

Customer Prediction System For A Salon Management System

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Abstract: Hard drives and cloud storage are sources of permanent storage in present days. In our era after the Industrial Revolution, the old methods of writing logs have become futile as the computers have taken their place. Long term memories (cloud, hard drive) are used to store the data safely which can be extracted whenever you like. With these, the record keeping system of all the businesses have been revolutionized and the safety of the data has also been ensured that way. This system is designed to safeguard the data of a salon by saving the entire customer onto a cloud database and provide reports to the owner so that they can check which services are more used and how much is the weekly and monthly income. The system also has a module which predicts the next visit of the customer based on various parameters such as service used and the customer himself, based on these predictions the Customer gets a notification that it is time to get the service again.

Keywords: Algorithm, Artificial Intelligence, Database, Exploratory Data Analysis, Linear Regression, Logistic Regression, Machine Learning.

I. Introduction

With the development of the databases in the internet the process of managing records of businesses had become easier than ever before. The method of maintaining written records has become old fashioned as well as risky because there is always a chance of losing the data if the record book is lost. Also, the process of billing manually is tedious and mundane. Not to mention the annoying process of maintaining the record of each and every customer, also you can't keep a track of income easily you have to do manual calculation of the bills for the entire day. All of this can be easily be solved by the use of an online salon management system. That is exactly what our project aims at achieving, to automate the process of managing a salon.

The salon management system is an all-round system which automates the entire process of billing and maintaining the customer records at a salon along with maintaining the inventory as well as the record of each and every visit of a customer which can be viewed by the admin any time he wants. The data is stored and managed over the cloud which makes the system highly mobile.^[1] This is a fully equipped system that alone manages the billing as well as the management of customer data Storage. The project also includes a prediction module which predicts the revenue of the upcoming weeks based on current data. This prediction system helps the manager to maintain the inventory and meet the needs of the customers as they arrive. We have made the use of Linear Regression Algorithm for data prediction. Linear Regression is the best algorithm to handle linear data which is the case here.^[2]

II. Problem Statement

The current Salon management systems use a traditional book-pencil methodology for storing data as well as billing. Which makes the salon admin/manager to create a new entry for every customer visit in the book which makes it difficult to keep a track of a customer's visits. Furthermore, the current system has no effective way to find out the service-based reports of the salon other than just sitting and manually noting down the services provided which also makes maintaining stock of the salon difficult and tedious. The data (book) is highly susceptible to loss or theft, the current database is prone to redundancy or inconsistent data (admin forgot to make an entry for a customer or staff deliberately does not enter data to make a buck). The current book-pencil system is just kept on an open table which makes it very vulnerable to be tampered by anyone including the staff or the customer. The proposed system will restrict the access only to the chief administrator.

III. Existing Systems

- Smart Hair Salon Management System:^[3]

The proposed system uses complicated hardware and software integrations which increases the Application is easy to use, time saving and efficient to give service to the clients of salon. The system is useful to both owner and customer which is electronics storage of all required data. The system is real time system

which does not require human efforts in calculating bills and maintain customer details. The security in salon management system can be maintained by using small camera. The system can use battery backup when there is no power supply. For users' authentications the password system can be implemented. Instead of keyboard, touch screen can be implemented.

IV. Proposed System

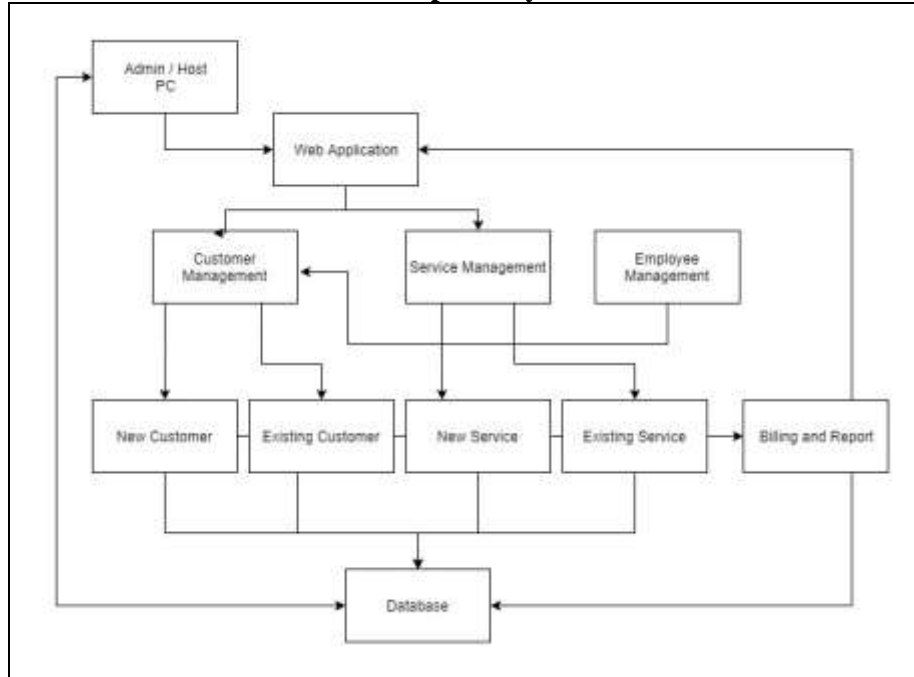


Fig. : System Block Diagram

The system works as follows:

Administrator may login to the system. He may manage customer database, add or remove services, and view reports based on service on based on income for a week or month. Another module is also present to manage the billing process. The customer database is also separately stored in a database. It manages the employee database, storing which employee served which customer. The prediction module predicts the next visits of the customer. The notification system sends the notification to the customer based on the predictions made by the predictor. This system was designed with the following objectives kept in mind, it also follows the ACID properties of a database management system. The aims and objectives of our salon management system are as follows:^[4]

- Data Atomicity
- Data Consistency
- Data Isolation
- Data Durability
- User Friendly
- Accurate and fast Responses

We analysed the working of multiple salons and tried to find the services that might be helpful to them in managing their salons more efficiently. After this phase we found out the following requirements of a salon which might be helpful to the admin.

Table: Basic functionalities expected from the system.

ACTOR	REQUIREMENT	DESCRIPTION
SALON MANAGER/ ADMIN	Create a database for the existing customers	The salon staff wants to see how many customers are they serving i.e. the number of loyal customers.
	Update database of the customers to add new coming customers	Admin wants a module where he can add the details of new customers who walk in.

	Create a dynamic Database to store the number of services with their costs.	This will help in the report generation and billing of the customers when they use the services.
	Update the database of the service provided.	This will help in avoiding data redundancy by changing the cost/name of the services without adding a new entry in the database.
	Bill Generation	The admin will add the name of the customer and the services used by him/her which will automatically create a bill and store it in the database.
	Report Generation	Report generation will be used as customer-oriented or service-oriented.

V. Development

We develop a computerized database. We made databases for every element in the framework – List of Customers, List of Staff Members, List of Services gave, Bill database for every transaction.

It was an exceptionally dreary work to do. We had some missing data which we had to leave NULL in the database. Later we cleaned the database and realized the model which we are going to use in the system. The Service List contains the cost of each service, when the bill is created it contains an integration of all of the services that the particular customer has used. On that basis, we realized that there is a direct proportion between the customer and the bill amount. The main advantage here is that we are dealing with Linear Data: A linear relationship means that you can represent the relationship between two sets of variables with a line (the word “linear” literally means “a line”).^[5] We observed that there is no regular pattern for the customers to visit the salon however we observed a high “total bill” amount if there are a greater number of customers that day compared to other days. This phenomenon led us to deciding the Bill amount to be the parameter which we will use to train the Machine Learning Algorithm. Machine Learning is an application of Artificial Intelligence which here will help us in obtaining the predicted amount of revenue generated for a particular day or week. The first step to any data prediction algorithm is to know the type of data we are going to work with. On conducting the Exploratory Data Analysis (EDA) we found the data to be of linear type. Exploratory Data Analysis (EDA) is an approach/philosophy for data analysis that employs a variety of techniques (mostly graphical) to maximize insight into a data set; uncover underlying structure; extract important variables; detect outliers and anomalies; test underlying assumptions; develop parsimonious models and determine optimal factor settings.^[6] Now we clean the data to find and handle anomalies. On plotting the data, we found that there are some issues with the pattern of the customers visiting the salon. For example, let us consider that there are 20 weeks of data available and we are working on “Monday”. Suppose that out of those 20 Mondays there are 12 Mondays where there are a fixed number of customers walking in the store say 7 but for the other 8 Mondays there are more or a smaller number of customers entering. This type of data is very difficult to plot using the bar or scatter plotting hence we use the Box Plot method. Box plot is a simple way of representing statistical data on a plot in which a rectangle is drawn to represent the second and third quartiles, usually with a vertical line inside to indicate the median value. The lower and upper quartiles are shown as horizontal lines either side of the rectangle.^[7]

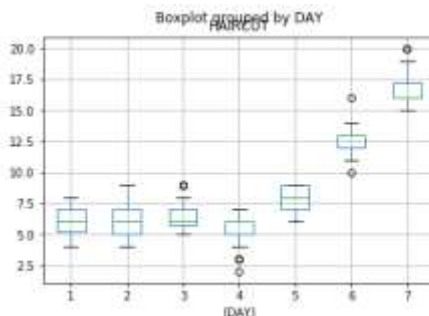


Fig. Box Plot Graph for the database analysis.

We have considered two algorithms for the prediction system : Linear Regression and Logistic Regression. On using Logistic regression we came across a problem that it only provides the answer as a binary term i.e. 0 or 1 based on the probability. This led to the problem that we could only decide whether the revenue collected was above or below a particular value say Rs. 2000. This method no matter how effective is pretty

useless to us. We needed something that gave a precise value to the user. We then used Linear Regression to predict value of the revenue that might generate for the following weeks depending on the current values.

We first train the algorithm with some values from the dataset. The training is done by the algorithm itself. The stronger the training algorithm more accurate result is obtained.

WEEK NO.	HAIRCUT	CONSTANT TERM	Actual REVENUE	Predicted REVENUE
8	7.0	0	700.0	700.805884
46	7.0	0	700.0	700.805884
11	8.0	0	800.0	800.765144
7	6.0	0	600.0	600.846625
23	6.0	0	600.0	600.846625
1	6.0	0	600.0	600.846625
12	6.0	0	600.0	600.846625
28	6.0	0	600.0	600.846625
29	6.0	0	600.0	600.846625
32	5.0	0	500.0	500.887366
44	9.0	0	900.0	900.724403
31	8.0	0	800.0	800.765144
45	18.0	0	1800.0	1800.357736
51	4.0	0	400.0	400.928107
44	6.0	0	600.0	600.846625
5	7.0	0	700.0	700.805884
12	9.0	0	900.0	900.724403
31	6.0	0	600.0	600.846625
15	6.0	0	600.0	600.846625
52	6.0	0	600.0	600.846625
4	16.0	0	1600.0	1600.439217
44	12.0	0	1200.0	1200.602180
37	6.0	0	600.0	600.846625
2	6.0	0	600.0	600.846625
21	8.0	0	800.0	800.765144
48	5.0	0	500.0	500.887366
37	18.0	0	1800.0	1800.357736
9	6.0	0	600.0	600.846625
16	8.0	0	800.0	800.765144
51	6.0	0	600.0	600.846625

Fig. Training Process

Once we have enough trained data in hand, we proceed to test the algorithm on the remaining data in the database. Finally we compute the output and obtain the predicted revenue for the upcoming weeks.

VI. Results

WEEK NO.	Predicted REVENUE
8	4973.265143
46	3341.005100
11	3460.372515
7	2460.960303
23	3321.677035
1	2847.491457
12	5552.608675
28	2456.763010
29	1770.500170
32	4876.309715
44	4110.785498
31	5284.321679
45	9159.688773
51	1806.517025
44	2809.678443
5	3914.518844
12	5472.076056
11	5344.017501
15	3207.575394
52	4259.153189
4	0952.358221
44	6630.072095
37	6015.899251
2	2456.763010
21	0662.204700
48	3510.292120
37	0196.326062
9	7248.719065
16	4527.110014
51	4650.672059

OLS Regression Results						
Dep. Variable:	TOTAL_REVENUE	R-squared:	0.985			
Model:	OLS	Adj. R-squared:	0.985			
Method:	Least Squares	F-statistic:	5950.			
Date:	Tue, 19 Mar 2019	Prob (F-statistic):	0.00			
Time:	23:00:48	Log-likelihood:	-2532.9			
No. Observations:	364	AIC:	5076.			
DF Residuals:	359	BIC:	5095.			
DF Model:	4					
Covariance Type:	nonrobust					
	coef	std err	t	P> t	[0.025	0.975]
Intercept	-6.7935	35.531	-0.191	0.848	-76.668	63.081
HAIRCUT	92.1597	6.363	14.404	0.000	79.660	104.673
SHAVE	74.3532	7.829	9.498	0.000	58.957	89.749
HAIR_COLOR	294.5021	8.277	35.580	0.000	278.224	310.780
FACIAL	443.8267	8.209	54.065	0.000	427.603	459.971
Omnibus:		194.873	Durbin-Watson:	2.012		
Prob(Omnibus):		0.000	Jarque-Bera (JB):	8591.600		
Skew:		1.494	Prob(JB):	0.00		
Kurtosis:		27.165	Cond. No.	40.0		

Fig. Result Predicted output and Regression values

VII. Conclusion

There are many salons even in the current Digital age who still use the traditional methods of Book-pencil for record keeping. Our system will help automate this process of record keeping as well as maintaining the staff records. Hence, we can conclude that our system is feasible in every aspect and it ameliorates the current book-pen methodology. While also ensuring the security of the data. The system can be implemented in

any salon of your choice by making small tweaks to the code which makes it highly mobile. Thus, based on above points we can conclude that this system is a simple yet useful project for the management of salons. The Linear regression is the most optimal algorithm we can use for such data and prediction.

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