**Explanation of the techniques of ML**

**1️. Classification Models (Predicting Attrition & Layoffs)**

**Goal:** Predict if an employee will leave (Yes/No).

✔ **Logistic Regression** – A statistical model that estimates the probability of an employee leaving based on factors like salary, job satisfaction, and career growth.

✔ **Random Forest Classifier** – Uses multiple decision trees to make better predictions by averaging their results, reducing errors in predicting attrition.

✔ **Gradient Boosting (XGBoost, LightGBM, CatBoost)** – An advanced boosting technique that corrects errors in prediction step by step, improving accuracy in classifying employees at risk of leaving.

✔ **Neural Networks (ANNs)** – Mimics human decision-making using layers of artificial neurons to find hidden patterns in employee behavior that lead to attrition.

➡ **Use case:** Predict which employees are at high risk of leaving based on historical trends.

**2️. Regression Models (Predicting Salary Impact Due to Layoffs)**

**Goal:** Estimate changes in salary after layoffs.

✔ **Linear Regression** – A simple model that finds relationships between salary and other variables (e.g., experience, industry, company size) to predict salary changes post-layoff.

✔ **Random Forest Regression** – Uses multiple decision trees to make accurate salary predictions by capturing non-linear relationships.

✔ **Gradient Boosting Regression (XGBoost, LightGBM)** – Learns salary patterns and improves accuracy by minimizing prediction errors iteratively.

➡ **Use case:** Predict how salary is affected after layoffs in different industries.

**3️. Clustering Models (Grouping Employees at Risk of Leaving)**

**Goal:** Group employees based on similarities in attrition risk.

✔ **K-Means Clustering** – Groups employees into different clusters (e.g., high-risk, medium-risk, low-risk) based on job satisfaction, work experience, and salary.

✔ **Hierarchical Clustering** – Builds a tree-like structure to categorize employees into groups, useful for HR segmentation.

✔ **DBSCAN** – Identifies unusual patterns in attrition, such as employees leaving in unexpected spikes.

➡ **Use case:** Find employee segments most likely to leave due to job dissatisfaction, salary issues, or work stress.

**4️. NLP Techniques (Analyzing Exit Interviews & Employee Feedback)**

**Goal:** Extract insights from employee feedback on why they leave.

✔ **Sentiment Analysis (TextBlob, VADER, BERT)** – Analyzes employee feedback to detect negative or positive sentiment, helping HR understand dissatisfaction trends.

✔ **Topic Modeling (LDA, TF-IDF, Word2Vec)** – Finds recurring themes in exit interviews (e.g., "toxic workplace", "low salary", "no growth opportunities").

➡ **Use case:** Identify top reasons employees mention for leaving, using automated text analysis.

**5️. Anomaly Detection (Spotting Unusual Layoff Trends)**

**Goal:** Detect unexpected spikes in layoffs.

✔ **Isolation Forest** – Identifies employees or companies with unusual layoff patterns by comparing them to normal trends.

✔ **One-Class SVM** – Recognizes anomalies in employee departures, such as mass layoffs in a short period.

➡ **Use case:** Detect which industries are experiencing unexpected layoff surges.