SQL Query Basics and Data Retrieval Techniques

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1 Introduction to SQL Queries

SQL (Structured Query Language) is used to interact with relational databases. Basic query commands allow users to retrieve, filter, sort, and analyze data efficiently.

2 Basic Data Retrieval with SELECT

2.1 SELECT Statement

The `SELECT` statement is used to retrieve specific columns from a table:

```
SELECT column1, column2 FROM tablename;
```

`SELECT *` retrieves all columns.

2.2 Filtering Data with WHERE

The `WHERE` clause restricts results to rows that meet specific conditions:

```
SELECT column1 FROM tablename WHERE condition;
```

Common operators include `=`, `<>` (not equal), `>`, `<`, `LIKE`, and `BETWEEN`.

2.3 Sorting Results with ORDER BY

`ORDER BY` arranges the output in ascending (`ASC`) or descending (`DESC`) order:

```
SELECT column1 FROM tablename ORDER BY column1 DESC;
```

3 Aggregate Functions for Data Analysis

SQL offers several aggregate functions to summarize data:

- `COUNT()` - Counts non-`NULL` entries.
- `SUM()` - Adds numeric values.
- `AVG()` - Calculates average.
- `MIN()` and `MAX()` - Find lowest and highest values.

Example:

```
SELECT COUNT(column) FROM tablename WHERE condition;
```

4 Grouping Results with GROUP BY and HAVING

4.1 GROUP BY Clause

GROUP BY organizes rows into groups, allowing aggregate functions on each group:

```
SELECT column1, COUNT(*) FROM tablename GROUP BY column1;
```

4.2 HAVING Clause

The HAVING clause filters groups created by GROUP BY:

```
SELECT column1, COUNT(*) FROM tablename
GROUP BY column1
HAVING COUNT(*) > 10;
```

5 Joins for Combining Tables

5.1 Types of Joins

- **INNER JOIN**: Returns matching rows between tables.
- **LEFT JOIN**: Returns all rows from the left table and matching rows from the right.
- **RIGHT JOIN**: Returns all rows from the right table and matching rows from the left.
- **FULL JOIN**: Returns all rows when there is a match in one of the tables.

Example:

```
SELECT a.column1, b.column2 FROM table1 AS a
INNER JOIN table2 AS b ON a.id = b.id;
```

6 Subqueries

A subquery is a query nested within another query, often in the WHERE clause:

```
SELECT column1 FROM tablename
WHERE column2 = (SELECT MAX(column2) FROM tablename2);
```

7 Common SQL Clauses and Operators

- `DISTINCT`: Removes duplicate rows.
- `IN`: Checks if a value is within a list of values.
- `LIKE` with Wildcards (`%`, _): For pattern matching.
- `BETWEEN`: Filters within a range.
- Logical operators: `AND`, `OR`, `NOT`.