**Data Forecasting**



**Answer Predictive Questions**

For HR Data Analysis



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**Data dynamos**

**Harnessing the Power of Data to Drive Innovation**

**The dataset appears to have a wealth of HR-related columns. Key fields include:**

* **Demographics: Gender, Age, Ethnicity, MaritalStatus**
* **Job Details: Department, DistanceFromHome, BusinessTravel, HireDate**
* **Performance and Tenure: PerformanceRating, YearsAtCompany,**

**YearsInMostRecentRole, YearsSinceLastPromotion, YearsWithCurrManager**

* **Compensation: Salary, StockOptionLevel**
* **Other: OverTime, Attrition**

**Predictive Questions for Analysis**

**Based on this structure, Here are some predictive questions tailored to HR data analysis that you might consider based on the data you have:**

**Predictive Analysis:**

1. Can we predict the likelihood of attrition based on employee attributes?

2. Are there any leading indicators of high-performing employees?

**Why It Matters:**

* **Proactive Decision-Making:** Predicting attrition or identifying potential high performers allows the company to act before problems escalate.
* **Strategic Planning:** Aligns HR strategies with business goals by forecasting workforce trends and needs.

1. **Employee Turnover**

**Which employees are likely to leave the organization based on factors like job satisfaction, education level, or performance rating?**

**Analysis:** Using the **Random Forest Classifier**, the model achieved an accuracy of **97.76%**. The key features influencing promotion predictions include:

* **Years Since Last Promotion**: Employees who had a recent promotion were less likely to be promoted again.
* **Job Satisfaction & Manager Rating**: Employees with higher ratings had a better chance of promotion.
* **Years at Company**: Employees with longer tenures had slightly higher chances of promotion.

The model predicted **No** for a test employee with the following attributes: [35, 3, 7, 4, 3, 3, 4, 2, 1, 2, 3, 4, 5].

1. **Tenure Prediction**

**How long is an employee expected to stay at the company?**

**Analysis:** Using the **Random Forest Classifier**, the attrition model achieved an accuracy of **97.39%**. Findings include:

* **Overtime:** Employees working overtime had a significantly higher attrition rate.
* **Salary:** Lower salaries were associated with a greater likelihood of leaving.
* **Job Satisfaction:** Had minimal impact on predicting attrition.

**Employee Tenure Insights:**

* **Average tenure:** 4.56 years
* **Median tenure:** 4.0 years
* **Predicted expected tenure :** 5.02 years

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1. **Attrition Prediction**

**What is the likelihood that an employee will leave the company based on their data (e.g., age, job role, years of service, salary, etc.)?**

To predict the likelihood of an employee leaving based on various factors (e.g., age, job role, years of service, salary, etc.), I'll:

1. **Expand the dataset** to include more relevant features (age, job role, salary, years at company, etc.).
2. **Train a predictive model** (Random Forest or Logistic Regression) to estimate attrition probability.
3. **Allow you to input an employee's details** to predict their likelihood of leaving.

**Attrition Prediction Model Performance:**

* **Accuracy:** 84.69%
* **Precision (No Attrition):** 86.25%
* **Precision (Attrition):** 68.00%
* **Recall (No Attrition):** 96.67%
* **Recall (Attrition):** 31.48%

1. **Performance Prediction**

**What are the key factors that predict high or low employee performance ratings?**

**Analysis:** Using the **Random Forest Model**, key factors impacting job satisfaction are:

* **Salary (30.5%)**: Higher salaries strongly correlate with job satisfaction.
* **Age (18.9%)**: Older employees report higher satisfaction levels.
* **Years at Company (12.3%)**: Longer tenure contributes to higher satisfaction.

1. **Job Satisfaction** **Prediction**

**What is the level of job satisfaction of an employee based on factors like travel, salary, management, etc.?**

**Analysis:** Using the **Random Forest Model**, key factors impacting job satisfaction are:

* **Salary (30.5%)**: Higher salaries strongly correlate with job satisfaction.
* **Age (18.9%)**: Older employees report higher satisfaction levels.
* **Years at Company (12.3%)**: Longer tenure contributes to higher satisfaction.

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1. **Promotion Readiness**

**Which employees are most likely to be promoted based on their performance and tenure?**

**Analysis:** Using the **Random Forest Classifier**, the strongest indicators of promotion likelihood include:

* **Years at Company (0.84 correlation)**.
* **Manager Rating (0.02 weak correlation)**.
* **Work-Life Balance (0.016 very weak correlation)**.

1. **Retention Strategies**

**Which groups of employees are at the highest risk of leaving, and what strategies could reduce their likelihood of leaving?**

To identify employees at high risk of leaving, analyze attrition trends based on key factors like:

* **OverTime** (workload)
* **Salary** (compensation)
* **YearsAtCompany** (tenure)
* **JobSatisfaction** (happiness at work)
* **WorkLifeBalance** (stress levels)

**Groups at Highest Risk of Leaving:**

* **Low Salary**: Employees who left had an average salary of **$81,956**, much lower than those who stayed (**$125,856**).
* **Short Tenure**: Those who left had **~2.5 years** at the company, compared to **7.4 years** for those who stayed.
* **Job Satisfaction & Work-Life Balance**: Nearly the same for both groups, meaning **these factors alone don’t strongly predict attrition**.

**Strategies to Reduce Attrition:**

1. **Competitive Compensation**: Increase salaries for newer employees to match industry standards.
2. **Career Growth Opportunities**: Since shorter tenure employees leave more often, provide **fast-track promotions** or **clear career paths**.
3. **Better Onboarding & Engagement**: Support new hires in the **first 2-3 years** to ensure they feel valued.
4. **Impact of Overtime on Attrition**

**Does working overtime increase the likelihood of an employee leaving the company?**

analyze whether working overtime increases the likelihood of an employee leaving the company by checking the correlation between **OverTime** and **Attrition.**

**Impact of Overtime on Employee Attrition:**

* **Employees who do NOT work overtime:**
  + 89.56% stay with the company.
  + 10.43% leave.
* **Employees who work overtime**:
  + 69.47% stay.
  + 30.53% leave.

Employees who work overtime are about 3 times more likely to leave the company compared to those who don’t (30.53% vs. 10.43%). This suggests that excessive overtime may contribute to employee burnout and attrition**.**

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1. **Salary Prediction Based on Job Role**

**What is the expected salary of an employee based on their department, experience, and job role?**

the salary prediction model achieved a **mean absolute error of $65,765**, indicating moderate accuracy. Key insights:

* **HR Managers** had the highest estimated salaries.
* **Recruiters and Sales Representatives** had the lowest predicted salaries.
* **Salary increases with years at the company, peaking between 8-10 years**
* **Top 3 highest-paid roles:**
  + HR Manager: **$449,331**.
  + Analytics Manager: **$346,484**.
  + General Manager: **$317,531**.
* **Bottom 3 lowest-paid roles:**
  + Recruiter: **$37,648**.
  + Sales Representative: **$40,656**.
  + Software Engineer: **$51,967**.
* **Average salary by years of experience:**
  + New employees (0 years): **$91,418**.
  + Employees with 8–10 years of experience: **$134,665 – $145,605**.

**DataDynamos**