SQL Project on HR Employee Attrition Dataset

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Introduction

In this SQL project, I have undertaken a comprehensive analysis of the HREmployeeAttrition dataset sourced from www.kaggle.com to enhance my SQL proficiency and gain practical experience in data manipulation and analysis. This dataset provides detailed information about employees, including attributes such as job role, education, and attrition status. The project focuses on executing a series of SQL queries to explore various facets of the data, derive meaningful insights, and uncover trends related to employee attrition.

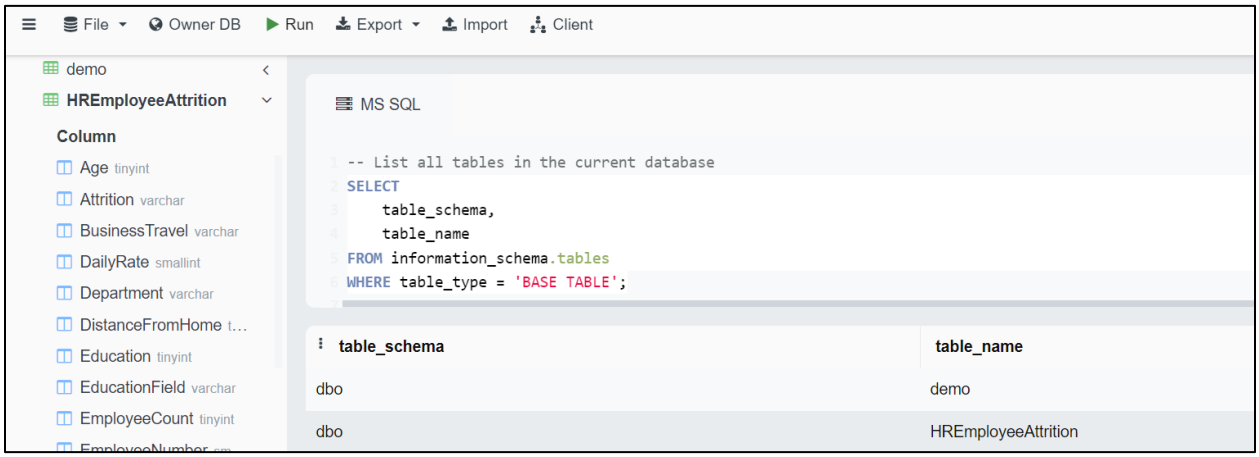
The primary objectives of this project include:

1. **Exploratory Data Analysis (EDA):** I have conducted preliminary investigations to understand the structure and content of the dataset. This involves identifying the number of records, and detecting any inconsistencies or anomalies.
2. **Descriptive Statistics:** I have used SQL queries to compute essential statistics, such as averages, minimums, and maximums, to summarize data distributions and understand key metrics like average monthly income and attrition rates across different departments and job roles.
3. **Trend Analysis:** The project involves examining trends and patterns in employee attrition based on factors such as job satisfaction, distance from home, and education level.
4. **Advanced Queries:** To deepen my SQL skills, I have implemented advanced queries using aggregation, grouping, conditional logic and window functions to analyze employee turnover by various attributes.

To summarize, this project serves as a valuable exercise in applying SQL techniques to real-world data scenarios, aiming to enhance my ability to draw actionable insights from complex datasets.

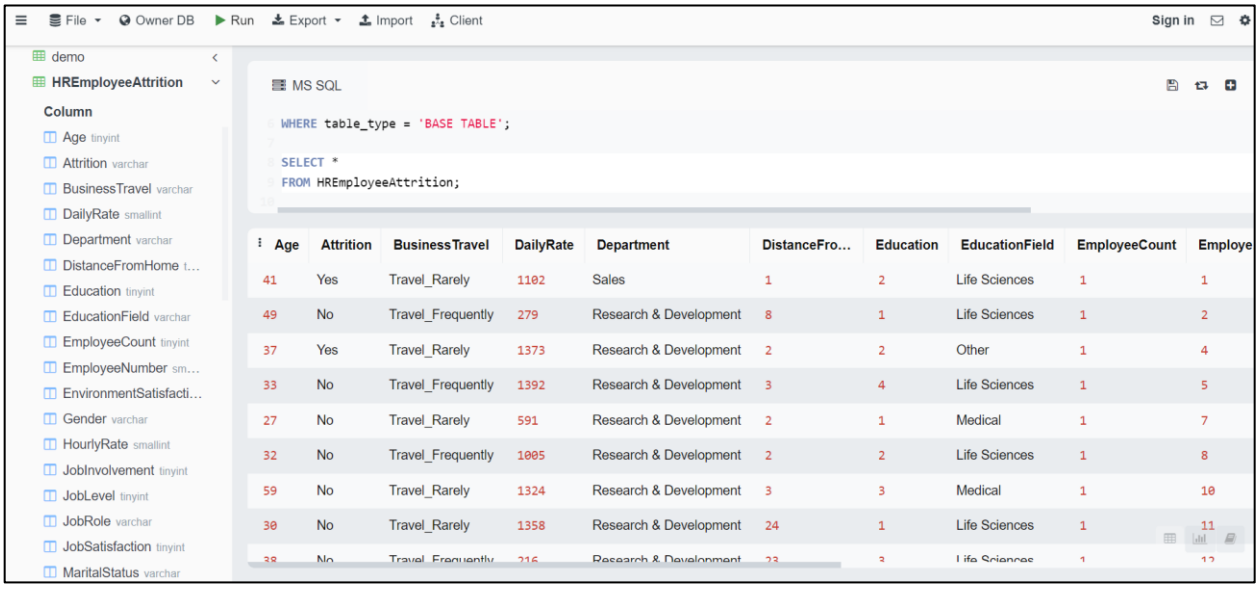
Base Tables Present in a Database

Getting an overview of all tables present in the database, which is helpful for database administrators and developers. The SQL query you provided is used to retrieve information about all the base tables present in a database.



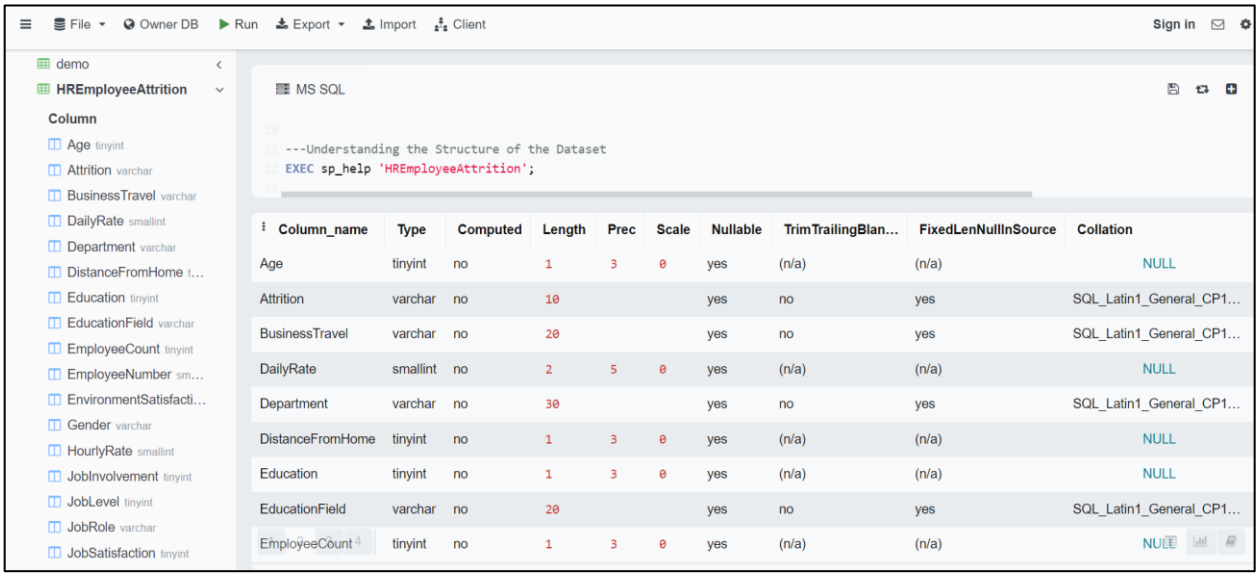
Exploratory Data Analysis (EDA):

- As a data analyst, Exploratory Data Analysis is the starting point of the data analysis. It allows to view all the data in the table, helping to understand the structure, column names, data types, and the general nature of the data.
- To check for data quality issues such as missing values, outliers, and inconsistencies visually.



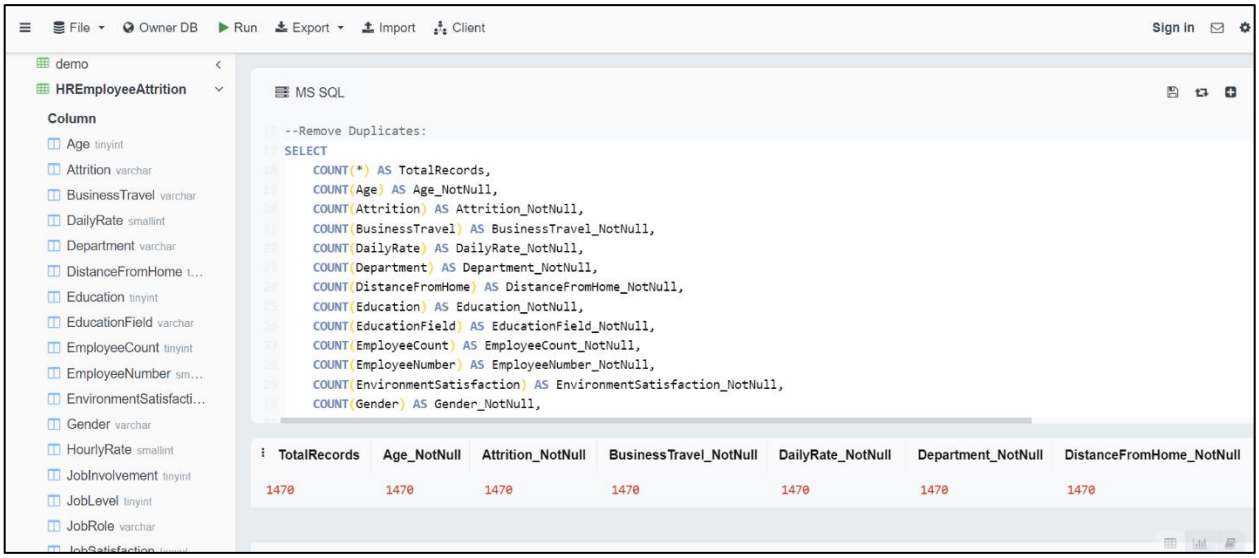
1. Understanding the Structure of the Dataset

The EXEC sp_help command is specific to Microsoft SQL Server. It is used to display detailed information about a database object, such as a table, view, or stored procedure.



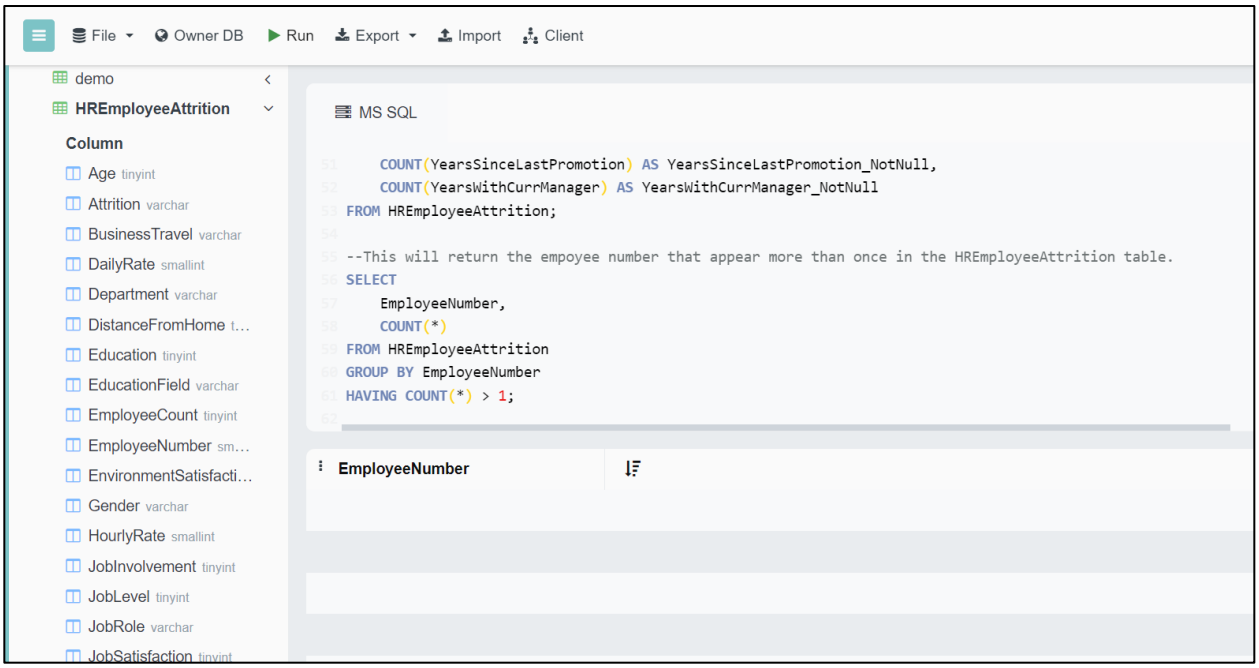
2. To find the missing values in a dataset

To find the missing values in a dataset with the specified columns using SQL, you can count the number of NULL values for each column.



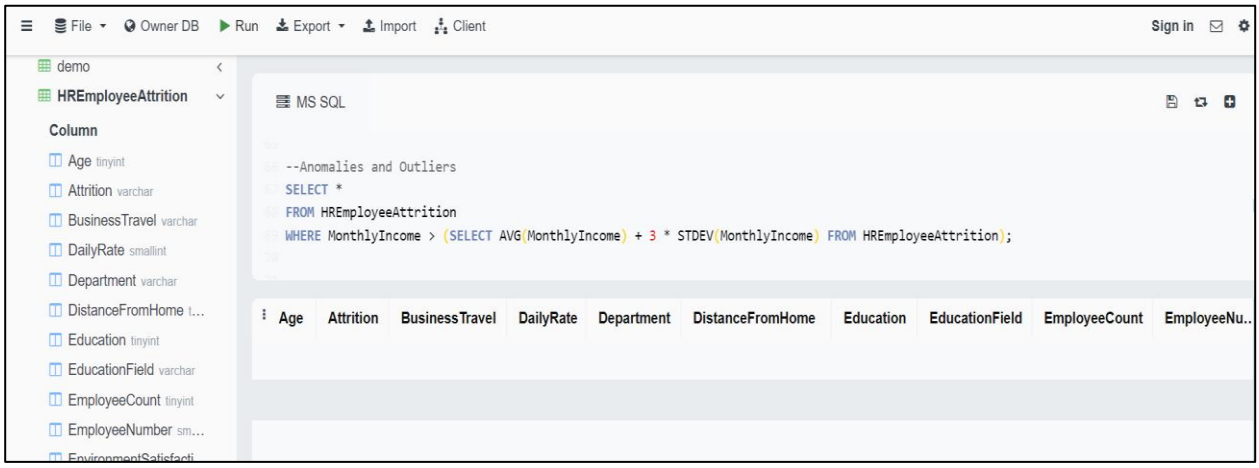
3. Finding missing values in EmployeeNumber attribute(Primary Key)

It is used to find duplicate entries in the HREmployeeAttrition table based on the EmployeeNumber field. If EmployeeNumber having multiple records with the same EmployeeNumber might indicate a data quality issue, such as duplicate records that need to be investigated and resolved.



4. Finding Anomalies and Outliers

Finding outlier can be useful in various business scenarios, such as detecting unusually high salaries that may need further investigation or validation. Here, below query is used to identify employees with exceptionally high monthly incomes. The choice of "three standard deviations" as a threshold is based on statistical conventions, as data points beyond this range are often considered outliers in a normal distribution.



Fundamental Data Analysis

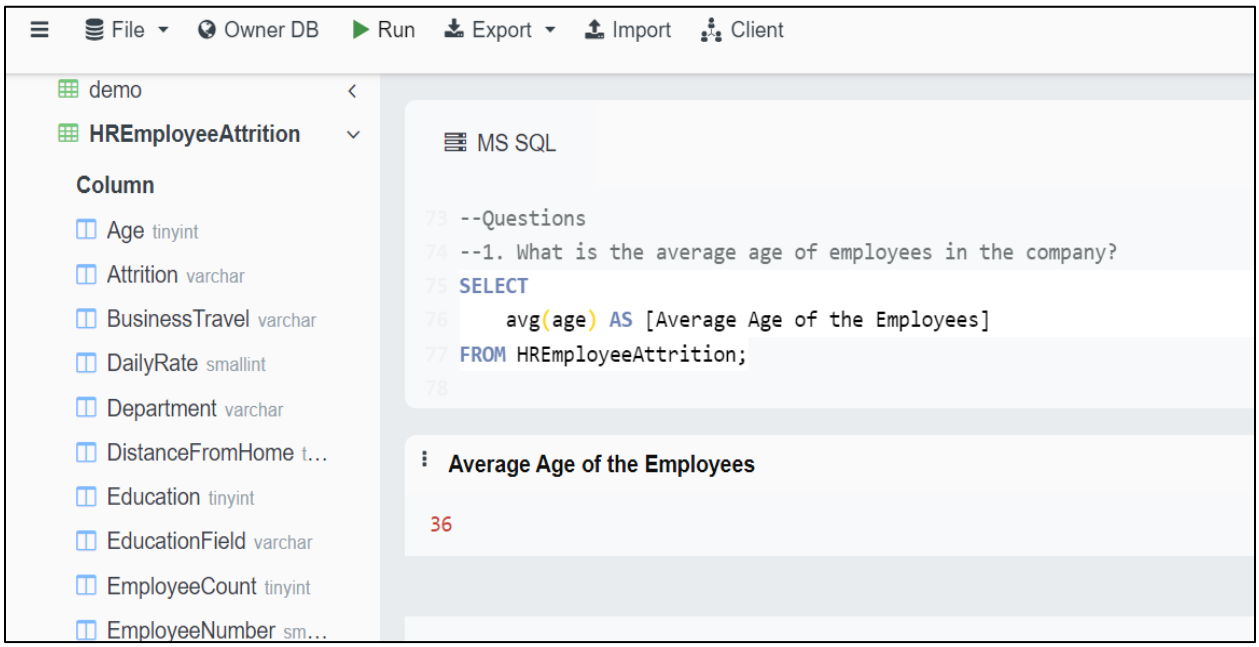
Fundamental key checks such as data retrieval, analysis, and summarization within a database are the part of data exploration and analyzation of data stored in relational databases.

- **Selection Queries:** Used to select specific data from one or more tables in a database.
- **Aggregation Queries:** Used to summarize data in the table.
- **Grouping Queries:** These queries group data based on one or more columns and often include aggregate functions to summarize data within each group.
- **Filtering Queries:** It retrieves data based on specific conditions using the WHERE clause.
- **Sorting Queries:** Used to order the results based on one or more columns.
- **Limiting Queries:** To limit the number of rows returned by a query.

Questions:

1. **What is the average age of employees in the company?**

Computing the **average age** of employees in the HREmployeeAttrition table is a basic but essential analysis that helps in understanding the overall demographic profile of the workforce. Hence, the average age distribution of the employees in the company is 36(age).

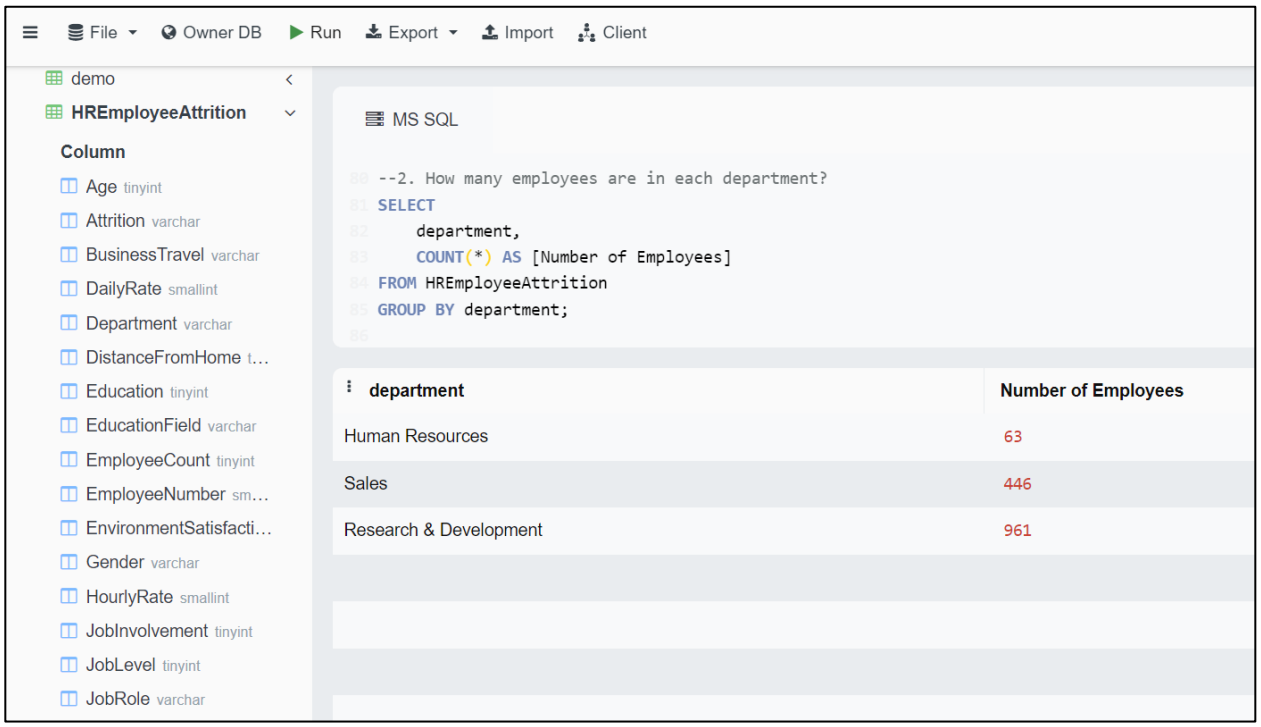


This information is useful for understanding the composition of the workforce, planning for succession, and making decisions related to hiring or employee development.

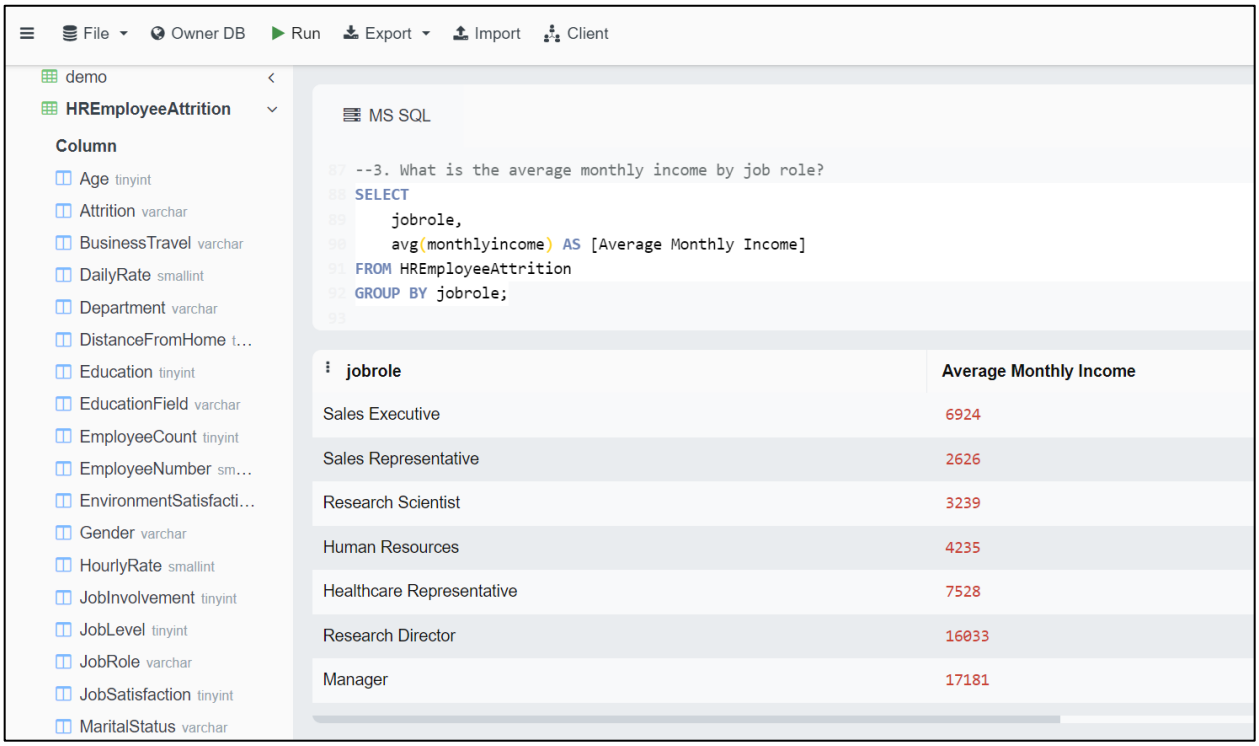
2. **How many employees are in each department?**

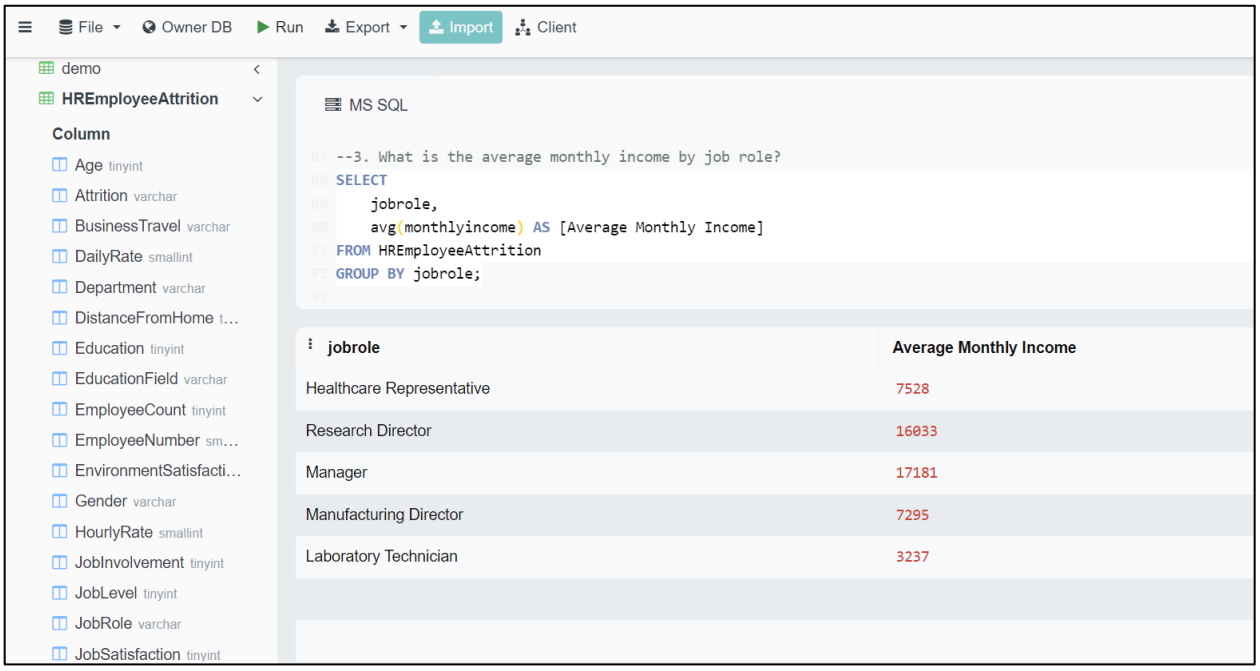
The aims to count the number of employees in each department. It helps in understanding the distribution of staff across various departments, which can provide insights into resource allocation, department size, and workforce management.

For each unique department value, the query aggregates the data and calculates the count of employees within that department.



3. What is the average monthly income by job role?



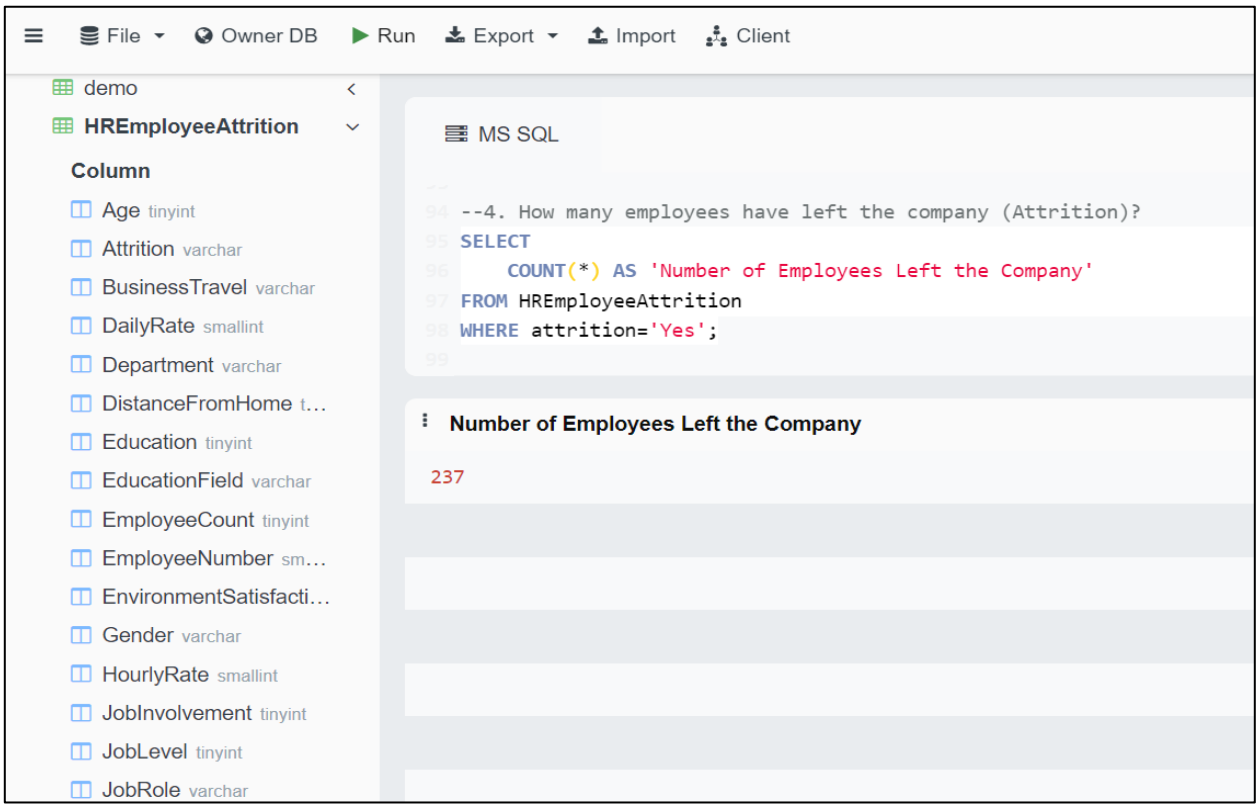


It calculates the average monthly income for employees in each job role. This analysis helps in understanding the compensation structure and disparities among different job roles within the organization. Comparing average incomes across job roles can provide insights into whether compensation levels are aligned with industry standards or company expectations.

4. **How many employees have left the company (Attrition)?**

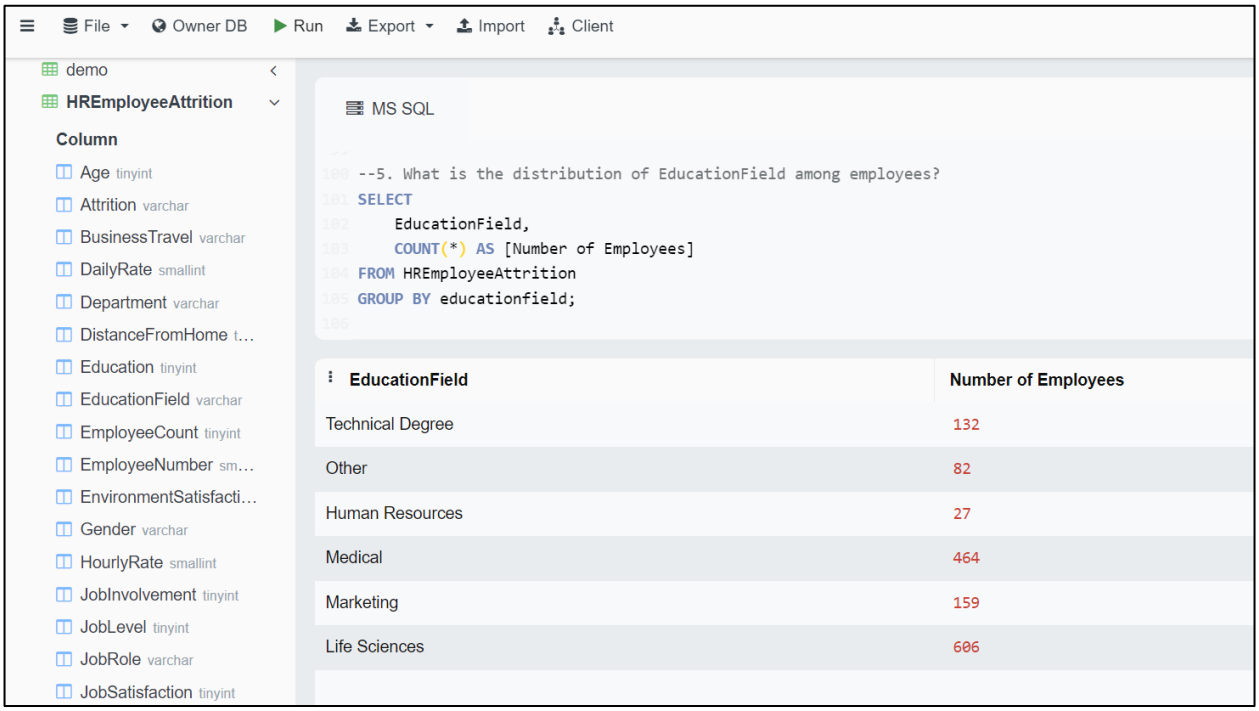
The query counts the number of employees who have exited the company, which is crucial for understanding employee turnover and attrition rates. It ensures that only employees who have left the company (indicated by 'Yes' in the attrition column) are included in the count.

Knowing the number of employees who have left can inform workforce planning and management decisions in terms of understanding staffing needs, planning for recruitment, and developing retention strategies.



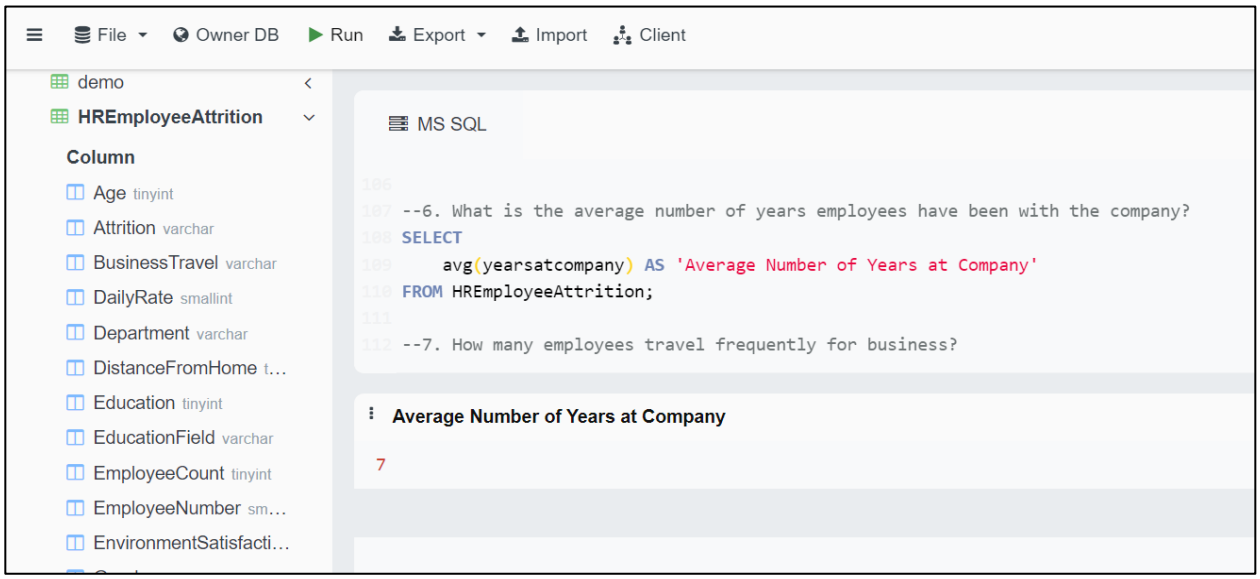
5. **What is the distribution of EducationField among employees?**

The number of employees in each educational field, providing insights into the educational background of the workforce. Insights into the educational background of employees can inform recruitment strategies and training programs. For example, if a certain educational field is underrepresented, the company might target recruitment efforts to attract more candidates from that field.



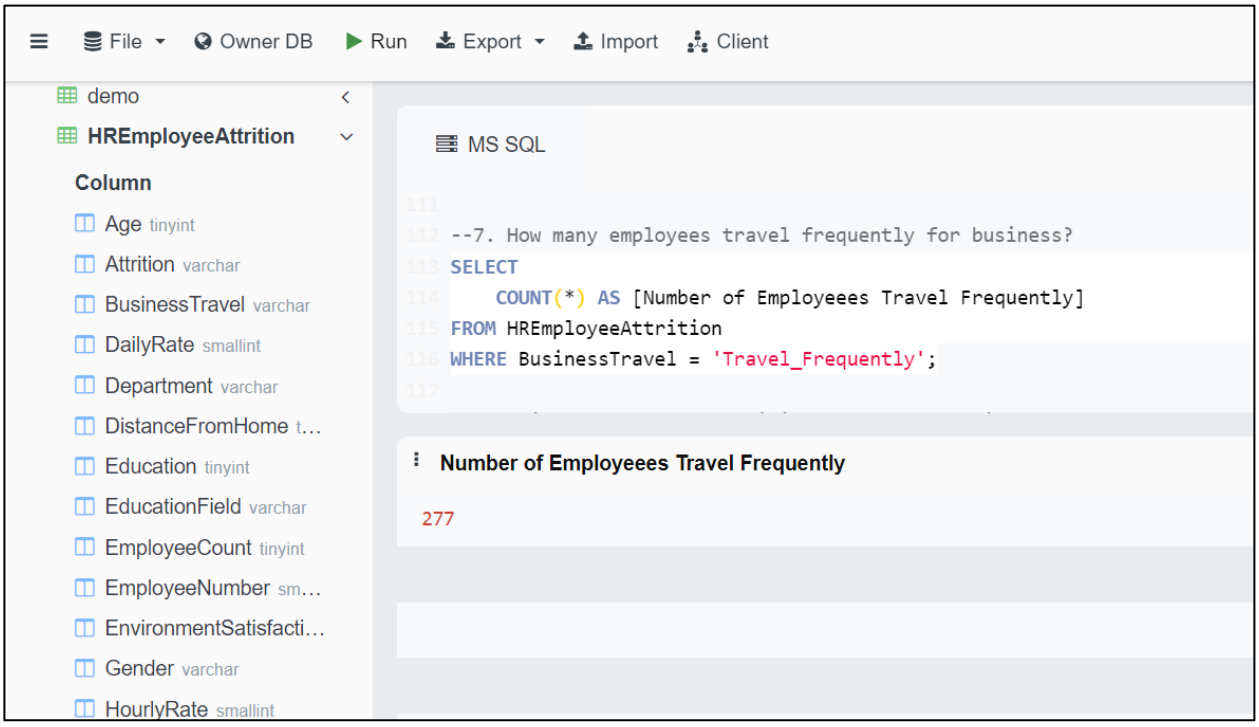
6. What is the average number of years employees have been with the company?

The mean number of years that employees have been with the company, providing insights into employee tenure and stability. Comparing the average no. of years at the company with industry standards can provide how the company's employee tenure compares with competitors.



7. How many employees travel frequently for business?

The number of employees whose business travel status is categorized as "Travel_Frequently". This helps in understanding the proportion of employees with high travel requirements within the organization.

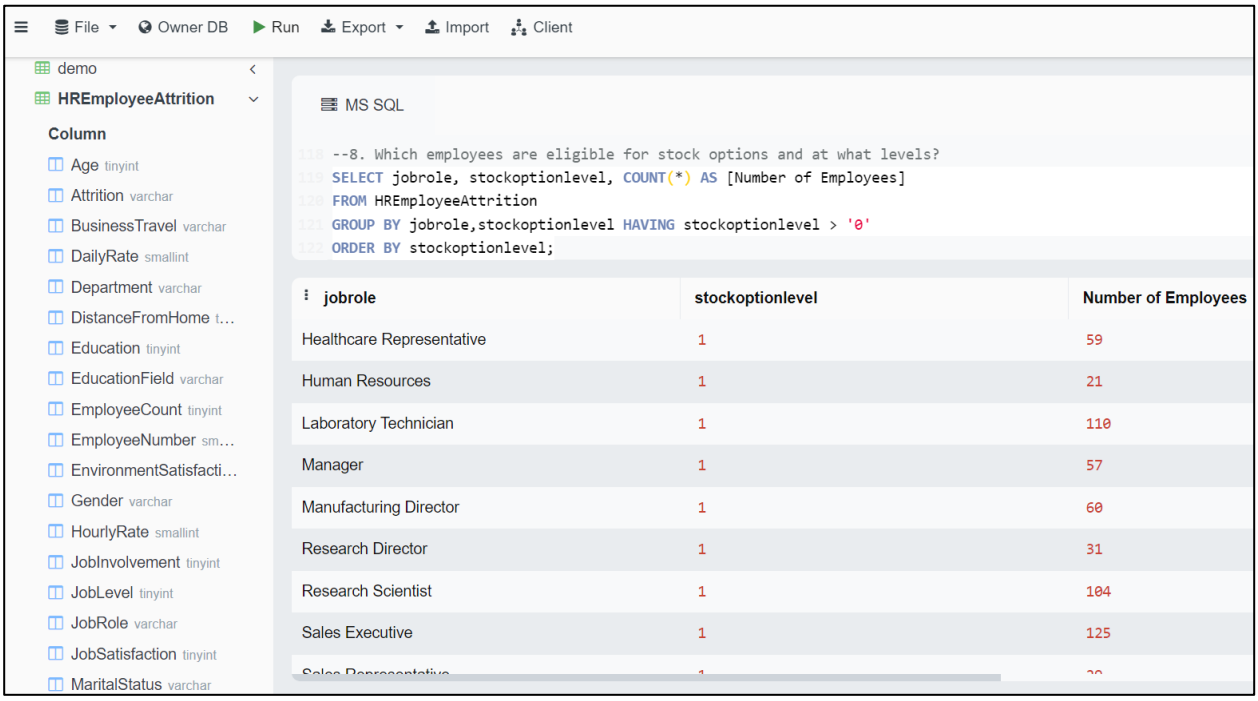


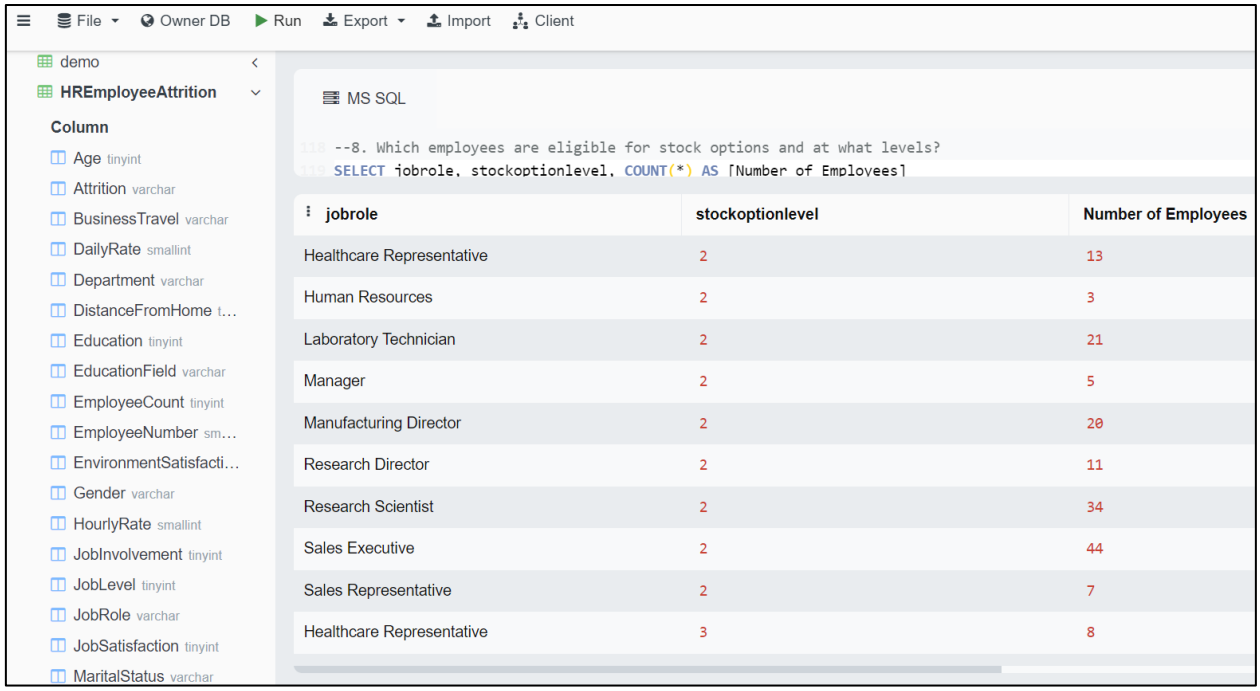
Understanding how many employees travel frequently helps in analyzing travel-related policies and expenses. It can be used to assess the need for travel management solutions or support for frequent travelers.

8. Which employees are eligible for stock options and at what levels?

The query provides a list of employees who are eligible for stock options and specifies their respective stock option levels. This information is crucial for understanding compensation packages and benefits.

Knowing which employees have stock options and at what levels can aid in strategic planning, especially when considering employee retention and reward strategies.


File
Owner DB
Run
Export
Import
Client
demo
HREmployeeAttrition
Column
Age tinyint
Attrition varchar
BusinessTravel varchar
DailyRate smallint
Department varchar
DistanceFromHome t...
Education tinyint
EducationField varchar
EmployeeCount tinyint
EmployeeNumber sm...
EnvironmentSatisfacti...
Gender varchar
HourlyRate smallint
JobInvolvement tinyint
JobLevel tinyint
JobRole varchar
JobSatisfaction tinyint
MaritalStatus varchar
MS SQL
--8. Which employees are eligible for stock options and at what levels?
SELECT jobrole, stockoptionlevel, COUNT(*) AS [Number of Employees]
FROM HREmployeeAttrition
GROUP BY jobrole,stockoptionlevel HAVING stockoptionlevel > '0'
ORDER BY stockoptionlevel;
jobrole
stockoptionlevel
Number of Employees
Healthcare Representative 1 59
Human Resources 1 21
Laboratory Technician 1 110
Manager 1 57
Manufacturing Director 1 60
Research Director 1 31
Research Scientist 1 104
Sales Executive 1 125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Run
Export
Import
Client
demo
HREmployeeAttrition
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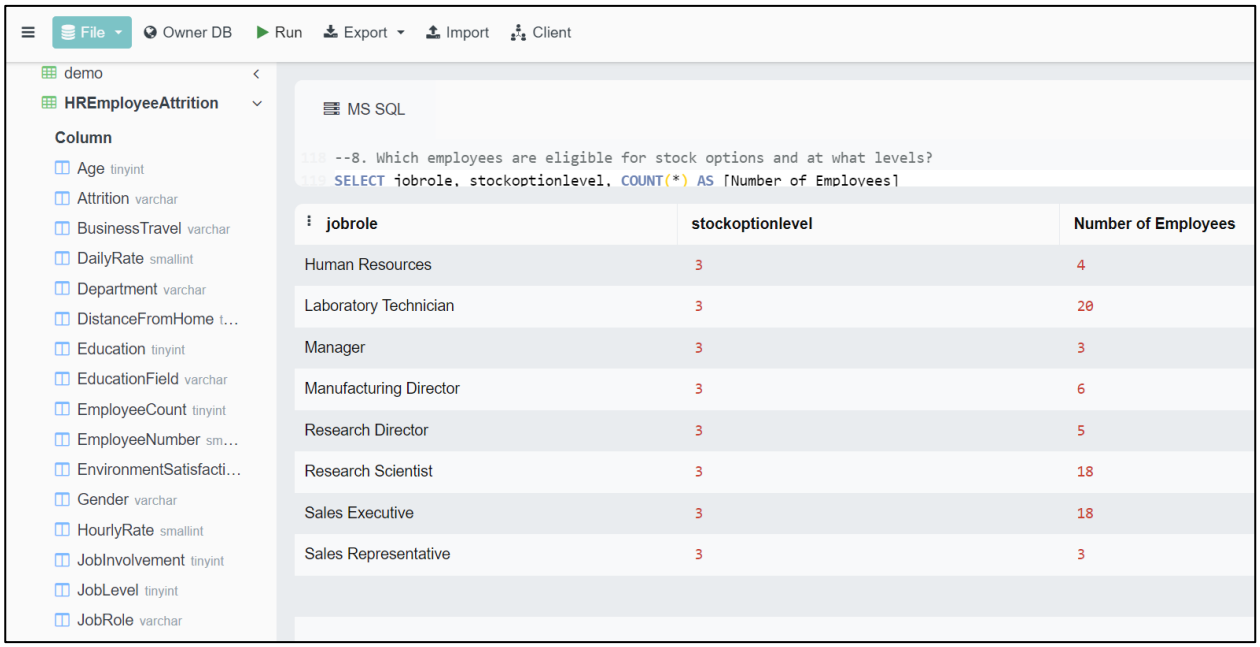
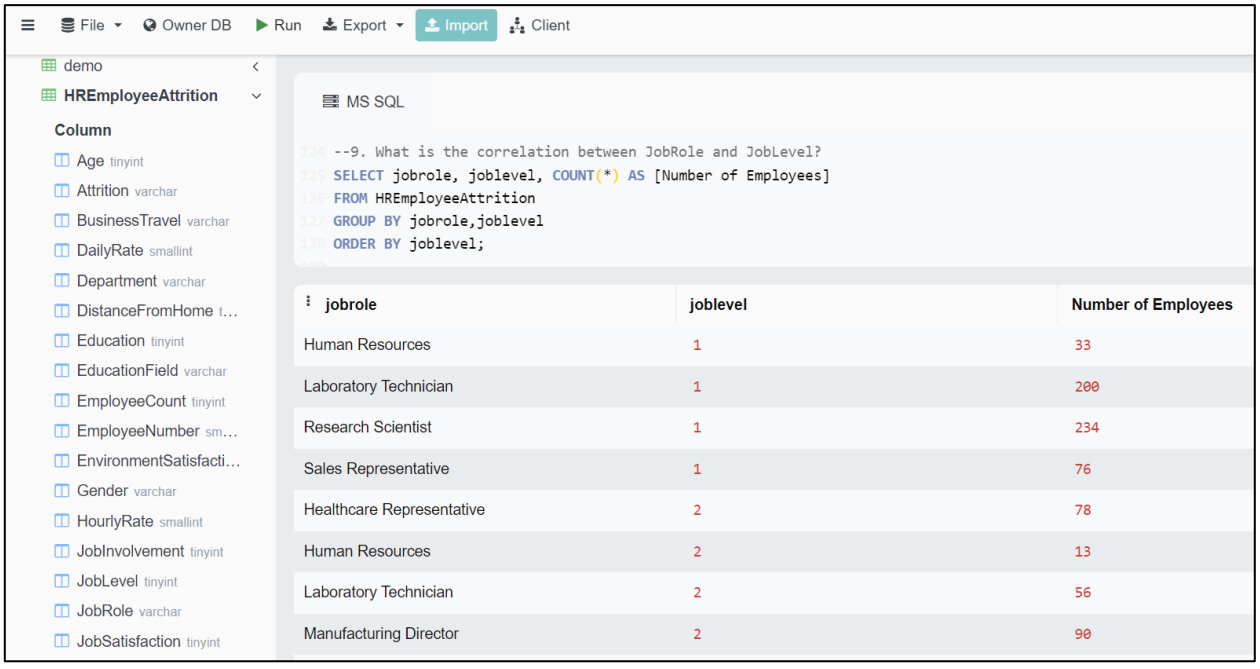
Attrition varchar
BusinessTravel varchar
DailyRate smallint
Department varchar
DistanceFromHome t...
Education tinyint
EducationField varchar
EmployeeCount tinyint
EmployeeNumber sm...
EnvironmentSatisfacti...
Gender varchar
HourlyRate smallint
JobInvolvement tinyint
JobLevel tinyint
JobRole varchar
JobSatisfaction tinyint
MaritalStatus varchar
MS SQL
--8. Which employees are eligible for stock options and at what levels?
SELECT jobrole, stockoptionlevel, COUNT(*) AS [Number of Employees]
jobrole
stockoptionlevel
Number of Employees
Healthcare Representative 2 13
Human Resources 2 3
Laboratory Technician 2 21
Manager 2 5
Manufacturing Director 2 20
Research Director 2 11
Research Scientist 2 34
Sales Executive 2 44
Sales Representative 2 7
Healthcare Representative 3 8



jobrole	stockoptionlevel	Number of Employees
Human Resources	3	4
Laboratory Technician	3	20
Manager	3	3
Manufacturing Director	3	6
Research Director	3	5
Research Scientist	3	18
Sales Executive	3	18
Sales Representative	3	3

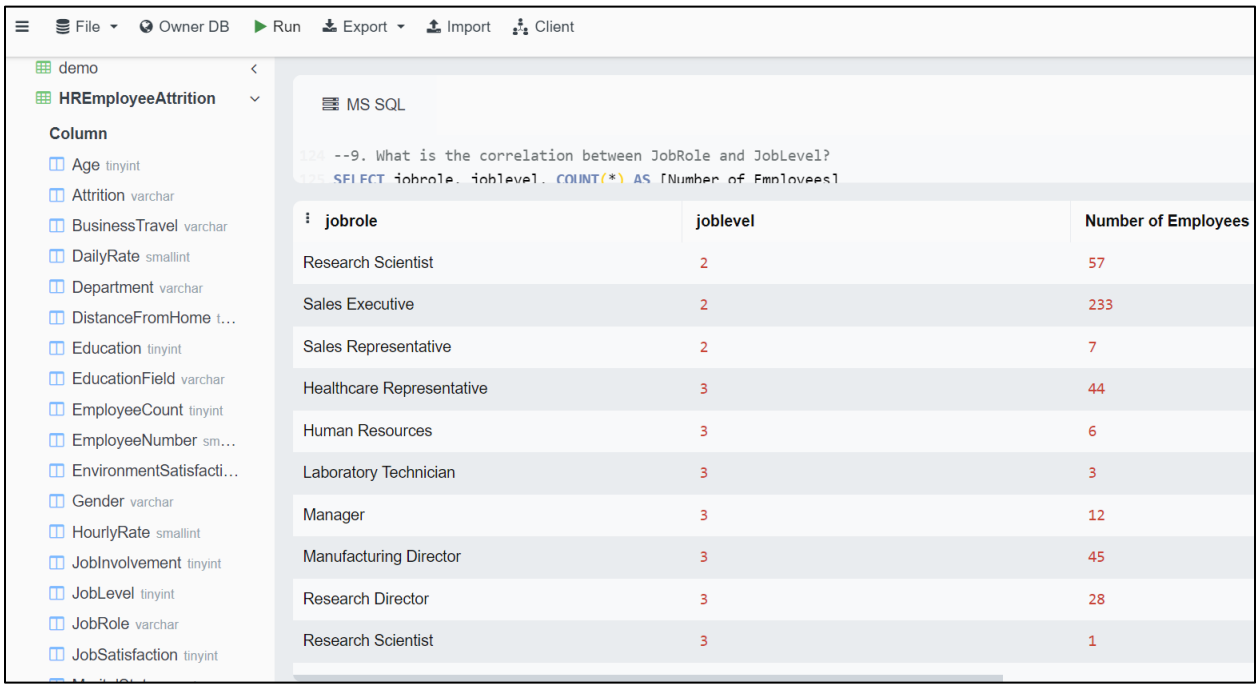
9. What is the correlation between JobRole and JobLevel?

The COUNT(*) function will be applied to each unique combination of jobrole and joblevel, giving the number of employees for each specific role and level combination.

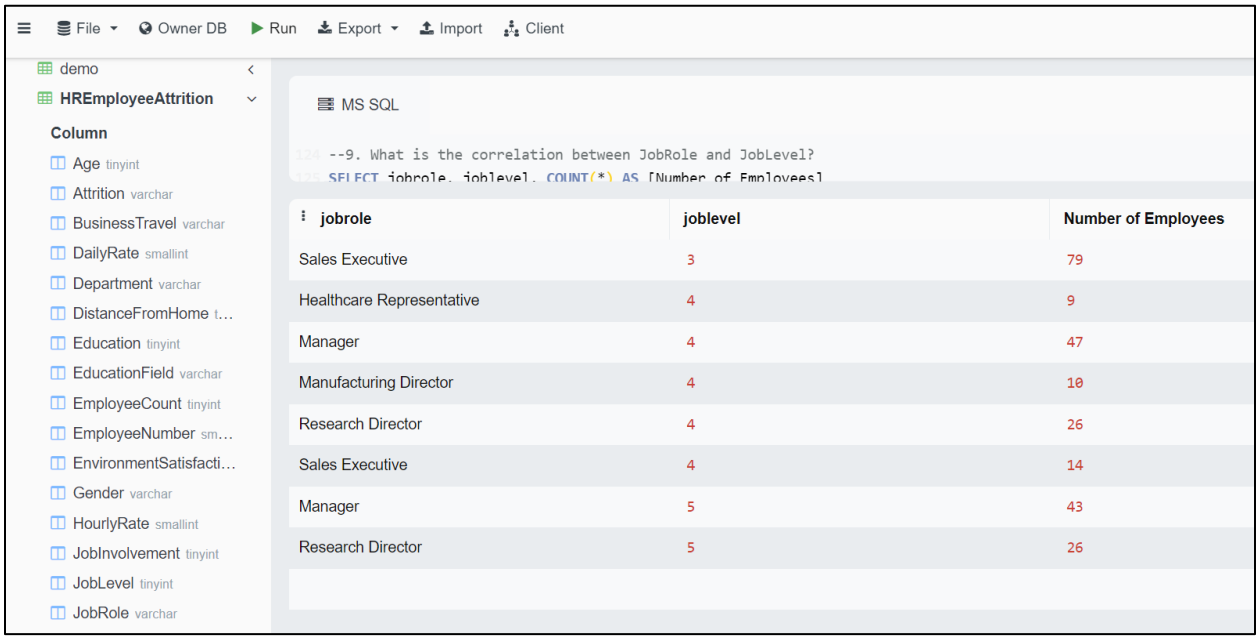


jobrole	joblevel	Number of Employees
Human Resources	1	33
Laboratory Technician	1	200
Research Scientist	1	234
Sales Representative	1	76
Healthcare Representative	2	78
Human Resources	2	13
Laboratory Technician	2	56
Manufacturing Director	2	90

This query provides insights into how employees are distributed across various job roles and levels. It helps in understanding which job roles and levels have the most or least number of employees.



jobrole	joblevel	Number of Employees
Research Scientist	2	57
Sales Executive	2	233
Sales Representative	2	7
Healthcare Representative	3	44
Human Resources	3	6
Laboratory Technician	3	3
Manager	3	12
Manufacturing Director	3	45
Research Director	3	28
Research Scientist	3	1



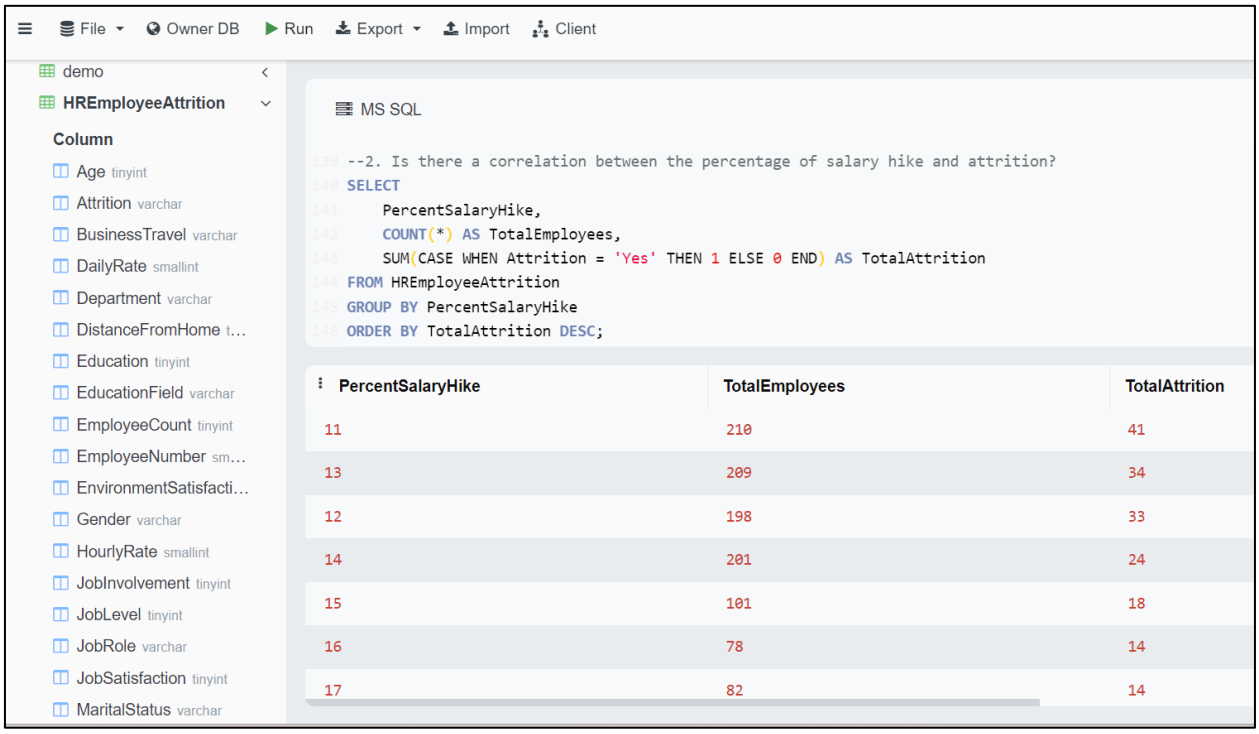
jobrole	joblevel	Number of Employees
Sales Executive	3	79
Healthcare Representative	4	9
Manager	4	47
Manufacturing Director	4	10
Research Director	4	26
Sales Executive	4	14
Manager	5	43
Research Director	5	26

Reasons for Attrition

1. **What is the overall attrition rate in the company?**

It provides a summary of attrition data from the AttritionTable. It counts the total number of employees, calculates the total number of attritions, and computes the attrition rate as a percentage. This information is useful for analyzing employee turnover, assessing HR performance, and making strategic decisions related to employee retention and workforce management.

2. Is there a correlation between the percentage of salary hike and attrition?



It analyzes the relationship between the **PercentSalaryHike** and employee attrition within the dataset **HREmployeeAttrition**.

The results can reveal trends such as whether employees with certain salary hike percentages are more likely to leave. For instance, if higher salary hikes correlate with higher attrition, this could indicate dissatisfaction with the company or other underlying issues.

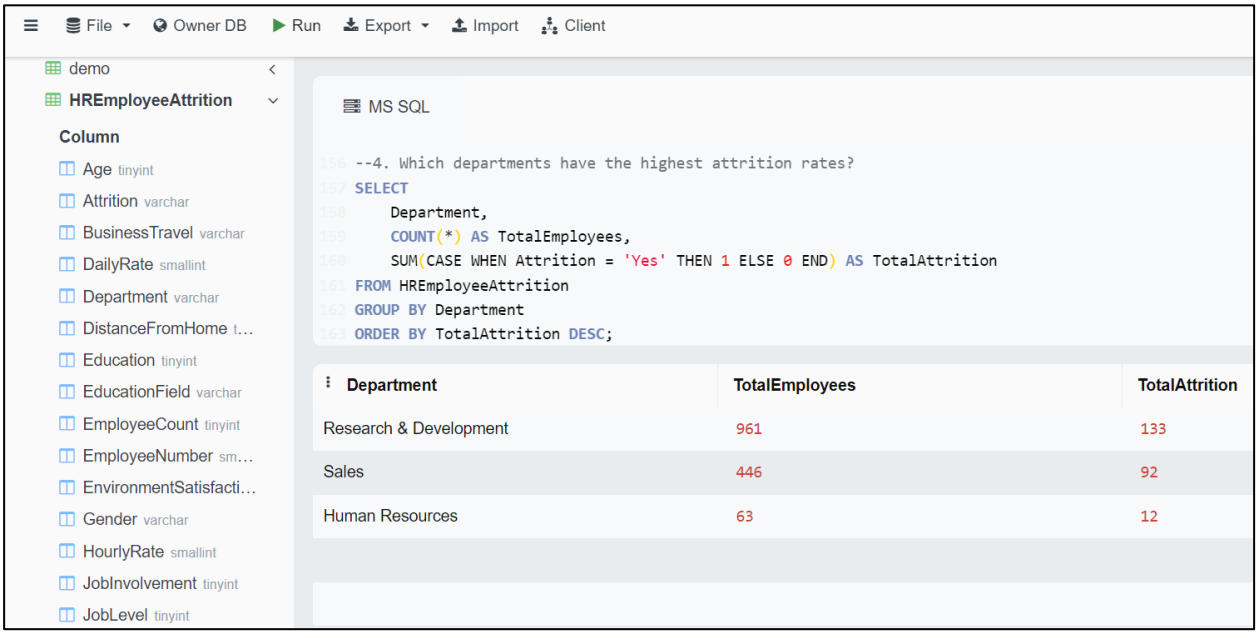
3. What is the relationship between JobSatisfaction and Attrition?

This query helps to analyze how job satisfaction levels are associated with employee attrition. By grouping and counting employees based on job satisfaction and their attrition status, you can identify trends and patterns related to employee turnover.

Can observe if employees with lower or higher job satisfaction are more likely to leave the company. For instance, if employees with lower job satisfaction have higher attrition rates, this indicates a potential area for improvement in job satisfaction and retention strategies.

4. Which departments have the highest attrition rates?

The clause ensures that the aggregation functions (COUNT and SUM) are applied within each department separately, rather than across the entire dataset.

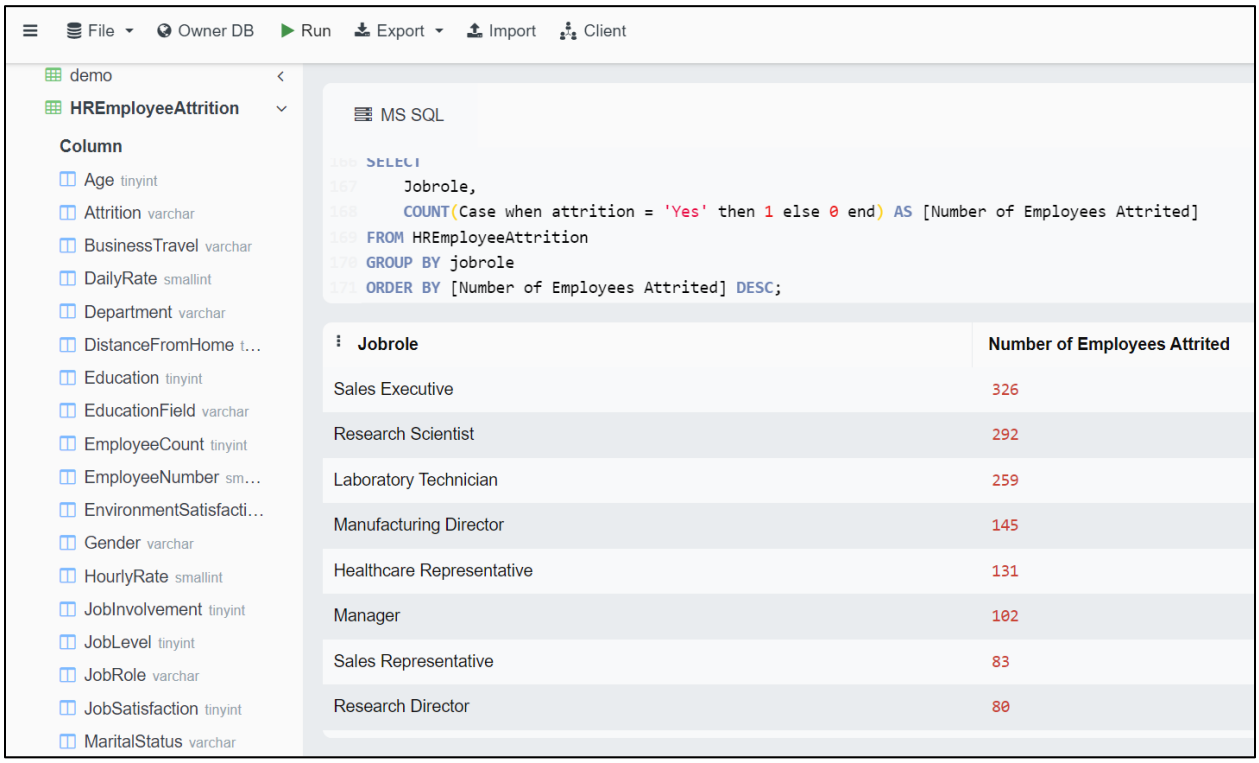


Departments with higher attrition rates are highlighted, allowing you to focus on these areas for further investigation. It may indicate potential issues within those departments, such as management problems, work environment concerns, or other factors affecting employee retention.

5. **Employees from which designation falls attrition more?**

Job roles with higher attrition counts are highlighted, indicating where there might be significant issues affecting employee retention. This can reveal potential problems specific to those roles.

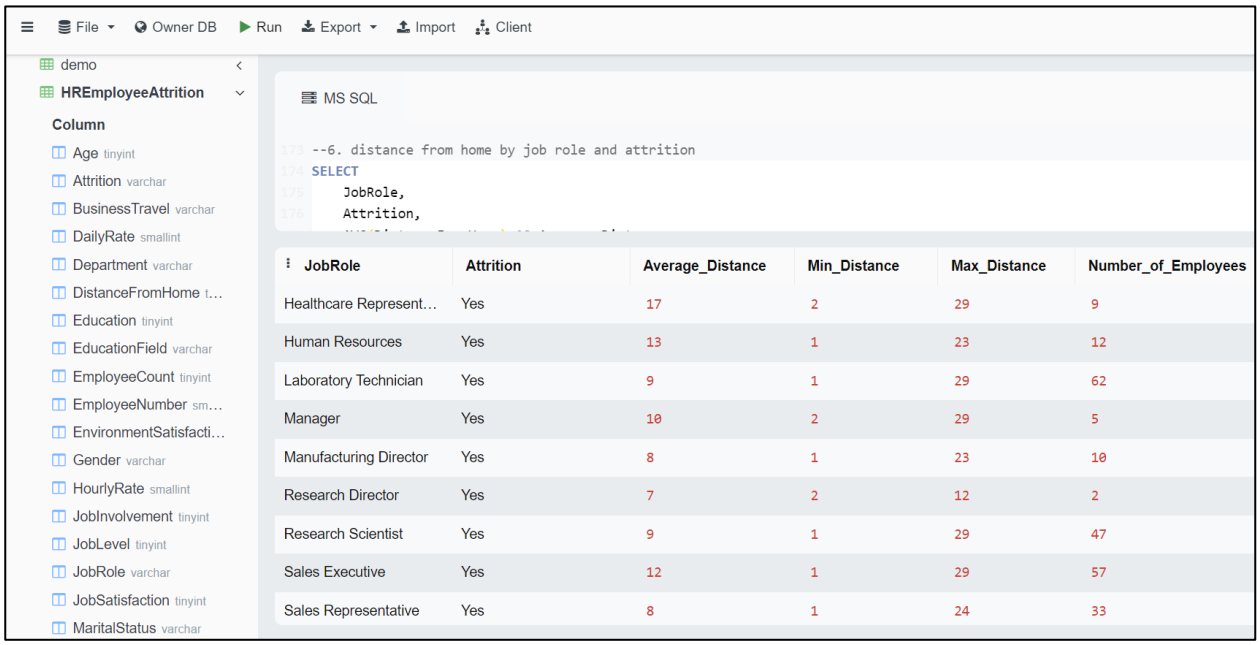
Knowing which job roles have the highest attrition can guide HR and management in focusing their efforts on improving conditions for those specific roles. This might include revising job responsibilities, improving job satisfaction, or addressing role-specific concerns.



6. Distance from home by job role and attrition?

This SQL query is designed to analyze and summarize the distance employees live from home, segmented by their job role and attrition status within the **HREmployeeAttrition** dataset.

By examining the average, minimum, and maximum distances, you can assess whether distance from home might be a factor influencing employee attrition in different roles. For example, if certain roles have employees with significantly higher or lower average distances, it might suggest regional or logistical issues.

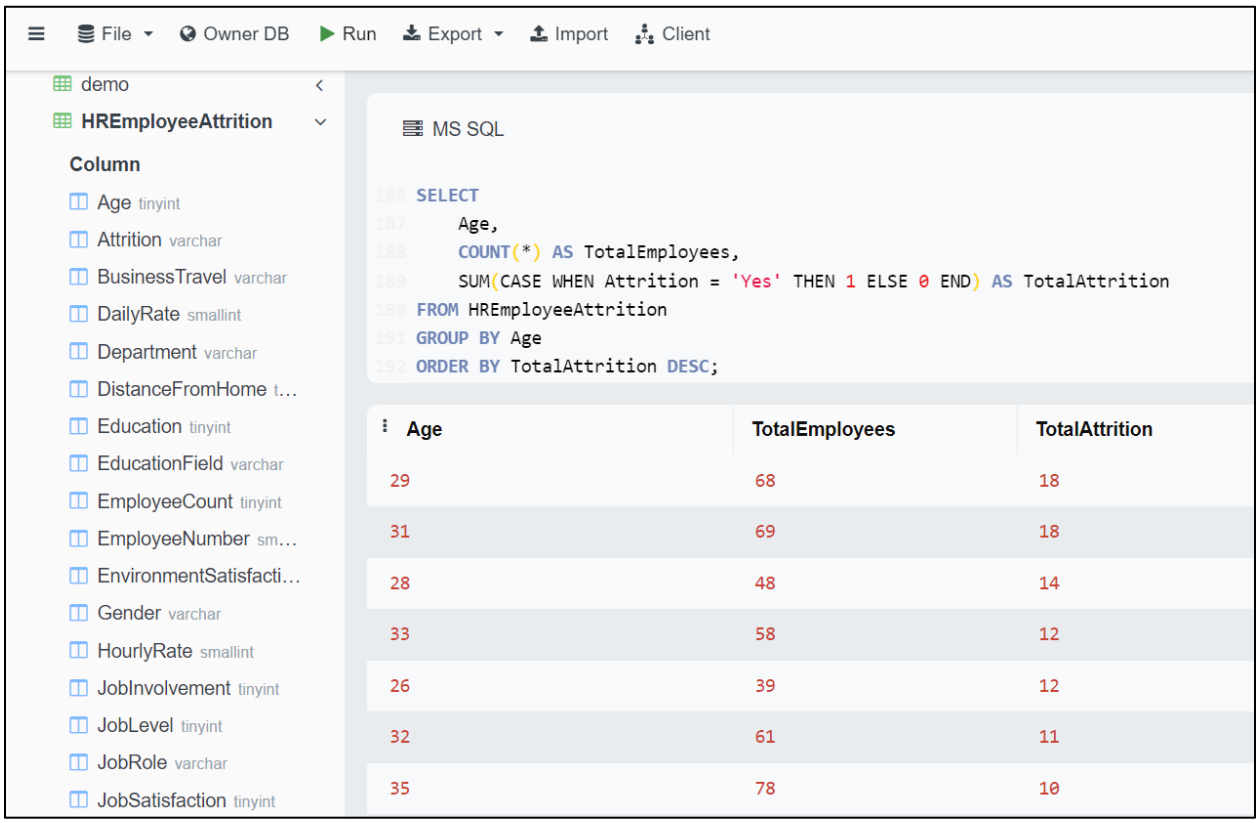


JobRole	Attrition	Average_Distance	Min_Distance	Max_Distance	Number_of_Employees
Healthcare Represent...	Yes	17	2	29	9
Human Resources	Yes	13	1	23	12
Laboratory Technician	Yes	9	1	29	62
Manager	Yes	10	2	29	5
Manufacturing Director	Yes	8	1	23	10
Research Director	Yes	7	2	12	2
Research Scientist	Yes	9	1	29	47
Sales Executive	Yes	12	1	29	57
Sales Representative	Yes	8	1	24	33

7. How does attrition vary across different age groups?

It provides insights into how attrition rates vary across different age groups. By grouping data by age, it helps to understand if certain age groups are more prone to leaving the company.

By sorting the results in descending order of attrition, you can easily identify which age groups have the highest number of employees who have left. This can highlight potential trends or issues related to specific age groups.



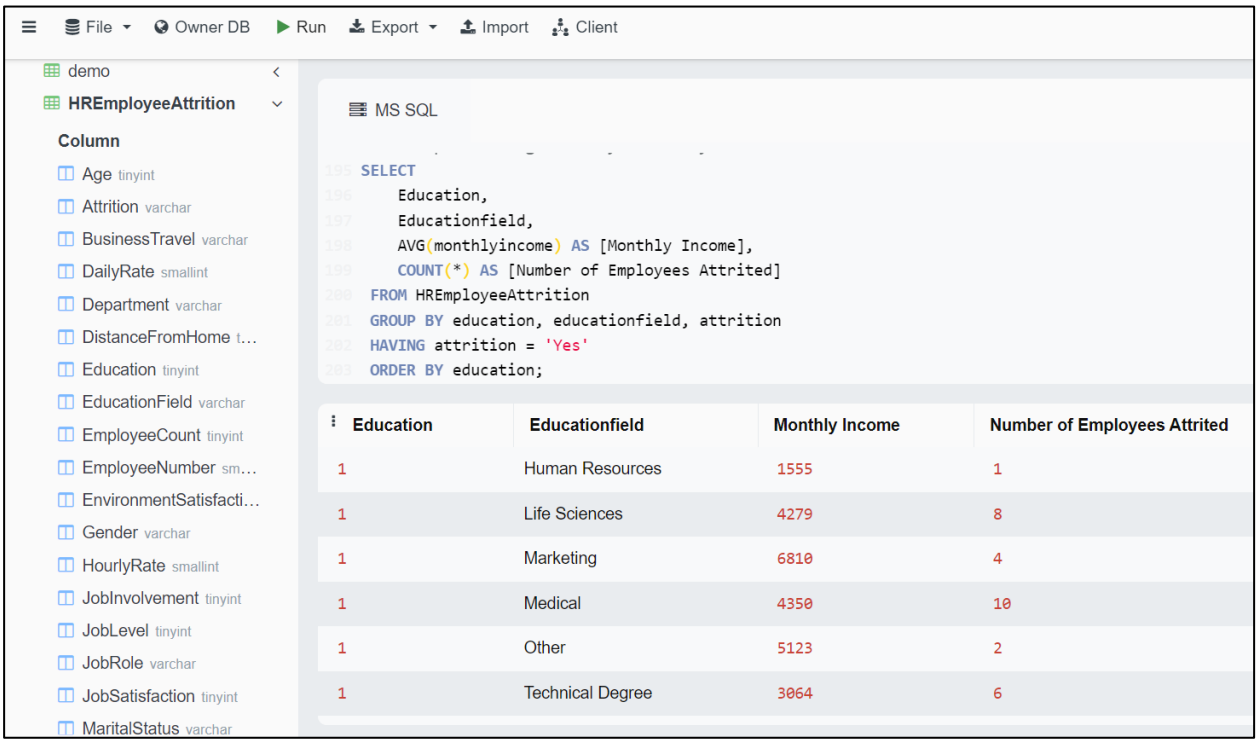
Age	TotalEmployees	TotalAttrition
29	68	18
31	69	18
28	48	14
33	58	12
26	39	12
32	61	11
35	78	10

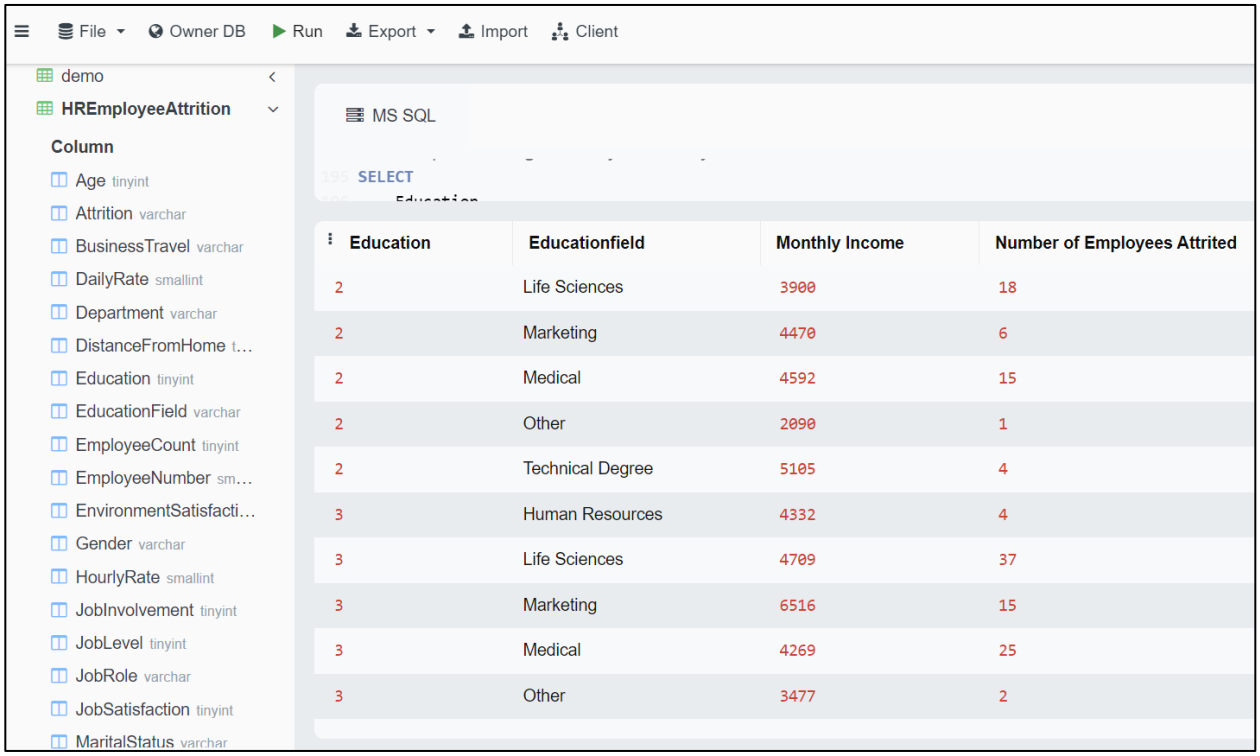
Age	TotalEmployees	TotalAttrition
30	60	9
24	26	7
44	33	6
21	13	6
41	40	6
19	9	6
25	26	6
36	69	6
39	42	6
20	11	6

8. Compare average monthly income by education and attrition?

Here, analyzed employee attrition based on their education level and field of education, focusing on how these factors relate to monthly income.

This query analyzes employee attrition by education level and field of education, calculating the average monthly income and counting the number of employees who have left the company within each group. It groups the data based on education and education field, filters to include only those who have attrited, and orders the results by education level. This analysis helps to understand how attrition rates and income are influenced by educational background, providing valuable insights for strategic HR decisions.





Education	Educationfield	Monthly Income	Number of Employees Attrited
2	Life Sciences	3900	18
2	Marketing	4470	6
2	Medical	4592	15
2	Other	2090	1
2	Technical Degree	5105	4
3	Human Resources	4332	4
3	Life Sciences	4709	37
3	Marketing	6516	15
3	Medical	4269	25
3	Other	3477	2
3	Technical Degree	4327	16
4	Human Resources	2073	1
4	Life Sciences	5108	25
4	Marketing	7981	9
4	Medical	5723	13
4	Other	3760	6
4	Technical Degree	2713	4
5	Human Resources	2956	1
5	Life Sciences	7446	1
5	Marketing	6134	1

Conclusion

In this SQL project, I thoroughly explored and analyzed the **HREmployeeAttrition** dataset to gain insights into employee attrition patterns and other key metrics. This analysis enhanced my SQL skills, particularly in data querying, aggregation, and interpretation. The findings provided a deeper understanding of how various factors, such as department, job role, salary, and demographic attributes, influence employee retention and turnover.

Recommendations to the Company:

1. **Targeted Retention Strategies:** Develop specific retention strategies for departments and job roles with high attrition rates. This may include career development programs, competitive compensation packages, and enhanced workplace support.
2. **Compensation Review:** Conduct a comprehensive review of salary structures, particularly focusing on roles with lower satisfaction levels and higher turnover. Ensuring competitive and fair compensation can enhance employee satisfaction and reduce attrition.
3. **Employee Engagement Initiatives:** Implement programs to boost engagement, such as regular feedback sessions, recognition programs, and opportunities for professional growth.
4. **Demographic-Specific Policies:** Recognize and address the diverse needs of different employee demographics. For example, younger employees may value career development opportunities, while older employees might prioritize job stability and benefits.

Reference

1. SQL Tutorial - https://www.w3schools.com/sql/sql_syntax.asp
2. IBM HR Analytics Employee Attrition & Performance - https://www.kaggle.com/datasets/pavansubhasht/ibm-hr-analytics-attrition-dataset
3. SQL Tuning - https://www.tutorialspoint.com/sql/sql-syntax.htm
4. Database Management System - https://www.geeksforgeeks.org/sql-tutorial/