

## HW4 - CSE 412

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### Single Table Search:

**⌚ Search WITHOUT Indexing**  
Standard queries on raw tables. Slow for large datasets.

Search

Run Join Search

Results Top 5 shown **⌚ 0.0203s**

ID	NAME	NATION	CLUB	RATING	PACE
20801	Cristiano Ronaldo	Portugal	Al Nassr	85	76
269489	Fábio Ronaldo	Portugal	Motor Lublin	69	82
260140	Ronaldo Martínez	Paraguay	Platense	67	74
268431	Ronaldo Dejesús	Paraguay	Lanús	66	52
252484	Ronaldo Deaconu	Romania	Unirea Slobozia	63	66

**⌚ Search WITH Indexing**  
Optimized queries using B-Tree indexes. Significantly faster.

Search

Run Join Search

Results Top 5 shown **⌚ 0.0174s**

ID	NAME	NATION	CLUB	RATING	PACE
20801	Cristiano Ronaldo	Portugal	Al Nassr	85	76
269489	Fábio Ronaldo	Portugal	Motor Lublin	69	82
260140	Ronaldo Martínez	Paraguay	Platense	67	74
268431	Ronaldo Dejesús	Paraguay	Lanús	66	52
252484	Ronaldo Deaconu	Romania	Unirea Slobozia	63	66

### SQL Query For Search Without Indexing:

```
SET LOCAL enable_indexscan = OFF;  
EXPLAIN ANALYZE SELECT * FROM players WHERE name ILIKE '%Ronaldo%';
```

### SQL Query For Search With Indexing:

```
SET LOCAL enable_indexscan = ON;  
EXPLAIN ANALYZE SELECT * FROM players WHERE name ILIKE '%Ronaldo%';
```

### Join Table Search:

### ⌚ Search WITHOUT Indexing

Standard queries on raw tables. Slow for large datasets.

#### ⌚ SINGLE TABLE SEARCH

Enter Player Name...

#### ⌚ JOINED QUERY SEARCH

England

Results Top 5 shown

⌚ 0.0068s

ID	NAME	NATION	CLUB	RATING	PACE
220697	James Maddison	England	Spurs	84	67
238216	Conor Gallagher	England	Atlético de Madrid	81	75
265340	Jess Park	England	Manchester Utd	81	83
213666	Ruben Loftus-Cheek	England	Milano FC	80	81
269136	Kobbie Mainoo	England	Man Utd	77	68

### ⌚ Search WITH Indexing

Optimized queries using B-Tree indexes. Significantly faster.

#### ⌚ SINGLE TABLE SEARCH

Enter Player Name...

#### ⌚ JOINED QUERY SEARCH

England

Results Top 5 shown

⌚ 0.0052s

ID	NAME	NATION	CLUB	RATING	PACE
220697	James Maddison	England	Spurs	84	67
238216	Conor Gallagher	England	Atlético de Madrid	81	75
265340	Jess Park	England	Manchester Utd	81	83
213666	Ruben Loftus-Cheek	England	Milano FC	80	81
269136	Kobbie Mainoo	England	Man Utd	77	68

## SQL Query For Search Without Indexing:

```
SET LOCAL enable_indexscan = OFF;
SET LOCAL enable_hashjoin = OFF;
SET LOCAL enable_mergejoin = OFF;
EXPLAIN ANALYZE
SELECT p.id, p.name, p.nation, p.club, ps.ovr, ps.pac FROM players p
JOIN player_stats ps ON p.player_id = ps.player_id
WHERE p.nation = 'England' AND p.position = 'CM';
```

## SQL Query For Search Without Indexing:

```
SET LOCAL enable_indexscan = ON;
SET LOCAL enable_hashjoin = ON;
SET LOCAL enable_mergejoin = ON;
EXPLAIN ANALYZE
SELECT p.id, p.name, p.nation, p.club, ps.ovr, ps.pac FROM players p
JOIN player_stats ps ON p.player_id = ps.player_id
WHERE p.nation = 'England' AND p.position = 'CM';
```

## **Explanation:**

### **Without Indexing:**

When I search for "Ronaldo" without using an index, my database behaves like someone reading a book from cover to cover to find a specific word. It has to check every single row in the players table (all 17,000+) to see if the name matches. It requires a lot of reading and processing power because the database cannot skip any data. As the dataset grows, this approach gets significantly slower. Similarly, in the Join Search, without the index, the database had to brutally compare rows between the Players and Stats tables.

### **With Indexing:**

When I create an index on the name column, the database builds a separate, organized structure (like a B-Tree). This is exactly like the index at the back of a textbook. It tells the database exactly which rows contain "Ronaldo". Instead of reading 17,000 rows, the database might only read a few "branches" of the index tree to find the exact location of the data. It jumps straight to the result. Similarly, in the Join Search, with the index, it instantly located the English players and their positions, snapping the data together efficiently (likely using a Hash Join).