



## **Parul Institute of Engineering & Technology Internship Report Guideline**

### **Appendix 1**

# **Customer Churn Prediction for a Telecommunications Company**

## **A PROJECT REPORT**

*Submitted by*

**KOPPULA SUDHAKAR**

**200303124305**

*In partial fulfillment for the award of the degree of*

**BACHELOR OF ENGINEERING**

*in*

**COMPUTER SCIENCE AND ENGINEERING**

**Parul Institute of Engineering and  
Technology, Limda**

## Appendix 2



**Parul University, Limda**  
**March-2024**

**Parul Institute of Engineering & Technology, Limda**



## CERTIFICATE

This is to certify that the project report submitted along with the project entitled "**Customer Churn Prediction for a Telecommunications Company**" has been carried out by **KOPPULA SUDHAKAR (200303124305)** under my guidance in partial fulfillment for the degree of Bachelor of Engineering in Computer Science and Engineering, 8<sup>th</sup> Semester of Gujarat Technological University, Ahmadabad during the academic year 2023-24.

Yatin Shukla

Internal Guide

Dr. Amit Barve

Head of the Department

**Appendix 3**  
**[Industry Letter Head]**

Date: 02/12/2024

**TO WHOM IT MAY CONCERN**

This is to certify that Koppula Sudhakar, a student of Parul Institute of Engineering and Technology has successfully completed his/her internship in the field of <Data Science / Field> from <5/12/2023> to <5/04/2024> (Total number of Weeks: 16) under the guidance of Yuvraj Lodhi.

His internship activities include <Internship Activities>.

During the period of her/ his internship program with us, he / she had been exposed to different processes and was found diligent, hardworking and inquisitive.

We wish him every success in his life and career.

For <Industry Name>

Authorised Signature with Industry Stamp

## Appendix 4

# Parul Institute of Engineering & Technology, Limda



## DECLARATION

We hereby declare that the Internship / Project report submitted along with the Internship / Project entitled "**Customer Churn Prediction for a Telecommunications Company**" submitted in partial fulfillment for the degree of Bachelor of Engineering in Computer Science and Engineering to Gujarat Technological University, Ahmedabad, is a bonafide record of original project work carried out by me at **Edzu Edtech (Ghaziabad)** under the supervision of **Yuvraj Lodhi** and that no part of this report has been directly copied from any students' reports or taken from any other source, without providing due reference.

**Name of the Student**

1

Koppula Sudhakar

**Sign of Student**

## **Acknowledgment**

Behind any major work undertaken by an individual, there lies the contribution of the people who helped them to cross all the hurdles to achieving a goal. It gives me immense pleasure to express our sense of sincere gratitude towards our respected guide Sr.Asst.Prof. Yatin Shukla, professor for his persistent, outstanding, invaluable cooperation and guidance. It is our achievement to be guided under his. He is a constant source of encouragement and momentum that any intricacy becomes simple. We gained a lot of invaluable guidance and prompt suggestions from him during the ideation of the project. We will be indebted to him forever and we take pride to work under his guidance.

**Place:**

**Date:**

**Koppula Sudhakar– 200303124305**

## **Abstract**

Customer turnover is a big problem and one of the biggest concerns for large companies. Since this directly affects the revenue of companies, especially the telecommunications industry, companies are trying to develop ways to predict changes in the number of potential customers. Therefore, it is important to find factors that increase customer turnover to take the necessary measures to reduce turnover. The main contribution of our work is the development of churn prediction model that helps telecom operators predict customers who are likely to churn. The model developed in this work uses machine learning techniques on a big data platform and creates a new way to design and select features. A standard measure of area under the curve (AUC) is used to measure model performance, and the resulting AUC value is 93.3%. Another important contribution is thus the social network of customers in the prediction-model, which separates the functions of social network analysis (SNA). Using SNA improved the performance of the model from 84 to 93.3% compared to the AUC standard. The model was and tested in the which ran on a large dataset, which transformed the large raw data provided by the telecommunications company. The model tested based on selection includes logistic Regression, Decision Trees, Random Forests, Gradient Boosting Machines, Support Vector Machine, Neural Networks.

## Table of Contents

|   |          |
|---|----------|
| Acknowledgment .....  | i        |
| Abstract .....  | ii       |
| Table of Contents .....   | iii      |
| <b>Chapter 1 Overview of The Company .....</b>  | <b>1</b> |
| 1.1 History .....   | 1        |
| 1.2 Different product / scope of work .....   | 2        |
| 1.3 Organization Chart .....  | 2        |
| 1.4 Capacity of plant .....   | 2        |
| Chapter 2 Overview of different plants/units/departments/shops of the organization and Layout<br>of     the     production/process     being     carried     out     in     the     company.<br>..... | 3        |
| 2.1 It includes the details about the work being carried out in each department.....  | 5        |
| 2.1.1 Business Development Manager (BDM).....   | 5        |
| 2.1.2 Project Kick-off Meeting .....  | 5        |
| 2.1.3 Documentation.....  | 5        |
| 2.1.4 Sprint Schedule .....   | 5        |
| 2.1.5 Testing Department.....   | 5        |
| 2.1.6 Alpha Testing.....  | 5        |
| 2.1.7 Pre – Production Deployment.....  | 6        |
| 2.1.8 Beta Testing .....  | 6        |
| 2.2 List the technical specifications of major equipment used in each department....  | 7        |
| 2.2.1 Business Development Manager (BDM).....   | 7        |
| 2.2.2 UI/UX Department.....   | 7        |
| 2.2.3 Senior Developer.....   | 7        |
| 2.2.4 Project Coordinator.....  | 7        |
| 2.2.5 Testing Department.....   | 7        |
| 2.2.6 Pre-production and Production Servers .....   | 8        |
| 2.2.7 Public Domain Server .....  | 8        |
| 2.3 Prepare a schematic layout that shows the sequence of operation for end product<br>manufacturing .....  | 9        |

|   |    |
|---|----|
| 2.4 Explain in detail about each stage of production .....                            | 10 |
| 2.4.1 New Lead .....  | 10 |
| 2.4.2 BDM (Business Development Manager) .....  | 10 |
| 2.4.3 Initial Project Requirements.....   | 10 |
| 2.4.4 Project Kickoff Meeting.....  | 10 |
| 2.4.5 Documentation .....   | 11 |
| 2.4.6 Sprint Schedule .....   | 11 |
| 2.4.7 Testing Phase .....   | 11 |
| 2.4.8 Alpha Testing.....  | 11 |
| 2.4.9 Pre-Production Deployment.....  | 12 |
| 2.4.10 Beta Testing .....   | 12 |
| Chapter 3 Introduction .....  | 13 |
| 3.1 Project / Internship Summary .....  | 13 |
| 3.2 Purpose.....  | 13 |
| 3.3 Objective.....  | 13 |
| 3.4 Scope (what it can do and can't do) .....   | 14 |
| 3.5 Technology and Literature Review.....   | 14 |
| 3.5.1 Technology.....   | 15 |
| 3.5.2 Literature Review.....  | 18 |
| 3.6 Project / Internship Planning.....  | 19 |
| 3.6.1 Project / Internship Development Approach and Justification .....               | 19 |
| 3.6.2 Project / Internship Effort and Time, Cost Estimation.....                      | 19 |
| 3.6.3 Roles and Responsibilities .....  | 19 |
| 3.6.4 Group Dependencies .....  | 19 |
| 3.7 Project / Internship Scheduling (Gantt Chart/PERT/Network Chart) .....            | 19 |
| Chapter 4 System Analysis .....   | 20 |
| 4.1 Study of Current System .....   | 20 |
| 4.2 Problem and Weaknesses of Current System .....                                    | 20 |
| 4.3 Requirements of New System.....   | 20 |
| 4.4 System Feasibility.....   | 20 |
| 4.4.1 Does the system contribute to the overall objectives of the organization? ..... | 20 |

|   |           |
|---|-----------|
| 4.4.2 Can the system be implemented using the current technology and within the given cost and schedule constraints ..... | 20        |
| 4.4.3 Can the system be integrated with other systems which are already in place? .....                                   | 20        |
| 4.5 Activity / Process in New System / Proposed System.....   | 22        |
| 4.6 Features of New System / Proposed System.....   | 22        |
| 4.7 List Main Modules / Components / Processes / Techniques of New System / Proposed System.....                          | 22        |
| 4.8 Selection of Hardware / Software / Algorithms / Methodology / Techniques / Approaches and Justification .....         | 22        |
| <b>References .....</b>   | <b>23</b> |
| <b>Appendix .....</b>   | <b>4</b>  |

# **CHAPTER-1**

## **1.0     OVERVIEW OF THE COMPANY**

### **1.1     History**

Established in 2023, Edzu is an edtech platform that helps students with internships, professional training programs, career guidance, and mentorship. Our aim is to bridge the gap between formal education and the everchanging requirements of the industry. At Edzu, we believe everyone should have the opportunity to create progress through technology and develop the skills of tomorrow. With assessments, learning paths and courses authored by industry experts, our platform helps individuals benchmark expertise across roles. Our mission is to train the world's workforce in the careers of the future. We partner with leading technology companies to learn how technology is transforming industries, and teach the critical tech skills that companies are looking for in their workforce.

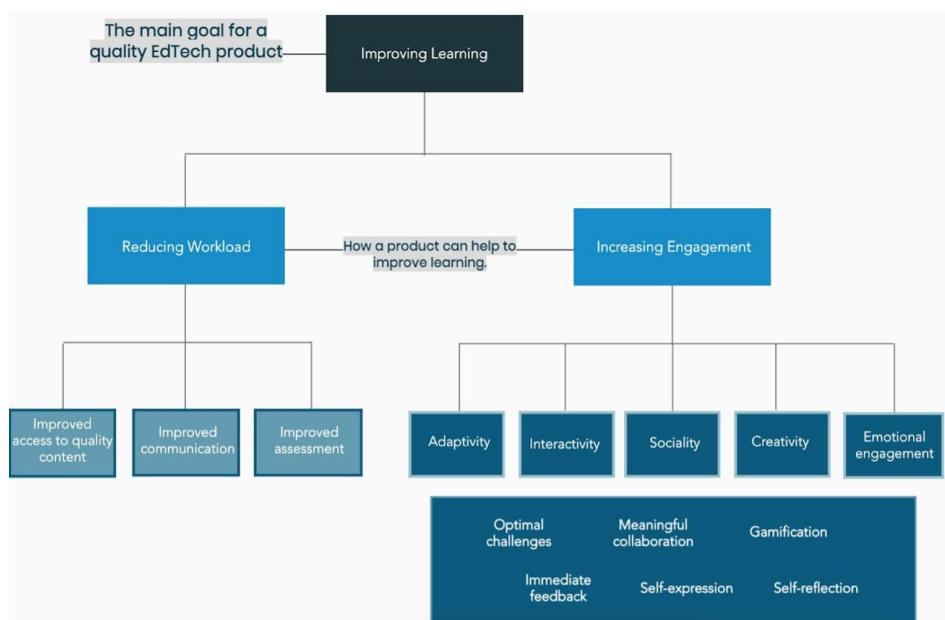
At EDZU, we believe everyone should have the opportunity to create progress through technology and develop the skills of tomorrow. With assessments, learning paths and courses authored by industry experts, our platform helps individuals benchmark expertise across **roles**. Our mission is to train the world's workforce in the careers of the future. We partner with leading technology companies to learn how technology is transforming industries, and teach the critical tech skills that companies are looking for in their workforce.

We are constantly working towards creating a name and a brand that is synonymous with success. Success for the platform. Success for our clients.

## 1.2 Different product / Scope of work

Internet website designers, digital marketing services, bulk text messaging services, computer software developers, computer software dealers, mobile application developers, and Android application developers are among the domains in which it is renowned for offering top-notch services.

## 1.3 Organization chart



## 1.4 Capacity of plant

**It is a company of 11- 20 employees.**

## **CHAPTER-2**

### **2.0 Overview of different plant / unit / department / shops of the organization and Layout of the production/process being carried out in the company.**

#### **Production / Process being in our company:**

##### **1. New Lead:**

- A potential client expresses interest in your company's services.

##### **2. BDM (Business Development Manager):**

- The BDM engages with the lead to understand their requirements and discuss the potential collaboration.

##### **3. Initial Project Requirements:**

- If the client agrees to collaborate, the lead is converted into a project.

##### **4. Project Kick-off Meeting:**

- Senior team members, including UI, UX, Sr. Developer, BDM, and Project Coordinator, meet with the client to gather detailed project requirements. This may include aspects like logo design, color schemes, contact details, and the business model of the project.

##### **5. Documentation:**

- The company team prepares comprehensive documentation based on the gathered project requirements.

## **6.Sprint Schedule:**

- Teams and departments collaborate based on the project's requirements, following a Sprint schedule. Regular updates are provided to the client during the development phase.

## **6. Testing Phase:**

- After development, the project goes to the testing department.
- Testers create test cases and conduct alpha testing, providing feedback to developers for any necessary adjustments.

## **7. Alpha Testing:**

- The alpha testing phase involves internal testing within the company to identify and fix any issues before moving to the next stage.

## **8. Pre-Production Deployment:**

- Upon successful alpha testing, the project is deployed to a pre-production server for beta testing.

## **10 Approval and Deployment:**

- After deployment and receiving approval, the project is released to the customer by deploying it to the public domain server.

## **2.1 It includes the details about the work being carried out in each department.**

### **2.1.1 Business Development Manager (BDM):**

- Engages with potential clients to understand their needs.
- Discuss collaboration and gather initial project requirements.

### **2.1.2 Project Kick-off Meeting:**

- Involves senior team members (UI, UX, Sr. Developer, BDM, Project Coordinator).
- Gather detailed project requirements, including design elements, contact details, and business models.

### **2.1.3 Documentation:**

- The company team compiles comprehensive documentation based on the gathered project requirements.

### **2.1.4 Sprint Schedule:**

- All departments collaborate based on the project's requirements.
- Follows a structured Sprint schedule for development with regular client updates.

### **2.1.5 Testing Department:**

- Receives the project after development for testing purposes.
- Testers create test cases and conduct alpha testing.
- Provide feedback to developers for necessary adjustments.

### **2.1.6 Alpha Testing:**

- Internal testing within the company to identify and fix any issues before moving forward

### **2.1.7 Pre – Production Deployment:**

- After successful alpha testing, the project is deployed to a pre– production server for beta testing.

### **2.1.8 Approval and Deployment:**

- After passing beta testing and receiving approval, the project is released to the customer.
- Deployed to the public domain server for public access.

**2.2 List the technical specifications of major equipment used in each department.**

**2.2.1 BDM (Business Development Manager):**

- Laptop or desktop computer
- Communication tools (email, messaging apps, video conferencing)
- Customer Relationship Management (CRM) software

**2.2.2 UI/UX Department:**

- High-performance computers with graphic design capabilities
- Graphics tablets for precise design work

**2.2.3 Senior Developer:**

- High-end development workstation (laptop or desktop)
- Integrated Development Environment (IDE) such as Visual Studio, IntelliJ, or Eclipse
- Version control system (e.g., Git)
- Collaboration tools for code review and sharing (e.g., GitHub, Bitbucket)

**2.2.4 Project Coordinator:**

- Project management software (e.g., Jupiter, python 3.8, )
- Communication tools for team collaboration
- Documentation tools (e.g., Microsoft Word, Google Docs)

**2.2.5 Testing Department:**

- Testing devices (computers, mobile devices, tablets) for cross-platform testing
- Automated testing tools (e.g., Selenium, JUnit)
- Bug tracking and test management tools (e.g., Bugzilla, TestRail)

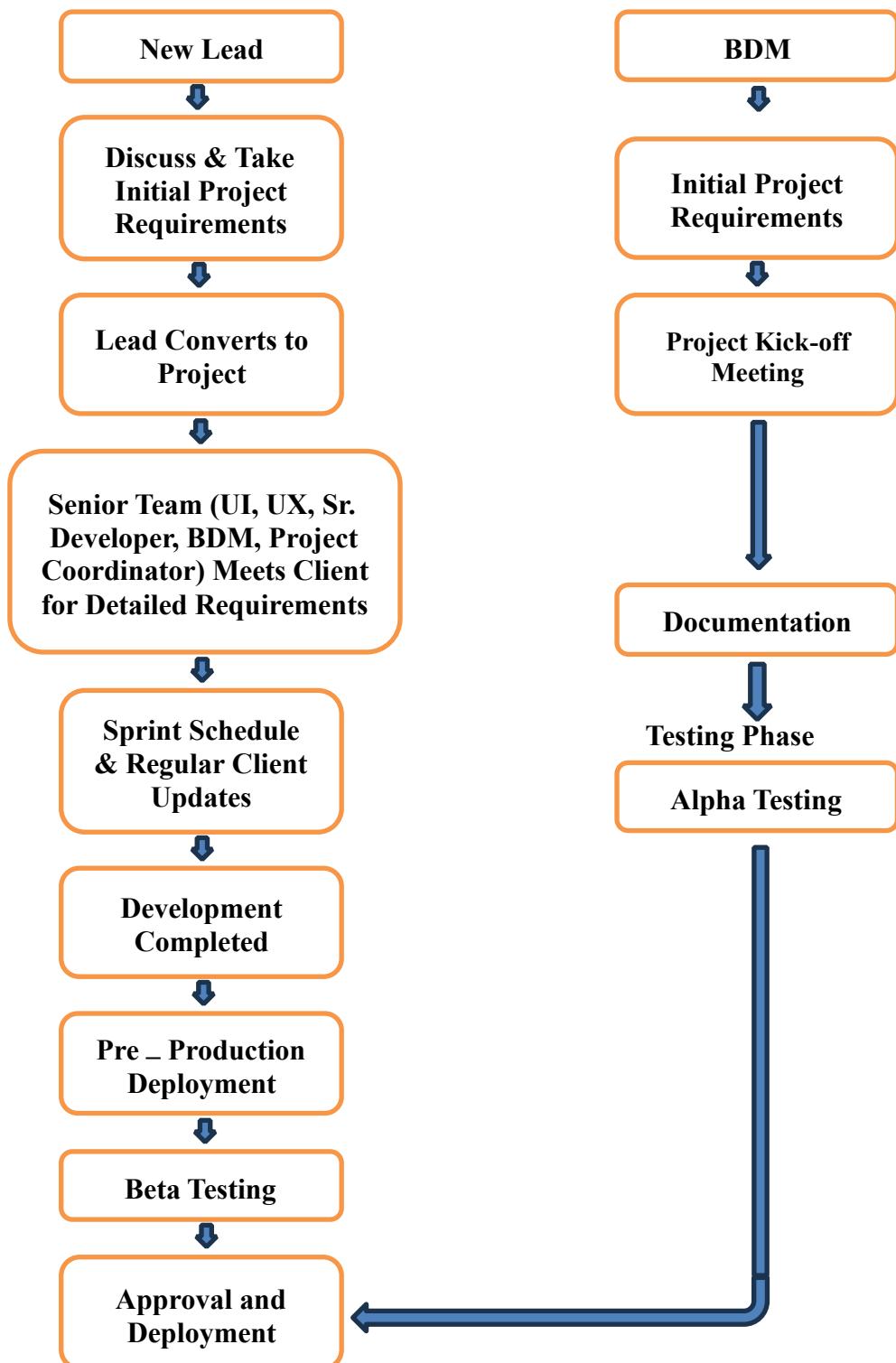
### **2.2.6 Pre-Production and Production Servers:**

- High-performance servers with adequate storage and processing power
- Virtualization software (e.g., VMware, Hyper-V)
- Web server software (e.g., Apache, Nginx)

### **2.2.7 Public Domain Server:**

- Anaconda Navigator

2.3 Prepare a schematic layout that shows the sequence of operation for end product manufacturing.



**2.4 Explain in detail about each stage of production.**

**2.4.1 New Lead:**

- This is the initial stage where a potential client expresses interest in your company's services. It could be through various channels such as direct inquiries, referrals, or marketing efforts.

**2.4.2 BDM (Business Development Manager):**

- The Business Development Manager engages with the lead to understand their needs, business objectives, and any specific requirements they may have. This involves discussions about the services your company offers, potential collaboration, and how your company can meet the client's needs.

**2.4.3 Initial Project Requirements:**

- If the client decides to collaborate, the lead is converted into a project. This stage involves a more in-depth discussion to gather the initial project requirements. The goal is to outline the scope, goals, and deliverables of the project.

**2.4.4 Project Kickoff Meeting:**

- A meeting is scheduled with key stakeholders, including UI, UX, Sr. Developer, BDM, and Project Coordinator, along with the client. This meeting is crucial for aligning everyone on the project's vision, understanding client expectations, and defining specific details like design preferences, functionalities, and project timelines.

#### **2.4.5 Documentation:**

- The project requirements gathered in the kickoff meeting are documented comprehensively. This documentation serves as a reference for the entire team and provides clarity on the project's scope, specifications, and deliverables.

#### **2.4.6 Sprint Schedule:**

- Teams and departments collaborate based on the documented project requirements. Work is organized into sprints, which are time-boxed development cycles. Regular updates are provided to the client, ensuring transparency and allowing for any adjustments or feedback during the development phase.

#### **2.4.7 Testing Phase:**

- After development, the project moves to the testing phase. This involves the testing department, where dedicated testers create and execute test cases to identify and report any issues.

#### **2.4.8 Alpha Testing:**

- During alpha testing, the project undergoes internal testing within the company. Testers simulate real-world scenarios and provide feedback to developers for adjustments. This phase is crucial for catching and fixing bugs or issues before external testing.

#### **2.4.9 Pre-Production Deployment:**

- Upon successful completion of alpha testing, the project is deployed to a preproduction server. This environment mimics the production environment but is not accessible to the public. It allows for further testing and validation before moving to the next stage.

#### **2.4.10 Approval and Deployment:**

- Once the project passes beta testing and receives client approval, it is deployed to the public domain server. This marks the official release of the project to the intended audience.

Each stage is carefully designed to ensure a systematic and thorough approach to project development, from initial client engagement to the final deployment of the product. The emphasis on documentation, testing, and client collaboration throughout the process helps deliver a high-quality product that aligns with the client's expectations.

## **CHAPTER-3**

### **3.0 INTRODUCTION**

**3.1 Project / Internship Summary – The key to a good summary is the FIRST sentence, which MUST contain the most essential information that you wish to convey.**

At EDZU, we believe everyone should have the opportunity to create progress through technology and develop the skills of tomorrow. With assessments, learning paths and courses authored by industry experts, our platform helps individuals benchmark expertise across roles. Our mission is to train the world's workforce in the careers of the future. We partner with leading technology companies to learn how technology is transforming industries, and teach the critical tech skills that companies are looking for in their workforce.

We are constantly working towards creating a name and a brand that is synonymous with success. Success for the platform. Success for our clients.

economy but also develops community bonds, fostering a sense of belonging. Get certified by the end of the course and be industry ready with the placement assistance program.

### **3.2 Purpose**

The purpose of the Edzu Edtech is to provide a reliable and convenient service for delivering internships and projects to customers, while also supporting local businesses .

### **3.3 Objective**

The objective of the provide new projects and technicalities to the students who have applied to internship p in our company and is to create data science and analytics for further study.

### **3.4 Scope (what it can do and can't do)**

This makes huge impact on company economy and student brilliance and make the students to participate in placements.

#### **The application can do:**

- Allow customers to customize their subscriptions, order placing, alteration, and cancellation
- Use algorithms to ensure on-time delivery, optimize efficiency, and minimize environmental impact

#### **The application cannot do:**

- Unsupervised problems and its algorithms. Guarantee the quality or availability of the project and datasets.

Provide refunds or compensation for any delays, damages, or dissatisfaction

### **3.5**

#### **Technology :**

**PYTHON**

## **Literature Review**

### **3.5.1 Customer churn prediction in telecommunications**

This paper presents a new set of features for land-line customer churn prediction, including 2 six-month Henley segmentation, precise 4-month call details, line information, bill and payment information, account information, demographic profiles, service orders, complain information, etc. Then the seven prediction techniques (Logistic Regressions, Linear Classifications, Naive Bayes, Decision Trees, Multilayer Perceptron Neural Networks, Support Vector Machines and the Evolutionary Data Mining Algorithm) are applied in customer churn as predictors, based on the new features

### **3.5.2 An enhanced ensemble classifier for telecom churn prediction using cost based uplift modelling**

Telecom, being a dynamic and competitive industry which contains an inherently high potential for customer churn, necessitating of accurate churn prediction models. Regular classification approaches fail to effectively predict churn due to low correlation levels between conventional performance metrics and business goals.

### **3.5.3 A Swish RNN based customer churn prediction for the telecom industry with a novel feature selection strategy**

Owing to saturated markets, fierce competition, dynamic criteria, along with introduction of new attractive offers, the considerable issue of customer churn was faced by the telecommunication industry. Thus, an efficient Churn Prediction (CP) model is required for monitoring customer churn.

### **3.5.4 Hybrid approach using machine learning algorithms for customers' churn prediction in the telecommunications industry**

Ensemble learning involves using several individual classifiers and combining their predictions, which may result in better performance than a single classifier. This article proposes a two-layer flexible voting ensemble model to predict the customer churn rates in the telecommunication industries.

### **3.5.5 New insights into churn prediction in the telecommunication sector: A profit driven data mining approach**

Customer churn prediction models aim to indicate the customers with the highest propensity to attrite, allowing to improve the efficiency of customer retention campaigns and to reduce the costs associated with churn. Although cost reduction is their prime objective, churn prediction models are typically evaluated using statistically based performance measures, resulting in suboptimal model selection

### **3.5.6 A comparison of machine learning techniques for customer churn prediction**

We present a comparative study on the most popular machine learning methods applied to the challenging problem of customer churning prediction in the telecommunications industry. In the first phase of our experiments, all models were applied and evaluated using cross-validation on a popular, public domain dataset.

### **3.5.7 A comparative analysis of data preparation algorithms for customer churn prediction: A case study in the telecommunication industry**

Data preparation is a process that aims to convert independent (categorical and continuous) variables into a form appropriate for further analysis. We examine data-preparation alternatives to enhance the prediction performance for the commonly-used logit model.

### **3.5.8 Customer Churn Prediction in Telecommunication Industry Using Deep Learning**

Without proper analysis and forecasting, industries will find themselves repeatedly churning customers, which the telecom industry in particular cannot afford. A predictable model for customers will allow companies to retain current customers and to obtain new ones.

### **3.5.9 Customer Churn Analysis in Telecom Industry**

With the rapid development of telecommunication industry, the service providers are inclined more towards expansion of the subscriber base. To meet the need of surviving in the competitive environment, the retention of existing customers has become a huge challenge. In the survey done in the Telecom industry, it is stated that the cost of acquiring a new customer is far more than retaining the existing one.

### **3.5.10 Multi-objective feature selection by using NSGA-II for customer churn prediction in telecommunications**

This paper proposes a new multiobjective feature selection approach for churn prediction in telecommunication service field, based on the optimisation approach NSGA-II. The basic idea of this approach is to modify the approach NSGA-II to select local feature subsets of various sizes, and then to use the method of searching nondominated solutions

### **3.5.11 Deep Churn Prediction Method for Telecommunication Industry**

Being able to predict the churn rate is the key to success for the telecommunication industry. It is also important for the telecommunication industry to obtain a high profit. Thus, the challenge is to predict the churn percentage of customers with higher accuracy without comprising the profit.

### **3.5.12 Analysis of Customer Churn Prediction in Telecom Industry using Decision Trees and Logistic Regression**

Customer churn prediction in Telecom industry is one of the most prominent research topics in recent years. It consists of detecting customers who are likely to cancel a subscription to a service. Recently, the mobile telecommunication market has changed from a rapidly growing market into a state of saturation and fierce competition.

### **3.5.13 A novel customer churn prediction model for the telecommunication industry using data transformation methods and feature selection**

Customer churn is one of the most critical issues faced by the telecommunication industry (TCI). Researchers and analysts leverage customer relationship management (CRM) data through the use of various machine learning models and data transformation methods to identify the customers who are likely to churn.

### **3.5.14 Predicting Customer Churn in the Telecommunications Industry — An Application of Survival Analysis Modeling Using SAS**

Conventional statistical methods (e.g. logistics regression, decision tree, and etc.) are very successful in predicting customer churn. However, these methods could hardly predict when customers will churn, or how long the customers will stay with.

### **3.5.15 A REVIEW ON CUSTOMER CHURN PREDICTION DATA MINING MODELING TECHNIQUES**

To find one of the best data mining techniques in telecommunication especially in customer churn prediction. Methods/Statistical Analysis: This paper presents a review of customer's churn prediction in the telecommunication. The study shows a large number of attributes that are used to put into practice to develop customer churn prediction model by the large number of reviewer.

### **3.5.16 Customer Churn Prediction in Telecommunications Industry Based on Data Mining**

Nowadays, many businesses and organizations have begun to collect data on their future and current customers to evaluate churning rate and prevent the loss of potential customers while also keeping the current customers and making them happy. The challenging part, however, is not gathering the data, rather, it arises when these data are processed, and consumers are segmented based on the information collected.

### **3.5.17 Churn Prediction in Telecommunication using Logistic Regression and Logit Boost**

Today in every industry weather, it is ISP, IT products, social network or mobile services there is the problem of customer churn (Customers changing their services from one service provider to another).

### **3.5.18 A comparative study of customer churn prediction in telecom industry using ensemble based classifiers**

Churn Prediction plays a vital role in various domains like life insurance, banking and telecom industry. With the current advancement in Machine Learning and Artificial Intelligence, Churn Prediction is more realistic and accurate

### **3.5.19 Multi-objective rain optimization algorithm with WELM model for customer churn prediction in telecommunication sector**

Customer retention is a major challenge in several business sectors and diverse companies identify the customer churn prediction (CCP) as an important process for retaining the customers. CCP in the telecommunication sector has become an essential need owing to a rise in the number of the telecommunication service providers. Recently, machine learning (ML) and deep learning (DL) models have begun to develop effective CCP model. This paper presents a new improved synthetic minority over-sampling technique (SMOTE) with optimal weighted extreme machine learning (OWELM) called the ISMOTE-OWELM model for CCP.

### **3.5.20High Accuracy Predictive Modelling for Customer Churn Prediction in Telecom Industry**

Churn prediction is an important factor to consider for Customer Relationship Management (CRM). In this study, statistical and data mining techniques were used for churn prediction. We use linear (logistic regression) and non-linear techniques of Random Forest and Deep Learning architectures including Deep Neural Network, Deep Belief Networks and Recurrent Neural Networks for prediction.

### **3.6 Project / Internship Planning**

#### **3.6.1 Project / Internship Development Approach and Justification**

Clearly defining the objective of project and set directions for development process. Objectives include reducing churn rate by certain percentage.

First define the project objectives and data collection and exploration, feature engineering, model selection and training and model evaluation and validation, hyperparameter tuning and optimization, deployment and integration, monitoring and maintenance.

telecommunication company.

#### **3.6.2 Project / Internship Effort and Time, Cost Estimation**

**Effort and Time:** Requires 3 months to complete whole major project and its

Additionals.

#### **Cost Estimation:**

#### **3.6.3 Roles and Responsibilities**

It is done by individual and responsibility of it will be his/herself.

#### **3.6.4 Group Dependencies**

It is done individually and at least it got finalised by mentor.

### **3.7 Project / Internship Scheduling (Gantt Chart/PERT/Network Chart)**

| Task                              | Duration (Weeks) | Start Date |
|-----------------------------------|------------------|------------|
| Project Planning                  | 1                | 02/10/2024 |
| Data Collection and Cleaning      | 2                | 02/17/2024 |
| Exploratory Data Analysis (EDA)   | 2                | 03/02/2024 |
| Feature Engineering               | 3                | 03/16/2024 |
| Model Selection and Training      | 4                | 04/06/2024 |
| Model Evaluation and Fine-tuning  | 3                | 05/04/2024 |
| Documentation and Report Writing  | 2                | 05/25/2024 |
| Final Presentation and Submission | 1                | 06/08/2024 |

## **CHAPTER-4**

### **4.0 System Analysis**

#### **4.1 Study of Current System**

It is prediction for churn analysis of telecommunication company. It is only for prediction by using the Python libraries and Datasets.

#### **4.2 Problem and Weaknesses of the Current System**

The problem depends on mainly datasets.

#### **4.3 Requirements of New System**

There is no requirement of new systems but datasets are required.

#### **4.4 System Feasibility**

##### **4.4.1 Does the system contribute to the overall objectives of the organization?**

Implementing a customer churn prediction system in telecommunications company Can significantly contribute to the overall objectives of the organization in several ways like improved customer retention and enhanced customer experience and revenue growth etc.

##### **4.4.2 Can the system be implemented using the current technology and within the given cost and schedule constraints**

Based on assessments of the factors, determine the implementation of system is feasible within the current technology, cost constraints and schedule constraints.

##### **4.4.3 Can the system be integrated with other systems that are already in place?**

By effectively integrating the churn prediction system with other existing systems, Organizations can leverage the predictive insights to enhance customer interactions, Optimize marketing campaigns, improve customer service and ultimately reduce Churn rates.

#### **4.5 Activity / Process in New System / Proposed System**

By implementing the activities and processes in the proposed churn prediction System, the telecommunications company can effectively identify at risk customers, take proactive measures to retain them, and ultimately reduce churn rates.

#### **4.6 Features of New System / Proposed System**

Features of proposed systems are customer demographics, usage patterns, service history, customer interactions, billing and payment history, customer sentiment analysis, customer lifecycle events, competitor activity, predictive analytics models and real time monitoring and alerts

#### **4.7 List Main Modules / Components / Processes / Techniques of New System / Proposed System**

The main modules are data collection, data preprocessing module, feature engineering module, model development module, model evaluation module, hyperparameter tuning module, deployment module, monitoring and maintenance module, integration with business process module, feedback loop and iteration module.

#### **4.8 Selection of Hardware / Software / Algorithms / Methodology / Techniques / Approaches and Justification**

Hardware:

Requirements: Considerations include computational power, memory, and storage capacity handle large volumes of data and perform complex machine learning tasks efficiently.

Selection: Cloud-based platforms such as AWS, Azure, or Google Cloud offer scalable infrastructure options suited for data processing and machine learning tasks. Alternatively, on-premises servers or clusters can be used, depending on the organization's preferences and existing infrastructure.

Software:

Requirements: Look for software tools that support data preprocessing, feature engineering, model development, deployment, and monitoring.

Selection: Popular choices include Python-based libraries such as pandas, scikit-learn, TensorFlow, and PyTorch for data manipulation, modeling, and deep learning. Additionally, frameworks like Apache Spark may be used for distributed computing tasks. Tools like Docker and Kubernetes facilitate containerization and orchestration of machine learning workflows.

## Algorithms:

Requirements: Algorithms should be capable of capturing complex relationships in the data and providing accurate predictions.

Selection: Consider a mix of traditional machine learning algorithms such as logistic regression, decision trees, random forests, and gradient boosting machines (GBM), along with deep learning techniques like neural networks. Ensemble methods combining multiple algorithms often yield better performance.

## Methodology:

Requirements: The methodology should be systematic, iterative, and data-driven, ensuring that models are developed and evaluated rigorously.

Selection: Adopt a CRISP-DM (Cross-Industry Standard Process for Data Mining) or similar framework for data mining projects. This methodology involves distinct phases including business understanding, data understanding, data preparation, modeling, evaluation, and deployment, facilitating a structured approach to churn prediction projects.

## Techniques:

Requirements: Techniques should address data preprocessing, feature engineering, model selection, evaluation, and deployment.

Selection: Use techniques such as feature scaling, dimensionality reduction (e.g., PCA), categorical encoding, and imputation for data preprocessing. Feature selection methods like recursive feature elimination (RFE) or L1 regularization can help identify relevant features. For model evaluation, utilize metrics like accuracy, precision, recall, F1-score, and ROC-AUC. Techniques such as grid search, random search, or Bayesian optimization may be employed for hyperparameter tuning.

## Approaches:

Requirements: Choose approaches that align with the organization's objectives, data characteristics, and domain expertise.

Selection: Consider both supervised and unsupervised learning approaches. Supervised learning models predict churn based on labeled historical data, while unsupervised techniques like clustering may uncover hidden patterns in unlabeled data. Additionally, ensemble methods like stacking or blending can combine multiple models for improved performance.

## Justification:

The selected hardware, software, algorithms, methodology, techniques, and approaches collectively enable the development of a robust churn prediction system tailored to the telecommunications industry. They provide the necessary tools, frameworks, and methodologies to handle large-scale data processing, build accurate predictive models, and deploy them into production environments. By following a systematic and data-driven approach, organizations can effectively identify at-risk customers, implement targeted retention strategies, and reduce churn rates, ultimately improving customer satisfaction and business performance.

## **REFERENCES**

- 1.Bingquan Huang, School of Computer Science and Informatics, University College Dublin, Belfield, Dublin 4, Ireland. In: Customer churn prediction in telecommunications.
2. Ammar A.Q. Ahmed, Rathnnavel Subramainam College of Arts & Science, Coimbatore, Tamil Nadu, India. In : Churn prediction on huge telecom data using hybrid firefly based classification.
3. R. Sudharsan, Department of Computer Science and Engineering, Vels Institute of Science, Technology & Advanced Studies, Chennai, India.In: A Swish RNN based customer churn prediction for the telecom industry with a novel feature selection strategy.
4. Yogesh Beeharry, Department of Electrical and Electronic Engineering, Faculty of Engineering, University of Mauritius, Réduit, Mauritius.In Hybrid approach using machine learning algorithms for customers' churn prediction in the telecommunications industry
5. Wouter Verbeke, Department of Decision Sciences and Information Management, Katholieke Universiteit Leuven, Naamsestraat 69, B-3000 Leuven, Belgium. In: New insights into churn prediction in the telecommunication sector: A profit driven data mining approach.
6. T. Vafeiadis, mSensis S.A., VEPE Technopolis, Bld C2, P.O. Box 60756, GR-57001 Thessaloniki, Greece.In: A comparison of machine learning techniques for customer churn prediction.
7. Stefan Lessmann, Humboldt-University of Berlin, Unter den Linden 6, D-10099 Berlin, Germany.In: A comparative analysis of data preparation algorithm for customer churn prediction: A case study in the telecommunication industry.
8. Samah Wael Fujo , Suresh Subramanianand Moaiad Ahmad Khder , College of Information Technology, Ahlia University, Bahrain Department of Computer Science, Applied Science University, Bahrain.In: Customer Churn Prediction in Telecommunication Industry Using Deep Learning.
9. .Kiran Dahiya, Computer Science Department Manav Rachna College of Engineering Faridabad, India.In: Customer churn analysis in telecom industry.
- 10.Bingquan Huang, School of Computer Science and Informatics, University College Dublin, Belfield, Dublin 4, Ireland.In: Multi-objective feature selection by using NSGA-II for customer churn prediction in telecommunication

- 11.Ms. Lewlisa Saha,School of Computer Engineering, Kalinga Institute of Industrial Technology, Bhubaneswar 751024, India.In: Deep Churn Prediction Method for Telecommunication Industry.
12. Preeti K. Dalvi, Department of Computer Science PVG's COET Pune, India.In: Analysis of customer churn prediction in telecom industry using decision trees and logistic regression.
13. Joydeb Kumar Sana, Department of Computer Science and Engineering, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh.In: A novel customer churn prediction model for the telecommunication industry using data transformation methods and feature selection.
14. Junxiang Lu, Ph.D. Sprint Communications Company Overland Park, Kansas.  
In: Predicting Customer Churn in the Telecommunications Industry — An Application of Survival Analysis Modeling Using SAS.
15. Ammara Ahmed, Department of CSE Rathnavel Subramaniam College of Arts & Science Coimbatore, India.In: A review and analysis of churn prediction methods for customer retention in telecom industries.
16. Lawchak Fadhil Khalid, Information Technology Dept. Duhok Polytechnic University Duhok, Iraq.In: Customer Churn Prediction in Telecommunications Industry Based on Data Mining.
17. **Hemlata Jain**, 2013PUSBAPHDE02477, Computer Science, School of Basic and Applied Sciences, Poornima University Jaipur-303905, India.In: Churn Prediction in Telecommunication using Logistic Regression and Logit Boost.
18. Abinash Mishra, Department of Computer Applications National Institute of Technology Tiruchirappalli, Tamil Nadu, India.In: A comparative study of customer churn prediction in telecom industry using ensemble based classifiers.

**19.** Irina V. Pustokhina, Department of Entrepreneurship and Logistics, Plekhanov Russian University of Economics, 117997, Moscow, Russia.In: Multi-objective rain optimization algorithm with WELM model for customer churn prediction in telecommunication sector.

**20.** R. Prashanth, Flytxt Mobile Solutions Pvt. Ltd., Carnival Technopark (Formerly Leela Infopark), Technopark, Trivandrum, 695581, Kerala, India.

In: High Accuracy Predictive Modelling for Customer Churn Prediction in Telecom Industry .