# Index analysis

## Environment

### Scheme

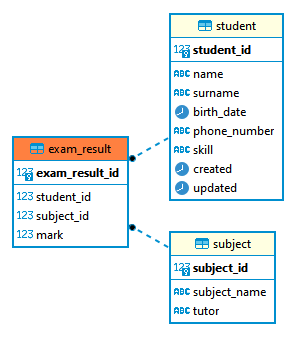


Table sizes

* exam\_result 1 million rows
* subject 1000 rows
* student 100k rows

## Exact match

SQL query:

* SELECT \* FROM student WHERE NAME = 'firstName1781'

Without any index:

* Seq Scan on student (cost=0.00..2387.00 rows=33 width=59) (actual time=0.121..6.639 rows=33 loops=1)
* Filter: (name = 'firstName1781'::text)
* Rows Removed by Filter: 99967
* Planning Time: **0.081 ms**
* Execution Time: **6.651 ms**

Hash index

* Bitmap Heap Scan on student (cost=4.26..119.80 rows=33 width=59) (actual time=0.018..0.039 rows=33 loops=1)
* Recheck Cond: (name = 'firstName1781'::text)
* Heap Blocks: exact=33
* -> Bitmap Index Scan on student\_name\_idx (cost=0.00..4.25 rows=33 width=0) (actual time=0.012..0.012 rows=33 loops=1)
* Index Cond: (name = 'firstName1781'::text)
* Planning Time: **0.361 ms**
* Execution Time: **0.059 ms**

Btree index

* Bitmap Heap Scan on student (cost=4.55..120.09 rows=33 width=59) (actual time=0.045..0.065 rows=33 loops=1)
* Recheck Cond: (name = 'firstName1781'::text)
* Heap Blocks: exact=33
* -> Bitmap Index Scan on student\_name\_idx (cost=0.00..4.54 rows=33 width=0) (actual time=0.040..0.040 rows=33 loops=1)
* Index Cond: (name = 'firstName1781'::text)
* Planning Time: **0.432 ms**
* Execution Time: **0.093 ms**

## Partial match

SQL query:

* SELECT \* FROM student WHERE surname LIKE ‘lastName305%'

Without index

* Seq Scan on student (cost=0.00..2387.00 rows=1010 width=59) (actual time=0.040..9.691 rows=155 loops=1)
* Filter: (surname ~~ 'lastName305%'::text)
* Rows Removed by Filter: 99845
* Planning Time: **0.114 ms**
* Execution Time: **9.707 ms**

Hash index

* Seq Scan on student (cost=0.00..2387.00 rows=1010 width=59) (actual time=0.121..12.495 rows=155 loops=1)
* Filter: (surname ~~ 'lastName305%'::text)
* Rows Removed by Filter: 99845
* Planning Time: **0.897 ms**
* Execution Time: **12.521 ms**

Btree index

* Seq Scan on student (cost=0.00..2387.00 rows=1010 width=59) (actual time=0.044..8.092 rows=155 loops=1)
* Filter: (surname ~~ 'lastName305%'::text)
* Rows Removed by Filter: 99845
* Planning Time: **0.430 ms**
* Execution Time: **8.105 ms**

Gist index

Create a Gist:

* CREATE EXTENSION IF NOT EXISTS pg\_trgm;
* CREATE INDEX student\_surname\_gist\_idx ON student USING gist (surname gist\_trgm\_ops);

Result:

* Bitmap Heap Scan on student (cost=52.11..1216.99 rows=1010 width=59) (actual time=3.179..3.223 rows=155 loops=1)
* Recheck Cond: (surname ~~ 'lastName305%'::text)
* Heap Blocks: exact=30
* -> Bitmap Index Scan on student\_surname\_gist\_idx (cost=0.00..51.86 rows=1010 width=0) (actual time=3.168..3.168 rows=155 loops=1)
* Index Cond: (surname ~~ 'lastName305%'::text)
* Planning Time: **0.557 ms**
* Execution Time: **3.285 ms**

Gin index

Create a Gin

* CREATE EXTENSION IF NOT EXISTS pg\_trgm;
* CREATE INDEX student\_surname\_gin\_idx ON student USING gin (surname gin\_trgm\_ops);

Result:

* Bitmap Heap Scan on student (cost=103.83..1268.71 rows=1010 width=59) (actual time=3.044..3.088 rows=155 loops=1)
* Recheck Cond: (surname ~~ 'lastName305%'::text)
* Heap Blocks: exact=30
* -> Bitmap Index Scan on student\_surname\_gin\_idx (cost=0.00..103.57 rows=1010 width=0) (actual time=3.033..3.033 rows=155 loops=1)
* Index Cond: (surname ~~ 'lastName305%'::text)
* Planning Time: **0.269 ms**
* Execution Time: **3.221 ms**

Gist+Gin index

Result:

* Bitmap Heap Scan on student s (cost=60.08..97.39 rows=10 width=59) (actual time=0.215..0.215 rows=0 loops=1)
* Recheck Cond: (phone\_number ~~ '8072822%'::text)
* -> Bitmap Index Scan on student\_phonenumber\_gin\_idx (cost=0.00..60.08 rows=10 width=0) (actual time=0.214..0.214 rows=0 loops=1)
* Index Cond: (phone\_number ~~ '8072822%'::text)
* Planning Time: **0.186 ms**
* Execution Time: **0.238 ms**