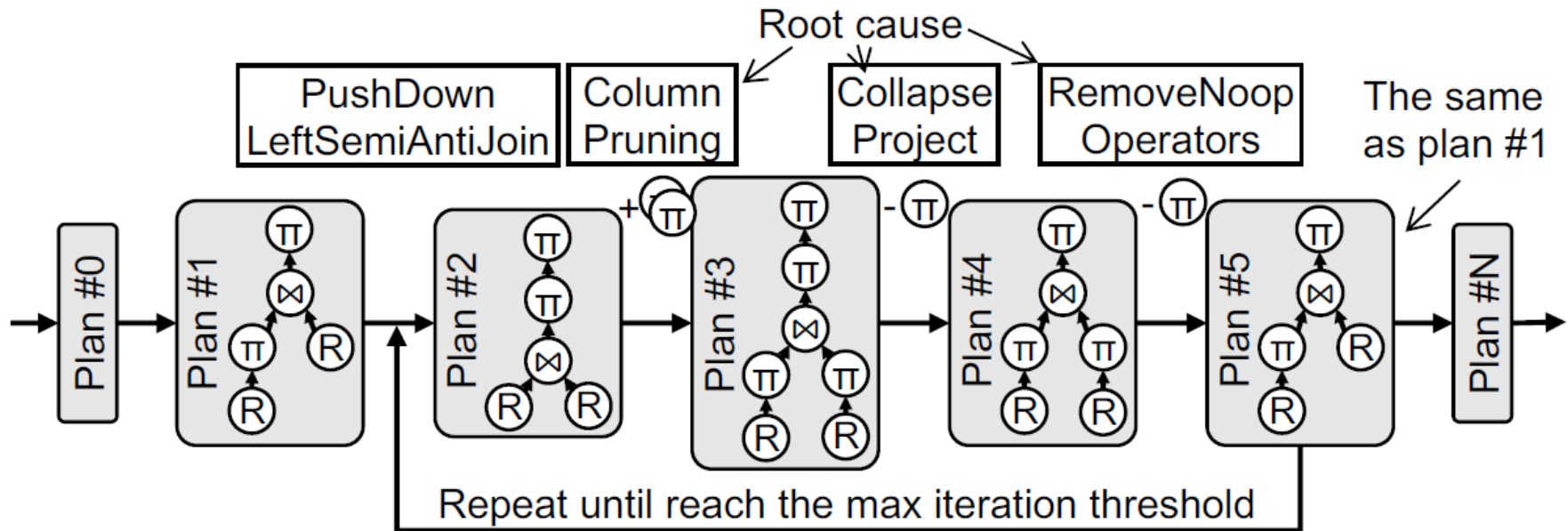
Transformation Error

```
SELECT tbl.id, tbl.nested.n
FROM tbl LEFT ANTI JOIN ids
ON tbl.id = ids.id
```

(a) Query that triggers optimization loop

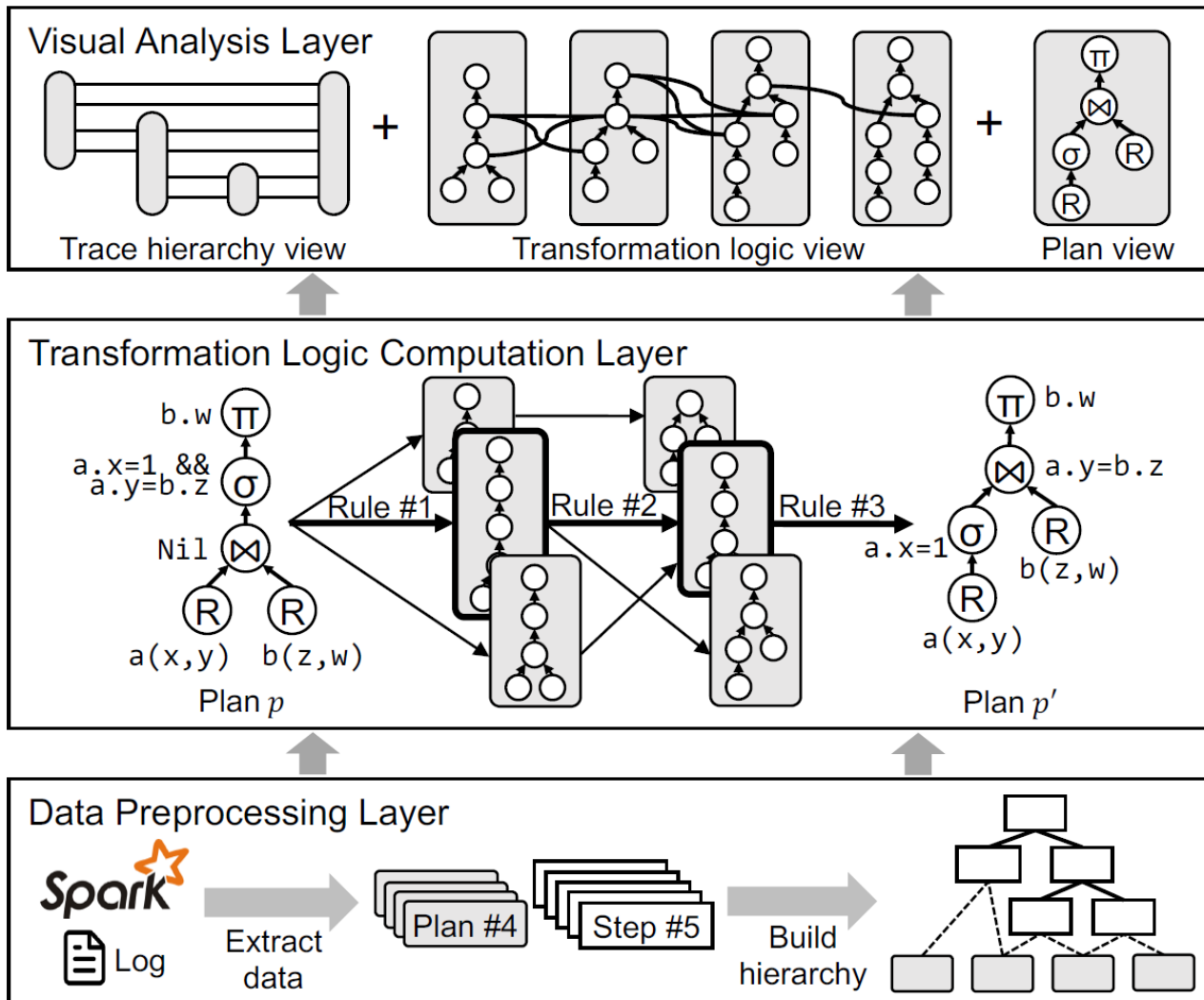
```
class Nested(b: Boolean, n: Long)
table tbl(id: String, nested: Nested)
table ids(id: String)
```

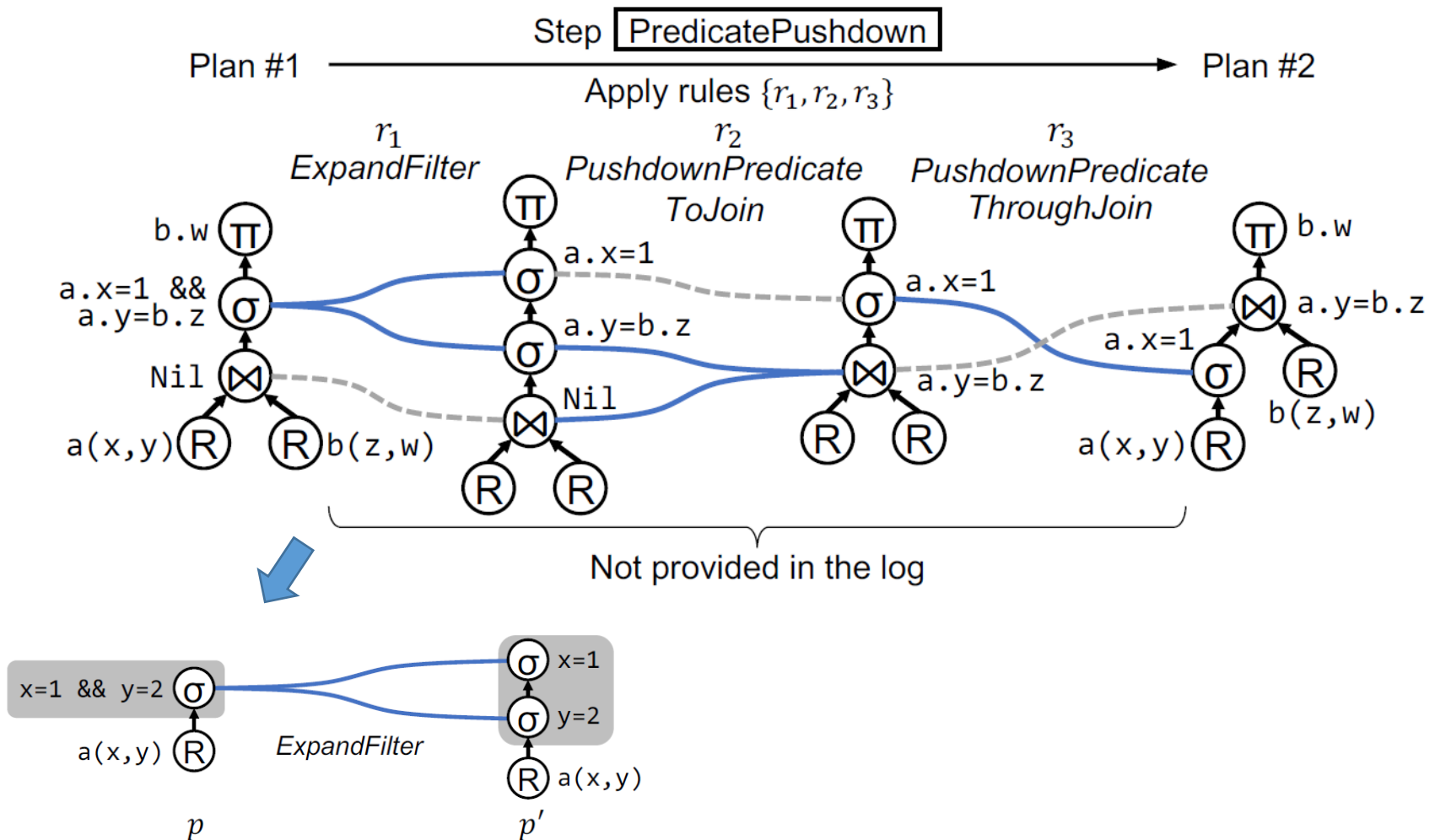
(b) Database schema



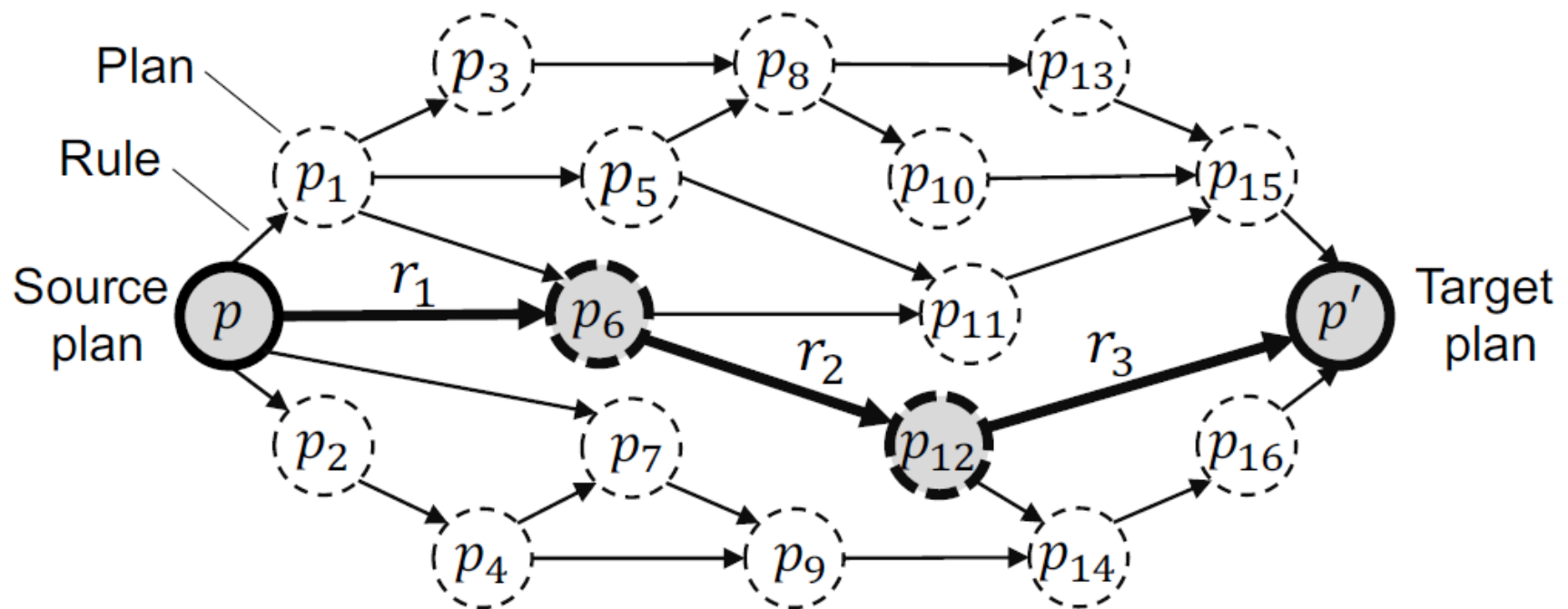
(c) The optimization loop

Workflow Error

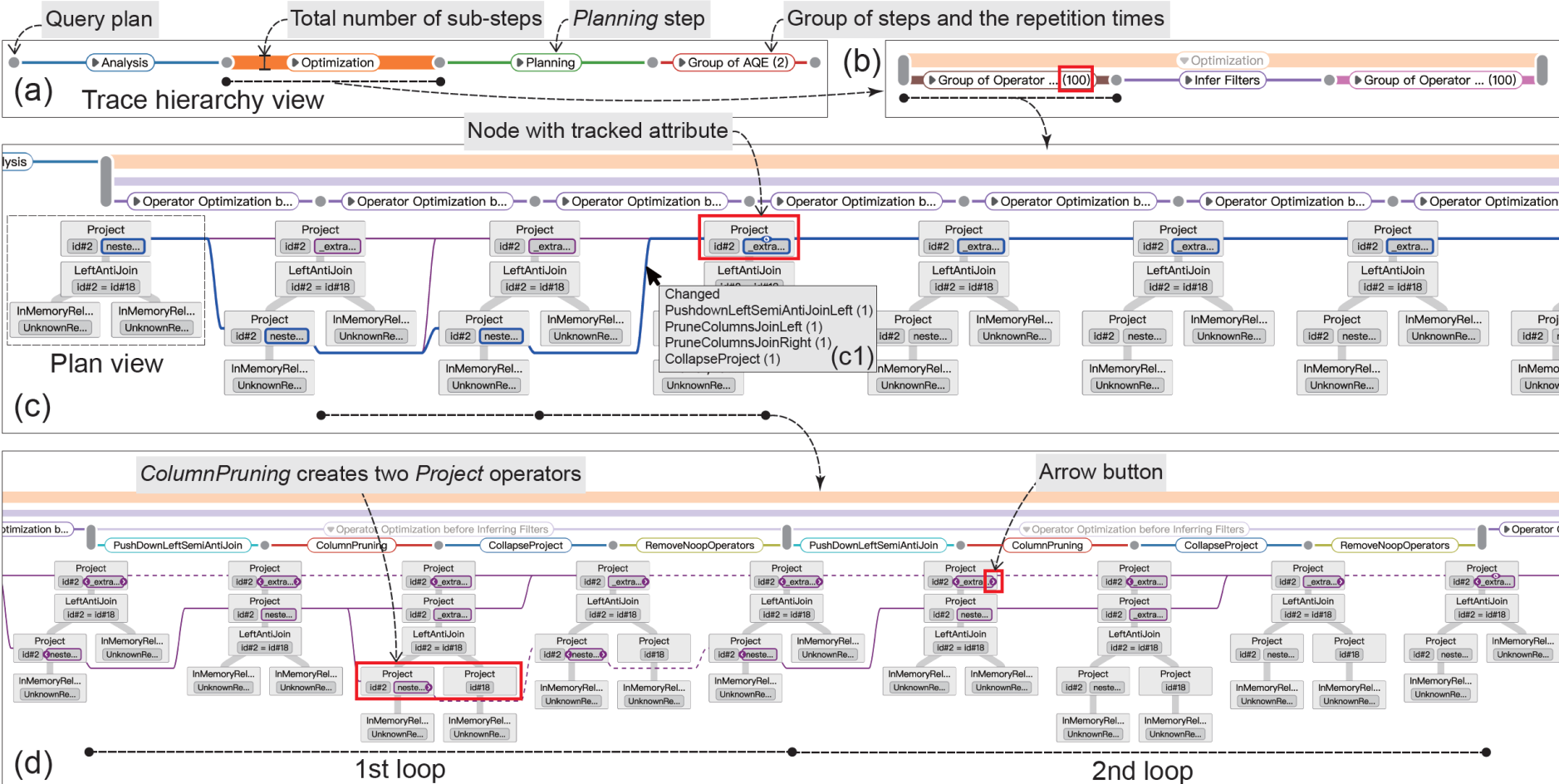




Key Concept: Plan Transformation



Shortest Path of Plan Transformation



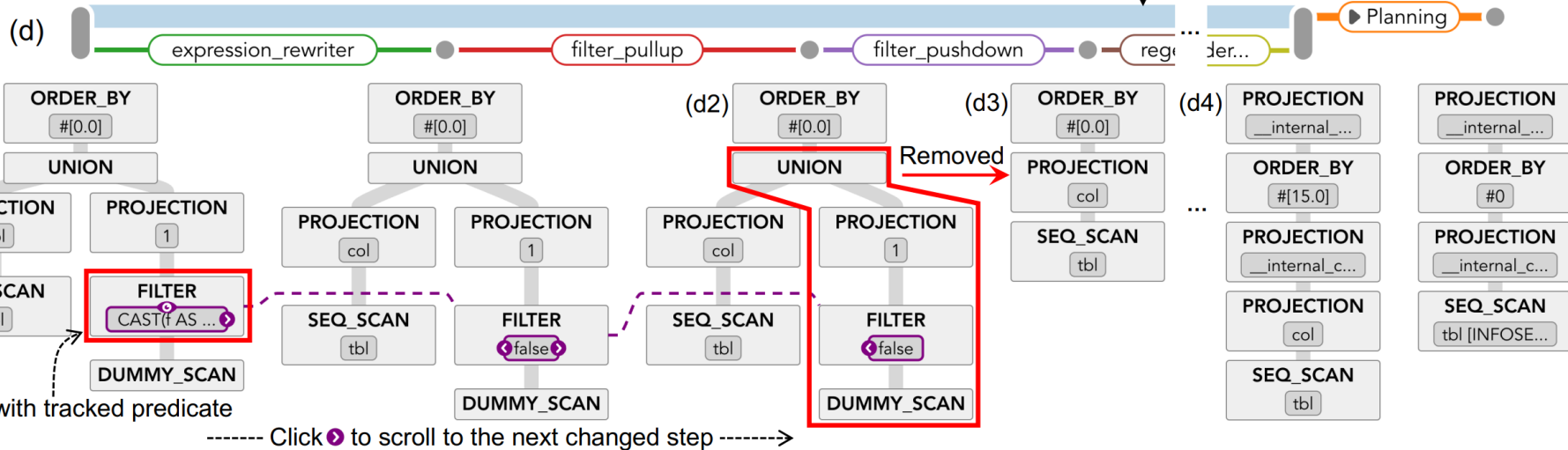
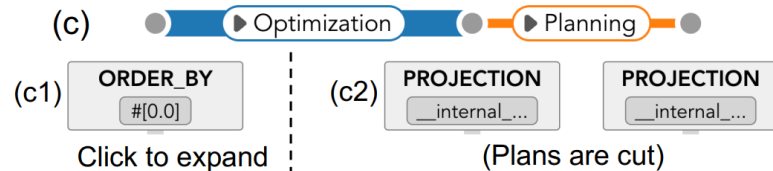


```
CREATE TABLE tbl (col INT); INSERT INTO tbl VALUES (1),(2),(3),(3);
```

(a) Table creation SQL

```
SELECT col FROM tbl UNION SELECT 1 WHERE false FROM order by 1;
```

(b) SQL query that returns incorrect results



```
CREATE TABLE t1 (str STRING); CREATE TABLE t2 (time2 INT);
CREATE TABLE t3 (time3 INT, num DOUBLE);
```

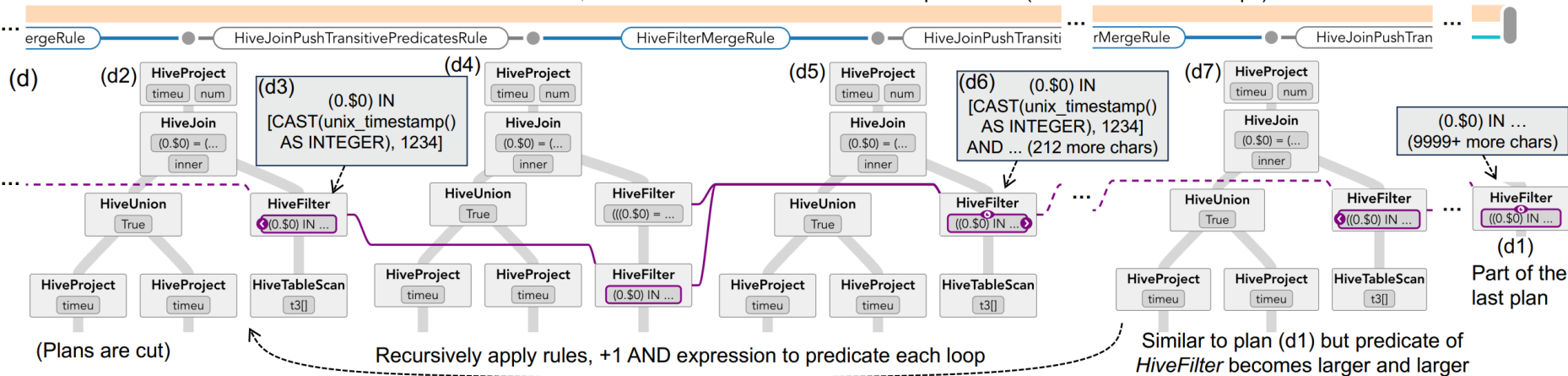
(a) Table creation SQL

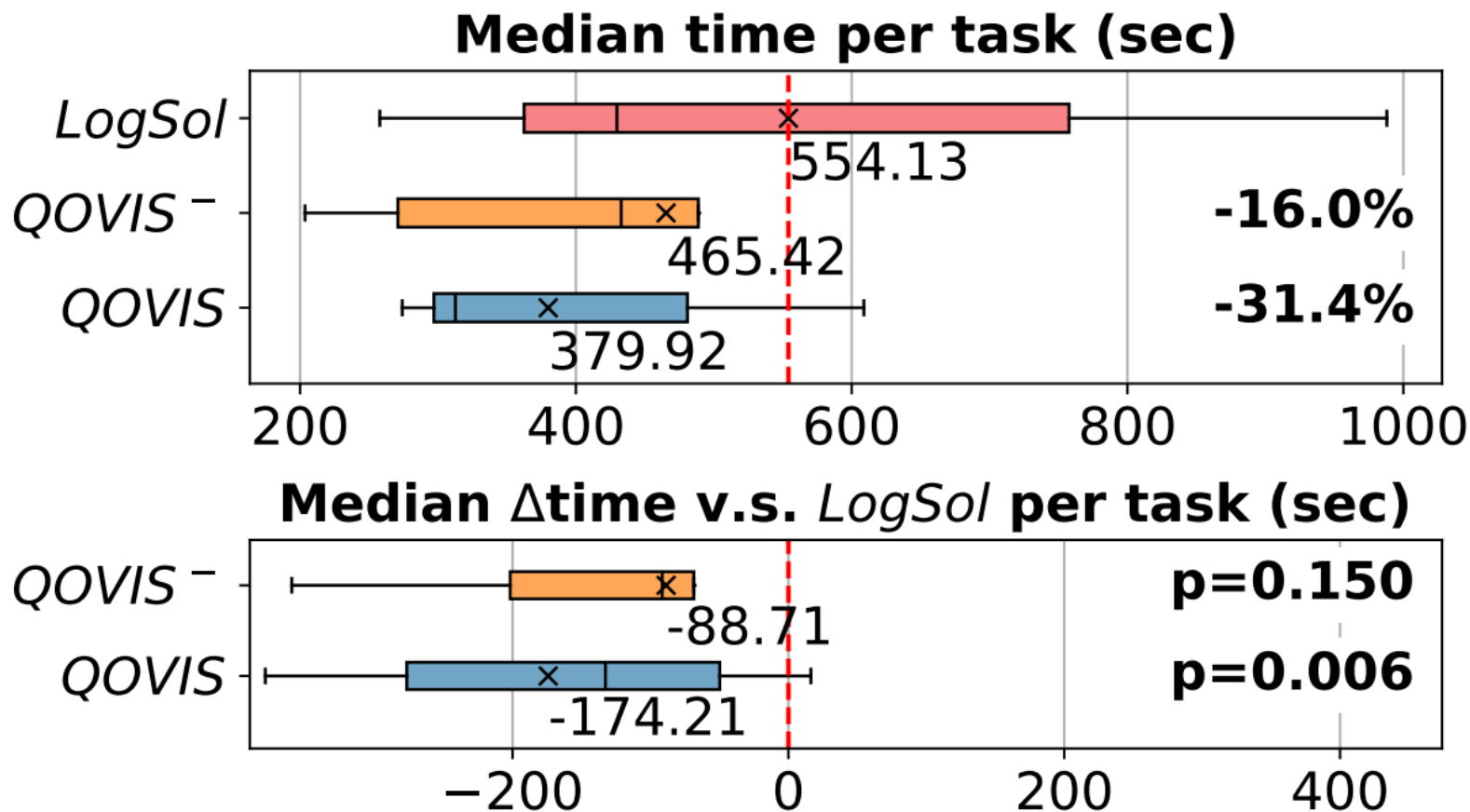
```
SELECT tu.timeu, t3.num FROM
(SELECT CAST(unix_timestamp() AS INT) AS timeu FROM t1
UNION ALL
SELECT time2 AS timeu FROM t2 WHERE time2 = 1234) tu
JOIN t3 ON tu.timeu = t3.time3;
```

(b) SQL query that cannot be explained/executed



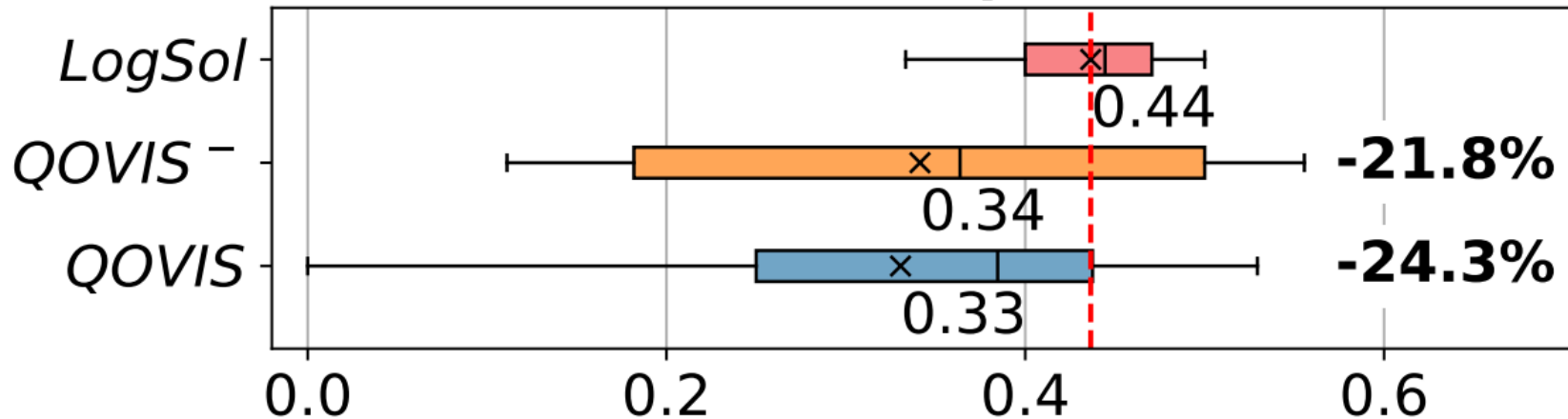
6 steps omitted (contains 5 different steps)



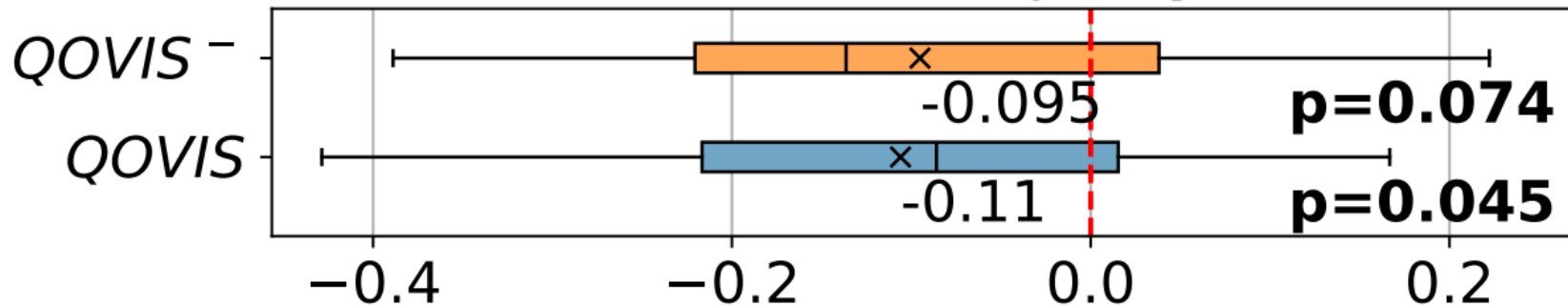


(a) Efficiency analysis

Mean error per task



Mean Δ error v.s. *LogSol* per task



(b) Accuracy analysis



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谢谢!

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