Quantitative Research Technical Exercise Report

Dataset: Employee HR Analytics (Kaggle)
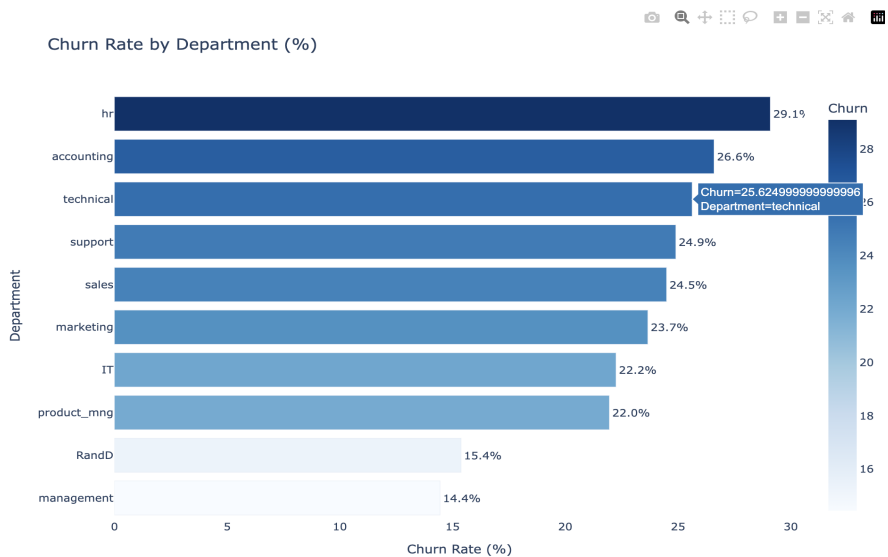
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1. Key Insights from Data Exploration

The dataset contains approximately 15,000 employee records with 11 variables describing satisfaction, evaluation scores, workload, tenure, salary, and promotion history. Overall churn rate ≈ 23.8%.
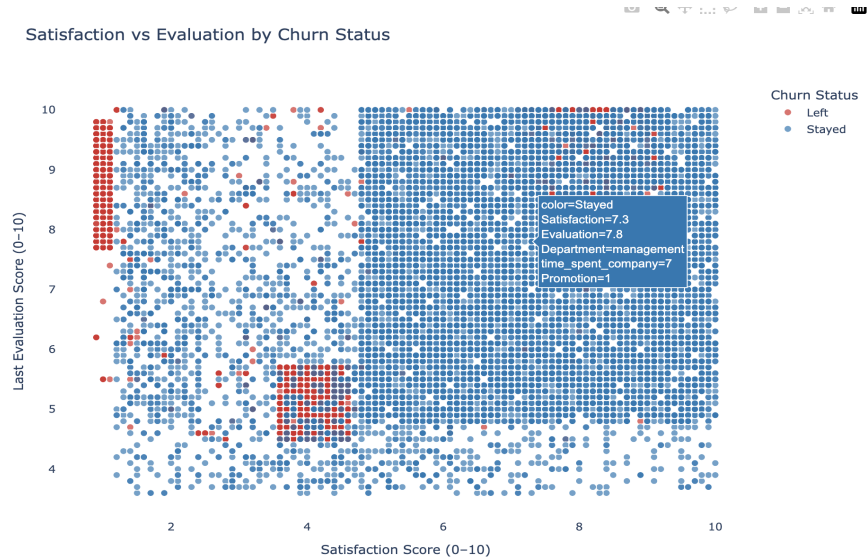
Feature	Mean	Median	Std Dev	Key Observation
Satisfaction	6.13	6.4	2.49	Wide variation — clear low-morale subgroup (<5).
Evaluation	7.16	7.2	1.71	Most perform well (7–8 range).
Avg Monthly Hours	201	200	49.9	Some overworked >250 hrs/month.
Tenure (yrs)	3.5	3.0	1.46	Typical mid-career employees.
Salary (INR)	62,743	41,721	66,486	Highly skewed — few very high earners.

Departments with highest churn: HR (29%), Accounting (26%), Technical (25%). Lowest churn: R&D; (15%), Management (14%). Low-satisfaction employees (<5) leave at much higher rates across all evaluation levels.
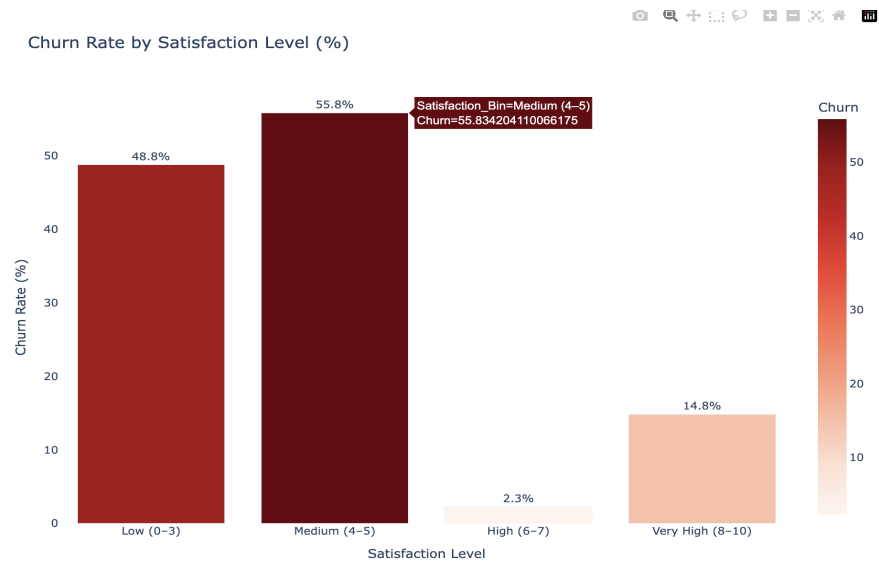
Visual 1: Churn Rate by Department

Visual 2: Satisfaction vs Evaluation by Churn Status

Visual 3: Churn Rate by Satisfaction Level

Churn Rate by Satisfaction Level (%)

2. Hypothesis Testing

Research Question: Are low-satisfaction employees (<5) significantly more likely to churn?

Chi-square test results: χ^2 = 3,668.78, p < 1×10■¹■ (df = 1). Since p < 0.05, we reject H■ — churn and satisfaction are dependent. Low-satisfaction employees have ~55% churn vs ~10% for high-satisfaction.

3. Predictive Modeling Overview

Model: Logistic Regression (Target = Churn, Features = Satisfaction, Tenure, Promotion).

Accuracy = 76.7%, Precision = 52.1%, Recall = 27.6%, F1 = 36.1%. Coefficients: Satisfaction (−0.37), Tenure (+0.19), Promotion (−1.50). Interpretation: Lower satisfaction and long tenure without promotion increase churn risk. Promotion substantially reduces churn odds.

4. Conclusions & Business Implications

1. Employee satisfaction is the dominant driver of churn — improving morale can cut attrition by >50%.
2. Promotion and career growth are critical for retention.
3. Department-specific engagement (HR, Accounting) should address workload and recognition.
4. Predictive models can flag at-risk employees for early HR intervention.

The analysis demonstrates a robust, quantifiable relationship between satisfaction and turnover. Targeted engagement and promotion strategies can significantly reduce overall churn.