



Final Project

Dataset: Employee Attrition

Presented by Pengabdi FinPro



MEET THE GROUP

Mentor



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Member



Faldo Aditya

Meet the
Group

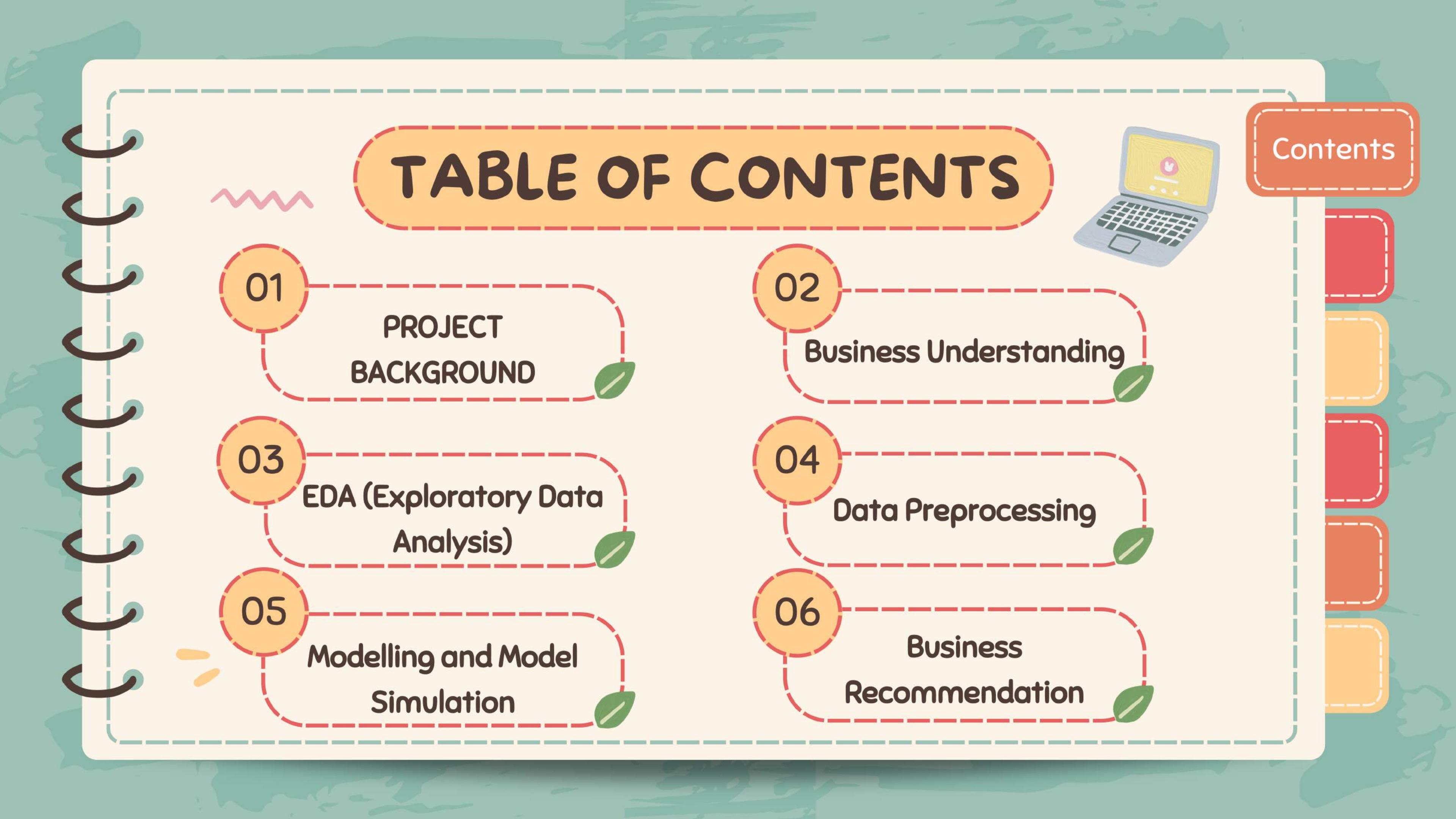


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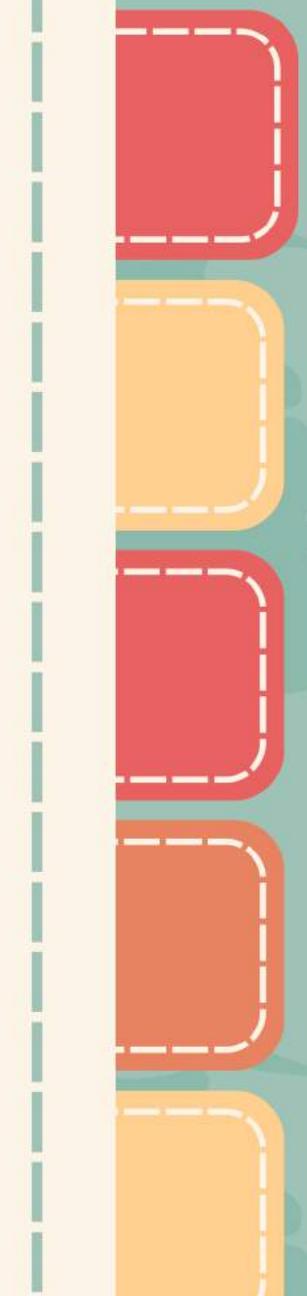
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Chapter 1

01

PROJECT BACKGROUND

Background

BACKGROUND

FinPro.co merupakan perusahaan startup yang bergerak di bidang IT & Software dan kami sebagai Tim Data Science diminta oleh Departemen HR untuk membuat sebuah model yang mampu memprediksi Attrition karyawan. Umumnya tingkat Attrition yang tinggi dapat mengakibatkan penambahan biaya seperti biaya rekrutmen dan pelatihan ulang karyawan baru yang besar bagi perusahaan.

Avg Cost Per Employee:
\$2792 - \$4425

Some of the obvious costs of turnover include ad spending for newly open positions and the extra time commitment of training new employees – Nichole Viviani, chief people officer at Xplor Technologies,



02

BUSINESS UNDERSTANDING

Problem yang dihadapi perusahaan:

Quarterly attrition rate/turnover karyawan perusahaan yang tinggi mencapai 16.1%, dimana menurut Maier (2015), turnover dikatakan tinggi jika mencapai 5% atau lebih.

Chapter 2

BUSINESS UNDERSTANDING

Goal

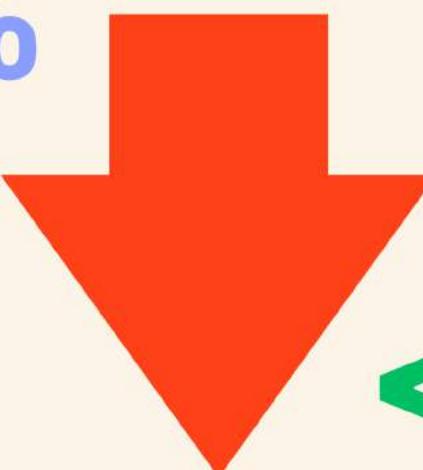
DECREASE
ATTRITION
RATE

~12%



16.1%

<5%



Objective

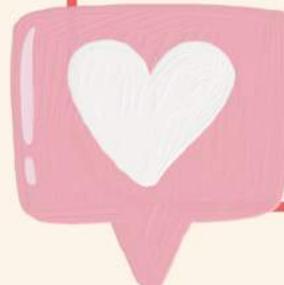
- Mengidentifikasi faktor penyebab (features importance).
- Mengembangkan model prediktif yang dapat memperkirakan tingkat attrition individu atau kelompok karyawan.
- Intervensi fitur pendorong Attrition
- Merekomendasikan program penurunan Attrition perusahaan berdasarkan faktor penting dari hasil model.

Business
Understanding

BUSINESS UNDERSTANDING

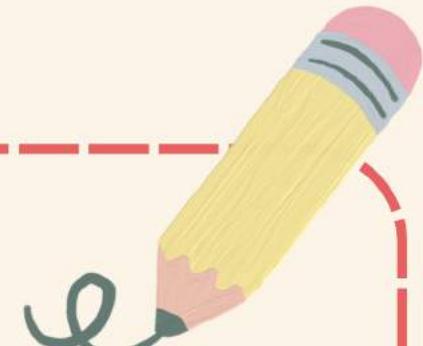
Business Metrics

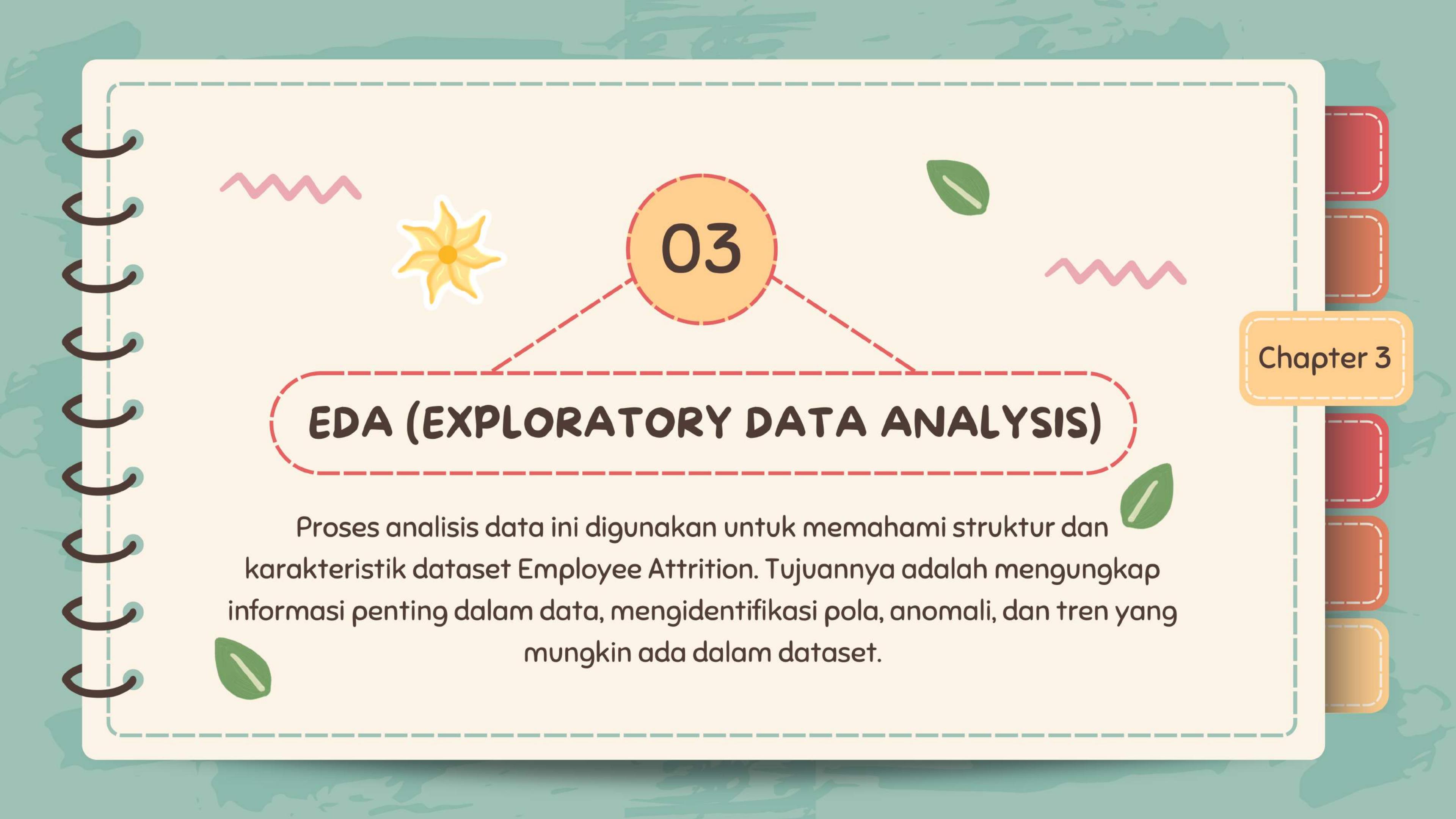
Attrition rate, yaitu pengukuran seberapa sering karyawan meninggalkan perusahaan atau posisi mereka dalam jangka waktu tertentu.



Attrition Rate (%) =
(Jumlah Karyawan “Yes” attrition / Jumlah Total Karyawan) x 100%

Business
Understanding





03

EDA (EXPLORATORY DATA ANALYSIS)

Proses analisis data ini digunakan untuk memahami struktur dan karakteristik dataset Employee Attrition. Tujuannya adalah mengungkap informasi penting dalam data, mengidentifikasi pola, anomali, dan tren yang mungkin ada dalam dataset.

Chapter 3

Dataset Overview

1470 rows x 35 columns

Age	MonthlyRate
DailyRate	NumCompaniesWorked
DistanceFromHome	PerformanceRating
Education	RelationshipSatisfaction
EducationField	StandardHours
EmployeeCount	StockOptionLevel
EmployeeNumber	TotalWorkingYears
EnvironmentSatisfaction	TrainingTimesLastYear
HourlyRate	WorkLifeBalance
JobInvolvement	YearsAtCompany
JobLevel	YearsInCurrentRole
JobSatisfaction	YearsSinceLastPromotion
MonthlyIncome	YearsWithCurrManager

Numerical Features

BusinessTravel
Department
EducationField
Gender
JobRole
MaritalStatus
MonthlyIncome
MonthlyRate
NumCompaniesWorked
Over18
OverTime

Categorical Features

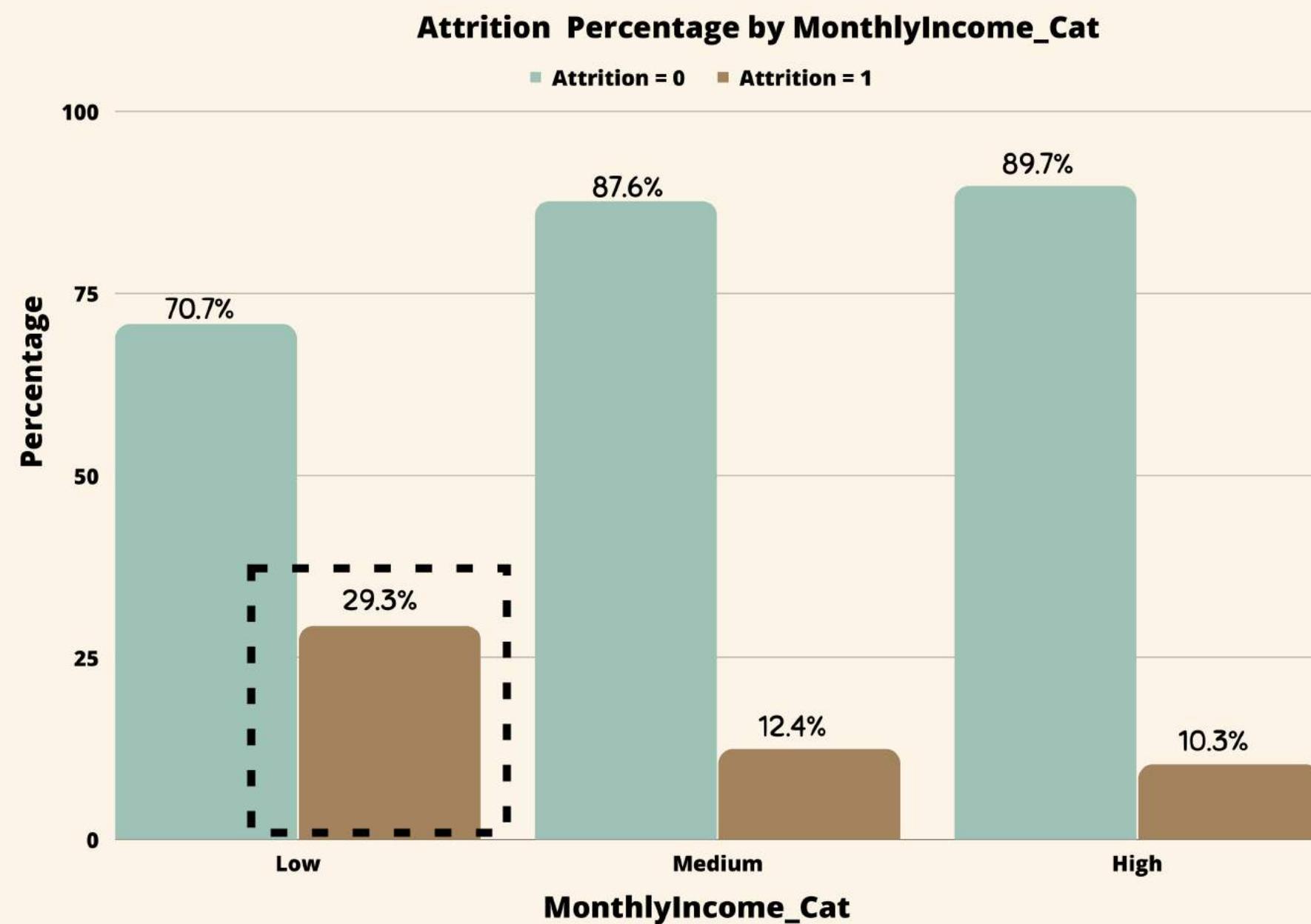
Attrition

Target

EDA

INSIGHT

MonthlyIncome terhadap Attrition



~30%

Karyawan Low Income

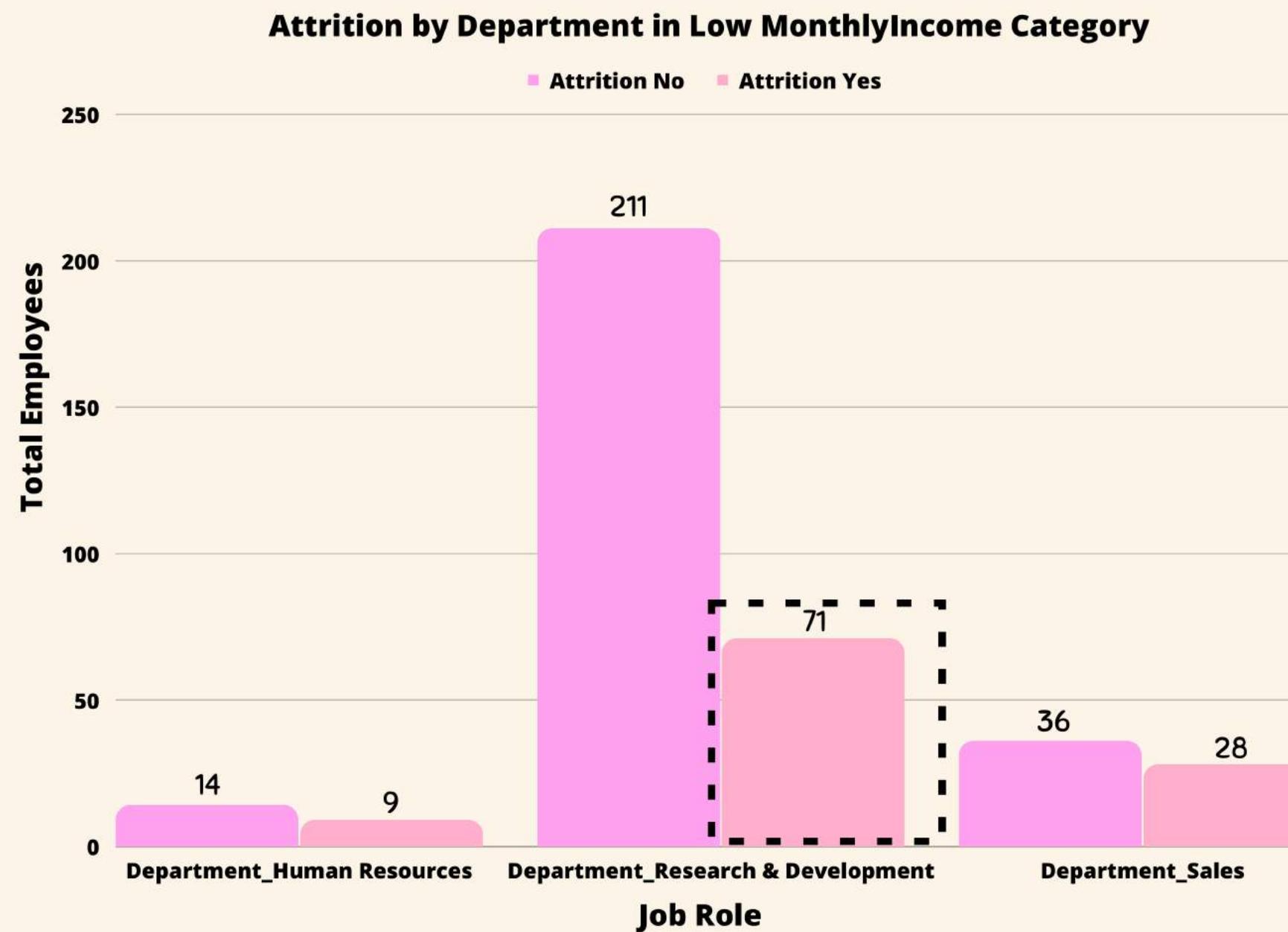
=

'Yes' Attrition

EDA

INSIGHT

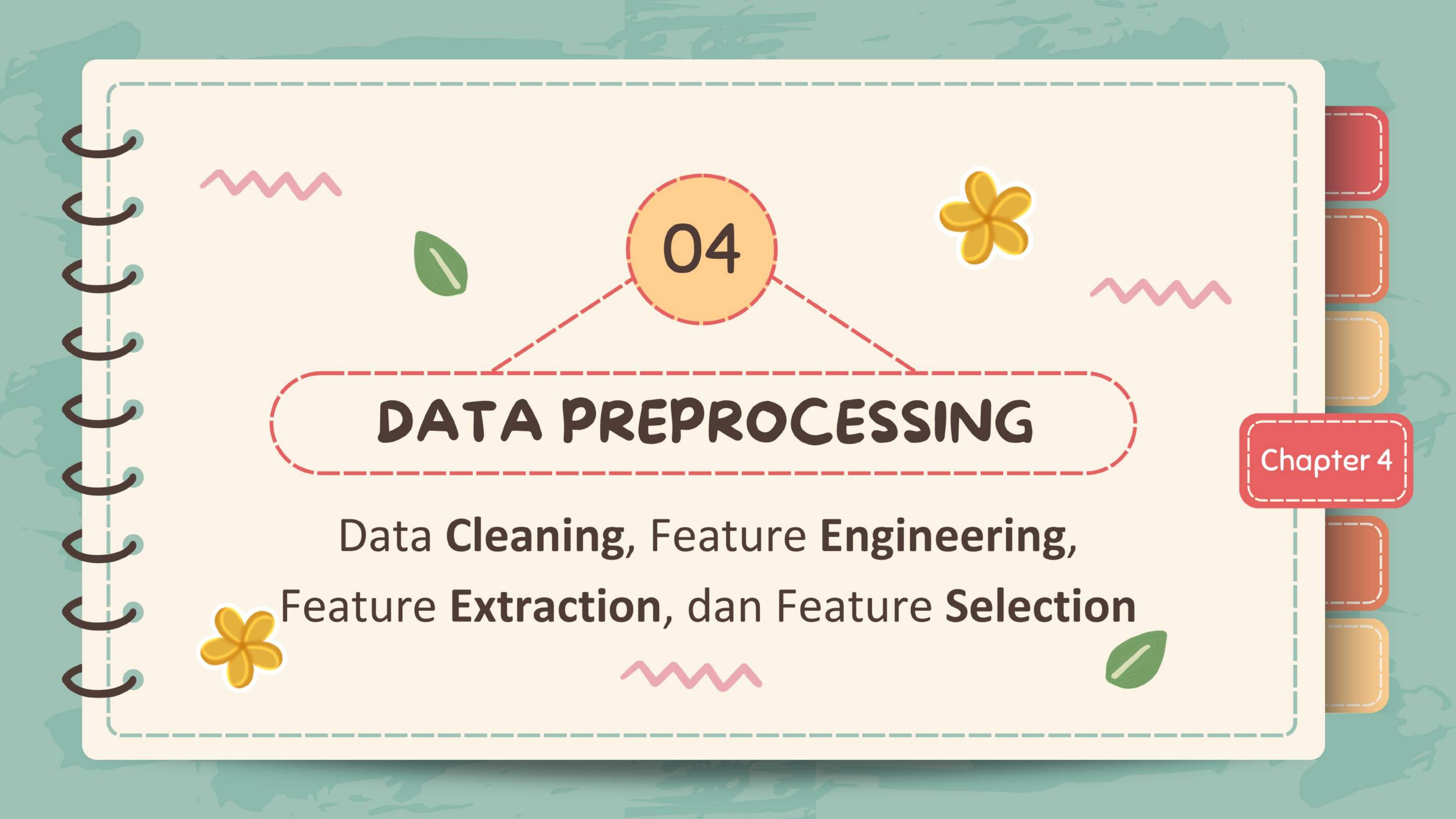
Melihat Persebaran Karyawan dengan MonthlyIncome 'Low' pada setiap Department terhadap Attrition



**LOW INCOME =
MonthlyIncome <
2911**

Department Reserach &
Development ==> 71
karyawan

EDA



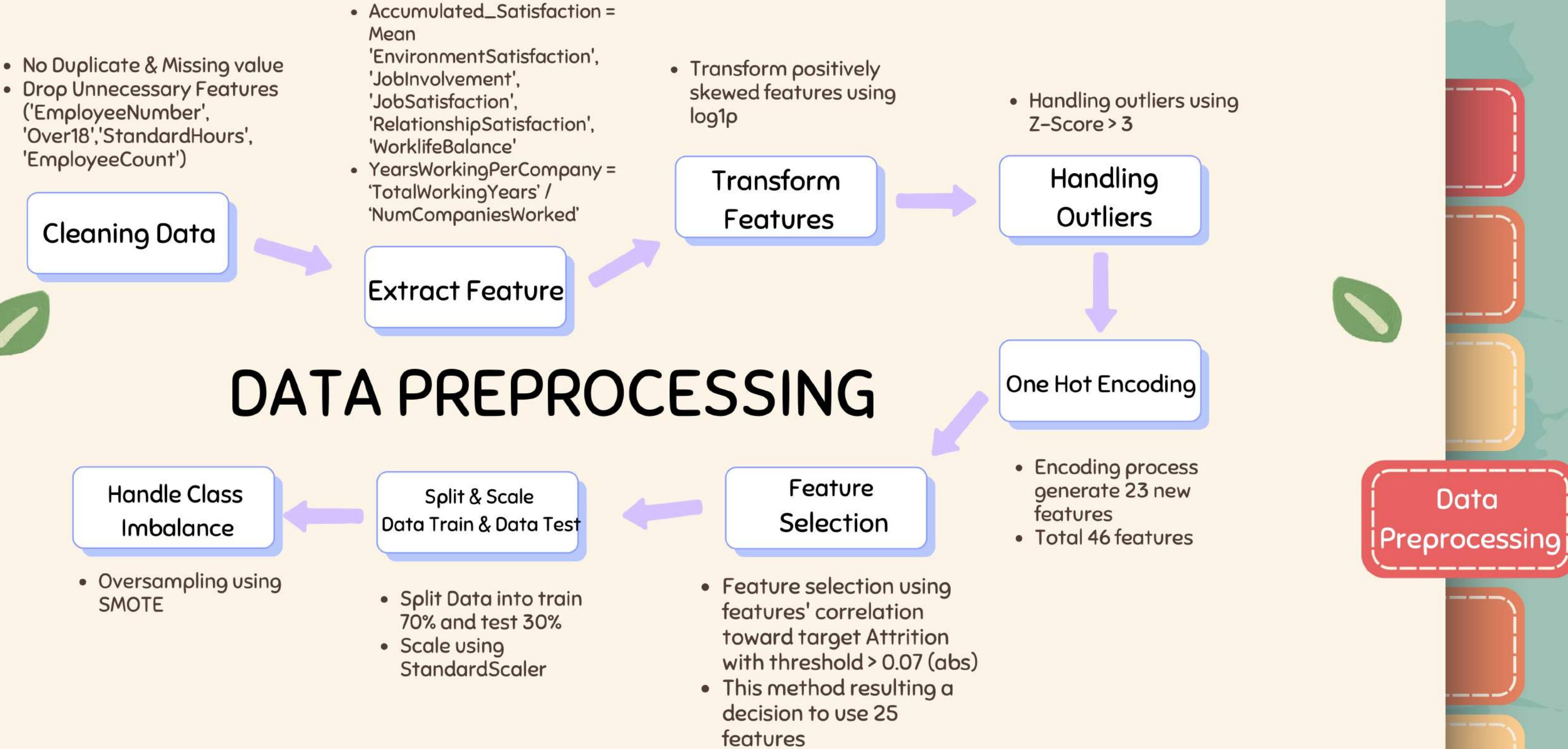
04

DATA PREPROCESSING

Data Cleaning, Feature Engineering,
Feature Extraction, dan Feature Selection

Chapter 4

DATA PREPROCESSING



SELECTED FEATURES

'Age'
'DistanceFromHome'
'JobLevel'
'MonthlyIncome'
'OverTime'
'StockOptionLevel'
'TotalWorkingYears'
'YearsAtCompany'
'YearsInCurrentRole'
'YearsWithCurrManager'
'Accumulated_Satisfaction'
'YearsWorkingPerCompany'
'BusinessTravel_Non-Travel'

'BusinessTravel_Travel_Frequently'
'Department_Research & Development'
'Department_Sales'
'MaritalStatus_Divorced'
'MaritalStatus_Married'
'MaritalStatus_Single'
'JobRole_Healthcare Representative'
'JobRole_Laboratory Technician'
'JobRole_Manager'
'JobRole_Manufacturing Director'
'JobRole_Research Director'
'JobRole_Sales Representative'

Data
Preprocessing



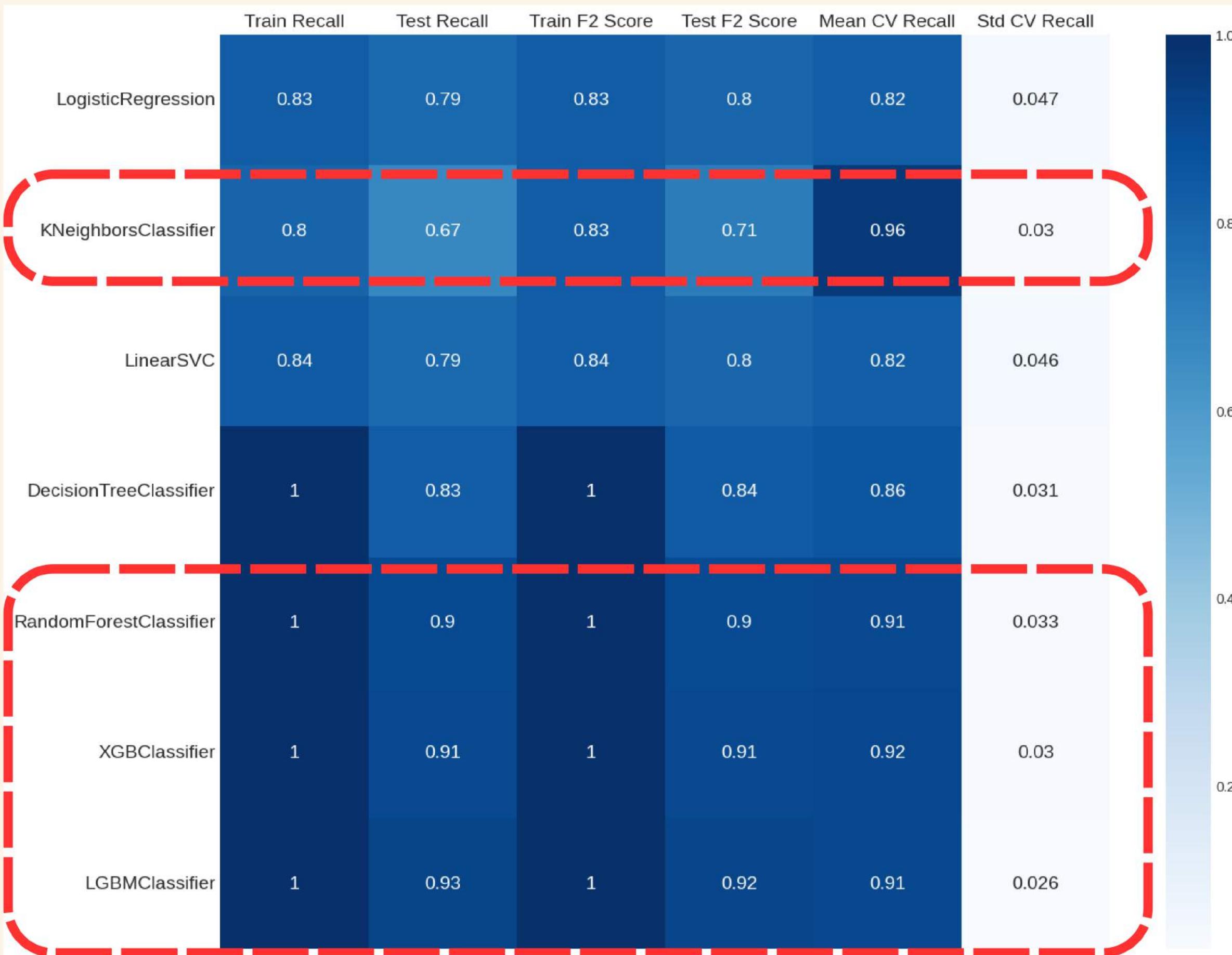
05

MODELLING & SIMULATION

Metrics yang diutamakan adalah Recall yang tinggi untuk mengurangi FN. Mempertimbangkan FP rendah demi cost effectiveness perusahaan.

Chapter 5

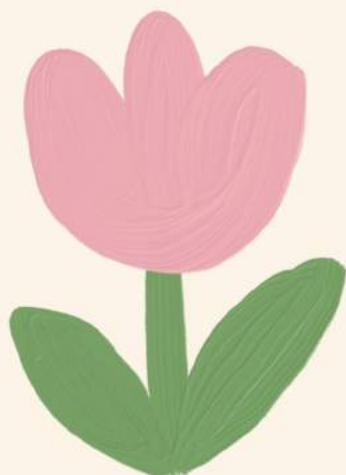
MODELLING



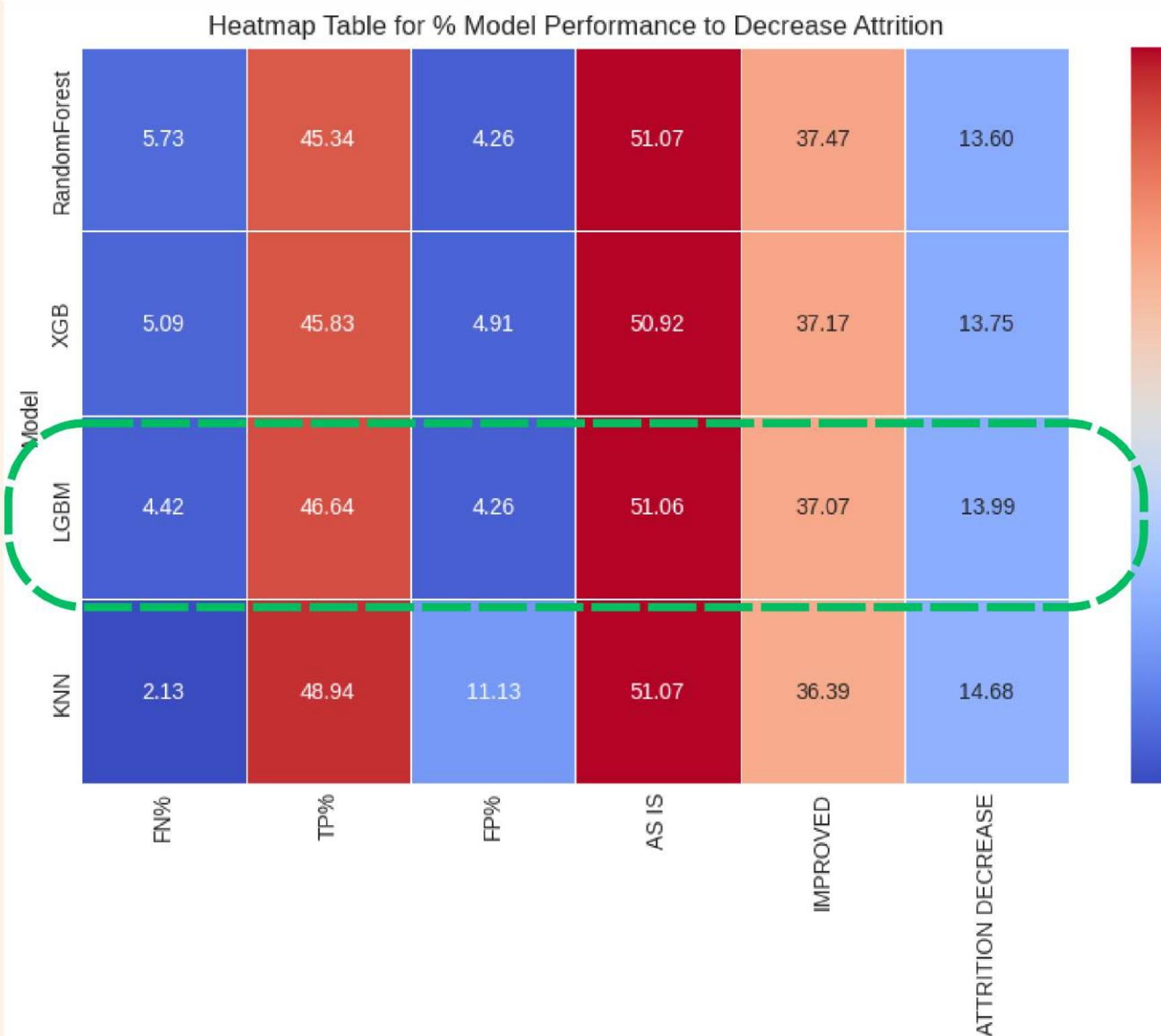
Parameter to choose best model:

1. Has high Recall Test
2. Has high Mean CV Recall
3. Has low Std CV Recall

+1 KNN (chosen because it has highest cv mean recall)



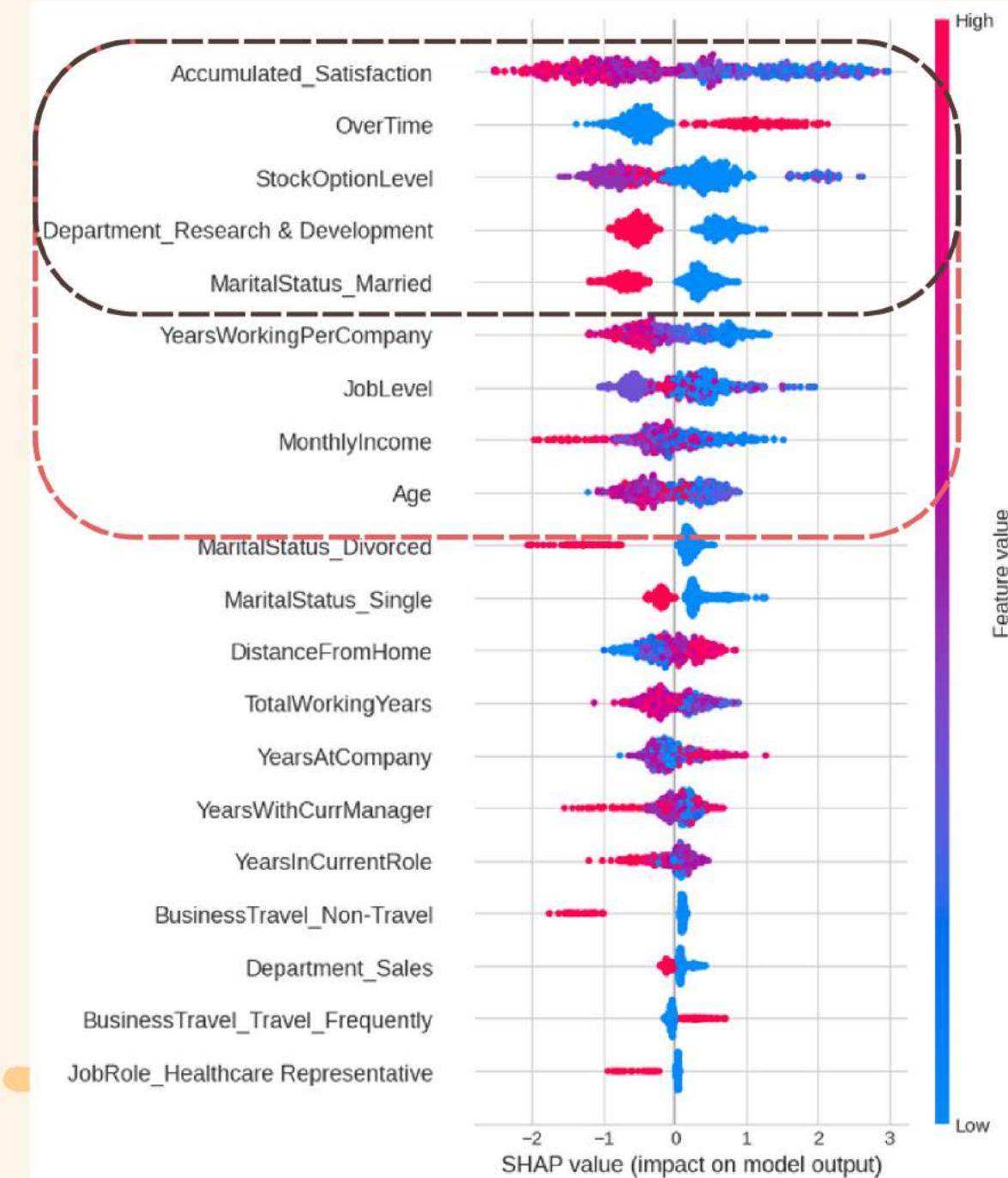
MODEL EVALUATION AFTER HYPERPARAMETER



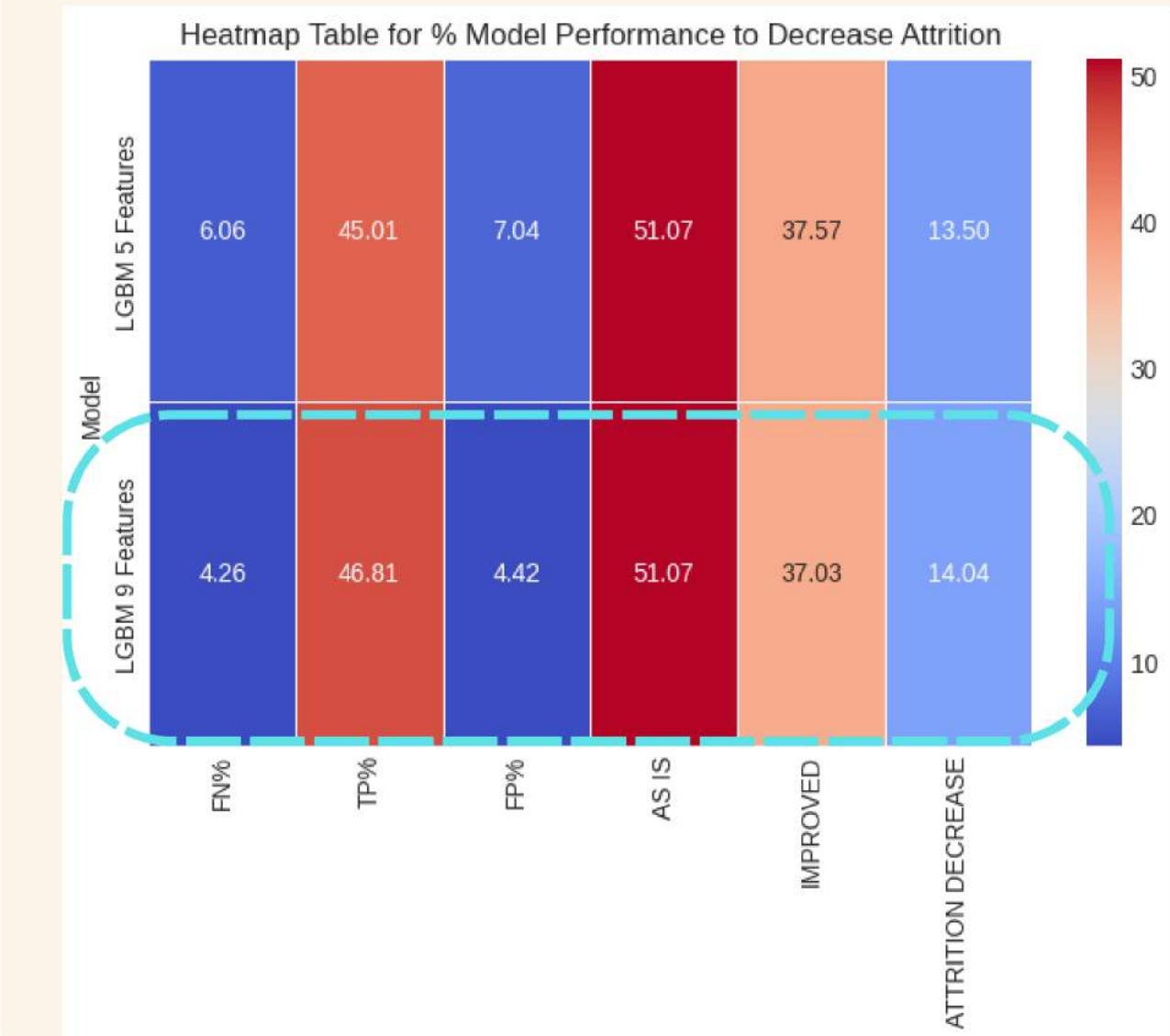
1. Has Attrition Decrease $\geq 12\%$ (target).
2. FN% lower than FN% Mean of all models (4.37%) or close to it.
3. FP% lower than FP% Mean of all models (6.14%) or close to it.

Therefore, we choose LGBMClassifier as our model.

SHAP FEATURE IMPORTANCE



We want to evaluate our model performance if using Top 5 and Top 9 of Features Importance



FINAL MODEL PERFORMANCE

LGBMClassifier with Top 9 features selected

ATTRITION DECREASE FORMULA:

$$AS\ IS = FN + TP$$

$$IMPROVED = FN + ((1 - \text{EFF RATE}) * TP)$$

$$\text{ATTRITION DECREASE} = AS\ IS - IMPROVED$$

$$\text{EFF RATE} = 0.3$$

MODEL ATTRITION DECREASE:

$$16.1\% - 14.04\% = \\ \underline{\underline{2.07\%}}$$

16.1%



2.07%

Business
Recom



06

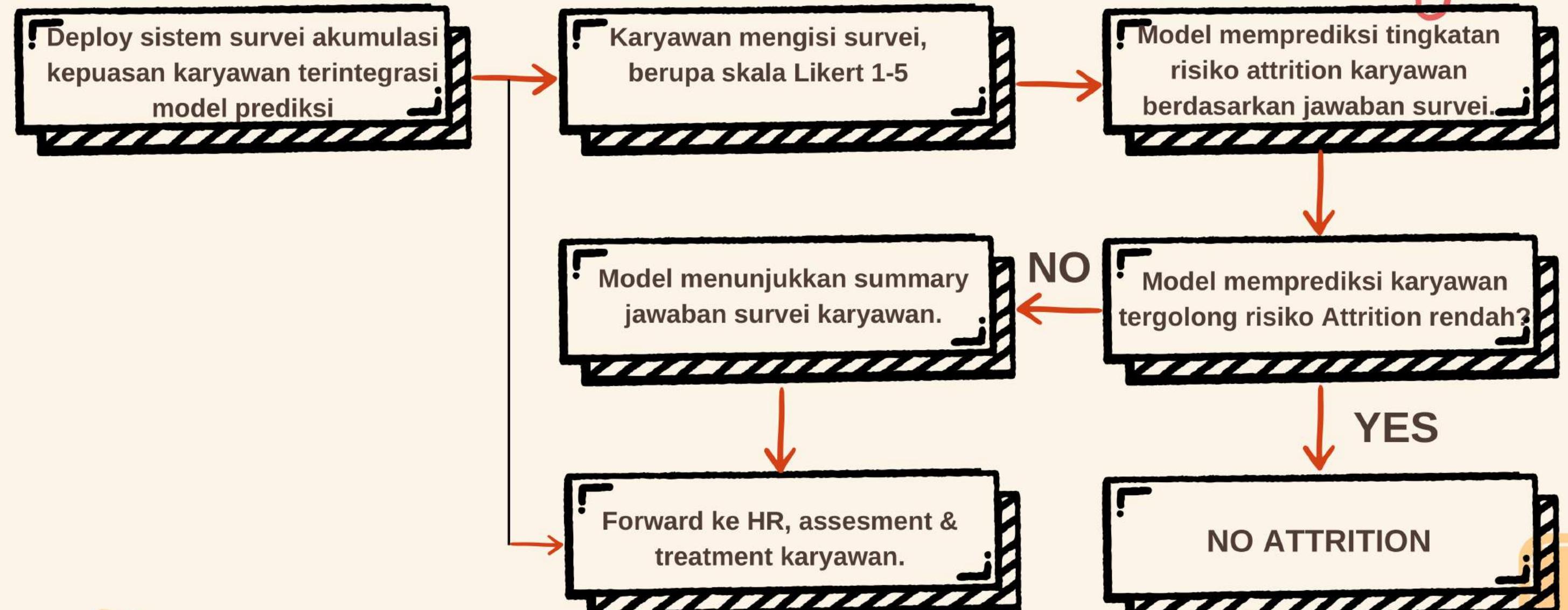
BUSINESS RECOMMENDATIONS

Accumulated Satisfaction, Monthly Income, OverTime, StockOption

Level, Department R&D, MaritalStatus Married, JobLevel, Age

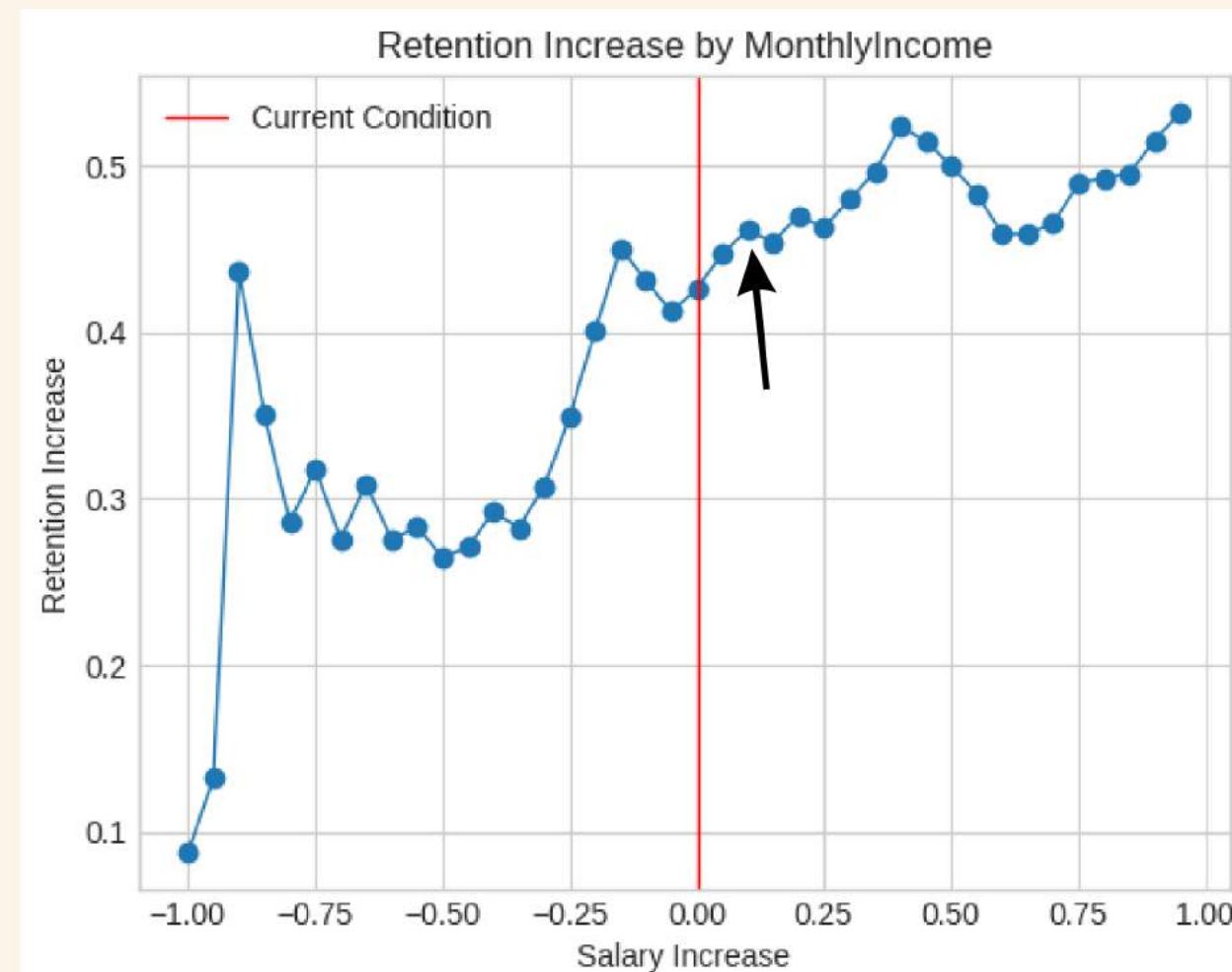
Chapter 6

MODEL FLOW ON DECREASE ATTRITION BY INCREASE EMPLOYEE SATISFACTION



Business
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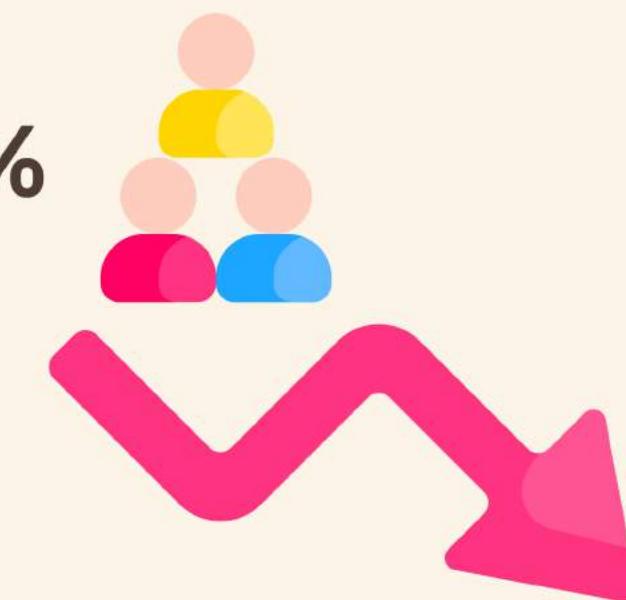
SALARY INTERVENTION



Salary intervention in general

Point of improvement 10% salary increase

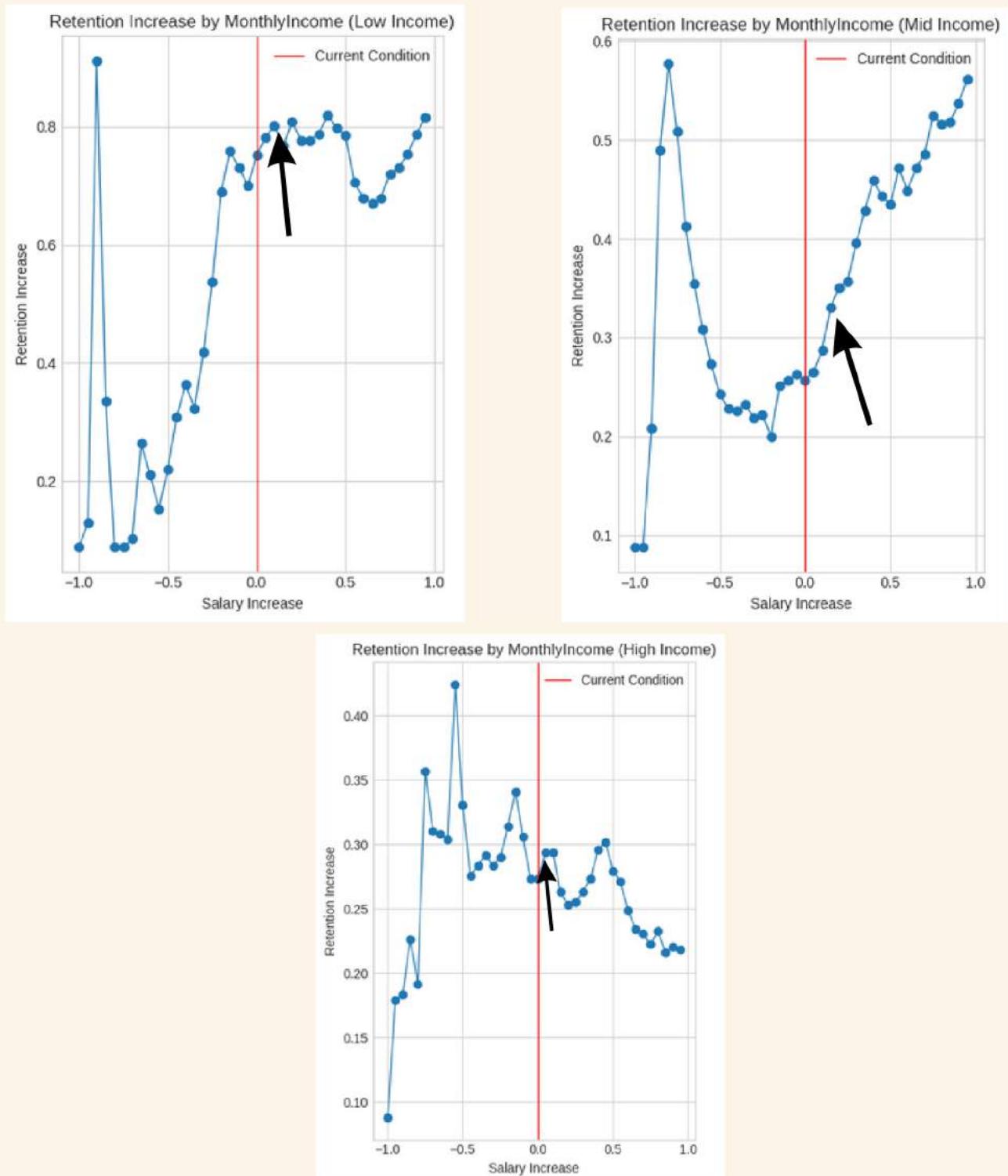
46.12%



109 Employees
Attrition Rate after : 8.7%

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SALARY INTERVENTION PER CATEGORY



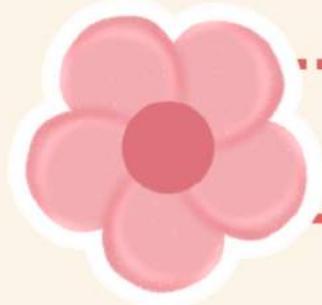
Point of improvement 10% salary increase for 'Low',
15% salary increase for 'Mid' and 5% salary increase for
'High'

166 Employees



Attrition Rate after: 4.8%

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SALARY INTERVENTION RESULT

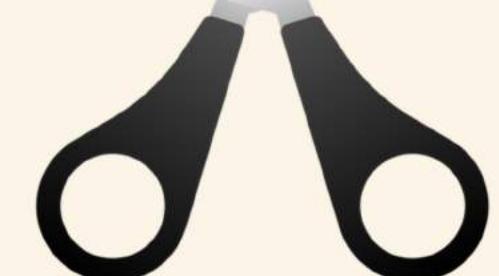
Our final recommendation for salary increase is using the second scheme. Which is increasing salary per category.

Salary Increase

Financial Cost:

\$ 113,491.5

~~COSTS~~



Hire New Employees

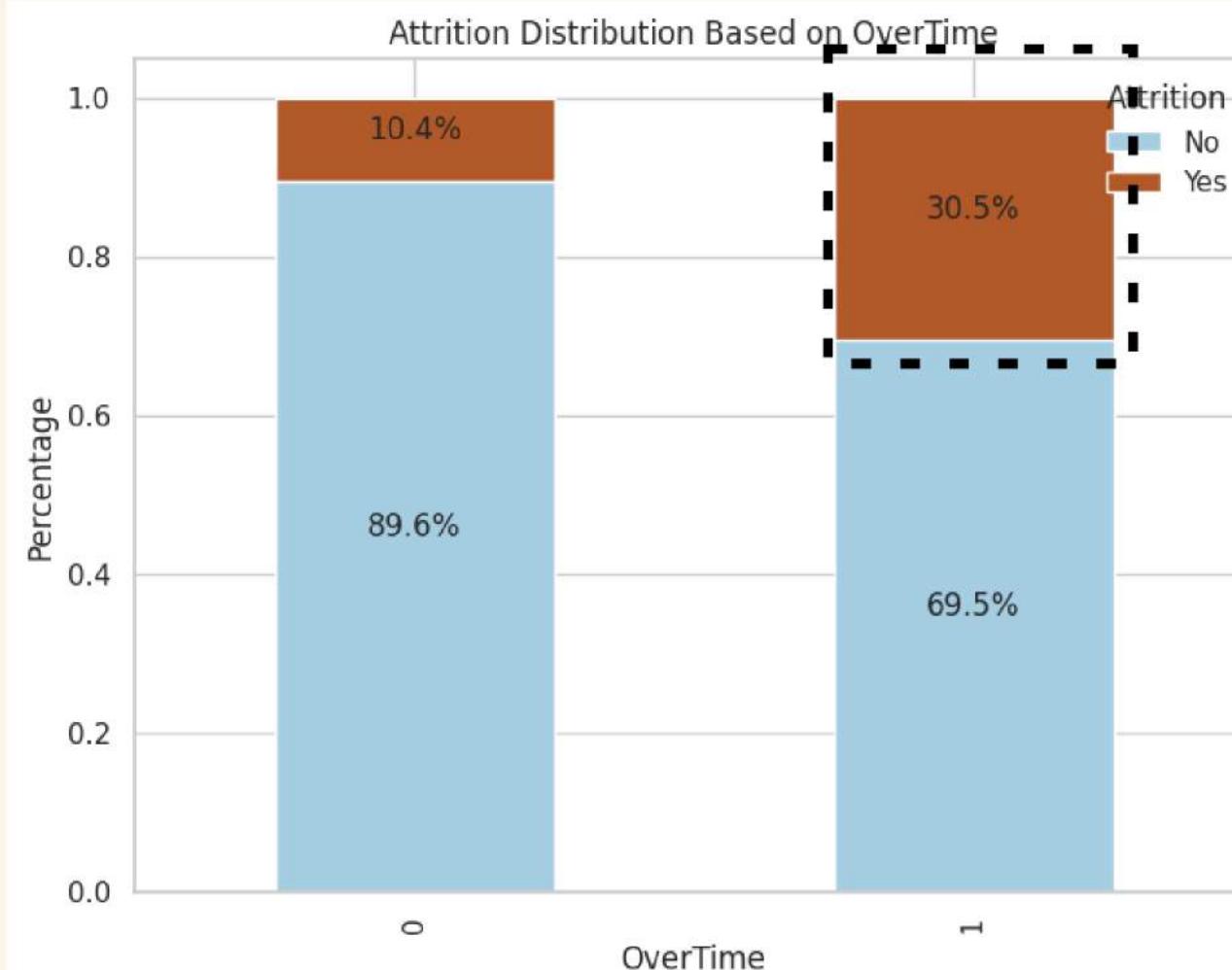
Financial Cost:

\$ 4425 x 237 = \$ 1,048,725

MAX \$ 935,233.5

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OVERTIME



Recommendations :

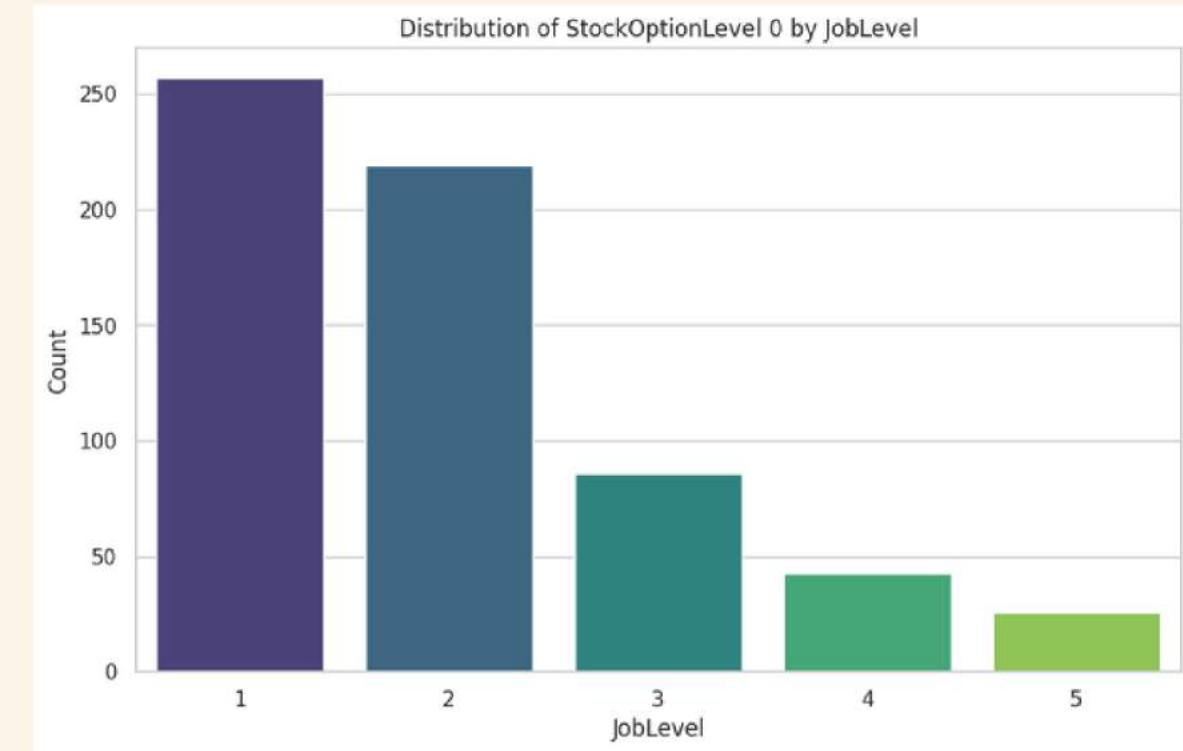
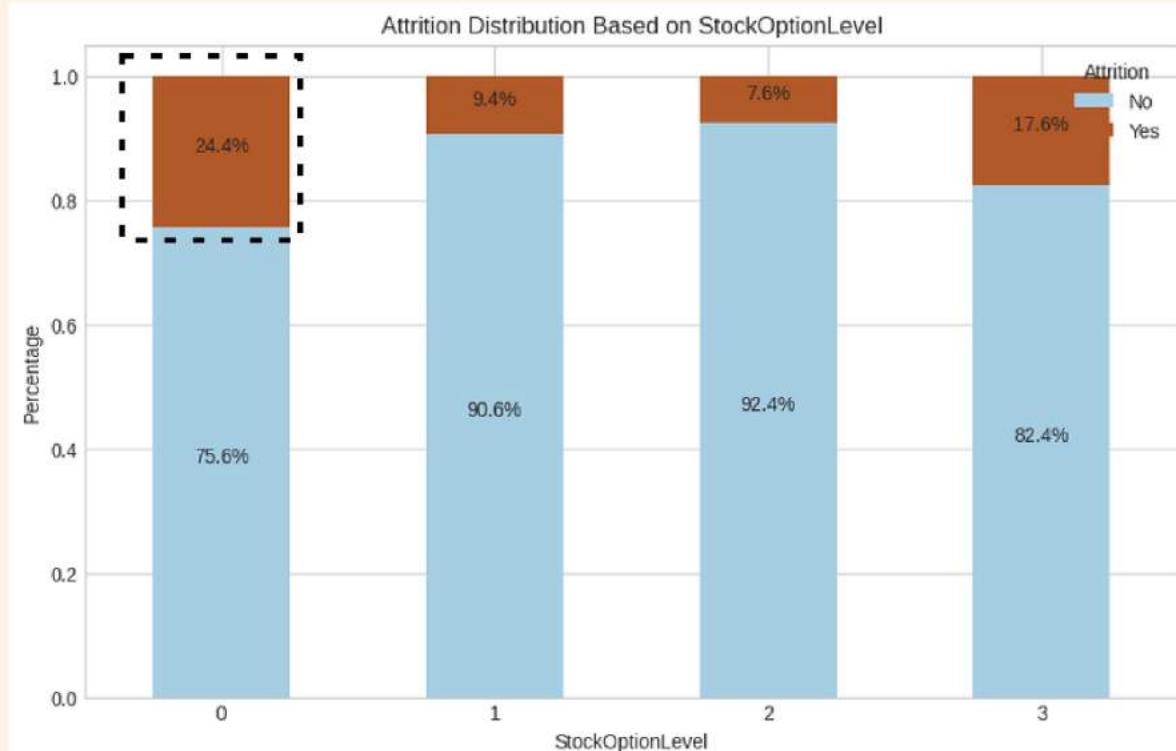
Evaluasi beban kerja lembur dan kompensasi/upah lembur karyawan. Evaluasi mungkin akan menghasilkan output **kenaikan upah lembur atau pengurangan lembur.**

“the overtime had a positive and significant effect on turnover intention”

(Rachmad dkk, 2020)

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STOCKOPTION LEVEL



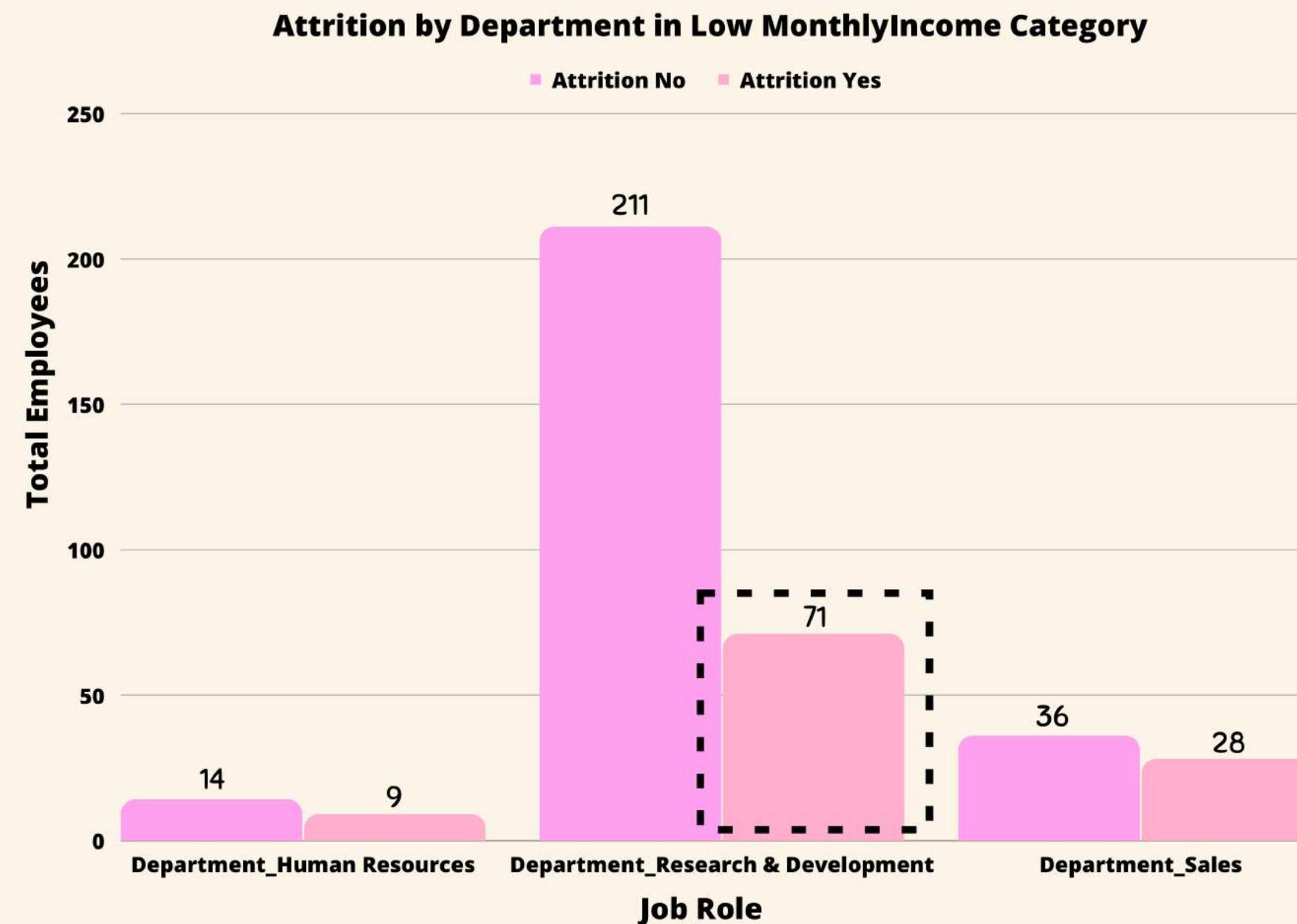
Recommendations :

Perusahaan dapat
mengkaji terkait
pemberian saham untuk
karyawan yang masih di
job level 1.

One potential approach to reduce turnover is to provide the employee with unvested compensation so that he forfeits some wealth if he leaves the firm prior to the vesting date (Elsevier, 2017)

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DEPARTMENT R&D

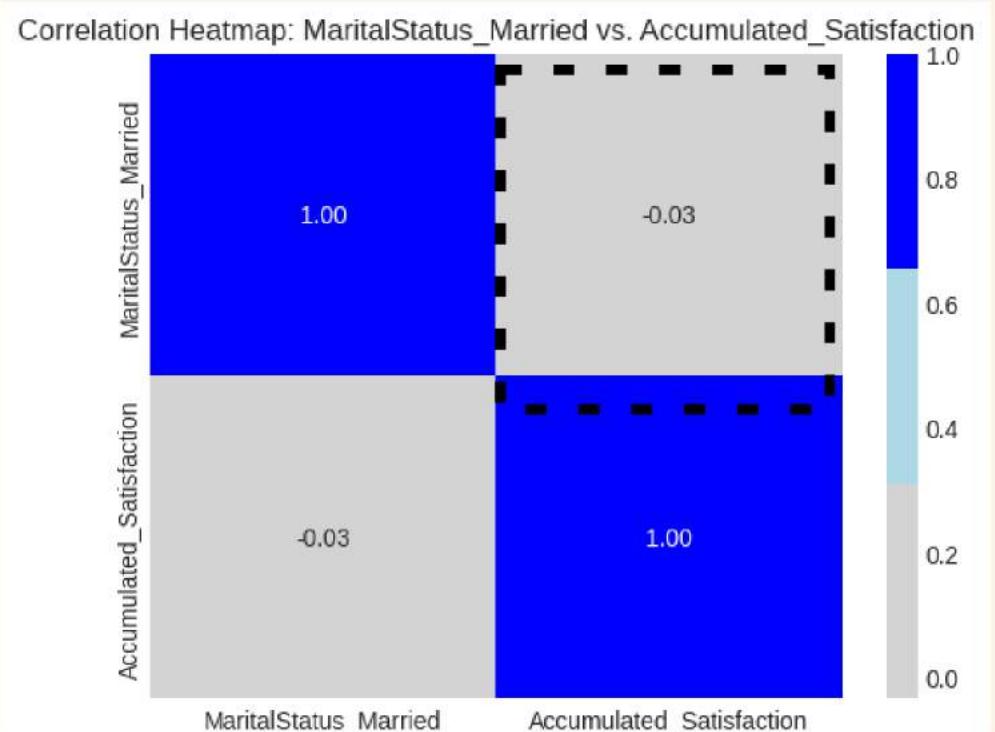
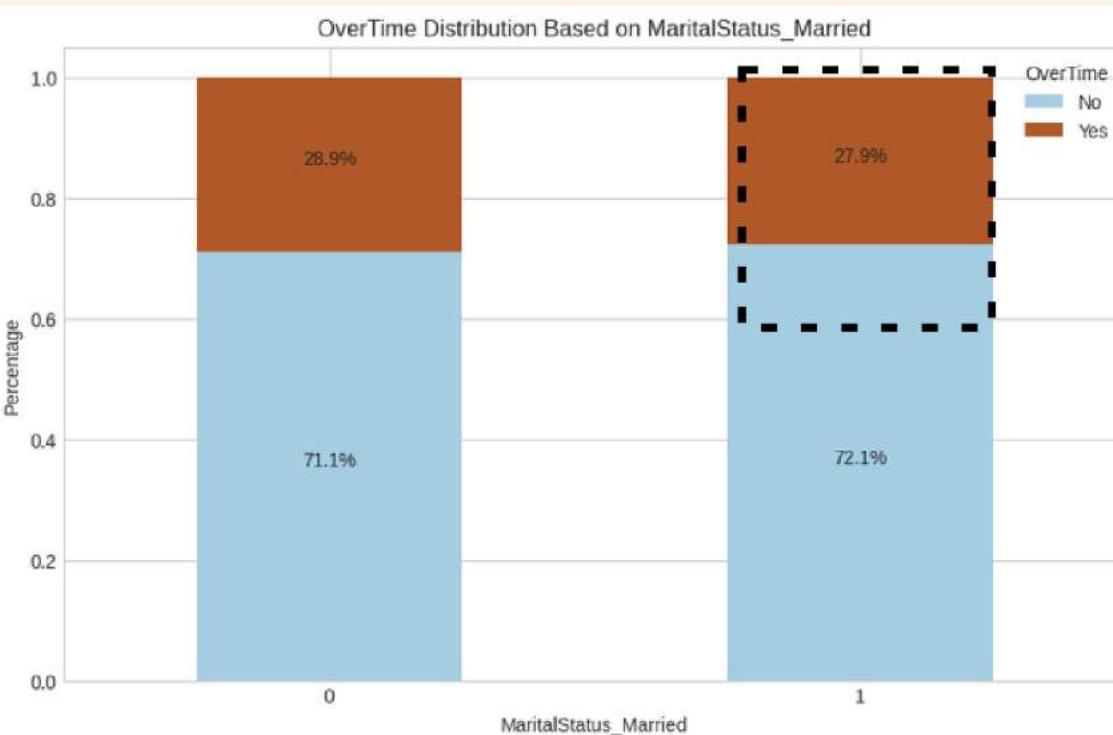


Recommendations :

Perusahaan dapat melakukan intervensi tehadap monthly income untuk karyawan di Department R&D yang tergolong low income, berdasarkan **rekomendasi intervensi salary sebelumnya**.

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MARITAL STATUS MARRIED



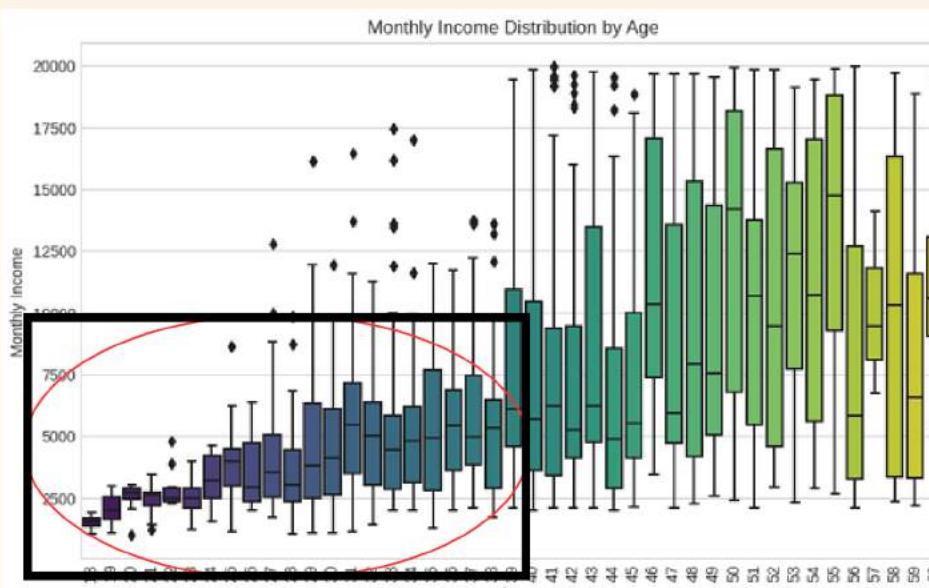
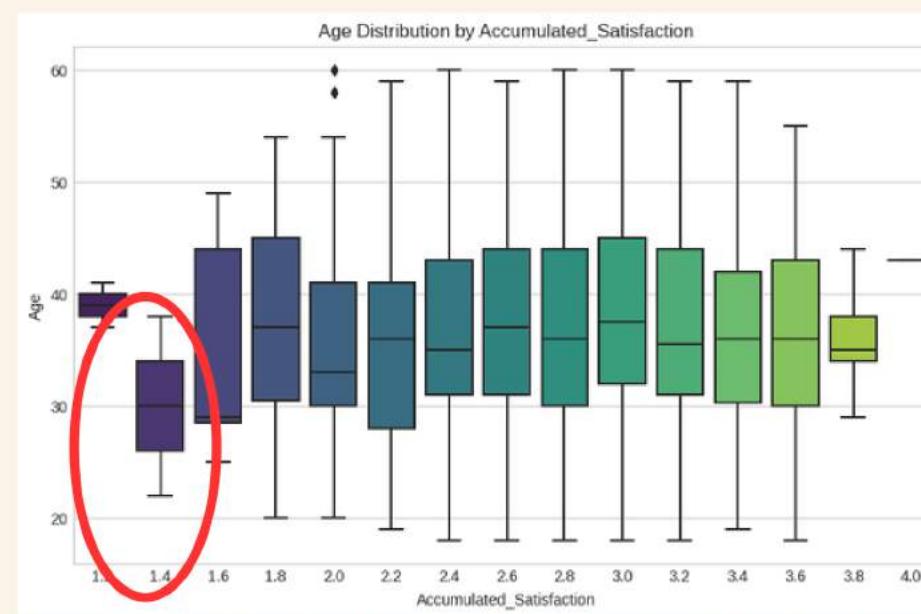
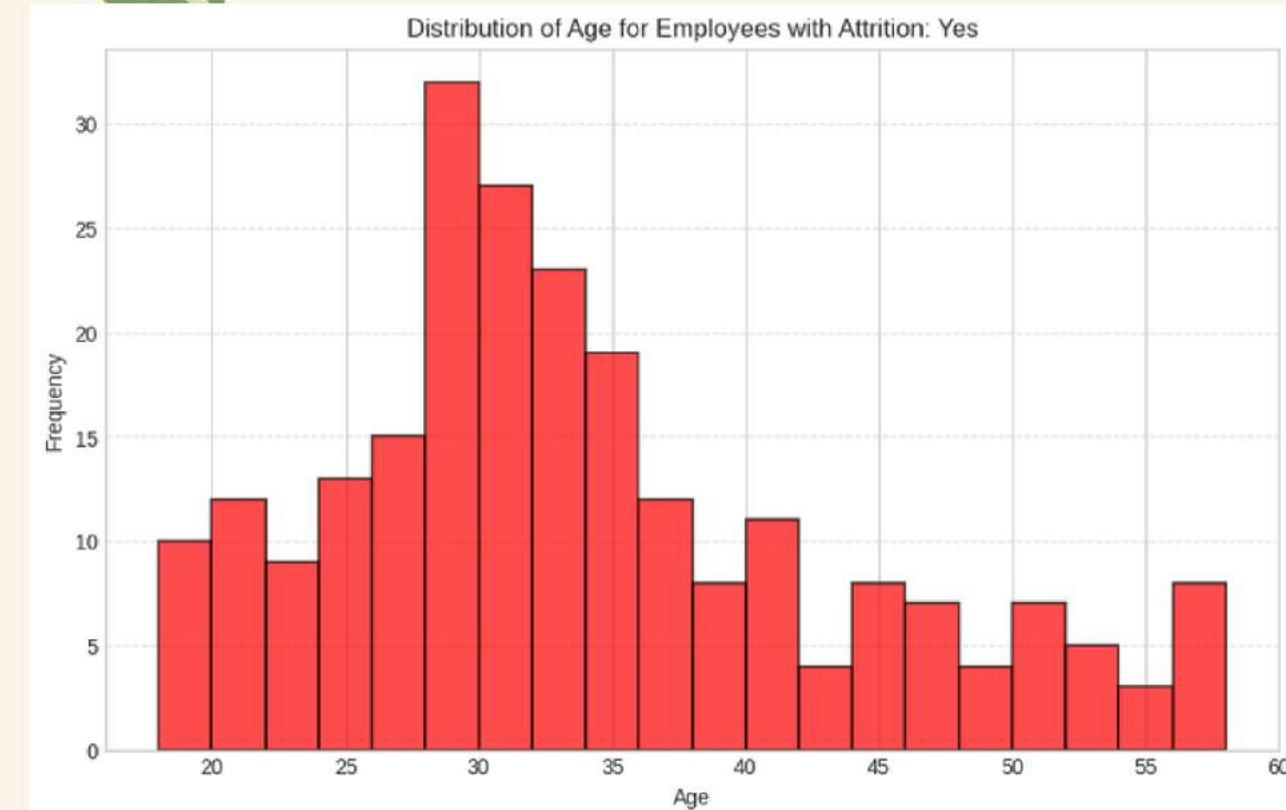
Recommendations :

HR/Management
perusahaan perlu meninjau
jam lembur dan tingkat
kepuasan karyawan dengan
Marital Status Married

The employees who devoted too
much time to their workplace and
have insufficient time for family
tend to leave their job (Lai meng
lee, 2023)

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AGE



Recommendations :

Perusahaan dapat meninjau terkait monthly income dan satisfaction sesuai dengan **rekомендasi intervensi sebelumnya**. Selain itu perusahaan juga perlu menyiapkan calon karyawan baru sebagai pengganti karyawan yang akan memasuki masa pensiun (diatas 50 tahun).

Yousuf Khan (2019), Centennials and Millennials (born after 1995) choose to work for an organization that can provide them career growth and opportunities. Compensation also tops their list for leaving the company

Business
Recom

PROJECT RESULTS

Result 1

This project succeed in building a model that can predict quarterly employee attrition rate and **decrease up to 14%** from initial rate.

Result 2

Model intervention in employee salary can possibly **convert 166** employees from attrition yes becomes no attrition.

Result 3

This project could **save up company cost** from hiring new employees up to \$ **935,233.5**



FINPRO

Thank You

