Job Market Analysis Using SQL Server

Microsoft® SQL Server®

Introduction

This project analyzes job market trends in Egypt using SQL Server by exploring custom-generated data to extract insights on hiring, salaries, and in-demand skills.

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Overview

Project Overview

"Job Market Analysis Using SQL Server" is a data-driven project that explores hiring trends, salary ranges, and in-demand skills in Egypt by executing structured SQL queries on a custom-built relational database.

- **Main Idea:** The system simulates real job market data, covering job posts, companies, locations, skills, and experience levels, to support pattern discovery and informed decision-making.
- **Problem Statement:** Job seekers and HR professionals often lack clear, data-backed insights into market trends, salaries, and required skills, which hinders effective career planning and recruitment.
- **Proposed Solution:** Using SQL Server, the project offers actionable insights through structured queries that help users understand labor market dynamics and make better choices.
- **Target Audience:** Job seekers, HR departments, and data analysts in Egypt's job market.

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Objectives

Project Objectives

1. **Design** and **implement** a relational database system that realistically simulates key aspects of Egypt's job market.
2. **Develop** a well-structured and scalable schema to represent core entities such as companies, job listings, geographic locations, required skills, and experience levels.
3. **Utilize** structured SQL queries to perform in-depth data analysis and generate actionable labor market insights.
4. **Enhance** analytical accuracy and efficiency through comprehensive data profiling, ensuring consistency, validity, and readiness for querying.
5. **Provide** meaningful insights to job seekers, HR professionals, and decision-makers regarding hiring trends, salary expectations, and in-demand skills.

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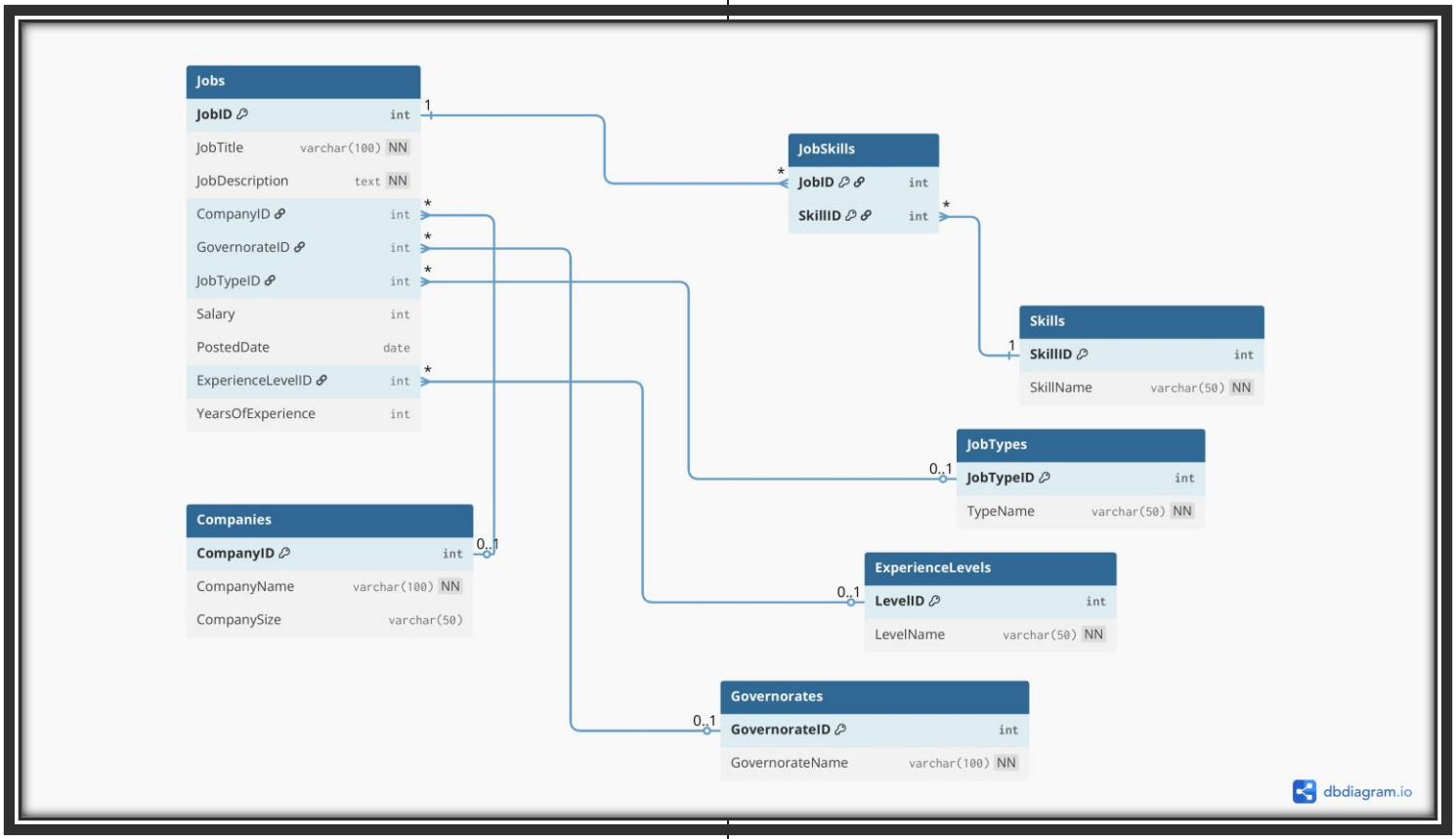
DB Schema


Jobs
JobID int
JobTitle varchar(100) NN
JobDescription text NN
CompanyID int
GovernorateID int
JobTypeID int
Salary int
PostedDate date
ExperienceLevelID int
YearsOfExperience int
JobSkills
JobID int
SkillID int
Skills
SkillID int
SkillName varchar(50) NN
JobTypes
JobTypeID int
TypeName varchar(50) NN
Companies
CompanyID int
CompanyName varchar(100) NN
CompanySize varchar(50)
ExperienceLevels
LevelID int
LevelName varchar(50) NN
Governorates
GovernorateID int
GovernorateName varchar(100) NN
dbdiagram.io

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Data Generation

Data Generation

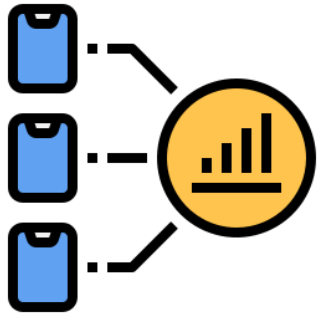
- The data used in this project was **manually generated by me**. I didn't use any external dataset, instead, I created **a custom dataset** that reflects realistic job market scenarios as accurately as possible.

  This allowed me to:

  - **Customize** the data to fit my project objectives.
  - **Ensure** it includes diverse roles, companies, and locations.
  - **Simulate** real-world patterns in job postings, salaries, experience levels, etc.

- I mainly used **7 tables** in this project, which are:

  - Companies
  - Governorates
  - JobTypes
  - ExperienceLevels
  - Jobs
  - Skills
  - JobSkills



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Tables Overview

Tables Overview

- To give you a clearer idea about the structure and content of the data, I'll now show a simple sample from each table to illustrate how the data looks. These samples represent just a small portion of the overall data :

Companies Table

CompanyID	CompanyName	CompanySize
1	Valeo Egypt	Large
2	Microsoft Egypt	Large
3	ITWorx	Medium
4	Vodafone Egypt	Large
5	Orange Digital Center	Large
6	Etisalat Misr	Large
7	Sumerge	Medium
8	Instabug	Medium
9	Raya Information Technology	Large
10	Dxwand	Small

ExperienceLevels Table

LevelID	LevelName
1	Junior
2	Mid
3	Senior

Tables Overview (Cont.)

- To give you a clearer idea about the structure and content of the data, I'll now show a simple sample from each table to illustrate how the data looks. These samples represent just a small portion of the overall data :

Governorates Table

GovernorateID	GovernorateName
1	Cairo
2	Giza
3	Alexandria
4	Fayoum
5	Assiut
6	Mansoura
7	Menoufia
8	Aswan
9	Tanta
10	Qena

JobSkills Table

JobID	SkillID
1	1
1	2
1	3
1	4
1	6
1	7
1	39
1	40
2	8
2	9

Tables Overview (Cont.)

- To give you a clearer idea about the structure and content of the data, I'll now show a simple sample from each table to illustrate how the data looks. These samples represent just a small portion of the overall data :

JobTypes Table

JobTypeID	TypeName
1	Full-time
2	Part-time
3	Remote
4	Hybrid

Skills Table

SkillID	SkillName
1	HTML
2	CSS
3	JavaScript
4	React
5	Vue.js
6	Bootstrap
7	Tailwind CSS
8	Node.js
9	Express.js
10	PHP

Tables Overview (Cont.)

- To give you a clearer idea about the structure and content of the data, I'll now show a simple sample from each table to illustrate how the data looks. These samples represent just a small portion of the overall data :

Jobs Table

JobID	JobTitle	JobDescription	CompanyID	GovernorateID	JobTypeID	Salary	PostedDate	ExperienceLevelID	YearsOfExperience
1	Front-End Developer	Build responsive inte...	1	1	1	13000	2025-06-01	2	2
2	Back-End Developer	Develop RESTful APIs...	2	1	4	15000	2025-06-05	2	3
3	Data Analyst	Analyze business dat...	1	1	1	12000	2025-06-18	2	2
4	Cybersecurity Analyst	Monitor network traf...	1	1	4	17000	2025-07-02	2	3
5	Full-Stack Developer	Handle both front-en...	3	3	1	17000	2025-06-10	3	4
6	UI/UX Designer	Design user interface...	3	3	3	13500	2025-07-03	2	2
7	Mobile App Developer	Create cross-platfor...	4	2	2	14000	2025-06-15	2	2
8	DevOps Engineer	Automate deployme...	4	2	1	20000	2025-07-03	3	5
9	Embedded Systems Engineer	Develop software for...	8	5	3	17500	2025-07-03	3	5
10	AI Engineer	Build NLP and comp...	9	4	3	21000	2025-07-01	3	5

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Data Profiling

Data Profiling Summary

- Before starting the analysis, I conducted data profiling to explore and understand the structure and quality of the data. This helped me build a strong understanding of the data before drawing any insights.

- The profiling process included the following steps:

  - **Retrieving** the number of columns in each table.
  - **Reviewing** data types and column properties.
  - **Counting** the number of rows in key tables like Jobs and Skills.
  - **Detecting** NULL values in the Jobs table.
  - **Getting** a statistical summary (Min, Max) for Salary and Years of Experience.
  - **Checking** for duplicate or illogical repetitions in job titles.
  - **Counting** the number of skills assigned to each job.

Examples & Insights

```sql
-- What are the most hiring companies?
SELECT C.CompanyName, COUNT(J.JobID) AS JobCount
FROM Companies AS C
INNER JOIN Jobs AS J ON C.CompanyID = J.CompanyID
GROUP BY C.CompanyName
ORDER BY JobCount DESC;
```

CompanyName	JobCount
Etisalat Misr	3
Microsoft Egypt	3
Valeo Egypt	3
Vodafone Egypt	2
ITWorx	2
Dxwand	1
Instabug	1
Orange Digital Center	1
Raya Information Technology	1
Sumerge	1

```sql
-- Which governorates offer the most jobs?
SELECT G.GovernorateName, COUNT(J.JobID) AS JobCount
FROM Governorates AS G
INNER JOIN Jobs AS J ON G.GovernorateID = J.GovernorateID
GROUP BY G.GovernorateName
ORDER BY JobCount DESC;
```

GovernorateName	JobCount
Cairo	7
Fayoum	2
Giza	2
Mansoura	2
Alexandria	2
Assiut	1
Aswan	1
Menoufia	1

```sql
-- What is the average salary based on experience level?
SELECT E.LevelName, AVG(J.Salary) AS AvgSalary
FROM ExperienceLevels AS E
INNER JOIN Jobs AS J ON E.LevelID = J.ExperienceLevelID
GROUP BY E.LevelName;
```

LevelName	AvgSalary
Junior	11666
Mid	14083
Senior	18666

```sql
-- What are the most in-demand skills in the job market?
SELECT S.SkillName, COUNT(JS.JobID) AS DemandCount
FROM Skills S
INNER JOIN JobSkills JS ON S.SkillID = JS.SkillID
GROUP BY S.SkillName
ORDER BY DemandCount DESC;
```

SkillName	DemandCount
Problem Solving	9
Python	6
GitHub	6
PyTorch	4
Cisco	4
TCP/IP	4
Git	3
REST APIs	3
CI/CD	3
Linux	3

```sql
-- Top 5 jobs by average salary?
SELECT TOP 5 JobTitle, AVG(Salary) AS AvgSalary
FROM Jobs
GROUP BY JobTitle
ORDER BY AvgSalary DESC;
```

JobTitle	AvgSalary
AI Engineer	21000
DevOps Engineer	20000
Machine Learning Engineer	20000
Security Engineer	19500
Data Engineer	19000

```sql
-- Top companies by average salary
SELECT C.CompanyName, AVG(J.Salary) AS AvgSalary
FROM Companies C
JOIN Jobs J ON C.CompanyID = J.CompanyID
GROUP BY C.CompanyName
ORDER BY AvgSalary DESC;
```

CompanyName	AvgSalary
Raya Information Technology	21000
Etisalat Misr	19166
Dxwand	19000
Instabug	17500
Vodafone Egypt	17000
Sumerge	16000
ITWorx	15250
Valeo Egypt	14000
Microsoft Egypt	12666
Orange Digital Center	12000

```sql
-- Number of jobs per experience level as a percentage?
SELECT
    E.LevelName,
    COUNT(*) AS CountPerLevel,
    CAST(CAST(ROUND(COUNT(*) * 100.0 / (SELECT COUNT(*) FROM Jobs), 0) AS INT) AS VARCHAR(100)) + '%' AS Percentage
FROM ExperienceLevels E
JOIN Jobs J ON E.LevelID = J.ExperienceLevelID
GROUP BY E.LevelName;
```

LevelName	CountPerLevel	Percentage
Junior	3	17%
Mid	6	33%
Senior	9	50%

```sql
-- Rank jobs by salary within each experience level
SELECT
    J.JobTitle,
    E.LevelName,
    J.Salary,
    RANK() OVER (PARTITION BY E.LevelName ORDER BY J.Salary DESC) AS SalaryRank
FROM Jobs J
INNER JOIN ExperienceLevels E ON J.ExperienceLevelID = E.LevelID;
```

JobTitle	LevelName	Salary	SalaryRank
Cloud Engineer	Junior	12000	1
Business Intelligence Developer	Junior	11500	2
Penetration Tester	Junior	11500	2
Cybersecurity Analyst	Mid	17000	1
Back-End Developer	Mid	15000	2
Mobile App Developer	Mid	14000	3
UI/UX Designer	Mid	13500	4
Front-End Developer	Mid	13000	5
Data Analyst	Mid	12000	6
AI Engineer	Senior	21000	1
DevOps Engineer	Senior	20000	2
Machine Learning Engineer	Senior	20000	2
Security Engineer	Senior	19500	4
Data Engineer	Senior	19000	5
Data Scientist	Senior	18000	6
Embedded Systems Engineer	Senior	17500	7
Full-Stack Developer	Senior	17000	8
Network Engineer	Senior	16000	9

```sql
-- What is the distribution of job types across different experience levels?
SELECT
    E.LevelName,
    JT.TypeName,
    COUNT(J.JobID) AS JobCount
FROM Jobs J
JOIN ExperienceLevels E ON J.ExperienceLevelID = E.LevelID
JOIN JobTypes JT ON J.JobTypeID = JT.JobTypeID
GROUP BY E.LevelName, JT.TypeName
ORDER BY E.LevelName, JobCount DESC;
```

LevelName	TypeName	JobCount
Junior	Full-time	1
Junior	Part-time	1
Junior	Remote	1
Mid	Full-time	2
Mid	Hybrid	2
Mid	Remote	1
Mid	Part-time	1
Senior	Full-time	5
Senior	Remote	3
Senior	Hybrid	1

The End

I hope you find my project valuable 🙏 ♥