**PROJECT REPORT**

**INTRODUCTION**

**OVERVIEW:**

Customer retention is a measure of how many customers stay with your business for the long term. It's what demonstrates your business's ability to stimulate customers to make repeat purchases and spend more money on your products and services over time.

**PURPOSE:**

The goal of customer retention programs is to help companies retain as many customers as possible, often through customer loyalty and brand loyalty initiatives

**PROBLEM DEFINITION AND DESING THINKING :**

Customer retention refers to the rate at which customers stay with a business in a given period of time. This is often referred to as churn rate and is a key metric for practically all B2B and B2C businesses.

Ultimately, customer retention is about building relationships with your existing customers, providing value in every interaction, and giving them memorable experiences. It's about meeting customer expectations and building loyalty that encourages them to return to purchase your products or services over and over.

**EMPATHY MAP :**

**BRAINSTORM:**

**IMPORT LIBRARIES:**

**READ THE DATASET:**

Our dataset format might be in .csv, excel files, .txt, .json, etc. We can read the dataset with the help of pandas. In pandas we have a function called read\_csv() to read the dataset. As a parameter we have to give the directory of the csv file.

**Descriptive statistical**

Descriptive analysis is to study the basic features of data with the statistical process. Here pandas has a worthy function called describe. With this describe function we can understand the unique, top and frequent values of categorical features. And we can find mean, std, min, max and percentile values of continuous features.

**Visual analysis** :

Visual analysis is the process of using visual representations, such as charts, plots, and graphs, to explore and understand data. It is a way to quickly identify patterns, trends, and outliers in the data, which can help to gain insights and make informed decisions

**LOGISTIC REGRESSION:**

Logistic regression estimates the probability of an event occurring, such as voted or didn’t vote, based on a given dataset of independent variables. Since the outcome is a probability, the dependent variable is bounded between 0 and 1.

**Decision tree model :**

A function named decisionTree is created and train and test data are passed as the parameters. Inside the function, DecisionTreeClassifier algorithm is initialised and training data is passed to the model with the .fit() function. Test data is predicted with .predict() function and saved in a new variable. For evaluating the model, a confusion matrix and classification report is done.

**Random forest model:**

A function named randomForest is created and train and test data are passed as the parameters. Inside the function, RandomForestClassifier algorithm is initialised and training data is passed to the model with .fit() function. Test data is predicted with .predict() function and saved in a new variable. For evaluating the model, a confusion matrix and classification report is done.

**KNN model**

A function named KNN is created and train and test data are passed as the parameters. Inside the function, KNeighborsClassifier algorithm is initialised and training data is passed to the model with .fit() function. Test data is predicted with .predict() function and saved in new variable. For evaluating the model, confusion matrix and classification report is done

**SVM model**

“Support Vector Machine” (SVM) is a supervised machine learning algorithm that can be used for both classification or regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in n-dimensional space (where n is a number of features you have) with the value of each feature being the value of a particular coordinate.

**ANN model**

Building and training an Artificial Neural Network (ANN) using the Keras library with TensorFlow as the backend. The ANN is initialised as an instance of the Sequential class, which is a linear stack of layers. Then, the input layer and two hidden layers are added to the model using the Dense class, where the number of units and activation function are specified. The output layer is also added using the Dense class with a sigmoid activation function. The model is then compiled with the Adam optimizer, binary cross-entropy loss function, and accuracy metric. Finally, the model is fit to the training data with a batch size of 100, 20% validation split, and 100 epoch

**Building Html Pages:**

● base.html

● index.html

● predyes.html

● predno.html

**base.html**

<!DOCTYPE html>

<html lang="en">

<head>

<!-- Required meta tags-->

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">

<meta name="description" content="Colorlib Templates">

<meta name="author" content="Colorlib">

<meta name="keywords" content="Colorlib Templates">

<!-- Title Page-->

<title>Telecom Churn Modelling</title>

<!-- Icons font CSS-->

<link href="{{ url\_for('static', filename='vendor/font-awesome-4.7/css/font-awesome.min.css') }}" rel="stylesheet">

<link href="{{ url\_for('static', filename='vendor/mdi-font/css/material-design-iconic-font.min.css') }}" rel="stylesheet">

<!-- Font special for pages-->

<link href="https://fonts.googleapis.com/css?family=Roboto:100,100i,300,300i,400,400i,500,500i,700,700i,900,900i" rel="stylesheet">

<!-- Vendor CSS-->

<link href="{{ url\_for('static', filename='vendor/select2/select2.min.css') }}" rel="stylesheet">

<!-- Main CSS-->

<link href="{{ url\_for('static', filename='css/main.css') }}" rel="stylesheet">

</head>

<body>

<div class="page-wrapper bg-red p-t-100 p-b-100 font-robo">

<div class="wrapper wrapper--w960">

<div class="card card-2">

<div class="card-heading"></div>

<div class="card-body">

<h2 class="title">Telecom Customer Churn Prediction</h2>

<div class="row row-space">

<p>Customer churn has become highly important for companies because of increasing competition among companies, increased importance of marketing strategies and conscious behaviour of customers in the recent years. Customers can easily trend toward alternative services. Companies must develop various strategies to prevent these possible trends, depending on the services they provide. During the estimation of possible churns, data from the previous churns might be used. An efficient churn predictive model benefits companies in many ways. Early identification of customers likely to leave may help to build cost effective ways in marketing strategies. Customer retention campaigns might be limited to selected customers but it should cover most of the customer. Incorrect predictions could result in a company losing profits because of the discounts offered to continuous subscribers.</p>

<div class="p-t-30">

<img src="in.png" width="450" height="200" >

</div>

<div class="p-t-30">

<form action="/assesment">

<button class="btn btn--radius btn--green" type="submit">Click me to continue with prediction</button>

</form>

</div>

</div>

</div>

</div>

</div>

</div>

<!-- Jquery JS-->

<script src="{{ url\_for('static', filename='vendor/jquery/jquery.min.js') }}" type="text/javascript"></script>

<!-- Vendor JS-->

<script src="{{ url\_for('static', filename='vendor/select2/select2.min.js') }}" type="text/javascript"></script>

<!-- Main JS-->

<script src="{{ url\_for('static', filename='js/global.js') }}" type="text/javascript"></script>

</body>

</html>

<!-- end document-->

index.html

<!DOCTYPE html>

<html lang="en">

<head>

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<!-- Main CSS-->

<link href="{{ url\_for('static', filename='css/main.css') }}" rel="stylesheet">

</head>

<style>

</style>

<body>

<div class="page-wrapper bg-red p-t-100 p-b-100 font-robo">

<div class="wrapper wrapper--w960">

<div class="card card-2">

<div class="card-heading"></div>

<div class="card-body">

<h2 class="title">Prediction form</h2>

<form action="predno.html" method="post">

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="gender">

<option disabled="disabled" selected="selected">Gender</option>

<option value="f">female</option>

<option value="m">Male</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="srcitizen">

<option disabled="disabled" selected="selected">Senior Citizen</option>

<option value="y">Yes</option>

<option value="n">No</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="partner">

<option disabled="disabled" selected="selected">Partner</option>

<option value="y">Yes</option>

<option value="n">No</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="dependents">

<option disabled="disabled" selected="selected">Dependents</option>

<option value="y">Yes</option>

<option value="n">No</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<input class="input--style-2" type="number" placeholder="Tenure" name="tenure">

</div>

</div>

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="phservices">

<option disabled="disabled" selected="selected">Phone Services</option>

<option value="y">Yes</option>

<option value="n">No</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="multi">

<option disabled="disabled" selected="selected">Multiple Lines</option>

<option value="y">Yes</option>

<option value="n">No</option>

<option value="nps">No Phone service</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="is">

<option disabled="disabled" selected="selected">Internet services</option>

<option value="dsl">DSL</option>

<option value="fo">Fibre Optics</option>

<option value="n">No</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="os">

<option disabled="disabled" selected="selected">Online Services</option>

<option value="y">Yes</option>

<option value="n">No</option>

<option value="nis">No Internet service</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="ob">

<option disabled="disabled" selected="selected">Online Backup</option>

<option value="y">Yes</option>

<option value="n">No</option>

<option value="nis">No Internet service</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="dp">

<option disabled="disabled" selected="selected">Device Protection</option>

<option value="y">Yes</option>

<option value="n">No</option>

<option value="nis">No Internet service</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="ts">

<option disabled="disabled" selected="selected">Tech Support</option>

<option value="y">Yes</option>

<option value="n">No</option>

<option value="nis">No Internet service</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="stv">

<option disabled="disabled" selected="selected">Streaming TV </option>

<option value="y">Yes</option>

<option value="n">No</option>

<option value="nis">No Internet service</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="smv">

<option disabled="disabled" selected="selected">Streaming Movies</option>

<option value="y">Yes</option>

<option value="n">No</option>

<option value="nis">No Internet service</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="contract">

<option disabled="disabled" selected="selected">Contract </option>

<option value="mtm">Month to Month</option>

<option value="oyr">One year</option>

<option value="tyrs">Two Years</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="plb">

<option disabled="disabled" selected="selected">Paperless Billing</option>

<option value="y">Yes</option>

<option value="n">No</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<div class="rs-select2 js-select-simple select--no-search">

<select name="pmt">

<option disabled="disabled" selected="selected">Payment Methods</option>

<option value="ec">Electronic Check</option>

<option value="mail">Mail Check</option>

<option value="bt">Bank Transfer(Automatic)</option>

<option value="cc">Credit Card(Automatic)</option>

</select>

<div class="select-dropdown"></div>

</div>

</div>

</div>

<div class="col-2">

<div class="input-group">

<input class="input--style-2" type="text" placeholder="Monthly Charges" name="mcharges">

</div>

</div>

</div>

<div class="row row-space">

<div class="col-2">

<div class="input-group">

<input class="input--style-2" type="text" placeholder="Total Charges" name="tcharges">

</div>

</div>

</div>

<div class="p-t-30">

<button class="btn btn--radius btn--green" type="submit">Submit</button>

</div>

<div class="row row-space">

<div class="p-t-30">

<b>{{yes}}</b>

</div>

</div>

</form>

</div>

</div>

</div>

</div>

<!-- Jquery JS-->

<script src="{{ url\_for('static', filename='vendor/jquery/jquery.min.js') }}" type="text/javascript"></script>

<!-- Vendor JS-->

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<script src="{{ url\_for('static', filename='js/global.js') }}" type="text/javascript"></script>

</body><!-- This templates was made by Colorlib ([https://colorlib.com](https://colorlib.com/)) -->

</html>

<!-- end document-->s

predyes.html

<!DOCTYPE html>

<html lang="en">

<head>

<!-- Required meta tags-->

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<meta name="author" content="Colorlib">

<meta name="keywords" content="Colorlib Templates">

<!-- Title Page-->

<title>Telecom Customer Churn Prediction</title>

<!-- Icons font CSS-->

<link href="{{ url\_for('static', filename='vendor/font-awesome-4.7/css/font-awesome.min.css') }}" rel="stylesheet">

<link href="{{ url\_for('static', filename='vendor/mdi-font/css/material-design-iconic-font.min.css') }}" rel="stylesheet">

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<!-- Main CSS-->

<link href="{{ url\_for('static', filename='css/main.css') }}" rel="stylesheet">

</head>

<style>

.center {

margin: auto;

width: 70%;

padding: 10px;

}

</style>

<body>

<div class="page-wrapper bg-red p-t-100 p-b-100 font-robo">

<div class="wrapper wrapper--w960">

<div class="card card-2">

<div class="card-heading"></div>

<div class="card-body">

<h2 class="title">Telecom Customer Churn Prediction</h2>

<div class="center">

<img src="yes.jpg" width="400" height="300">

</div>

<h3 class="title"><p>The Churn Prediction says <b><u>{{yes}}</u></b></p></h3>

</div>

</div>

</div>

</div>

<!-- Jquery JS-->

<script src="{{ url\_for('static', filename='vendor/jquery/jquery.min.js') }}" type="text/javascript"></script>

<!-- Vendor JS-->

<script src="{{ url\_for('static', filename='vendor/select2/select2.min.js') }}" type="text/javascript"></script>

<!-- Main JS-->

<script src="{{ url\_for('static', filename='js/global.js') }}" type="text/javascript"></script>

</body><!-- This templates was made by Colorlib ([https://colorlib.com](https://colorlib.com/)) -->

</html>

<!-- end document-->

predno.html

<!DOCTYPE html>

<html lang="en">

<head>

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<!-- Title Page-->

<title>Financial Risk Management</title>

<!-- Icons font CSS-->

<link href="{{ url\_for('static', filename='vendor/font-awesome-4.7/css/font-awesome.min.css') }}" rel="stylesheet">

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.center {

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}

</style>

<body>

<div class="page-wrapper bg-red p-t-100 p-b-100 font-robo">

<div class="wrapper wrapper--w960">

<div class="card card-2">

<div class="card-heading"></div>

<div class="card-body">

<h2 class="title">Telecom Customer Churn Prediction</h2>

<div class="center">

<img src="images.jpg" width="400" height="300" >

</div>

<h3 class="title"><p>The Churn prediction says <b><u>{{no}}</u></b></p> </h3>

</div>

</div>

</div>

</div>

<!-- Jquery JS-->

<script src="{{ url\_for('static', filename='vendor/jquery/jquery.min.js') }}" type="text/javascript"></script>

<!-- Vendor JS-->

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</html>

Build Python code:

Import the libraries

Load the saved model. Importing the flask module in the project is mandatory. An object of Flask class is our WSGI application. Flask constructor takes the name of the current module (\_\_name\_\_) as argument.

Render HTML page:

Here we will be using a declared constructor to route to the HTML page which we have created earlier.

In the above example, ‘/’ URL is bound with the home.html function. Hence, when the home page of the web server is opened in the browser, the html page will be rendered. Whenever you enter the values from the html page the values can be retrieved using POST Method. Retrieves the value from UI: Here we are routing our app to predict() function. This function retrieves all the values from the HTML page using Post request. That is stored in an array. This array is passed to the model.predict() function. This function returns the prediction. And this prediction value will be rendered to the text that we have mentioned in the submit.html page earlier.

**python code :**

from flask import Flask, render\_template, request

import keras

from keras.models import load\_model

app = Flask(\_\_name\_\_)

model = load\_model(open('/Users/ELCOT/Desktop/Churn\_Modelling - Copy.csv'))

@app.route('/')

def helloworld():

return render\_template("base1.html")

@app.route('/assesment')

def prediction():

return render\_template("index1.html")

@app.route('/predict', methods = ['POST'])

def admin():

a= request.form["gender"]

if (a == 'f'):

a=0

if (a == 'm'):

a=1

b= request.form["srcitizen"]

if (b == 'n'):

b=0

if (b == 'y'):

b=1

c= request.form["partner"]

if (c == 'n'):

c=0

if (c == 'y'):

c=1

d= request.form["dependents"]

if (d == 'n'):

d=0

if (d == 'y'):

d=1

e= request.form["tenure"]

f= request.form["phservices"]

if (f == 'n'):

f=0

if (f == 'y'):

f=1

g= request.form["multi"]

if (g == 'n'):

g1,g2,g3=1,0,0

if (g == 'nps'):

g1,g2,g3=0,1,0

if (g == 'y'):

g1,g2,g3=0,0,1

h= request.form["is"]

if (h == 'dsl'):

h1,h2,h3=1,0,0

if (h == 'fo'):

h1,h2,h3=0,1,0

if (h == 'n'):

h1,h2,h3=0,0,1

i= request.form["os"]

if (i == 'n'):

i1,i2,i3=1,0,0

if (i == 'nis'):

i1,i2,i3=0,1,0

if (i == 'y'):

i1,i2,i3=0,0,1

j= request.form["ob"]

if (j == 'n'):

j1,j2,j3=1,0,0

if (j == 'nis'):

j1,j2,j3=0,1,0

if (j == 'y'):

j1,j2,j3=0,0,1

k= request.form["dp"]

if (k == 'n'):

k1,k2,k3=1,0,0

if (k == 'nis'):

k1,k2,k3=0,1,0

if (k == 'y'):

k1,k2,k3=0,0,1

l= request.form["ts"]

if (l == 'n'):

l1,l2,l3=1,0,0

if (l == 'nis'):

l1,l2,l3=0,1,0

if (l == 'y'):

l1,l2,l3=0,0,1

m= request.form["stv"]

if (m == 'n'):

m1,m2,m3=1,0,0

if (m == 'nis'):

m1,m2,m3=0,1,0

if (m == 'y'):

m1,m2,m3=0,0,1

n= request.form["smv"]

if (n == 'n'):

n1,n2,n3=1,0,0

if (n == 'nis'):

n1,n2,n3=0,1,0

if (n == 'y'):

n1,n2,n3=0,0,1

o= request.form["contract"]

if (o == 'mtm'):

o1,o2,o3=1,0,0

if (o == 'oyr'):

o1,o2,o3=0,1,0

if (o == 'tyrs'):

o1,o2,o3=0,0,1

p= request.form["pmt"]

if (p == 'ec'):

p1,p2,p3,p4=1,0,0,0

if (p == 'mail'):

p1,p2,p3,p4=0,1,0,0

if (p == 'bt'):

p1,p2,p3,p4=0,0,1,0

if (p == 'cc'):

p1,p2,p3,p4=0,0,0,1

q= request.form["plb"]

if (q == 'n'):

q=0

if (q == 'y'):

q=1

r= request.form["mcharges"]

s= request.form["tcharges"]

t=[[int(g1),int(g2),int(g3),int(h1),int(h2),int(h3),int(i1),int(i2),int(i3),int(j1),int(j2),int(j3),int(k1),int(k2),int(k3),int(l1),int(l2),int(l3),int(m1),int(m2),int(m3),int(n1),int(n2),int(n3),int(o1),int(o2),int(o3),int(p1),int(p2),int(p3),int(p4),int(a),int(b),int(c),int(d),int(e),int(f),int(q),float(r),float(s)]]

x = model.predict(t)

print(x[0])

if (x[[0]] <= 0.5):

y ="No"

return render\_template("predno1.html", z = y)

if (x[0] == 1):

y ="Yes"

return render\_template("predyes1.html", z = y)

**END**