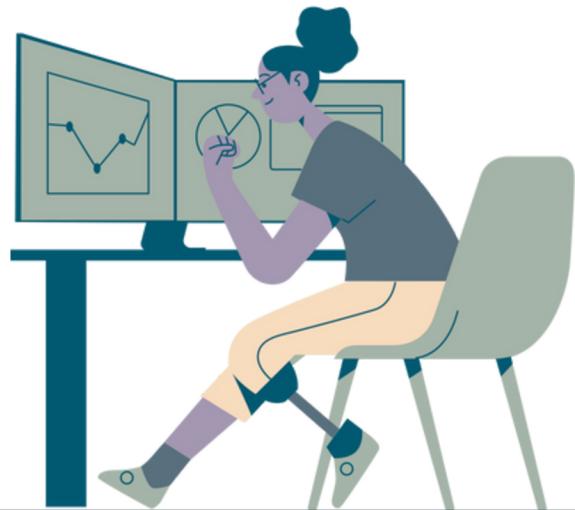


Human Resources

Analysis Case

Under the supervision of
Eng. Osama Adel



Discussion Points

An overview of our steps, our progress,
and recommendations.



Our Management Team



Omar Ali Eldeen



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Mahmoud Kamal

Introduction

Objective:

This analysis was conducted on human resources data to transform it into insights and recommendations that assist decision-makers in making the right decisions.





Data sources:

HR Data Analysis CSV

Employee

Employee	
Name	
Gender	
Age	
Department	
DistanceFromHome_KM	
State	
Ethnicity	[Employee]
Education	
EducationField	
JobRole	
MaritalStatus	
BusinessTravel	
Salary	
StockOptionLevel	
Overtime	
HireDate	
Attrition	
YearsAtCompany	
YearsInCurrentRole	
YearsInLastRole	
YearsWithCurrManager	

Performance

Performance	
PerformanceID	
EmployeeID	
ReviewDate	
EnvironmentSatisfaction	
JobSatisfaction	
RelationshipSatisfaction	
TrainingOpportunitiesWithinYear	
TrainingOpportunitiesTaken	
WorkLifeBalance	
SelfRating	
ManagerRating	

Rating

Rating	
Rating_ID	
RatingLevel	

Satisfaction

Satisfaction	
Satisfaction_ID	
SatisfactionLevel	

Data Cleaning

Data Cleaning



Notebook Link:

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Data Cleaning

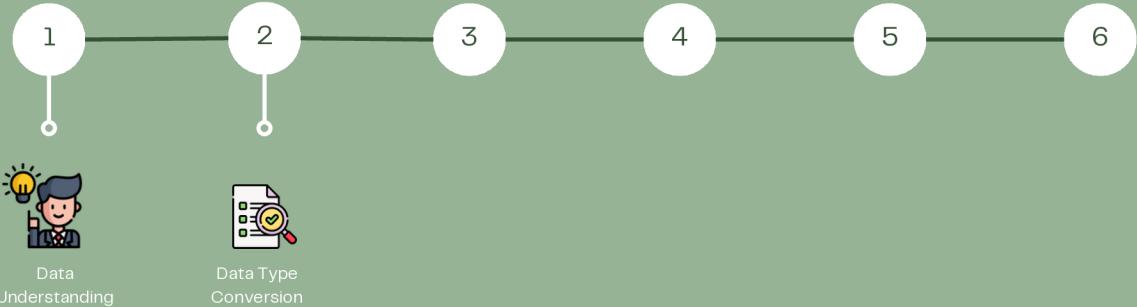


Data
Understanding

Notebook Link:

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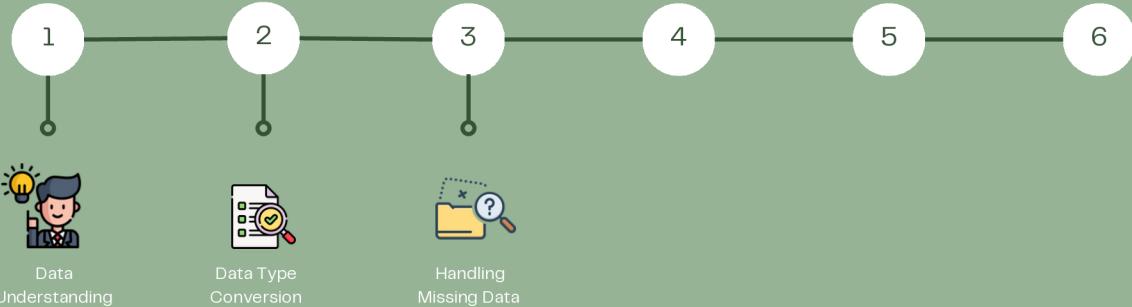
Data Cleaning



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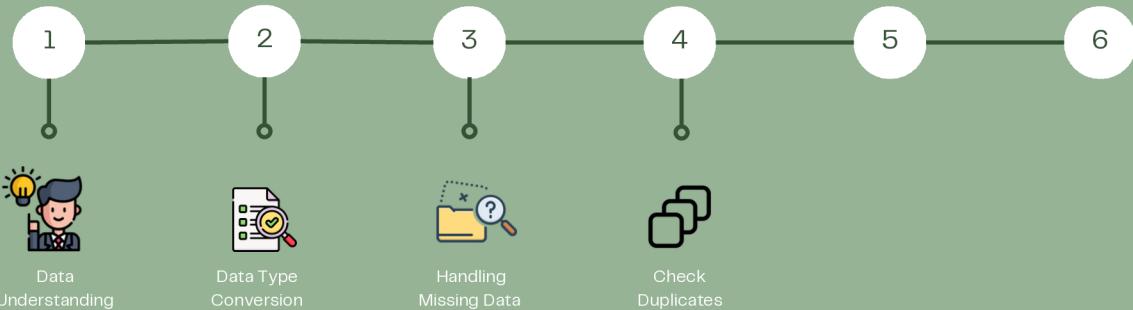
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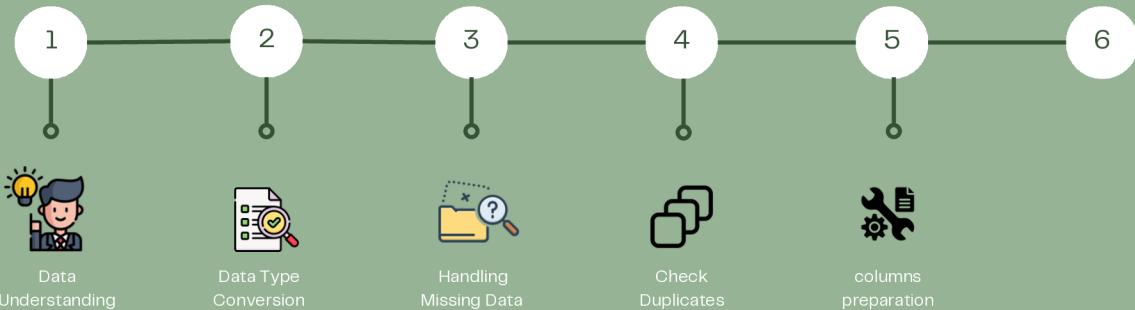
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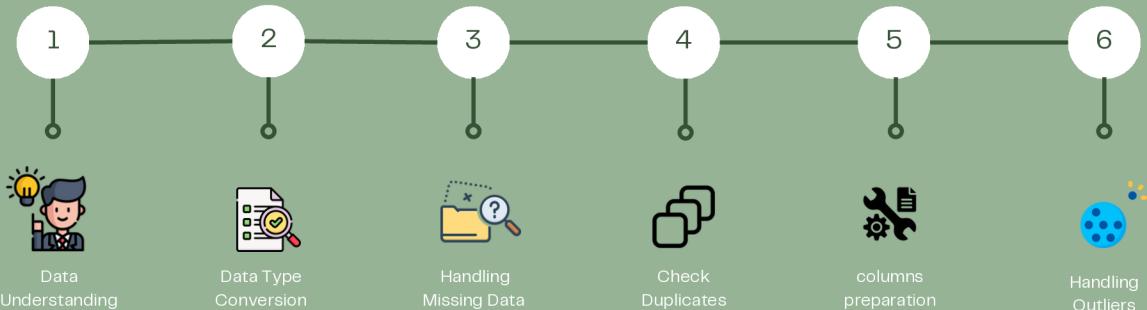
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Data Cleaning



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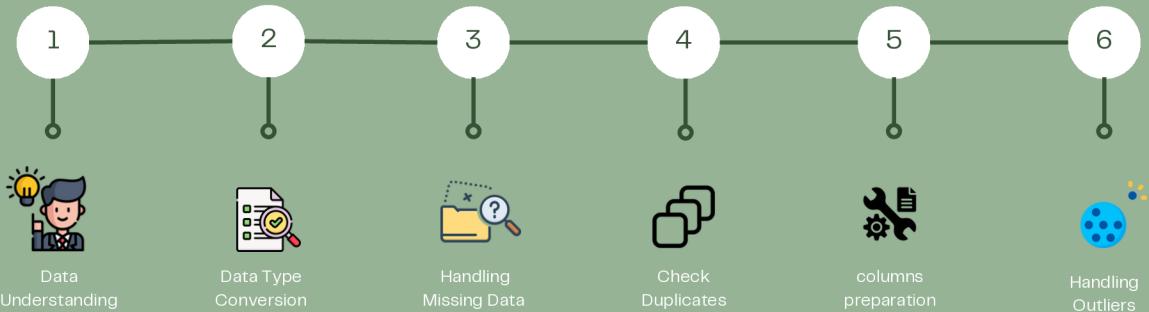


Handling Outliers



289768.625

Data Cleaning

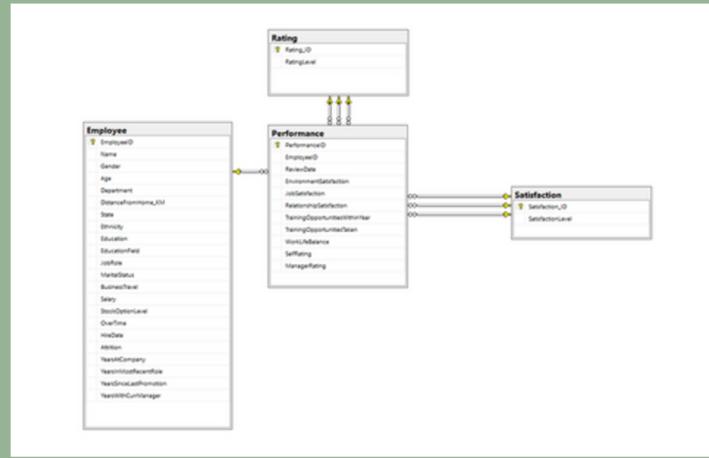


SQL insights





Data Normalization



SQL insights



SQL insights



Are the outliers
valid ?



SQL insights

Are the outliers
valid ?



why the company have
Attrition ?



Outliers

SQL Query:

```
--1- number of outliers
SELECT
COUNT(*) as "number of outliers"
FROM Employee
WHERE Employee.Salary >= 289768.625;
```

	number of outliers
1	124

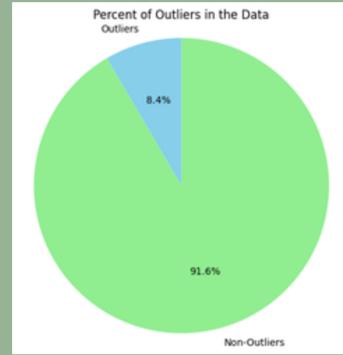
SQL Queries Link:

https://drive.google.com/file/d/1vSI5Rmq_rwEkBNLdFEg6f_nW6uI7Gqvi/view?usp=sharing

Outliers

SQL Query:

```
--2- percent of outliers in the data
--SELECT
COUNT(CASE WHEN Employee.Salary >= 289768.625 THEN 1 END) * 100.0 / COUNT(*) AS "percent of outliers"
FROM Employee;
```

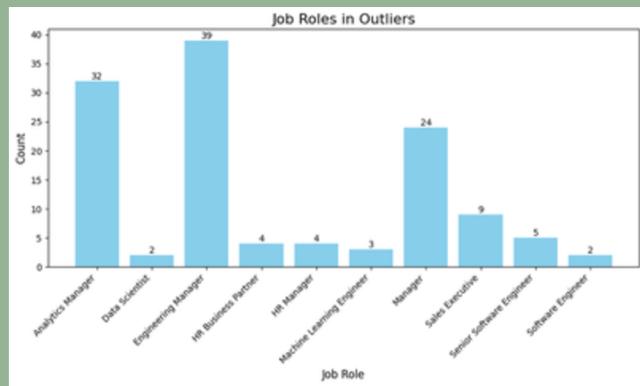


Python Visualization

Outliers

SQL Query :

```
--3- what is jobRole for outliers
SELECT
JobRole, COUNT(*) AS "count"
FROM Employee
WHERE Salary > 289768.625
GROUP BY JobRole;
```



Python Visualization

Outliers

SQL Query :

```
--4- manager salary in outliers
SELECT
JobRole, COUNT(*) as "Count of JobRoles"
FROM Employee
WHERE Salary > 289768.625 AND JobRole LIKE '%Manager%'
GROUP BY JobRole;
```

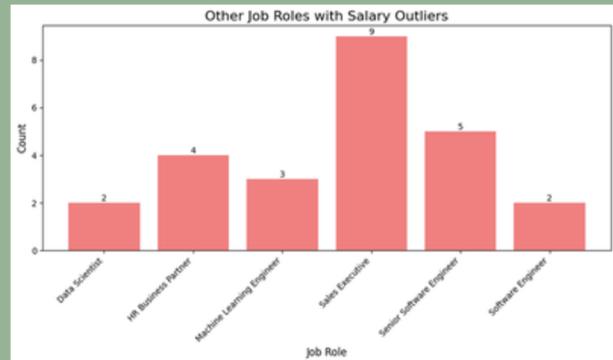


Python Visualization

Outliers

SQL Query :

```
--5- aother salary in outliers
SELECT
JobRole, COUNT(*) as "Count of JobRoles"
FROM Employee
WHERE Salary > 289768.625 AND JobRole not LIKE '%Manager%'
GROUP BY JobRole;
```



Python Visualization

Outliers

SQL Query :

```
--6- percent of manager and others in outliers
SELECT
    COUNT(CASE WHEN Employee.JobRole LIKE '%Manager%' AND Employee.Salary > 289768.625 THEN 1 END) * 100.0 /
    COUNT(CASE WHEN Employee.Salary > 289768.625 THEN 1 END) AS "Percent of manager in outliers",
    COUNT(CASE WHEN Employee.JobRole not LIKE '%Manager%' AND Employee.Salary > 289768.625 THEN 1 END) * 100.0 /
    COUNT(CASE WHEN Employee.Salary > 289768.625 THEN 1 END) AS "Percent of not manager in outliers"
FROM
    Employee;
```

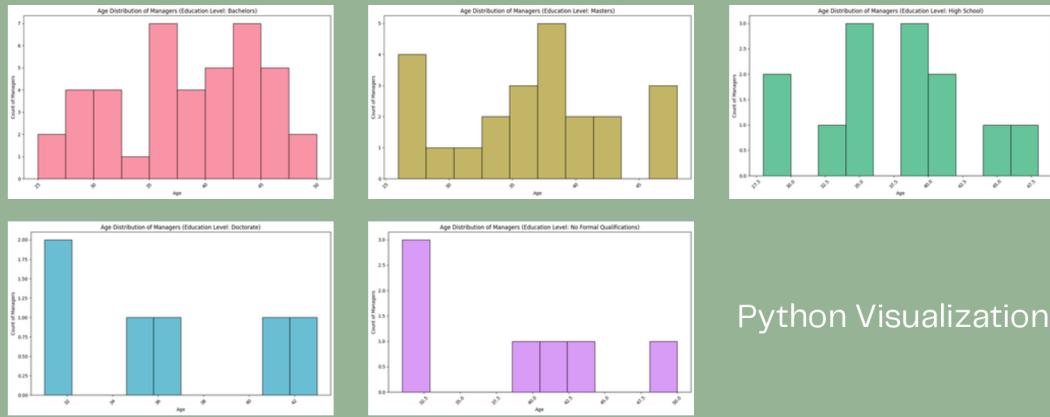


Python Visualization

Outliers

SQL Query:

```
--7- manager by Age, Education and YearsAtCompany  
select  
Distinct JobRole,Age,salary,Employee.Education,Employee.YearsAtCompany  
from Employee join Performance  
on Employee.EmployeeID = Performance.EmployeeID  
where Salary > 289768.625 and Employee.JobRole LIKE '%Manager%'  
group by JobRole,Age,salary,Employee.Education,Employee.YearsAtCompany,YearsInMostRecentRole, Employee.YearsSinceLastPromotion  
order by Age DESC
```

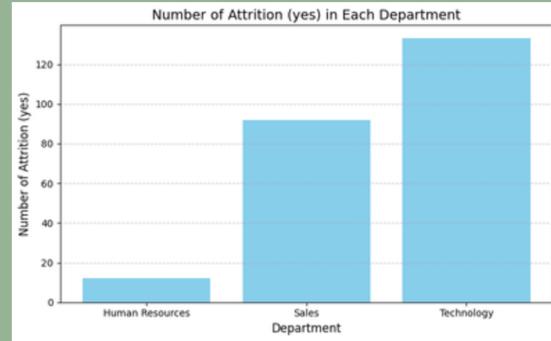


Python Visualization

ATTRITION

SQL Query:

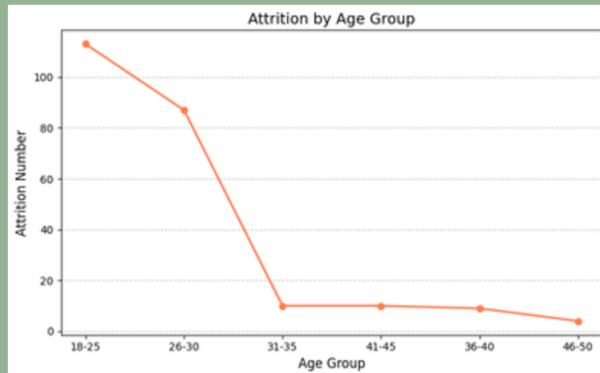
```
--1- relation between Attrition and Department
SELECT
    Employee.Department,
    COUNT(CASE WHEN Employee.Attrition = 'yes' THEN 1 END) AS "Attrition Number",
    COUNT(CASE WHEN Employee.Attrition = 'no' THEN 1 END) AS "Non-Attrition Number",
    COUNT(*) AS "Total Employees",
    COUNT(CASE WHEN Employee.Attrition = 'yes' THEN 1 END) * 100.0 / COUNT(*) AS "Attrition Percentage",
    COUNT(CASE WHEN Employee.Attrition = 'no' THEN 1 END) * 100.0 / COUNT(*) AS "Non-Attrition Percentage"
FROM
    Employee
GROUP BY
    Employee.Department
ORDER BY
    Employee.Department;
```



Python Visualization

ATTRITION

```
--2- What is the relationship between 'Age' and 'Attrition'?
SELECT
    CASE
        WHEN Employee.Age BETWEEN 18 AND 25 THEN '18-25'
        WHEN Employee.Age BETWEEN 26 AND 30 THEN '26-30'
        WHEN Employee.Age BETWEEN 31 AND 35 THEN '31-35'
        WHEN Employee.Age BETWEEN 36 AND 40 THEN '36-40'
        WHEN Employee.Age BETWEEN 41 AND 45 THEN '41-45'
        WHEN Employee.Age BETWEEN 46 AND 50 THEN '46-50'
    END AS Age_Group,
    COUNT(Employee.Attrition) AS "Attrition Number"
FROM Employee
WHERE Employee.Attrition = 'yes'
GROUP BY
    CASE
        WHEN Employee.Age BETWEEN 18 AND 25 THEN '18-25'
        WHEN Employee.Age BETWEEN 26 AND 30 THEN '26-30'
        WHEN Employee.Age BETWEEN 31 AND 35 THEN '31-35'
        WHEN Employee.Age BETWEEN 36 AND 40 THEN '36-40'
        WHEN Employee.Age BETWEEN 41 AND 45 THEN '41-45'
        WHEN Employee.Age BETWEEN 46 AND 50 THEN '46-50'
    END
ORDER BY "Attrition Number" DESC;
```



Python Visualization

ATTRITION

```
--3. What is the relationship between 'Salary' and 'Attrition'?  
SELECT  
    CASE  
        WHEN Employee.Salary BETWEEN 20000 AND 50000 THEN '20,000-50,000'  
        WHEN Employee.Salary BETWEEN 50001 AND 100000 THEN '50,001-100,000'  
        WHEN Employee.Salary BETWEEN 100001 AND 150000 THEN '100,001-150,000'  
        WHEN Employee.Salary BETWEEN 150001 AND 200000 THEN '150,001-200,000'  
        WHEN Employee.Salary BETWEEN 200001 AND 250000 THEN '200,001-250,000'  
        WHEN Employee.Salary BETWEEN 250001 AND 300000 THEN '250,001-300,000'  
        ELSE 'Above 300,000'  
    END AS Salary_Range,  
    COUNT(Employee.Attrition) AS "Attrition Number"  
FROM  
    Employee  
WHERE  
    Employee.Attrition = 'yes'  
GROUP BY  
    CASE  
        WHEN Employee.Salary BETWEEN 20000 AND 50000 THEN '20,000-50,000'  
        WHEN Employee.Salary BETWEEN 50001 AND 100000 THEN '50,001-100,000'  
        WHEN Employee.Salary BETWEEN 100001 AND 150000 THEN '100,001-150,000'  
        WHEN Employee.Salary BETWEEN 150001 AND 200000 THEN '150,001-200,000'  
        WHEN Employee.Salary BETWEEN 200001 AND 250000 THEN '200,001-250,000'  
        WHEN Employee.Salary BETWEEN 250001 AND 300000 THEN '250,001-300,000'  
        ELSE 'Above 300,000'  
    END  
ORDER BY  
    "Attrition Number" DESC;
```

output:

	Salary Range	Attrition Number
1	20,000-50,000	117
2	50,001-100,000	67
3	100,001-150,000	21
4	200,001-250,000	10
5	150,001-200,000	9
6	Above 300,000	8
7	250,001-300,000	5

ATTRITION

SQL Query:

```
--4- manager rating and Attrition (percentage)
SELECT
    P.ManagerRating,
    COUNT(CASE WHEN E.Attrition = 'yes' THEN 1 END) * 100.0 / COUNT(*) AS "Attrition Percentage",
    COUNT(CASE WHEN E.Attrition = 'no' THEN 1 END) * 100.0 / COUNT(*) AS "Non-Attrition Percentage"
FROM
    Employee E
JOIN
    Performance P ON E.EmployeeID = P.EmployeeID
GROUP BY
    P.ManagerRating
ORDER BY
    P.ManagerRating;
```

output:

	ManagerRating	Attrition Percentage	Non-Attrition Percentage
1	2	34.731543624161	65.268456375838
2	3	33.783175888439	66.216824111560
3	4	32.927927927927	67.072072072072
4	5	33.985102420856	66.014897579143

ATTRITION

SQL Query:

```
--S. 'Satisfaction-Level' and 'Attrition' (percentage)
SELECT
    S.SatisfactionLevel,
    P.JobSatisfaction,
    COUNT(CASE WHEN E.Attrition = 'yes' THEN 1 END) AS "Attrition Number",
    COUNT(CASE WHEN E.Attrition = 'no' THEN 1 END) AS "Non-Attrition Number",
    COUNT(*) AS "Total Employees",
    COUNT(CASE WHEN E.Attrition = 'yes' THEN 1 END) * 100.0 / COUNT(*) AS "Attrition Percentage", -- جذ اخراج ائتمان اخراج
    COUNT(CASE WHEN E.Attrition = 'no' THEN 1 END) * 100.0 / COUNT(*) AS "Non-Attrition Percentage" -- جذ اخراج ائتمان اخراج
FROM
    Employee E
JOIN
    Performance P ON E.EmployeeID = P.EmployeeID
JOIN
    Satisfaction S ON S.Satisfaction_ID = P.JobSatisfaction
GROUP BY
    S.SatisfactionLevel, P.JobSatisfaction
ORDER BY
    P.JobSatisfaction, S.SatisfactionLevel;
```

output:

	SatisfactionLevel	JobSatisfaction	Attrition Number	Non-Attrition Number	Total Employees	Attrition Percentage	Non-Attrition Percentage
1	Very Dissatisfied	1	36	94	130	27.692307692307	72.307692307692
2	Dissatisfied	2	549	1125	1674	32.795698924731	67.204301075268
3	Neutral	3	568	1083	1651	34.403391883706	65.596608116293
4	Satisfied	4	573	1112	1685	34.005934718100	65.994065281899
5	Very Satisfied	5	535	1034	1569	34.098151688973	65.901848311026

ATTRITION

SQL Query:

```
--6- Environment-Satisfaction and 'Attrition' ( percentage )
SELECT
    P.EnvironmentSatisfaction,
    COUNT(CASE WHEN E.Attrition = 'yes' THEN 1 END) AS "Attrition Number",
    COUNT(CASE WHEN E.Attrition = 'no' THEN 1 END) AS "Non-Attrition Number",
    COUNT(*) AS "Total Employees",
    COUNT(CASE WHEN E.Attrition = 'yes' THEN 1 END) * 100.0 / COUNT(*) AS "Attrition Percentage",
    COUNT(CASE WHEN E.Attrition = 'no' THEN 1 END) * 100.0 / COUNT(*) AS "Non-Attrition Percentage"
FROM
    Employee E
JOIN
    Performance P ON E.EmployeeID = P.EmployeeID
GROUP BY
    P.EnvironmentSatisfaction
ORDER BY
    P.EnvironmentSatisfaction ASC;
```

output:

	EnvironmentSatisfaction	Attrition Number	Non-Attrition Number	Total Employees	Attrition Percentage	Non-Attrition Percentage
1	1	35	101	136	25.735294117647	74.264705882352
2	2	44	97	141	31.205673758865	68.794326241134
3	3	776	1435	2211	35.097241067390	64.902758932609
4	4	706	1469	2175	32.459770114942	67.540229885057
5	5	700	1346	2046	34.213098729227	65.786901270772

ATTRITION

SQL Query:

```
--7-- Years At company and Attrition ( percentage )  
SELECT  
    E.YearsAtCompany,  
    COUNT(CASE WHEN E.Attrition = 'yes' THEN 1 END) AS "Attrition Number",  
    COUNT(CASE WHEN E.Attrition = 'no' THEN 1 END) AS "Non-Attrition Number",  
    COUNT(*) AS "Total Employees",  
    COUNT(CASE WHEN E.Attrition = 'yes' THEN 1 END) * 100.0 / COUNT(*) AS "Attrition Percentage",  
    COUNT(CASE WHEN E.Attrition = 'no' THEN 1 END) * 100.0 / COUNT(*) AS "Non-Attrition Percentage"  
FROM  
    Employee E  
GROUP BY  
    E.YearsAtCompany  
ORDER BY  
    E.yearsAtCompany ASC;
```

output:

	YearsAtCompany	Attrition Number	Non-Attrition Number	Total Employees	Attrition Percentage	Non-Attrition Percentage
1	0	60	130	190	31.578947368421	68.421052631578
2	1	61	116	177	34.463276836158	65.536723163841
3	2	25	99	124	20.161290322580	79.838709677419
4	3	24	124	148	16.216216216216	83.783783783783
5	4	15	114	129	11.627906976744	88.372093023255
6	5	20	95	115	17.391304347826	82.608695652173
7	6	11	90	101	10.891089108910	89.108910891089
8	7	9	112	121	7.438016528925	92.561983471074
9	8	6	113	119	5.042016806722	94.957983193277
10	9	5	113	118	4.237288135593	95.762711864406
11	10	1	127	128	0.781250000000	99.218750000000

ATTRITION

SQL Query:

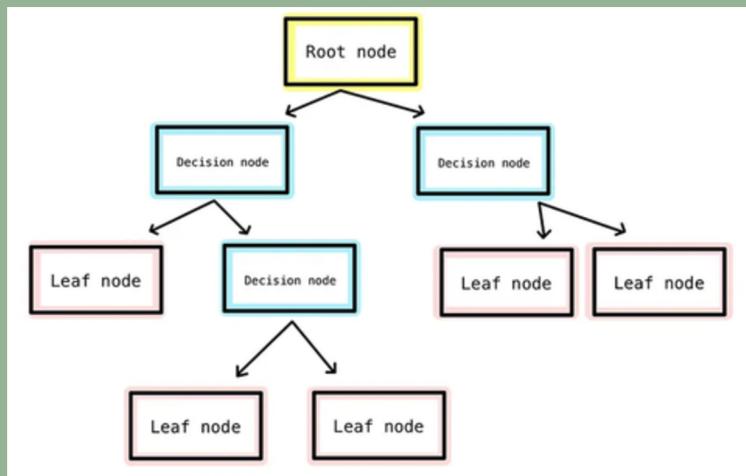
```
--8- job role , 'attrition' ( percentage )
SELECT
    Employee.JobRole,
    COUNT(CASE WHEN Employee.Attrition = 'yes' THEN 1 END) AS "Attrition Number",
    COUNT(CASE WHEN Employee.Attrition = 'No' THEN 1 END) AS " Non Attrition Number",
    COUNT(*) AS "Total Employees",
    COUNT(CASE WHEN Employee.Attrition = 'yes' THEN 1 END) * 100.0 / COUNT(*) AS "Attrition Percentage"
FROM
    Employee
GROUP BY
    Employee.JobRole
ORDER BY
    "Attrition Percentage" DESC;
```

output:

JobRole	Attrition Number	Non Attrition Number	Total Employees	Attrition Percentage
1 Sales Representative	33	50	83	39.759036144578
2 Recruiter	9	15	24	37.500000000000
3 Data Scientist	62	199	261	23.754789272030
4 Sales Executive	57	270	327	17.431192660550
5 Software Engineer	47	247	294	15.986394557823
6 HR Executive	3	25	28	10.714285714285
7 Machine Learning Engineer	10	136	146	6.849315068493
8 Senior Software Engineer	9	123	132	6.818181818181
9 Analytics Manager	3	49	52	5.769230769230
10 Manager	2	35	37	5.405405405405
11 Engineering Manager	2	73	75	2.666666666666
12 HR Business Partner	0	7	7	0.000000000000
13 HR Manager	0	4	4	0.000000000000

Machine Learning Model

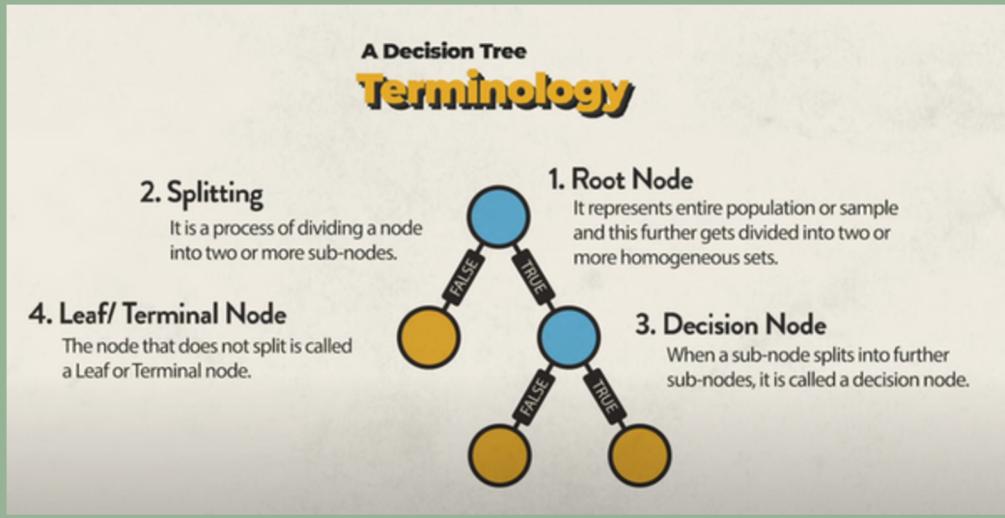
Decision Tree Classifier



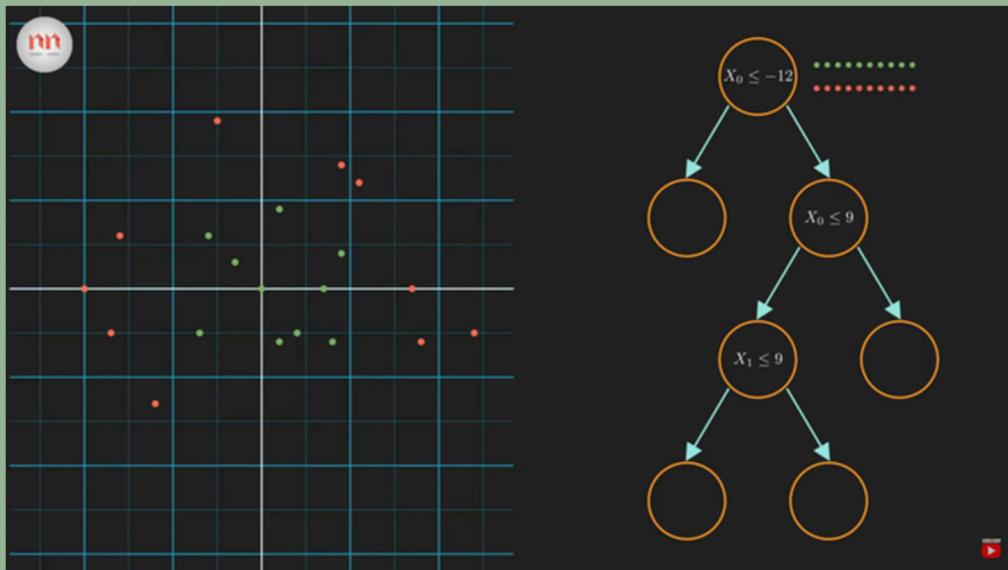
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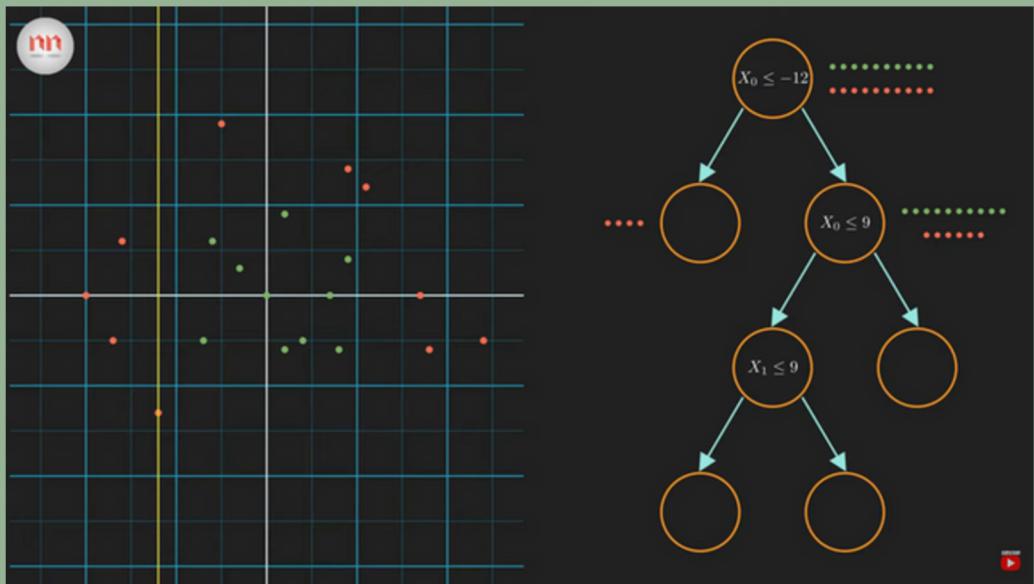
Decision Tree Classifier



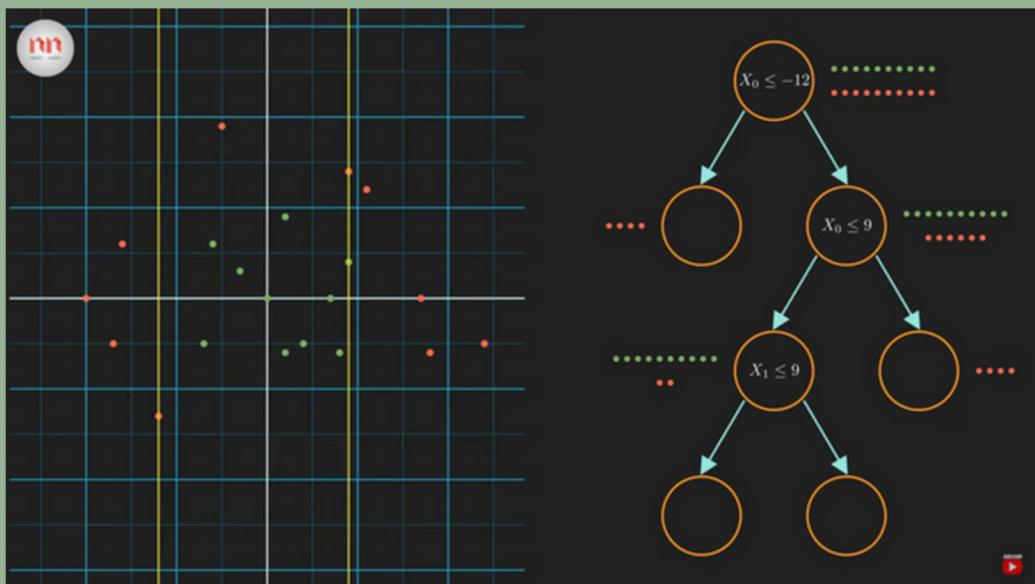
Decision Tree Classifier



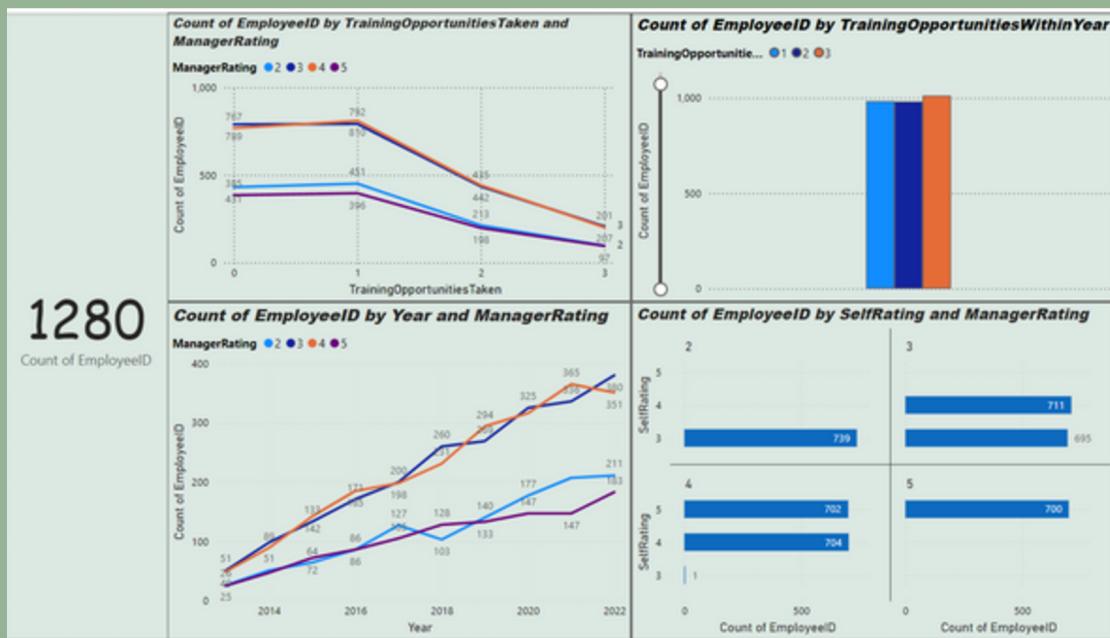
Decision Tree Classifier



Decision Tree Classifier

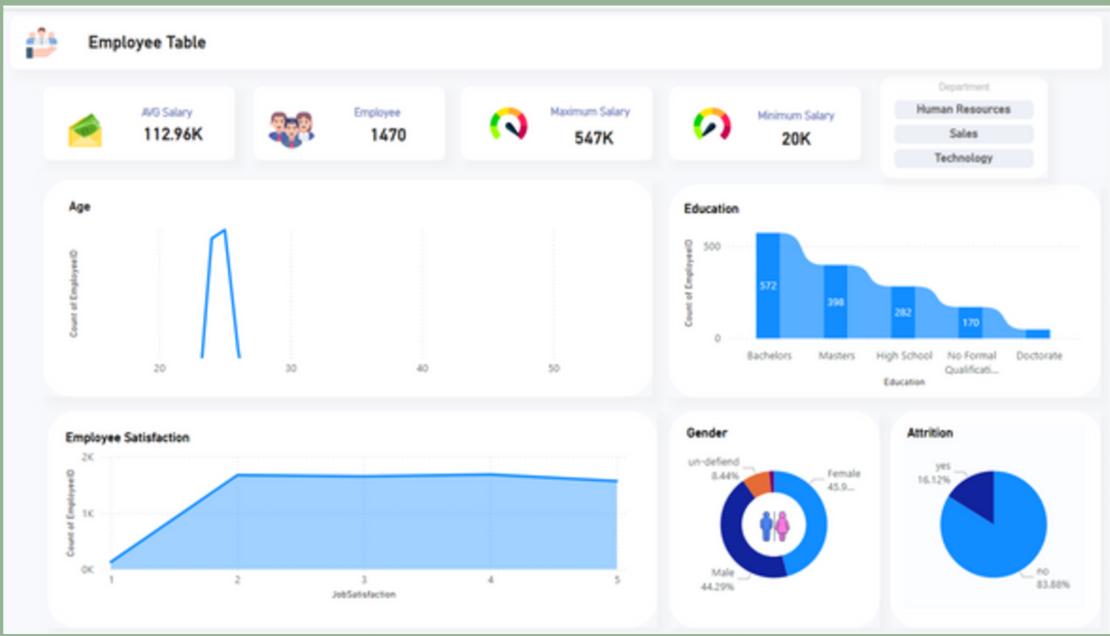


Visualization



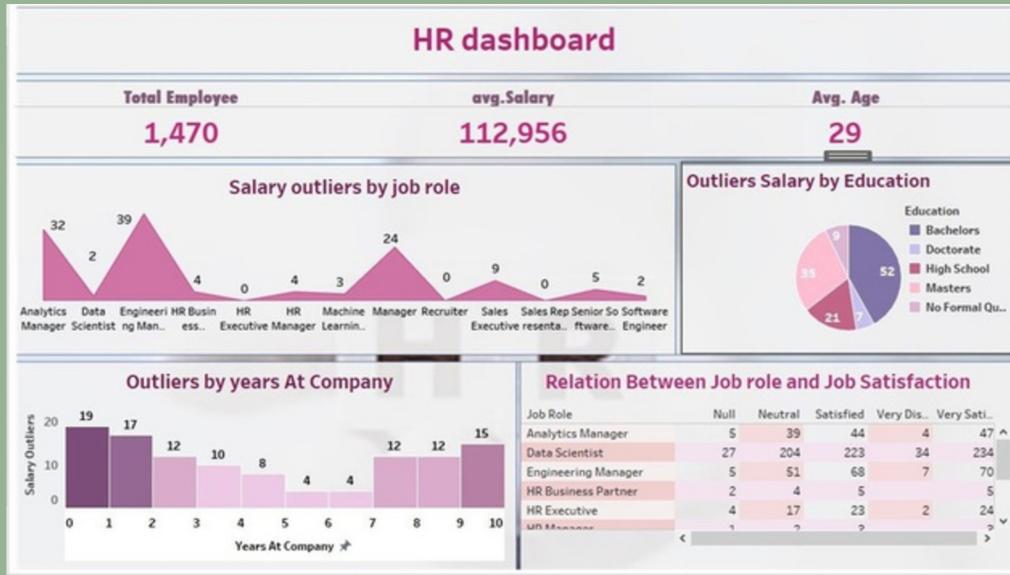
Dashboard Link:

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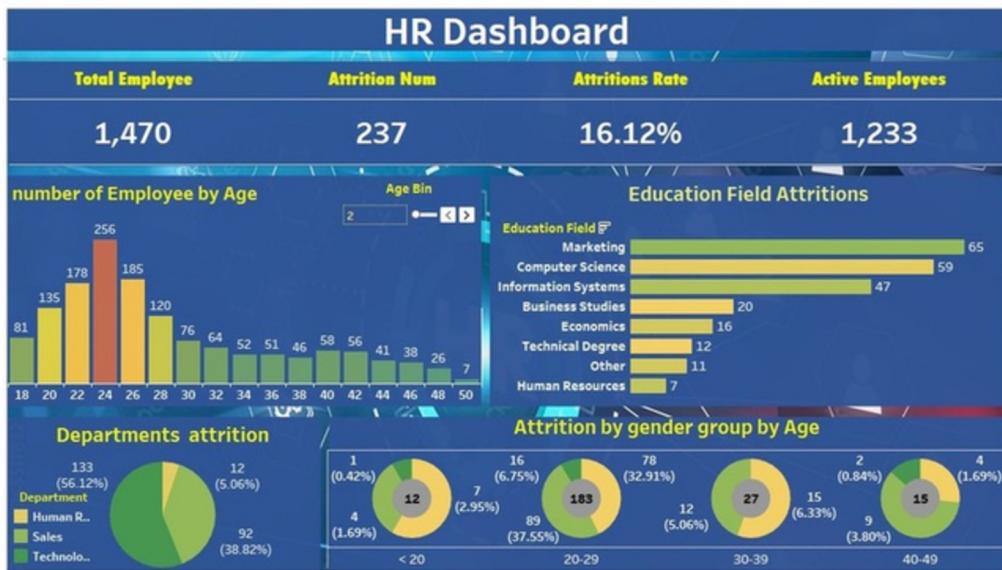
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Dashboard Link:

<https://drive.google.com/file/d/12FXM8OrrUoI3q6YeZY6xNc70ibdSUpnN/view?usp=sharing>



Dashboard Link:

<https://drive.google.com/file/d/12FXM8OrrUoI3q6YeZY6xNc70ibdSUpnN/view?usp=sharing>

Recommendations

Actions to be Taken:

- Through analysis, we were able to identify the age group most likely to experience attrition in the workplace. This group consists of young people aged 20-29, making it crucial to develop more effective attraction strategies to meet their needs and retain them.
- Employee Engagement Initiatives: Implement programs aimed at increasing employee engagement, such as regular feedback sessions, team-building activities, and recognition programs to boost morale and reduce attrition.
- Department-Specific Strategies: Conduct detailed assessments of departments with higher attrition rates to identify specific issues and tailor retention strategies accordingly, such as additional training or resources.

- Career Development Opportunities: Create clear pathways for career advancement and professional development to encourage employees to stay and grow within the organization.
- In addition to the job role, there are several factors to consider when determining the appropriate salary for each individual in an organization. The two main factors are:
 - Experience: referred to here as the number of years in the company, should have a balance between the number of years an employee has spent in the company and their salary.
 - The other factor is Education: Obtaining a higher educational degree should result in a salary that reflects and values the individual's level of education.

Thank you!