Work-Life Balance Prediction for Academic Women in Bangladesh Using Machine Learning

Presented by

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OUTLINE

INTRODUCTION

In the introductory section, I will give a brief outline of the problem scenario.

MOTIVATION, AIMS & OBJECTIVE

- Firstly, I will talk about our motivations for working in this field.
- Then I'll go over our project's main objectives.

METHODOLOGY

- Parameter selection, questionnaire preparation and data collection will be discussed in this section.

RESULT and Discussion

I will demonstrate our experimental result in this section.

CONCLUSION

I will discuss the summary of the research in this part.

Introduction

- In the past, women were only allowed to perform domestic tasks but nowadays, they are working in different sectors along with men.
- The concept of work-life balance of working women becomes more important in today's dynamic and rapid society.
- In the competitive era, the organization’s expectations from the employees are increasing day by day.
- Now work life balance is a challenging issue for working women.

Introduction cont.

- Discussions have arisen regarding how women can effectively balance their personal and professional lives.
- To predict work life balance of working women we used machine learning tools.
- These findings brought light on the variables impacting work-life balance and offered solutions for its improvement.

Motivation

- Achieving work-life balance is essential for every individual's wellbeing, work happiness, and general social peace.
- Although some researchers have used machine learning to verify the life balance of working women, we want to add new dimensions by finding their limitations.
- Our thesis aims to use machine learning to shed light on the challenges and opportunities faced by working women in achieving work-life balance.

Aims and Objectives

- Explore the current representation of women in various academic disciplines in Bangladesh.
- Assess the challenges and opportunities for women in academia regarding work-life balance.
- To predict if women working in academia in Bangladesh can maintain a work-life balance using machine learning.

Related Work

Name of the paper:

Innovative machine learning approach and evaluation campaign for predicting the subjective feeling of work-life balance among employees.

- **Date :2020**
- **Author : Pawlicka, A., Pawlicki, M., Tomaszewska, R., Choraś, M. and Gerlach, R.**

❏ The paper applied artificial neural networks to predict employees' subjective work-life balance feelings.

❏ The proposed model achieved a high accuracy rate of 81% based on a dataset of 800 employees.

Related Work

Name of the paper:

Deep Learning Model for Work-Life Balance Prediction for Working Women in IT Industry

- **Date** :**2022**
- **Author** : **Paigude, S. D., & Shikalgar, S. R.**

❑ It used deep learning models to predict work-life balance for women in the IT industry.

❑ It explored AI and machine learning potential impact.

❑ The sample size of female IT professionals was 150.

Related Work

Name of the paper:

A Study On Psychological Stress Of Working Women In Educational Institution Using Machine Learning.

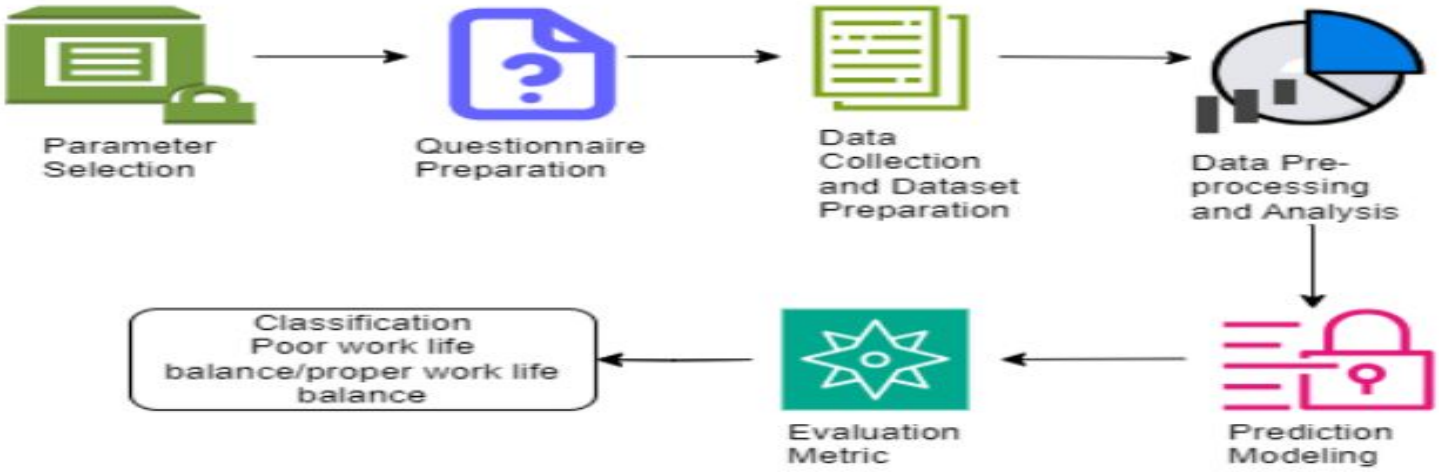
- **Date** :**2022**
- **Author** : **Sujithra, M., Velvadivu, P., Rathika, J., Priyadharshini, R. and Preethi, P.**

❑ It explored stress factors for women in educational institutions, emphasizing the challenges of balancing personal and professional life.

❑ The sample size of female IT professionals was very small.

Methodology

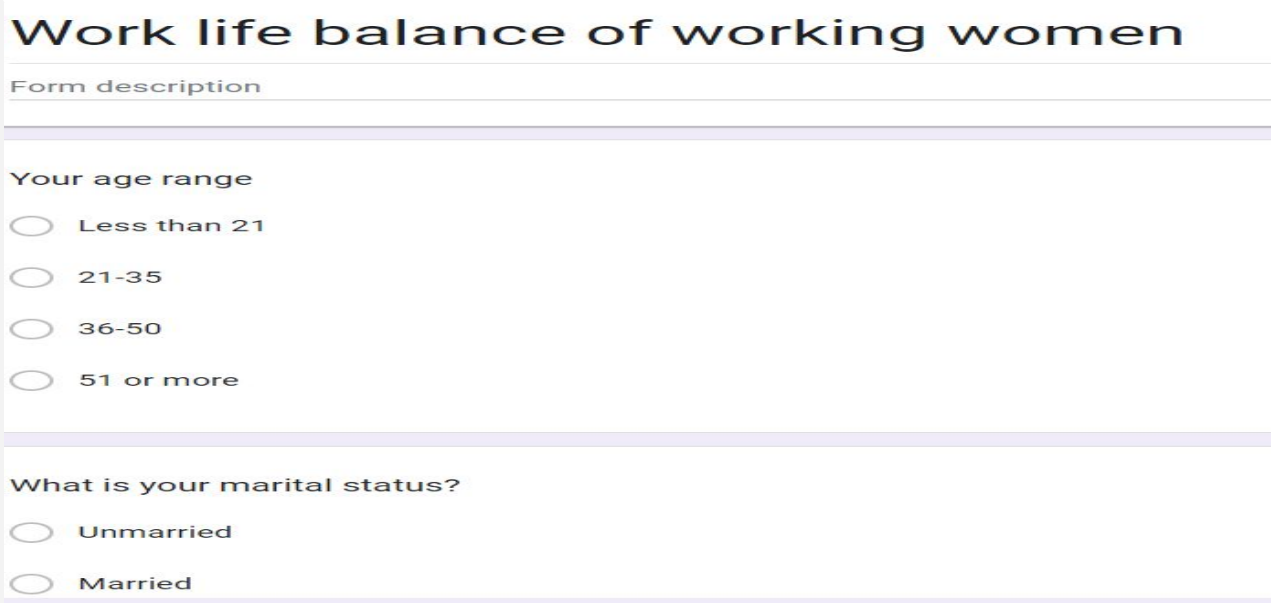
Our suggested methodology outlines the procedures that will be used for data collection, respondent selection, and data analysis in order to carry out this research.



Parameter Selection

Demographic Variables	Organizations Variables	Family Variables	Personal Variables	Social Variables
Age	Management Support	Motivational Support	Health Issue	Social Prejudice
Marital Status	Infrastructure Facility	Sharing of Household Chores	Anxiety	Time for Social Activities
Years of Experience	Health Assistance	Family Expectations	Time for Self	
Designation	Creche Facility	Gender Equality at Home		
Income	Pregnancy Support	Childcare Workload		
Satisfaction With Work Life Balance	Safety	Sharing of Childcare Responsibilities		
	Gender Equality	Family Type		
	Work Hours	No. of Family Members		
	Flexibility			

Questionnaire Preparation



Work life balance of working women

Form description

Your age range

- Less than 21
- 21-35
- 36-50
- 51 or more

What is your marital status?

- Unmarried
- Married

Google form link:
https://docs.google.com/forms/d/e/1FAIpQLSflZEcC62VKFPKRjXex2RE3GraUoho9LLsMxHLggAKJc-SpqQ/viewform?usp=pp_url

Data Collection and Dataset Preparation

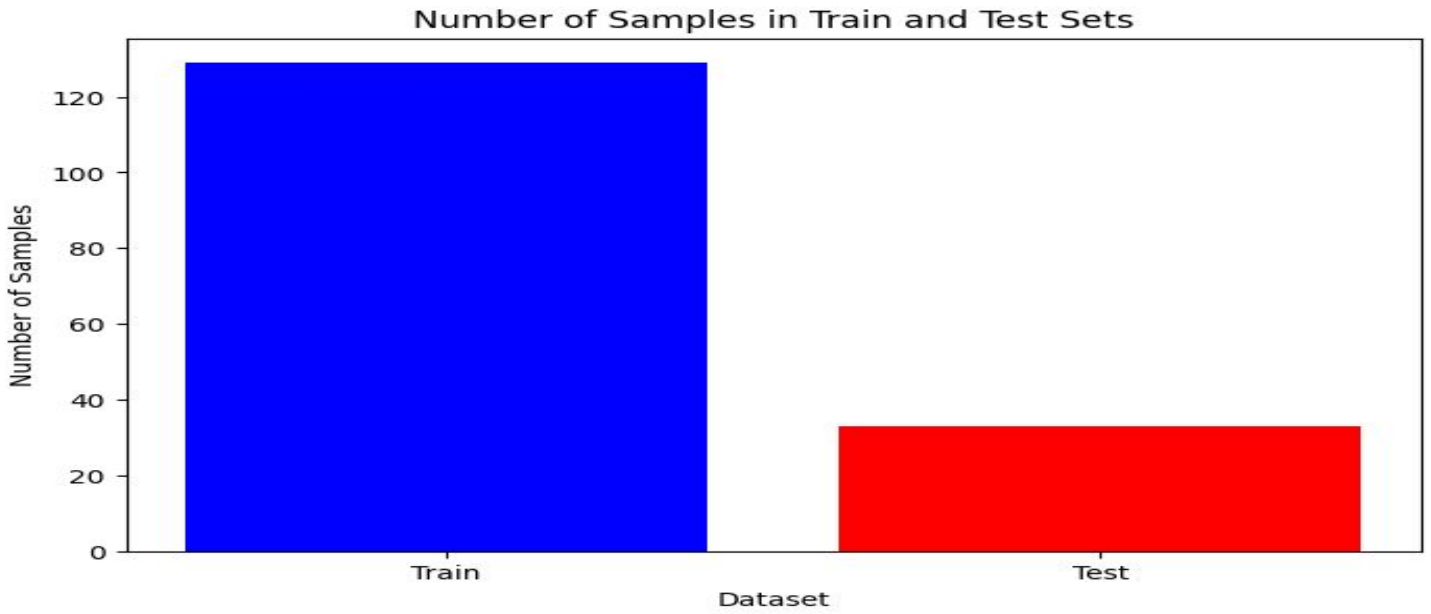
- The survey method has been used to collect primary data for the research objective.
- Data collected through in-person interviews and a tailored questionnaire from sample respondents align with the study's objectives.
- The survey comprised multiple-choice, binary (YES/NO), and Likert Scale questions.
- We created a Work-Life Balance (WLB) dataset using information gathered through primary data collecting.

Data Preprocessing

- Read a CSV file using the Pandas library.
- Removed unnecessary columns: Timestamp, Unnamed 45-47, Your organization name.
- Removed rows with NULL values, resulting in 162 values from 205.
- Removed unnecessary spaces between text for distinct values.
- Converted all text to lowercase using 'str.lower()' method.
- Converted categorical values to numeric using 'LabelEncoder()'

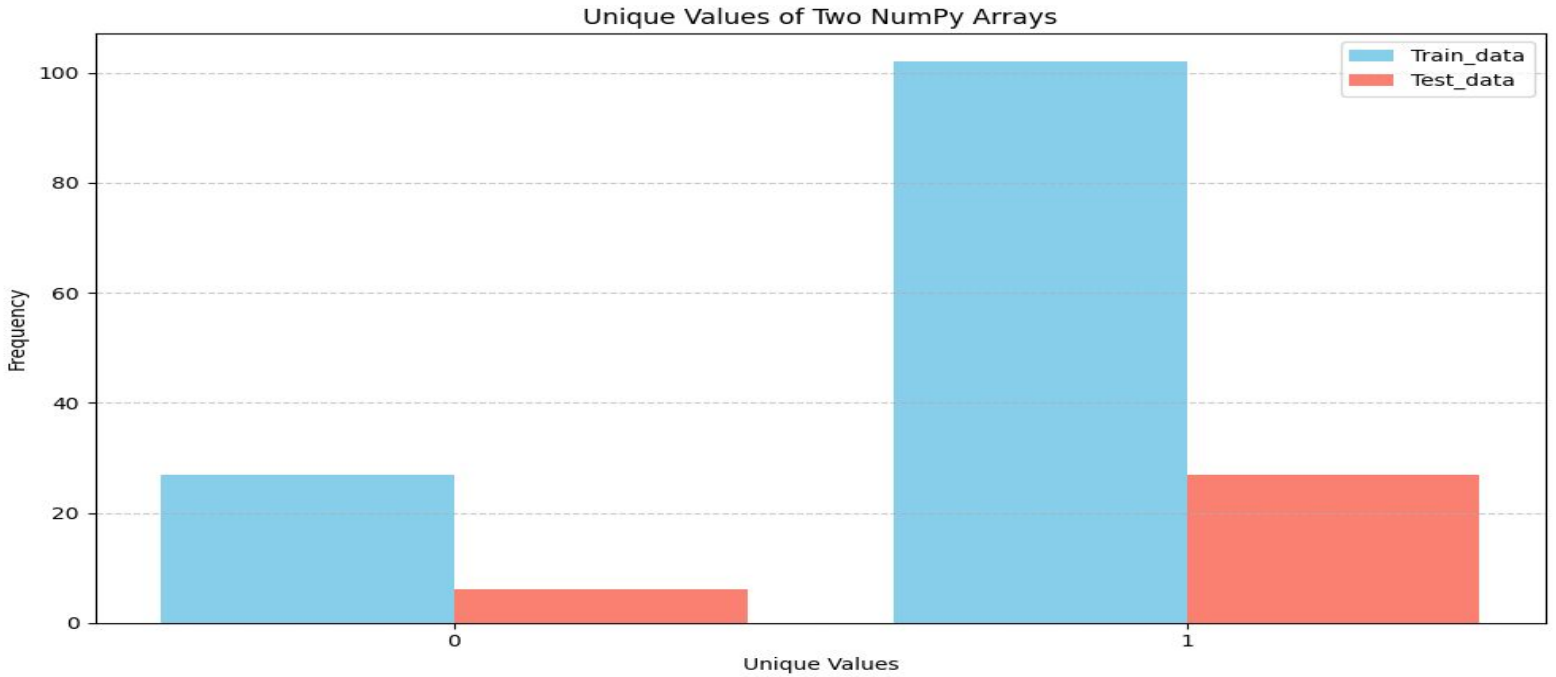
Data Analysis

Sample of Training and Testing data:



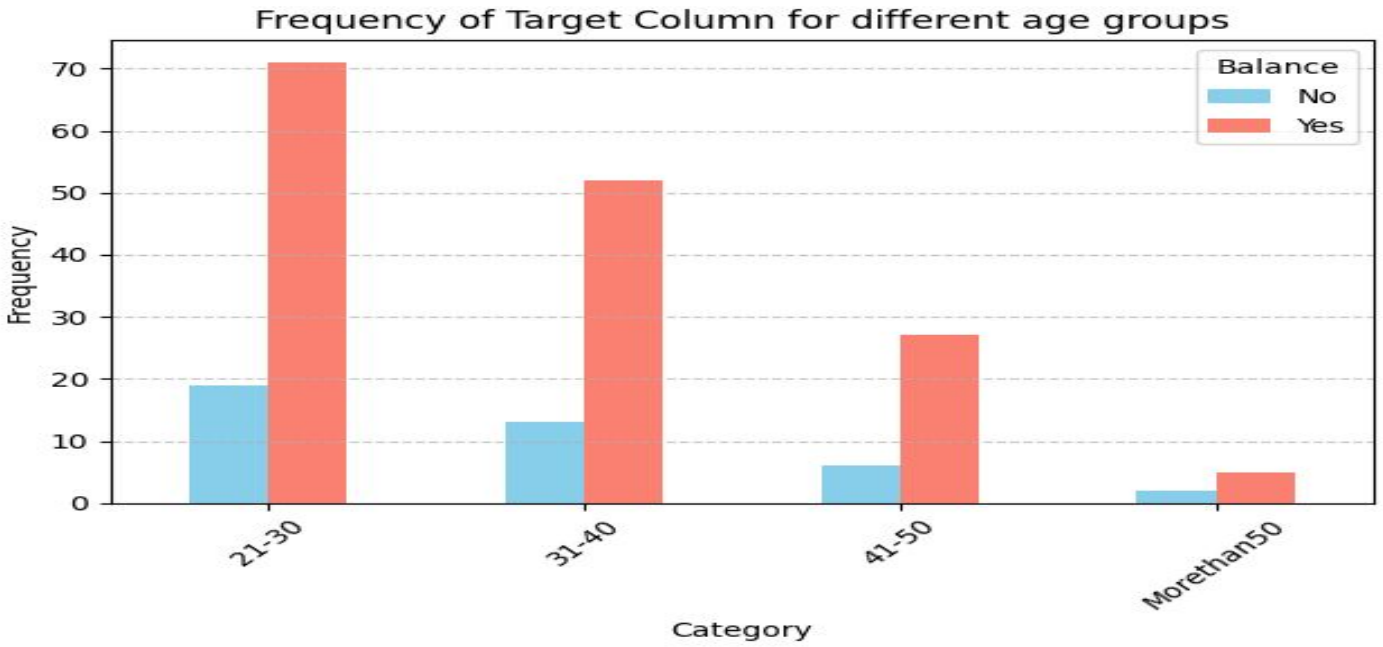
Data Analysis

Sample of Balance and Imbalance ratio:



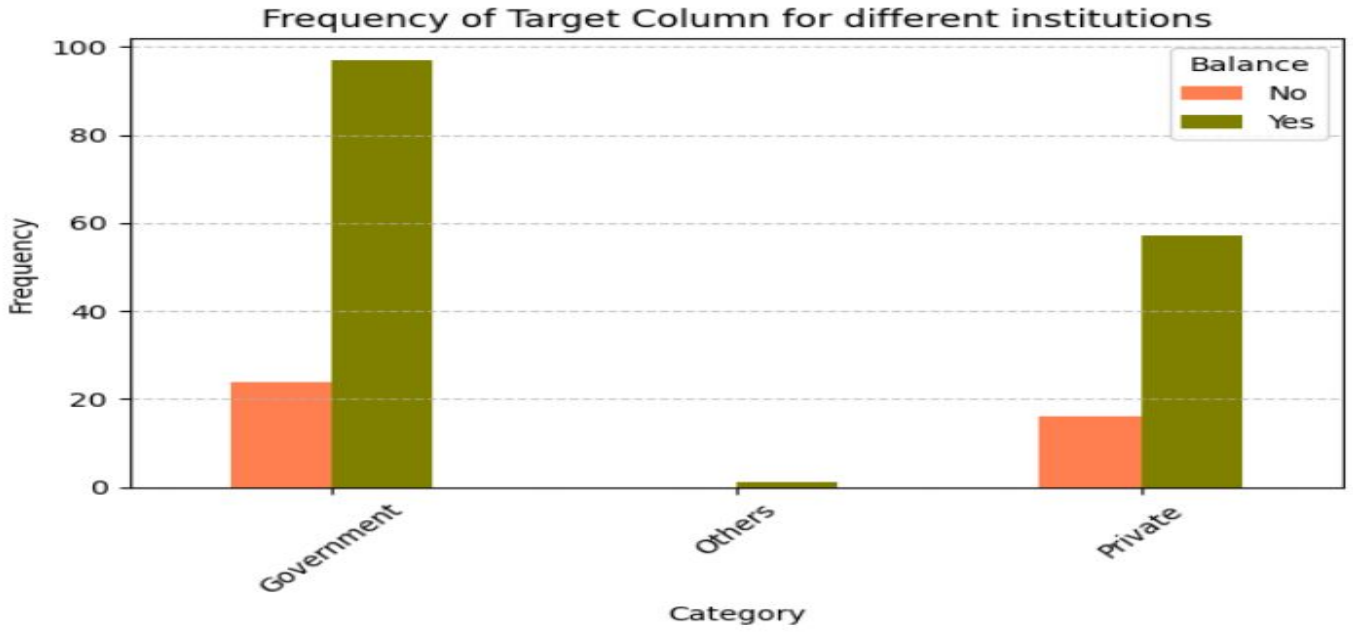
Data Analysis

Data analysis for different Age Groups:



Data Analysis

Data analysis for different Educational Institutions:



Classification Approaches

- We implemented several classification strategy for measuring work-life balance among working women using machine learning.
- Some classification approaches are given here:

- Logistic Regression
- K-Nearest Neighbor Algorithm
- Decision Tree
- Naive Bayes
- Support Vector Machine Algorithm
- Random Forest

Result and Discussions

- **Accuracy**

$$Accuracy = \frac{Total\ Instances}{True\ Positive + True\ Negative}$$

- **Precision**

$$Precision = \frac{True\ Positives}{True\ Positives + False\ Positives}$$

- **Recall**

$$Recall = \frac{True\ Positives}{True\ Positives + False\ Negatives}$$

- **F1- score**

$$F1 - Score = \frac{2(Precision*Recall)}{Precision + Recall}$$

Result and Discussions

Model Name	Accuracy	Precision	Recall	F1-score
Logistic Regression	81%	0.86	0.93	0.89
Decision Tree	84%	0.84	1.00	0.92
Naive Bayes	**90%**	**0.90**	**1.00**	**0.95**
Support Vector Machine	81%	0.89	0.89	0.89
Random Forest	81%	0.86	0.93	0.89
K-Nearest Neighbor	75%	0.83	0.89	0.86

Result and Discussions

Confusion Matrix

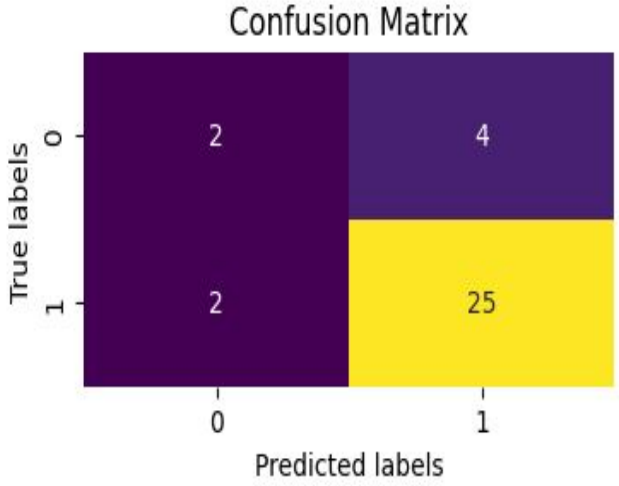
Actual	Predicted	
	Imbalance	Balance
Imbalance	True Negative	False Positive
Balance	False Negative	True Positive

Confusion Matrix

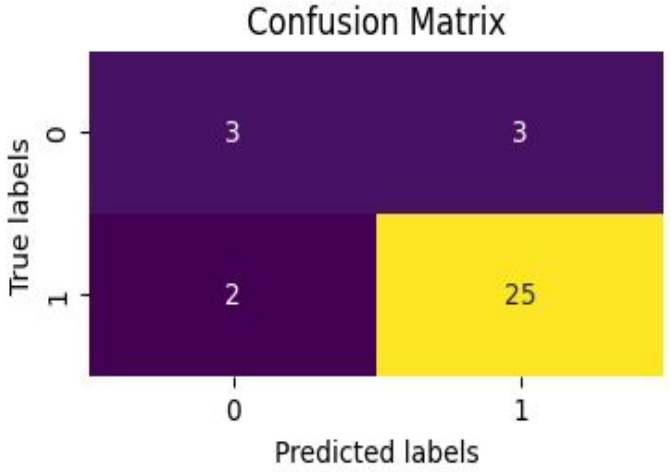
- True Positives: When the outcome is positive, True Positives are the model's accurate predictions.
- False Positives: False Positives are incorrect model predictions when the actual result is negative.
- False Negatives: False Negatives are incorrect model predictions when the actual result is positive.
- True Negatives: True Negatives are examples of accurate model predictions where the outcome is negative.

Confusion Matrix

Confusion Matrix for Logistic Regression:



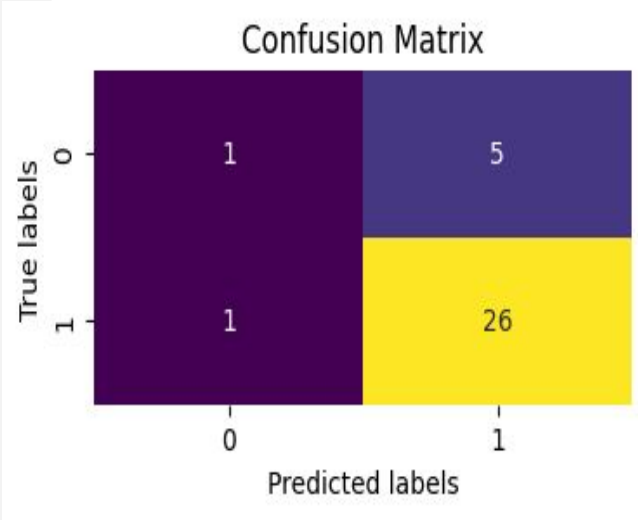
(a) for original dataset



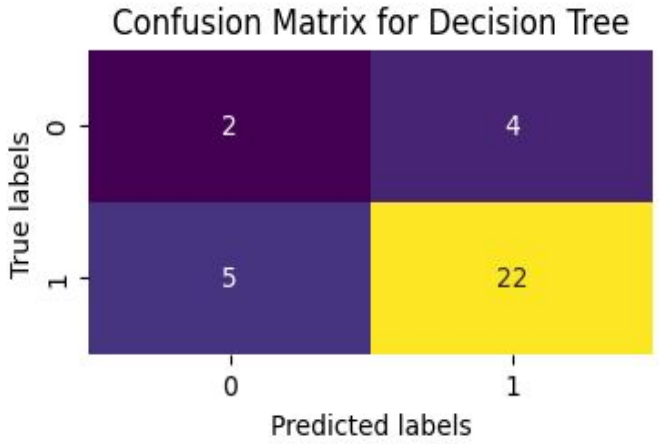
(b) for oversampling

Confusion Matrix

Confusion Matrix for Decision Tree:



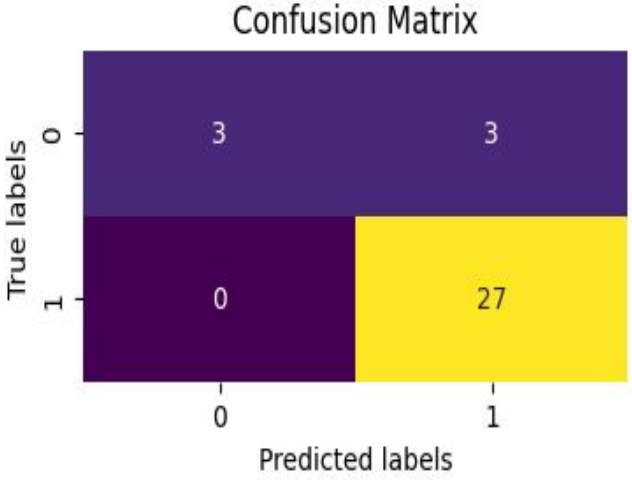
(a) for original dataset



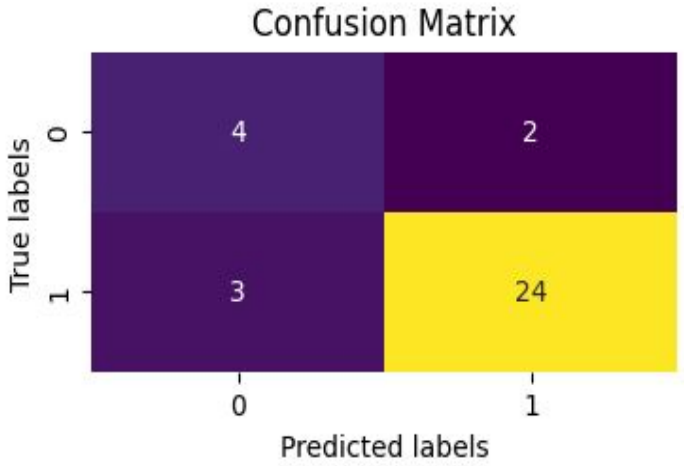
(b) for oversampling

Confusion Matrix

Confusion Matrix for Naive Bayes:



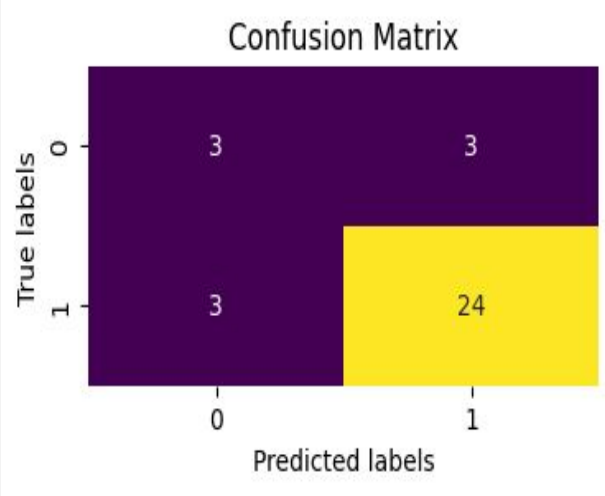
(a) for original dataset



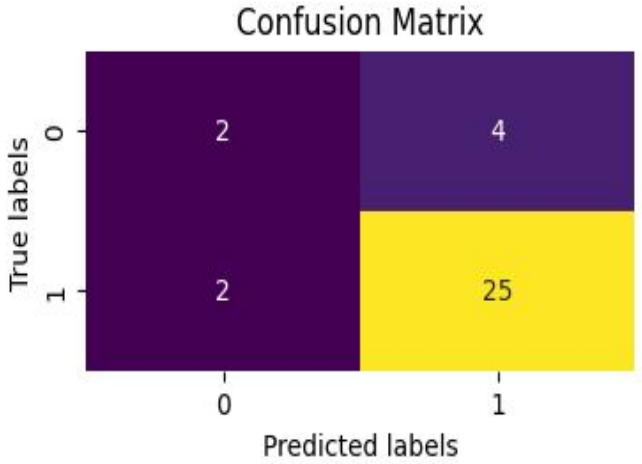
(b) for oversampling

Confusion Matrix

Confusion Matrix for Support Vector Machine:



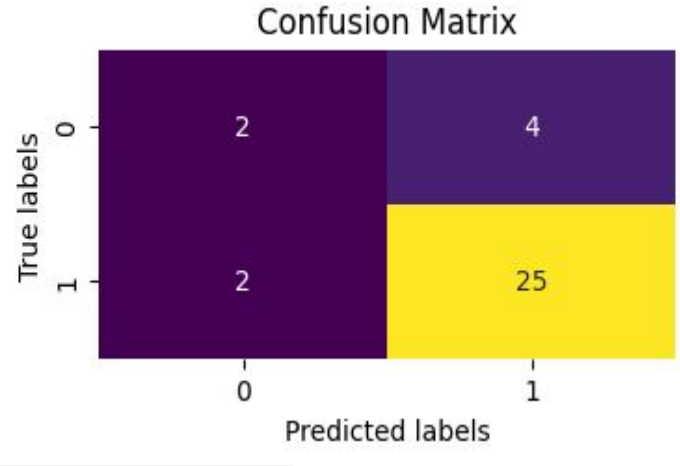
(a) for original dataset



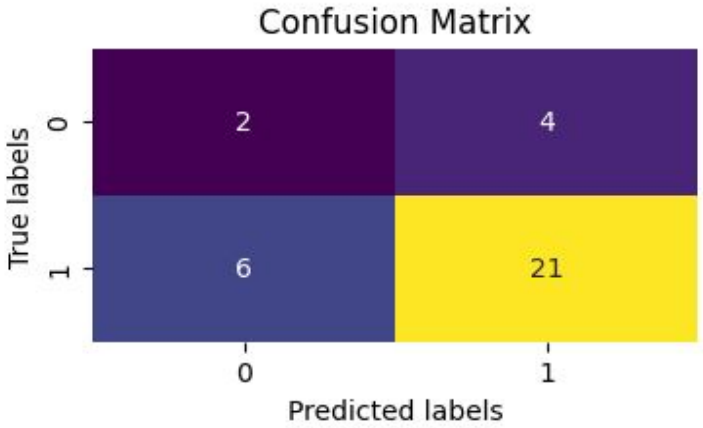
(b) for oversampling

Confusion Matrix

Confusion Matrix for Random Forest:



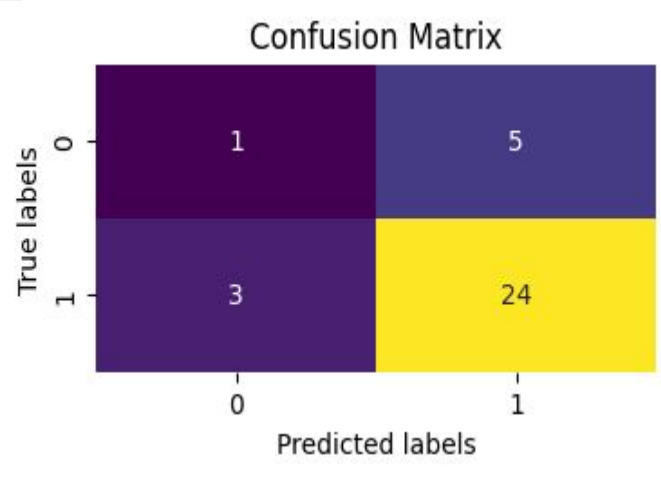
(a) for original dataset



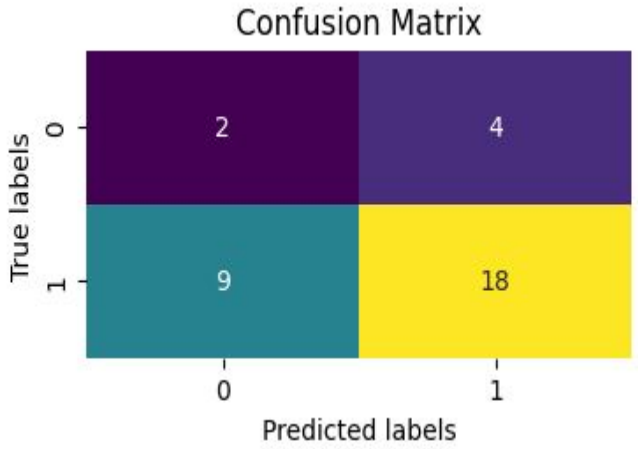
(b) for oversampling

Confusion Matrix

Confusion Matrix for K-Nearest Neighbor:



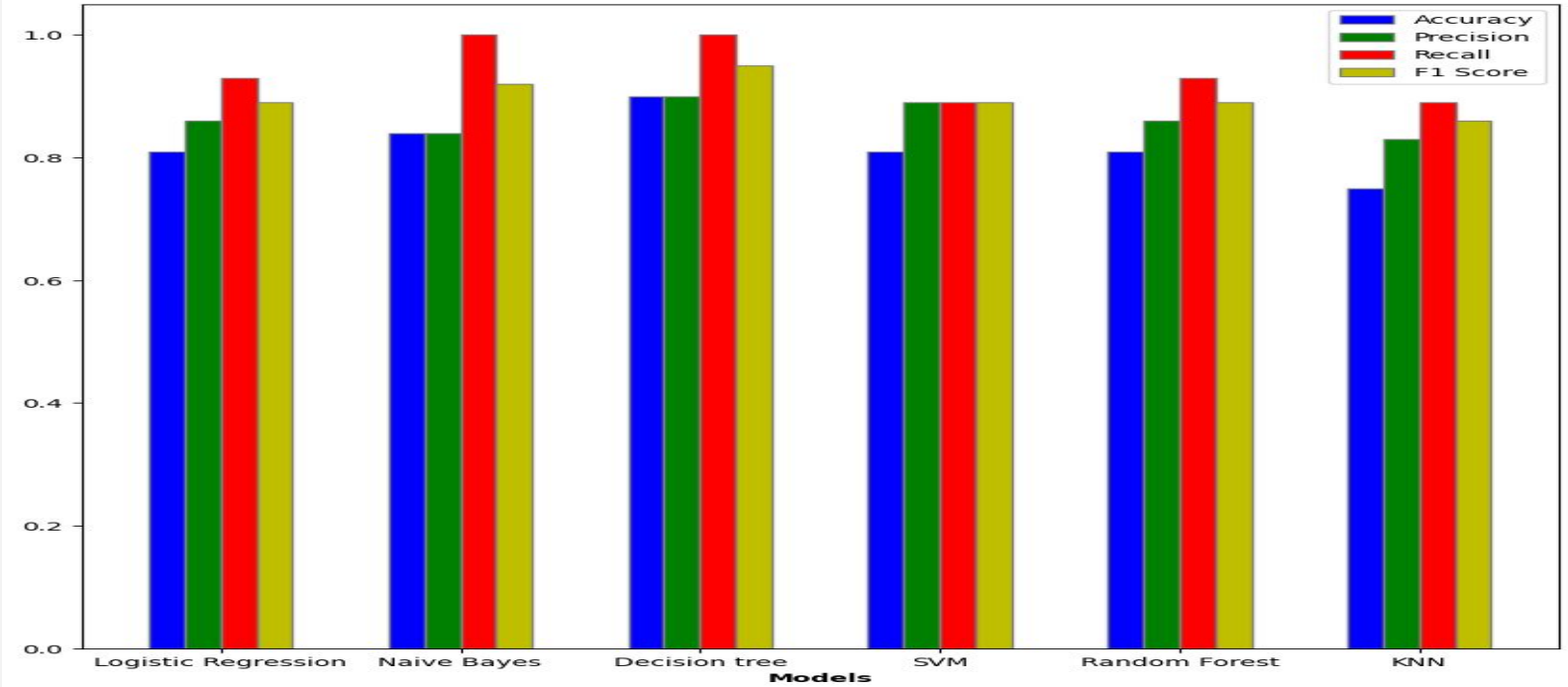
(a) for original dataset



(b) for oversampling

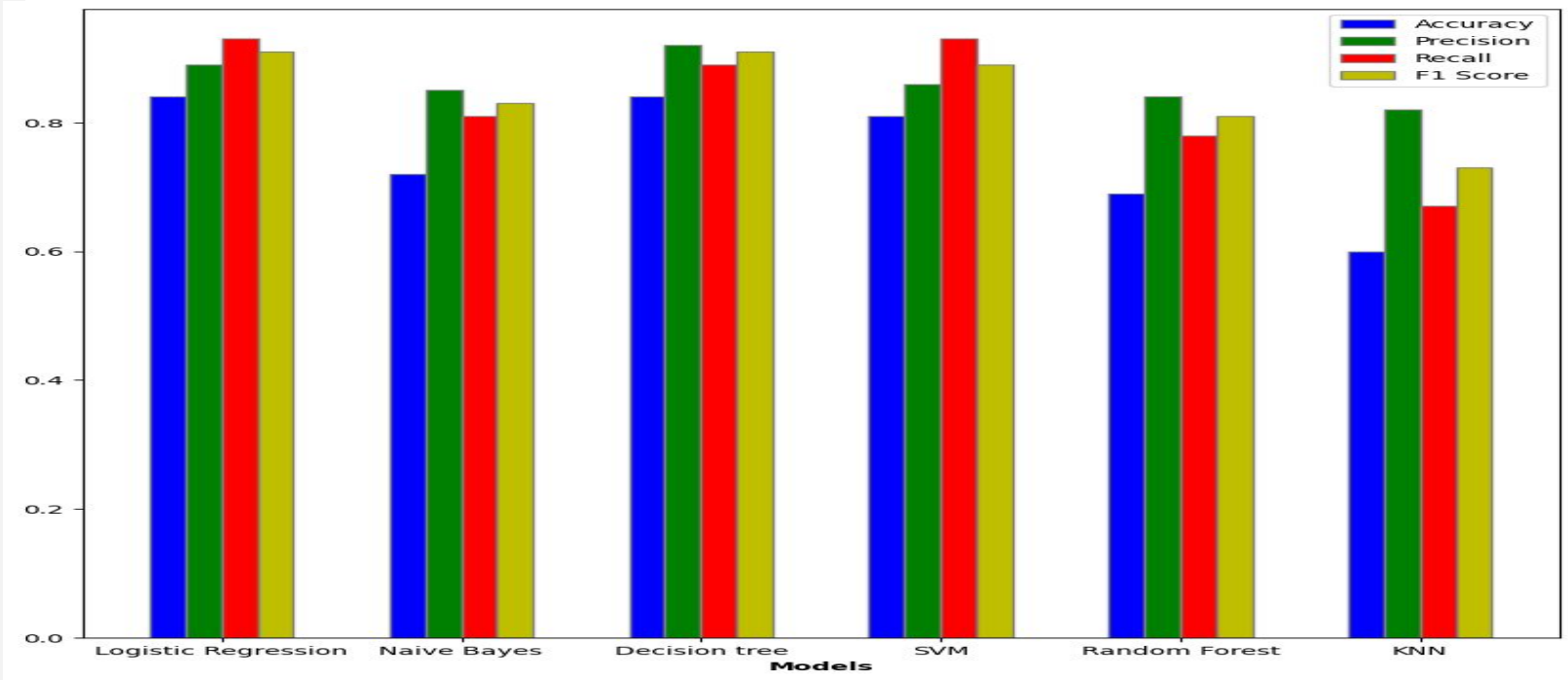
Performance Analysis

Performance (Accuracy, Precision, Recall, F1-score) Evaluation of Classifiers for original dataset



Performance Analysis

Performance (Accuracy, Precision, Recall, F1-score) Evaluation of Classifiers for oversampling



Conclusion

- We investigated work-life balance for working women, identifying critical elements like workplace policies and family dynamics.
- We utilized machine learning models including logistic regression and naive Bayes to analyze collected data.
- We achieved high accuracy (90%) with Naive Bayes, employing diverse metrics due to dataset imbalance.
- We significantly contributed to understanding and measuring work-life balance for working women through machine learning approaches.

Future Work

- Expand the dataset to comprehensively analyze work-life balance factors for diverse working women in Bangladesh, using machine learning algorithms.
- Augment qualitative insights through interviews or surveys to capture subjective experiences, enhancing the depth of understanding.
- Collaborate with organizations in banking, IT, and other industries to access real-time data and integrate policies for a holistic understanding of work-life balance influences.

References

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[4] Khan, S., Thomas, G., Kunbhar, B.A. and Mohamed, N.H.M., 2022. Impact of Work–Life Balance on Working Women in the Banking Sector. *Administrative Sciences*, *13*(1), p.7

[5] Pawlicka, A., Pawlicki, M., Tomaszewska, R., Choraś, M. and Gerlach, R., 2020. Innovative machine learning approach and evaluation campaign for predicting the subjective feeling of work-life balance among employees. *PloS one*, *15*(5), p.e0232771.

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THANKS!