Case Study

**Title**: *Predicting Employee Attrition to Improve Retention Strategies: An HR Analytics Case Study*

1. Business Problem

Employee turnover is a costly challenge for organizations. The goal of this project was to use data analytics to:

* Predict which employees are likely to leave the company.
* Identify the key drivers of attrition.
* Recommend data-driven interventions to retain top talent.

1. Dataset Overview

* **Source**: HR Employee Attrition dataset (IBM HR Analytics Employee Attrition & Performance dataset.)
* **Total Records**: 1,470 employees
* **Target Variable**: Attrition (Yes/No)

**Key Features:**

* Demographics: Age, Gender, Marital Status
* Employment: Department, Job Role, Monthly Income, Years at Company
* Behavior: Overtime, Business Travel, Job Satisfaction

1. Exploratory Data Analysis (EDA)

* Identified key patterns by department, age, travel frequency, overtime.
* High attrition found in:
  + **Sales** and **Laboratory Technician** roles
  + Employees aged **24–35**
  + **Frequent travelers** and those with **OverTime = Yes**

1. Predictive Modeling

* Used **Logistic Regression** and **Random Forest Classifier**
* Evaluated using **precision, recall, F1-score**, and **confusion matrix**

1. Model Performance

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| **Model** | **Accuracy** | **Recall (Attrition)** | **F1-score (Attrition)** |
| Logistic Regression | 86% | 23% | 0.35 |
| Random Forest | 83% | 11% | 0.17 |

* **Logistic Regression** was chosen for its better balance between recall and precision.

1. Key Insights

* **OverTime** is the strongest driver of attrition.
* **Single employees** are more likely to leave.
* **Sales** and **Lab Tech** roles show the highest attrition.
* **Age 24–35** is the most at-risk demographic.
* **Frequent travelers** are more prone to quit.

1. Recommendations

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| **Insight** | **Recommendation** |
| High OverTime | Rotate workload, hire support staff, monitor burnout indicators |
| Sales & Lab Tech Attrition | Launch stay interviews, offer role mobility and tailored retention bonuses |
| Single Employees | Build culture & connection, offer more flexibility |
| Frequent Travelers | Provide remote options, reduce travel burden or compensate fairly |
| Age 24–35 Leavers | Fast-track programs, career development, internal mentorship |