

Introduction to SQL

SQL Session

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Introduction

- # **Data** refers to raw information that consists of basic facts and figures.
 - # **Data** include any raw information that is stored on a computer, such as numerical data, images, coding, notes, and financial data.
 - # **What is Database:**
 - # **A database** is a collection of interrelated data that helps in the efficient retrieval, insertion, and deletion of data from the database and organizes the data in the form of tables, views, schemas, reports, etc.
 - # **For Example**, a university database organizes the data about students, faculty, admin staff, etc. which helps in the efficient retrieval, insertion, and deletion of data from it.
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What is DBMS?

- # A Database Management System (DBMS) is a software system that is designed to manage and organize data in a structured manner.
 - # It allows users to create, modify, and query a database, as well as manage the security and access controls for that database.
 - # DBMS provides an environment to store and retrieve data in convenient and efficient manner.
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Types of DBMS

- # **Relational Database Management System (RDBMS):** Data is organized into tables (relations) with rows and columns, and the relationships between the data are managed through primary and foreign keys. SQL (Structured Query Language) is used to query and manipulate the data.
 - # **NoSQL DBMS:** Designed for high-performance scenarios and large-scale data, NoSQL databases store data in various non-relational formats such as key-value pairs, documents, graphs, or columns.
 - # **Object-Oriented DBMS (OODBMS):** Stores data as objects, similar to those used in object-oriented programming, allowing for complex data representations and relationships
 - # **Cloud Databases:** Hosted and managed on cloud platforms (e.g., AWS RDS, Google Cloud SQL).
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What is SQL?

- # Structured query language (SQL) is a programming language for storing and processing information in a relational database.
 - # A relational database stores information in tabular form, with rows and columns representing different data attributes and the various relationships between the data values.
 - # You can use SQL statements to store, update, remove, search, and retrieve information from the database.
 - # You can also use SQL to maintain and optimize database performance.
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Why is SQL important?

- # Structured query language (SQL) is a popular query language that is frequently used in all types of applications.
 - # Data analysts and developers learn and use SQL because it integrates well with different programming languages.
 - # For example, they can embed SQL queries with the Java programming language to build high-performing data processing applications with major SQL database systems such as Oracle or MS SQL Server.
 - # SQL is also fairly easy to learn as it uses common English keywords in its statements
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History of SQL

- # SQL was invented in the 1970s by IBM researcher .
 - # It was initially known as the structured English query language (SEQUEL). The term was later shortened to SQL. Oracle, formerly known as Relational Software, became the first vendor to offer a commercial SQL relational database management system.
 - # SQL quickly became the standard language for interacting with relational databases, and it was soon adopted by other RDBMS vendors such as Oracle, Sybase, and Microsoft.
 - # American National Standards Institute (ANSI) and the International Standards Organization (ISO) published official SQL standards in 1986 and 1987, respectively.
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Differences between SQL and NoSQL

- # SQL databases are relational.
 - # SQL databases use structured query language (SQL) and have a predefined schema.
 - # SQL databases are vertically scalable.
 - # SQL databases are table-based.
 - # SQL databases are better for multi-row transactions, while
 - # NoSQL databases are non-relational.
 - # NoSQL databases have dynamic schemas for unstructured data.
 - # NoSQL databases are horizontally scalable.
 - # while NoSQL databases are document, key-value, graph, or wide-column stores.
 - # NoSQL is better for unstructured data like documents or JSON.
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Advantages SQL

- # **Faster Query Processing:** Large amount of data is retrieved quickly and efficiently. Operations like Insertion, deletion, manipulation of data is also done in almost no time.
 - # **No Coding Skills:** For data retrieval, large number of lines of code is not required. All basic keywords such as SELECT, INSERT INTO, UPDATE, etc are used and also the syntactical rules are not complex in SQL, which makes it a user-friendly language.
 - # **Standardized Language:** Due to documentation and long establishment over years, it provides a uniform platform worldwide to all its users.
 - # **Portable:** It can be used in programs in PCs, server, laptops independent of any platform (Operating System, etc). Also, it can be embedded with other applications as per need/requirement/use.
 - # **Interactive Language :** Easy to learn and understand, answers to complex queries can be received in seconds.
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Advantages SQL

- # **Scalability** : SQL databases can handle large volumes of data and can be scaled up or down as per the requirements of the application.
 - # **Security** : SQL databases have built-in security features that help protect data from unauthorized access, such as user authentication, encryption, and access control.
 - # **Data Integrity** : SQL databases enforce data integrity by enforcing constraints such as unique keys, primary keys, and foreign keys, which help prevent data duplication and maintain data accuracy.
 - # **Backup and Recovery** : SQL databases have built-in backup and recovery tools that help recover data in case of system failures, crashes, or other disasters.
 - # **Multiple data views** : One of the advantages of SQL is its ability to provide **multiple data views**. This means that SQL allows users to create different views or perspectives of the data stored in a database, depending on their needs and permissions.
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Disadvantages of DBMS

- # **Complexity:** SQL databases can be complex to set up and manage, requiring skilled database administrators to ensure optimal performance and maintain data integrity.
 - # **Cost :** Some versions are costly and hence, programmers cannot access it.
 - # **Partial Control :** Due to hidden business rules, complete control is not given to the database.
 - # **Limited Flexibility:** SQL databases are less flexible than NoSQL databases when it comes to handling unstructured or semi-structured data, as they require data to be structured into tables and columns.
 - # **Lack of Real-Time Analytics:** SQL databases are designed for batch processing and do not support real-time analytics, which can be a disadvantage for applications that require real-time data processing.
 - # **Limited Query Performance:** SQL databases may have limited query performance when dealing with large datasets, as queries may take longer to process than in-memory databases.
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Conclusion

- A Database Management System (DBMS) is an essential tool for efficiently managing, organizing, and retrieving large volumes of data across various industries.
 - Its ability to handle data securely, ensure integrity, support concurrent access, and provide backup and recovery options makes it indispensable for modern data-driven applications.
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Thank you...
