Artificial Intelligence

Epoka University

EMPLOYEE ATTRITION PREDICTION SYSTEM

People are the foundation of every successful organization

PROBLEM FORMULATION (PEAS)

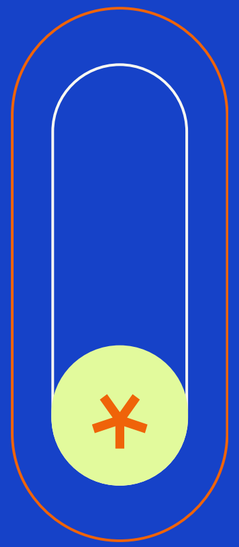
Task: Predict whether an employee is at risk of attrition

Performance Measure

ROC-AUC (ranking quality)
Recall (prioritized due to attrition cost)
F1-score (precision–recall balance)
Accuracy not used due to class imbalance

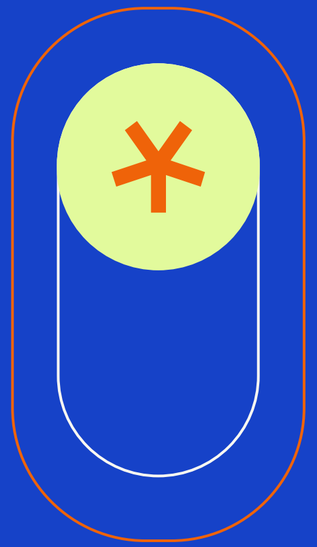
Environment

Static, partially observable HR environment
Historical employee data
Stochastic (human behavior is unpredictable) and administrative tasks



Actuators

Binary decision: Attrition Risk / No Attrition
In hybrid system, decision can come from rules or ML



Sensors

Employee attributes (age, income, overtime, tenure, satisfaction, etc.)

DATASET CHOICE

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The dataset reflects real-world employee data

- The chosen dataset is the HR Employee Attrition dataset, which contains employee demographic, job-related, and satisfaction attributes.
- The target variable is Attrition, indicating whether an employee leaves the company.
- This is an imbalanced classification problem, as the majority of employees stay while a smaller portion leave.
- Predicting attrition is important because losing employees is costly for organizations in terms of recruitment, training, and productivity.

AI METHODOLOGY

1 Rule-based

- Chosen for interpretability and transparency
- Suitable when expert knowledge exists
- Allows abstention when confidence is low

2 Random Forest

- Chosen over simpler models (e.g. Decision Trees) because:
- Handles non-linear relationships
- Robust to noise
- Works well on tabular HR data
- Outputs probabilities → enables threshold tuning

3 Hybrid Sequential

- Combines interpretability and predictive power.
- Improves recall compared to Random Forest alone.
- Ensures full coverage while maintaining explainability.

IMPLEMENTATION

Intelligent Agent Design:

PREDICTIVE MODELS BUILT

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Agent Type

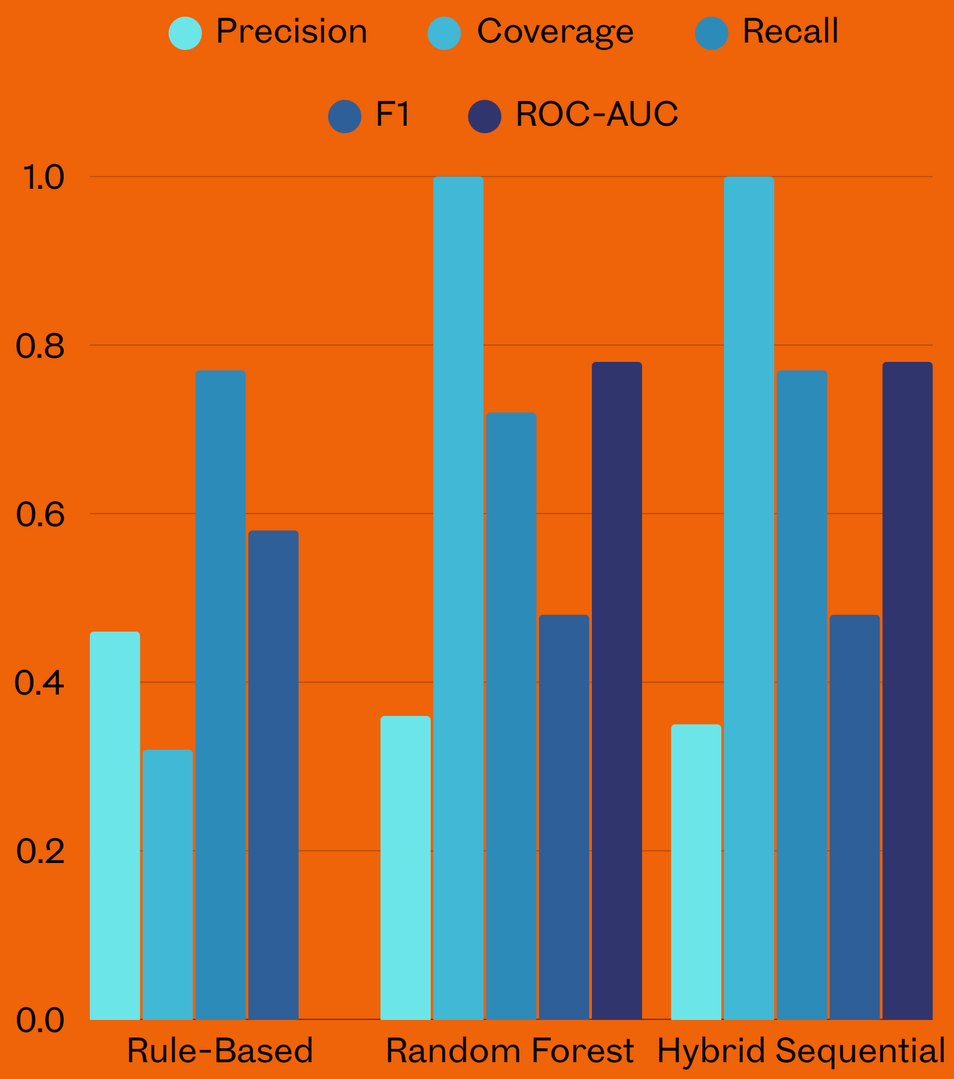
- Hybrid sequential intelligent agent
- Combines symbolic reasoning and learning

Decision Flow

- Rule-based agent evaluates employee
- If a rule fires → decision is produced
- If rules abstain → Random Forest predicts
- Final decision returned to user

Key Design Choice

- Rule-based decisions are preserved
- Random Forest ensures full coverage



RESULTS & ANALYSIS

Model	Coverage	Precision	Recall	F1	ROC-AUC
Rule-Based	32%	0.46	0.77	0.58	N/A
Random Forest	100%	0.36	0.72	0.48	0.78
Hybrid Sequential	100%	0.35	0.77	0.48	0.78

FUTURE WORK & IMPROVEMENTS

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- Incorporate temporal data (employee history over time)
- Test additional models (XGBoost, Logistic Regression)
- Improve rule learning using data-driven rule extraction
- Introduce fairness analysis and bias mitigation by analyzing whether the system produces biased predictions for specific employee groups.
- Deploy system as a real HR decision-support tool

Epoka University

AI improves attrition prediction.

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AI-DEMO

Now let's see the Demo!

THANK YOU!