Increasing Restaurant Revenue Using Potere.ai

Shraddha Deori

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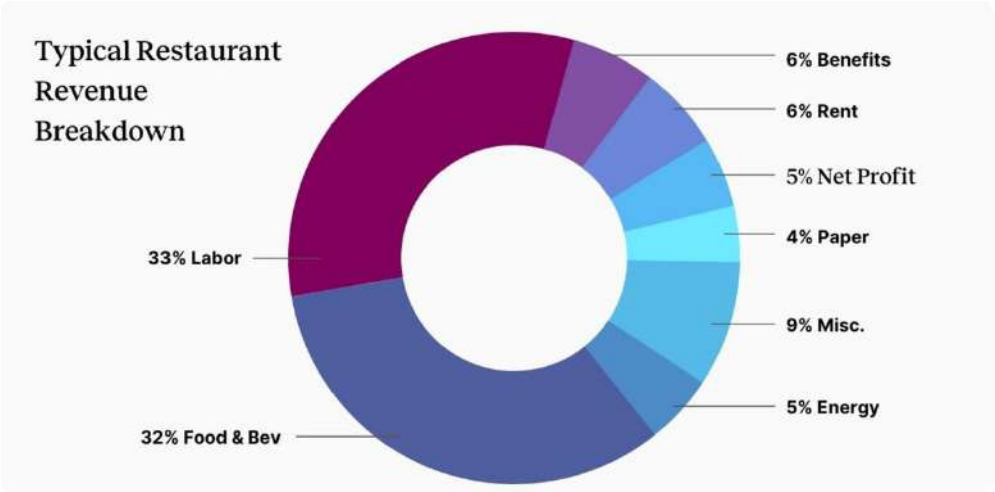
Abstract : Restaurants in and around the world, be it in a remote place in London to a booming city like Los Angeles, sometimes struggle to keep up with the increasing cost which may be pertaining to different sets of reasons. The restaurant industry, known for its dynamic and labor-intensive nature, faces a myriad of challenges in today's competitive landscape. One of the most critical factors impacting the success and profitability of restaurants is effective staff management. To address these challenges and ensure smooth operations, there is a pressing need for staff management software tailored specifically for the restaurant sector. In today's highly competitive restaurant industry, efficient staff management is paramount for success. A customized solution is necessary due to labor costs, scheduling difficulties, and customer service requirements. Staff management software designed for restaurants addresses these challenges effectively. It enables precise labor cost control, efficient scheduling, overtime management, and attendance tracking. Furthermore, it promotes effective communication, monitors performance indicators, and aids in worker retention. Ultimately, this software empowers data-driven decision-making and compliance with labor regulations, contributing to an improved guest experience and enhanced profitability for restaurants.

Introduction

The main issue in starting a new or continuing an already stable restaurant in today's world isn't a joke. Even before Covid-19, many were still struggling economically and had to shut down. The expenses that a restaurant must go through in its running time has a huge impact on its total profit or revenue.

Figure 1: Restaurant revenue breakdown



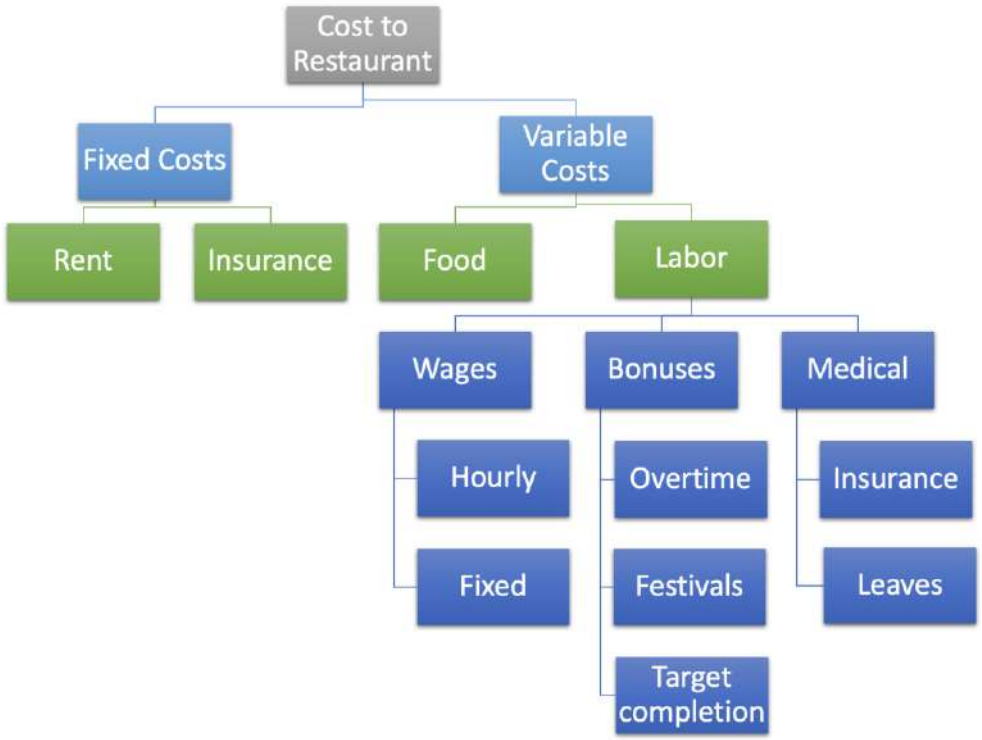
Source: Family Hospitality, Notch

Figure 1 shows us how Labor Cost, with the highest percentage of 33%, proves how controlling the labor cost can make a restaurant lower its total staff operational costs. However, the 32% for food and beverages is a bit tough to work on, because with increasing quality (which is essential for a restaurant for a long-time continuity), the cost of food will also increase, which will ultimately result in an increased sale.

Dividing staff into different groups indicates where cost is higher and more varied. Staff in restaurant have different roles in different settings:

1. Front of the House
    - Servers
    - Bartenders
    - Security
2. Back of the House
    - Head chef
    - Cooks
    - Dishwashers
3. Management
    - Heads
    - Managers
    - Founders

The costs that have to be incurred by any restaurant type is mainly divided into the following classes:



The prime cost, i.e. the variable cost can be calculated in the following steps:

1. Calculate COGS (Cost Of Selling Goods):

    COGS = Inventory + Purchases

2. Calculate prime cost/ variable cost:

   PC = Labor Cost + COGS

3. Calulate prime cost percentage:

   PC (%) = (Prime / Total Sales) * 100 %

This prime cost should ideally be in the range 10% - 30% for small restaurants, <40% for mid-sized restaurants and <50% for larger and more famous dine outs.

1.0. Problem Statement

The problem statement that I am covering in this report is to apply different AI/ML techniques to analyze the pattern of Labor/Staff Cost in a restaurant and coming up with an AI based software, which can be operated from the web, or any device (laptop, tablet, mobile) for ease of operation. I am aiming to create a feasible software product which can provide restaurants with real-time forecasted staff scheduling, keeps a record of early or late clock ins of staff, calculates overtime wages, sending information via messages or mails of updated scheduling, and calculates payroll for each staff member in real time for their ease.

2.0. Market/Customer/Business need assessment

What we have seen earlier about the maximum revenue going into labor costs, many restaurants are opting for replacing excess staff with technology, which can provide managers with an increased efficiency with the staff operations, as well as give them data-driven insights into what causes an increased or decreased sales and how are the staff are related to it. It helps maintain a good balance in profit and quality service. Keeping account of each staff money information and making strategical decisions in ensuring the perfect balance between the cost of operating and efficiency of the restaurant, which will in turn increase the restaurants' efficiency and infuse a sense of trust and confidence in the staff. Staff retention is also important in controlling the labor costs. Through Potere.ai, we can tackle this issue and help the small or midsized restaurants with cutting out excess cash burnouts and increase their revenue.

3.0. Target Specialization

The main objective of our product lies in the fact that restaurants need to cut down on their staff operating costs. Potere.ai will help restaurants based on their preferred options and what they want to use for the increased productivity of their staff and decrease the employee turnover rate. This will ensure in the positive upgradation of their operations, which will in turn boost up their revenue and cut down on unnecessary costs, with an increased efficiency and real-time data driven strategies and decisions.

4.0. External Search

The resources that I went through in analyzing the need for a software like Potere.ai in Indian restaurants and how restaurants in America have already been using such premiere applications to assist them in their daily tasks, are described below:

- *Restaurant Labor Management: A Software Guide* by **Lavu.com**
- *How To Manage a Restaurant: Create Systems* by **The Restaurant Boss** @ youtube
- *FACE RECOGNITION + ATTENDANCE PROJECT | OpenCV Python | Computer Vision* by **Murtaza's Workshop – Robotics and AI**
- *Employee Turnover and Your Restaurant's Bottom Line: Here Are The Numbers You Need to Know* by **notch.financial**

I also collected various datasets from Kaggle.com too, to find out the contributing factors which can be used in our software.

Note: All the datasets have been uploaded to my github profile and only the processes and results are being shown down here.

Dataset 1:

Figure 2: Total count of visitors per hour for a typical restaurant

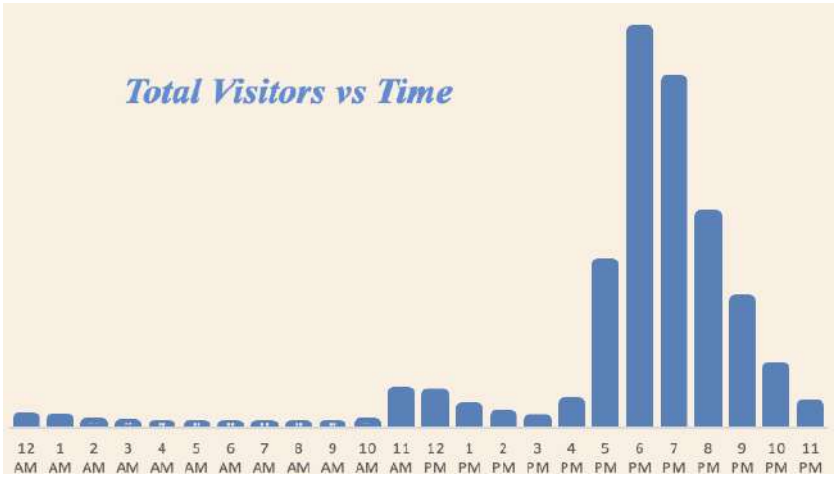


Figure 2 shows us that the number of visitors increases during the time from 10:30 am to 11 pm with the maximum in the window of 4 pm to 10 pm. This data proven decision can be used during the scheduling of employees.

Dataset 2:

Figure 3: No. of visitors per day for a year

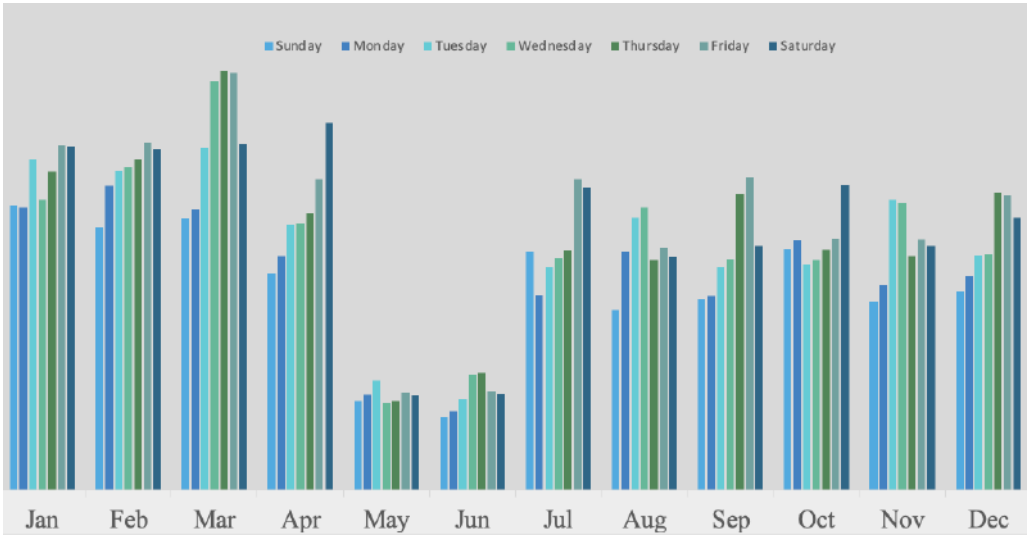
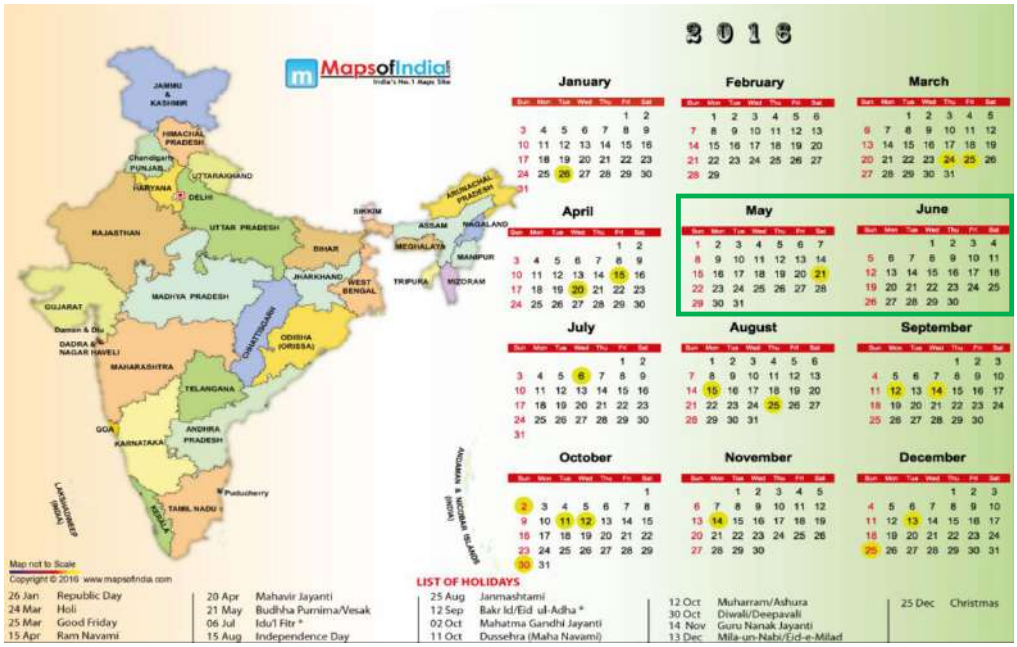


Figure 3 shows us that the number of visitors is highest in the month of March and the lowest during May and June in the year (Jan) 2016 - (April) 2017.

Figure 4: Calendar for the year 2016



The calendar for the year 2016 shows us that there weren't many of the holidays apart from the Saturdays and Sundays. So, the number of visitors decreased during this time window. This can also help us in scheduling of employees as well as keep track of the overtime during festive days, and the bonus that would be given.

Dataset 3:

Figure 5: Preferred restaurant type for after Covid-19

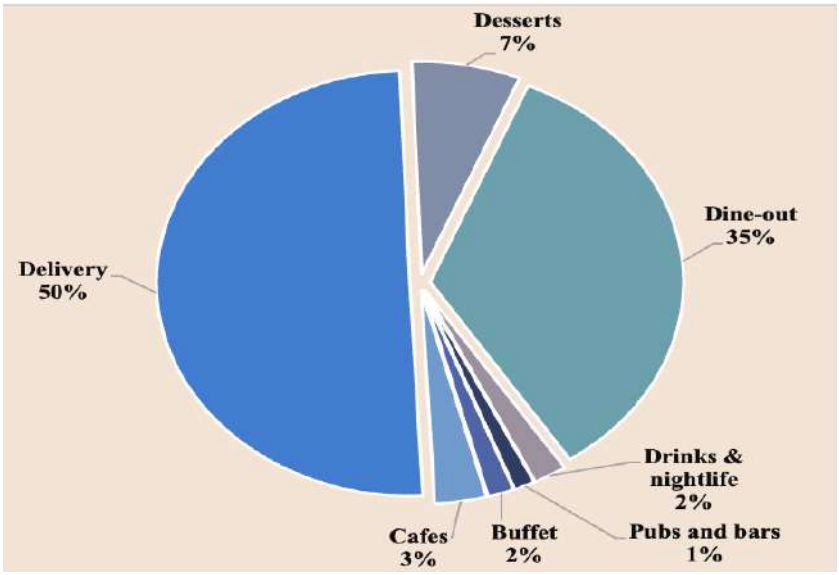


Figure 5 shows us how people prefer to eat after the Covid-19 shutdown was lifted and the environment was deemed somewhat safe. This brings to light that the restaurant type and the number of staff to be present is somewhat correlated. For example, the buffet, pubs & bars do not require much staff around. They only require specific servicemen for specific tasks. However, for dine-outs and cafes, there must be staff present at the busiest times. Also, most of the restaurants have a joint type of dine-out, café, pubs & bars, delivery, and dessert. These are the restaurants that require the greatest number of staff always present, which is not feasible for all of them, and are in dire requirement of Potere.ai, which can help them in forecasting when the staff present needs to increase. This would also help in keeping a track of the cross-training program of the staff, so that some of them can do a number of tasks and not only one.

This figure was created from a Zomato dataset present in Kaggle.com and after applying some Exploratory Data Analysis (EDA) techniques.

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
```

In [2]:
```
#load dataset
df = pd.read_csv('zomato.csv')
```

In [3]:
```
df.head()
```

Out[3]:

	url	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisin
	//www.zomato.com/bangalore/jalsa-banasha...	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	Yes	Yes	4.1/5	775	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	No Indi Mugh Chin
	/www.zomato.com/bangalore/spice-elephan...	2nd Floor, 80 Feet Road, Near Big Bazaar, 6th ...	Spice Elephant	Yes	No	4.1/5	787	080 41714161	Banashankari	Casual Dining	Momos, Lunch Buffet, Chocolate Nirvana, Thai G...	Chine No Indi T
	w.zomato.com/SanchurroBangalore?cont...	1112, Next to KIMS Medical College, 17th Cross...	San Churro Cafe	Yes	No	3.8/5	918	+91 9663487993	Banashankari	Cafe, Casual Dining	Churros, Cannelloni, Minestrone Soup, Hot Choc...	Ca Mexic Ital

In [104]:
```
#dropping unwanted columns
dff = df.drop(['url', 'address', 'phone', 'dish_liked', 'menu_item', 'name', 'location', 'rest_type'], axis = 1)
dff.head()
```

Out[104]:

	online_order	book_table	rate	votes	cuisines	approx_cost(for two people)	reviews_list	listed_in(type)	listed_in(city)
0	Yes	Yes	4.1/5	775	North Indian, Mughlai, Chinese	800	[('Rated 4.0', 'RATED\n A beautiful place to ...	Buffet	Banashankari
1	Yes	No	4.1/5	787	Chinese, North Indian, Thai	800	[('Rated 4.0', 'RATED\n Had been here for din...	Buffet	Banashankari
2	Yes	No	3.8/5	918	Cafe, Mexican, Italian	800	[('Rated 3.0', "RATED\n Ambience is not that ...	Buffet	Banashankari
3	No	No	3.7/5	88	South Indian, North Indian	300	[('Rated 4.0', "RATED\n Great food and proper...	Buffet	Banashankari
4	No	No	3.8/5	166	North Indian, Rajasthani	600	[('Rated 4.0', 'RATED\n Very good restaurant ...	Buffet	Banashankari

In [7]:
```
dff.isnull().sum()
```

Out[7]:
```
online_order                     0
book_table                       0
rate                          7775
votes                            0
cuisines                        45
approx_cost(for two people)    346
reviews_list                     0
listed_in(type)                  0
listed_in(city)                  0
dtype: int64
```

In [8]:
```
dff.rate = dff['rate'].fillna(0)
```

Correlation Matrix:

4.1. Benchmarking

Websites such as 5out.io and 7shifts have worked on restaurants from big to small in predictive intelligence and have proven their worth and brought successes to many outside India. However, my viewpoint for this product ideation is a bit different. Their main motive is increasing the operations efficiency of the restaurants, which is also what I thought of. But Potere.ai, as the name says, Potere means 'Power' or 'be able to' in Italian, this product will be benefitting for the employees' confidence in the restaurant, their work will be easier, and in increasing efficiency in the staff management, and give wings to the dreams of restaurant owners by giving them a chance to improve their revenue by cutting down on unnecessary costs.
Although I have taken inspiration from the above websites, one thing that Potere.ai will also take Face Recognition using AI and ML for the attendance of the employees and saving the attendance sheets to the pipeline of the website. This will also ensure that no employee is due for payment for their overtime.
This will really be helpful to the small and mid-sized restaurants to bring in technology, being adaptive to a changing atmosphere and bring in a competition to others. However, Potere.ai will help each and every restaurant to become their best. This will be started out in Assam first, then the North-East, then nationally and globally. This is to ensure that Assam also gets into a technology giant in the restaurant and hotel industry.

4.2. Applicable Regulations

To understand Utility Patent, we need to first understand the requirements for getting a Patent. Post that we will discuss Utility Patent and situation of **Utility Patent in India**. Generally, there are three criteria on which most of the countries judge an invention for giving a Patent. First is novelty which means an invention should be new across the world. It should not be disclosed in any document before the filing date. The said document or information should not be available to public in any form. Second is an inventive step. An invention should have technical advancement as compared to the existing knowledge. It should not be obvious to a person skilled in the art. Third is industrial applicability. An invention should have industrial application. It must have some commercial use. Therefore, to get a Patent for an invention, it should have met these three criteria.

As per IPExcel.com, Potere.ai successfully passes all the criteria.

1. Though the idea is being taken from other websites, the main true software will always be different from others in the fact that no two people are the same.
2. Though at the product ideation step we are at the base level. However, if given time and energy to upgrading the application, it will also bring about new changes in the technology realm.
3. It is also industrially applicable. Though there needs to be an understanding between us and the websites we are going to scrape data from.

4.3. Applicable Constraints

The following may be constraints to the software, but with increasing revenue and manpower, everything will sort out:

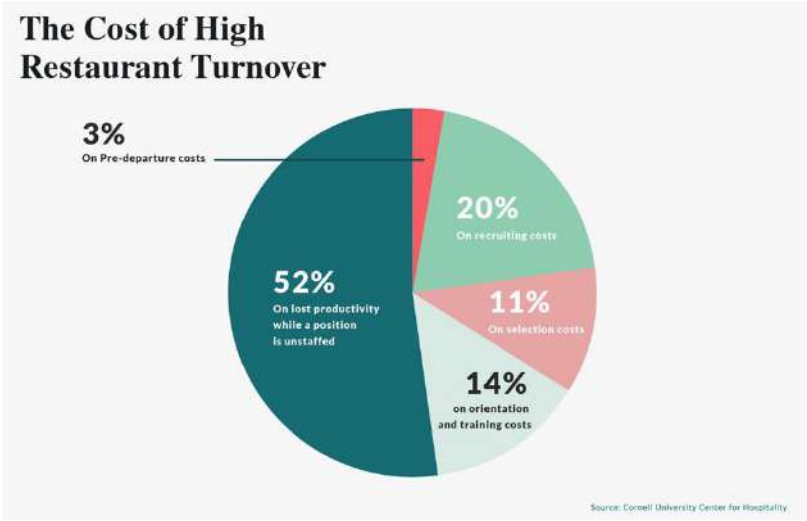
- Big data needs to be continually updated which will cause computational space complexities.
- These pipelines need to be analyzed by experienced data engineers or database engineers.
- Often unstructured data would also be saved, which needs to be analyzed quick.
- 3rd party websites must provide us access sometimes.
- Regulations on data privacy, employee hiring, government regulations for small businesses should be read and thoroughly understood by everyone in the management body and also all the heads.

5.0. Business Opportunity

Once this website is launched into the real world, the restaurant and hotel industrial businesses in Assam and North-East will be the first ones to deploy such a technology, adapted and learnt from the practical cases in the Americas, which will no doubt provide amples of opportunities to employees and restauraneurs. They'll be able to give more of their attention to what are the other problems and solve them.

This will also give a heads up to the new generation who want to open up restaurants and is thus a far greater business opportunity in a place where people tend to be afraid in making a business up from the stacks of bricks. The required staff forecasting can also help in accurately pre-planning and cutting down on longer durations of unlimited meetings and planning.

These discrepancies also increase the turnover rates for restaurants, due to decreased moralities in the employees and affecting their health due to overwork. With higher turnover rate than any other private sector turnover rate, the cost in restaurants spike up, because of the costs they had to take in hiring and training newbies, which is shown by the following figure:



Source: notch.financial

However, with Potere.ai, we can decrease this turnover rate just by giving appropriate career growth and opportunities to the employees, giving them cost benefits for reducing absenteeism, etc.

6.0. Monetization Idea

i. Before monetizing, we will provide restaurants with the option of free trial of 3 days and decide for themselves if they want it for them.

ii. Monetization will be based on what services the restaurant wants from us, like $50 - $100 per month for each service. It will depend on the restaurant type. For casual or quick dining, the rates will be lower, while for dine-outs the rates will be higher.

For example, Potere.ai provides services like :-

a. Face recognition for attendance system
b. Forecasted scheduling of staff
c. Automated time clock integration to ensure swift shift transitions
d. Automated cost added to employee for overtime work
e. Notifications for changed schedules
f. Cross-training and career development for employees
g. Tracking employee productivity

iii. We can monetize on the basis of use per hour also, which will be $8 per hour. This option will not depend on the restaurant or hotel type.

7.0. Concept Generation and Development

The product will take up several of the AI/ML tools, which would be the framework, for example:

a) For Face Recognition, deep learning knowledge is a must. Python comes with a library called 'OpenCV' which can be used with the 'Casscade Classifier' for still images or real time photo capture from webcams, alongwith the 'face recognition' library which works for advanced face detection. As I haven't tried myself the coding part for this, I have included a link from which I would learn at the earliest.

   Link: https://www.datacamp.com/tutorial/face-detection-python-opencv

   After faces are detected, the output will be saved to an excel spreadsheet on a weekly basis. These data can then be linked with our software, which can then be used for taking attendance of the staff, their payrolls will be computed at the same time, with their 'in' and 'out' time. This will be done to prevent staff from coming in early or late for their shift, which might be an issure with the shift transitions.

   However, there maybe a small issue here. Employees might come into the restaurant but might not go into work mode immediately. So, the attendance and payrolls will only be computed inside their workplace.

b) For forecasted scheduling of the staff, Regression Analysis can be used. It will take the previous records of visitors and weather conditions and predict how many employees will be required in a particular time of the day. This can be really helpful in

cutting down costs when there are excess employees present at a time when the visitors are less.

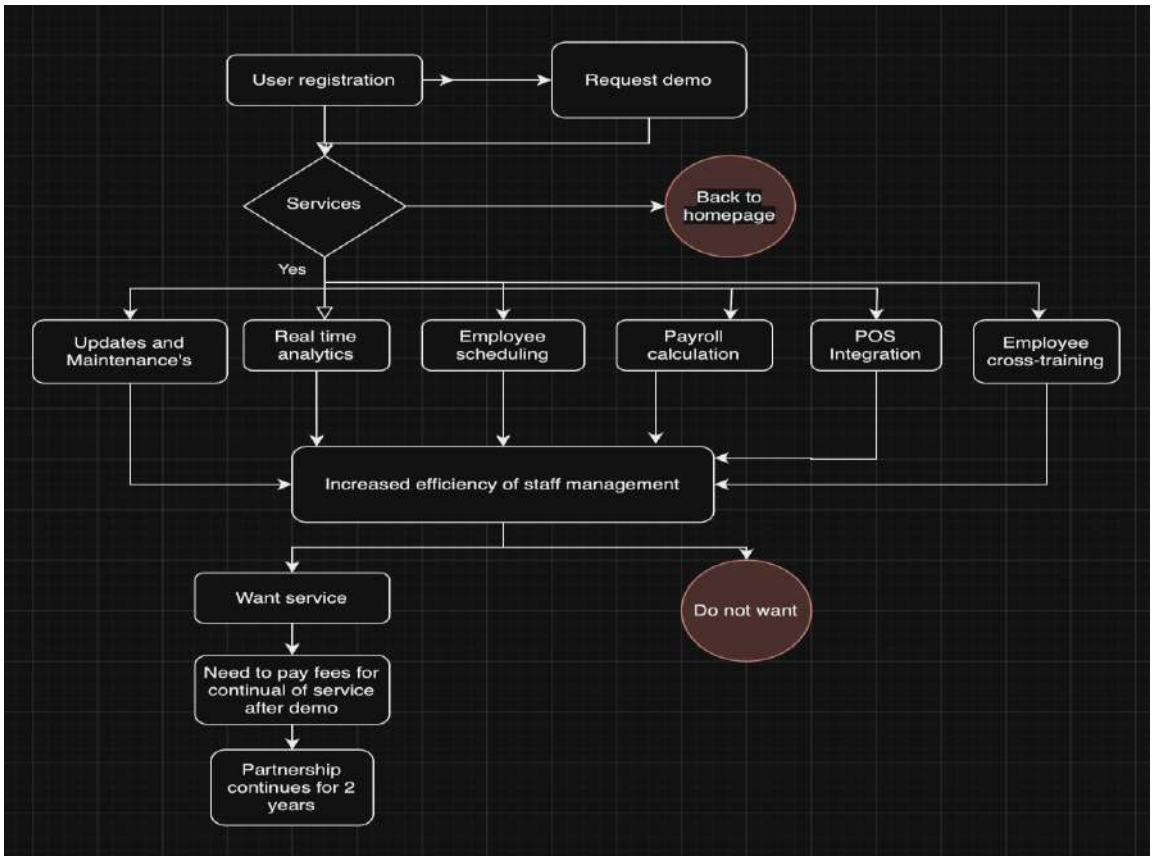
c) If there tends to be changes in the schedule of the employees, the software will take charge and send pre-defined messages via messaging, e-mails or automated calls. This will ensure that the employees are aware of how the staff required will change during a time and can plan accordingly. For this purpose, Microsoft Azure services can be used, or any other website feasible enough to be used in our software.

   Link: https://learn.microsoft.com/en-us/azure/communication-services/quickstarts/email/create-email-communication-resource

d) Cross training should be deployed to the employees, so that during a busy time, they can fill in for other staff who wouldn't be able to join in. This would also ensure career development for the staff, which would then decrease the turnover rate. These trainings with certifications would then be added to the personal accounts of the employees in the server, which will be useful in tracking how an employee is upgrading himself/herself in the process and would be eligible for other works too.

e) Sales-Per-Man-Hour (SPMH) can be calculated to keep the sales information, which will provide insights into how productive the staff are. This can also be tracked through the sentiment analysis of the feedback left by visitors, to provide insights into what can be upgraded for customer satisfaction.

8.0. Final Product Prototype



(Drawn with the help of https://app.diagrams.net)

9.0. Code Implementation

All the datasets, excel sheets, python file have been uploaded to the following github link:

Link: https://github.com/shraddha-deori/Feynn-Labs-Project-1.git

10.0. Conclusion

Significant challenges are posed by the restaurants, especially in regard to cost control, operational efficiency and staff management. The high percentage of labor costs in restaurant expenses makes it crucial for restaurants to find innovative solutions to manage staff efficiently and cut unnecessary expenses.

Our proposed solution, Potere.ai, aims to address these challenges by applying various AI and ML techniques to analyze staff cost patterns. We intend to develop an AI-based software accessible through web and mobile devices to provide real-time assistance to restauraneurs and managers. Potere.ai provides a complete toolkit to enhance staff management and lower labor costs, including the ability to estimate staff schedule, track clock-ins, compute overtime compensation, and automate payroll procedures. Our product aligns with the evolving trend in the restaurant industry, where technology is increasingly replacing excess staff, leading to enhanced operational efficiency.

Market assessment suggests a growing need for such a product, particularly in small and mid-sized restaurants, where cost optimization is critical. The data-driven methodology of Potere.ai offers insights into the relationship between employees and sales, enabling them to strike an equilibrium between profit and high-quality service. By providing opportunities for professional progress, it can also help retain employees.

While there are other options on the market, according to external search and benchmarking, Potere.ai will distinguishes itself out by focusing on employees' well-being, productivity, and real-time data-driven decision-making. The integration of face recognition for attendance further sets our product apart.

Potere.ai presents a significant business opportunity by helping restaurants in Assam and the North-Eastern region of India reduce costs, enhance efficiency, and compete effectively in the industry. The product's flexible monetization options cater to the needs of various sorts of restaurants.

However, certain constraints, including data management complexities and adherence to regulations, must be addressed during implementation.

The concept development involves the utilization of AI and ML tools such as face recognition, regression analysis, and cloud services to provide features like attendance management, staff scheduling, automated communication, cross-training, and performance tracking. Potere.ai focuses on employee welfare and operational excellence while empowering restaurant owners and managers with the resources needed to negotiate the industry's problems, cut labor expenses, and ultimately drive revenue growth.