

## Expense Monitoring System using Data Analytics and Machine Learning Techniques

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### ABSTRACT

*This application checks the legitimacy of the employee expense through three stage verification process and provides the detailed dynamic analysis of expenses as well as helps employee in knowing the result of his expense priorly through Machine Learning algorithm KNN with reasonable accuracy. This application helps the user in choosing the right options through suggestions provided by the application in order to increase the chances of approval and the user can also get to know the status of the expense dynamically from the time when the user submitted the expense. The user, auditor and admin can start discussion through the forum/community provided by the application.*

**Keywords:-***Machine Learning algorithm, Data Analytics, KNN algorithm*

### INTRODUCTION

As the Company's scale increases day by day management of company's expenses has become hectic and tedious. Just Expense forms aren't enough to claim their expense from their companies. So this results in poor management of expenses because once these forms are filled they are submitted to admin in person where admin stacks up this expense and then approve in the later period. This is a substandard approach which lacks in many aspects. This approach doesn't emphasize more on legitimacy of the expense which is a very vital use case that needs to be scrutinized. Because if this legitimacy is not inspected properly then it may lead to downfall of the company in terms of finance.

These issues are resolved by our proposed system which provides improved performance in terms of handling

humongous amount of expenses with ease. This system also has multilevel verification system to augment the legitimacy of the expense to the next level. Statistics reveal that around 40% of the world population have internet connection today when compared to less than 1% in 1995. Hence this application is made completely online where user can submit and claim expense from anywhere at any time. This application doesn't allow users to depend on third party applications since all the required dependencies are provided by the application. This application provides novel relationship between the businesses and also provides various options for users such as creating expense, managing his expense, reports, expense comparison through dynamic data analytics, planning of expense and so on. Similarly auditor and admin also has variety of options to manage expenses. In this application users, auditors, admin can discuss about policies

or any finance affairs through the form provided by the application

### THREE LAYERS

#### User

User alias submitter is the one who submits the expense and claims it. The user submits the proof and creates the expense card using create expense card option. Once the user has submitted the expense card the user doesn't need to constantly check the mail regarding the expense since status update system in this application helps user tracking his expense from time to time. If any info needs to be communicated or received he doesn't need to depend on any third party contact applications he can communicate through received messages feature or compose feature in this application.

#### Auditor

In this auditor sections auditor receives the invoice proofs and the expense card created. Auditor can review the expense along with proofs and can approve expense if all the required things match correctly, if any doesn't match then it is rejected, if any proofs are missing then auditor marks the expense as pending and sends the user the notification regarding the missing proofs or any necessities etc.



**Fig.1:-Approval Hierarchy**



**Fig.2:-Rejected Expense**

Auditor has the analytics of all users expense based on different categories. Auditor also has highest the highest and least expense in each category.

#### Admin

Admin receives the expense cards that have been approved by auditor while the remaining expense cards that have been rejected by the auditor will not reach admin inbox they will straight away be rejected. Since they didn't clear the initial stage of verification. Admin can reject or approve the expense based on the policy of the organization created. If policy is violated the expense is rejected. Admin has the whole analytics of expenses approved by the auditor, pending expenses that needs to be approved by the auditor and also the expense of the users based on each month. In this section admin configure the workflow by assigning the auditors to each users or group of users or all based on the scale of the company. Admin can approve or reject the expense with just a single click on the option available on the snaps respectively.

#### Data Analytics

Data Analytics is the extensive use of data to identify the patterns, relationships, growths between two or more similar elements of the same domain. It is the process of examining data sets in order to draw conclusions from the data patterns. The purpose of this data analytics is to uncover the hidden information from the pattern. In this application data analytics is used in order to compare graphically the expenses of each individual with others and also with each individuals' other expenses so that it gives insight about the expenditure pattern, usage, highest and least expense in each category etc.

#### Machine Learning

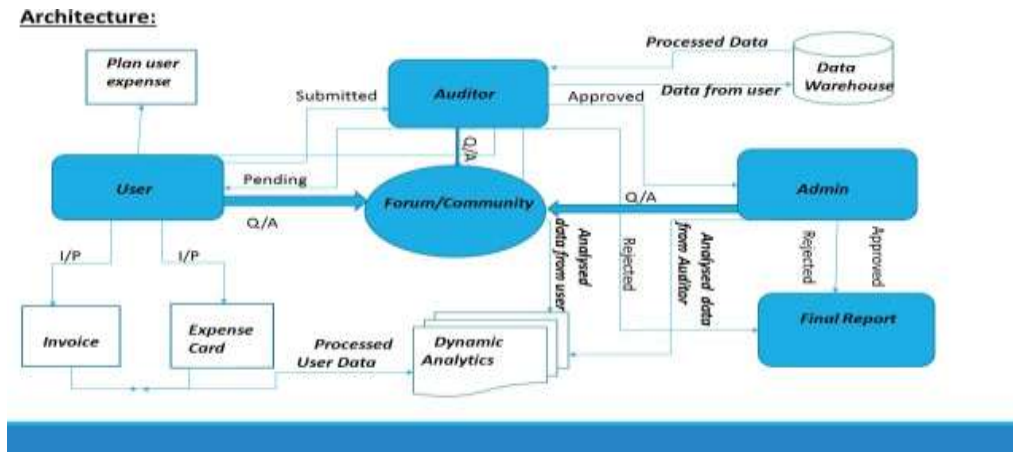
Machine Learning is an application of artificial Intelligence that provides system the ability to learn and improve from the experience or previous instances. Machine Learning makes use of data sets and processes these data sets using Machine Learning Algorithms to perform a task without using any explicit instruction. In

this application machine learning is used to predict the status of the expense i.e. to check approved or rejected based on the data sets of the previous visits by the other users respectively using KNN algorithm.

**ANALYSIS**

In this application initially the user

submits the Proofs and expense card, then the auditor receives the expense card and proofs and then verifies it once the expense is approved it is automatically forwarded to admin, who then finally verifies the expense based on the company’s policy.

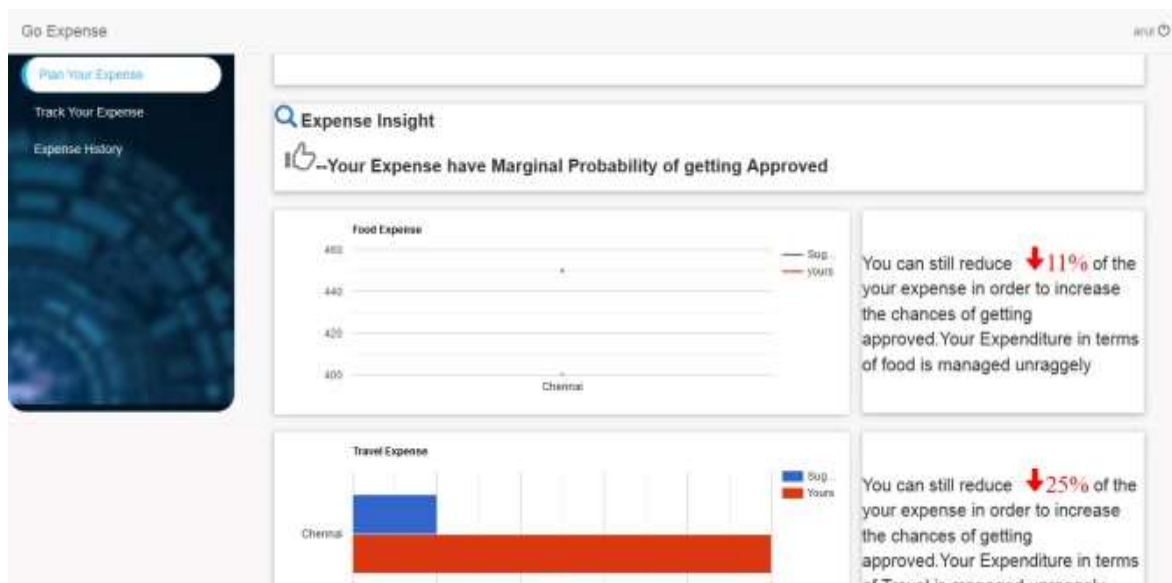


*Fig.3:-Architecture*

The user can plan his/her expense through an option called plan your expense option.

Once the user enters the planned expense amount in the given fields and clicks analyze button, the entered data is plotted as points, these points are the target points. Using KNN algorithm distance between

the target points and the other data points from the data set is calculated using either Euclidean distance or Manhattan distance. On sorting these calculated distances between points we can obtain the k nearest neighbors from target value and we can access the kth nearest value based on our application need.



*Fig.4:-Received Expense Cards*

Around 53 test cases have been tested for the prediction phase out of which 82% cases were successful giving the desired output as expected and thus providing a very good accuracy. All the corner and edge cases have been tested and verified in the prediction phase of the application.

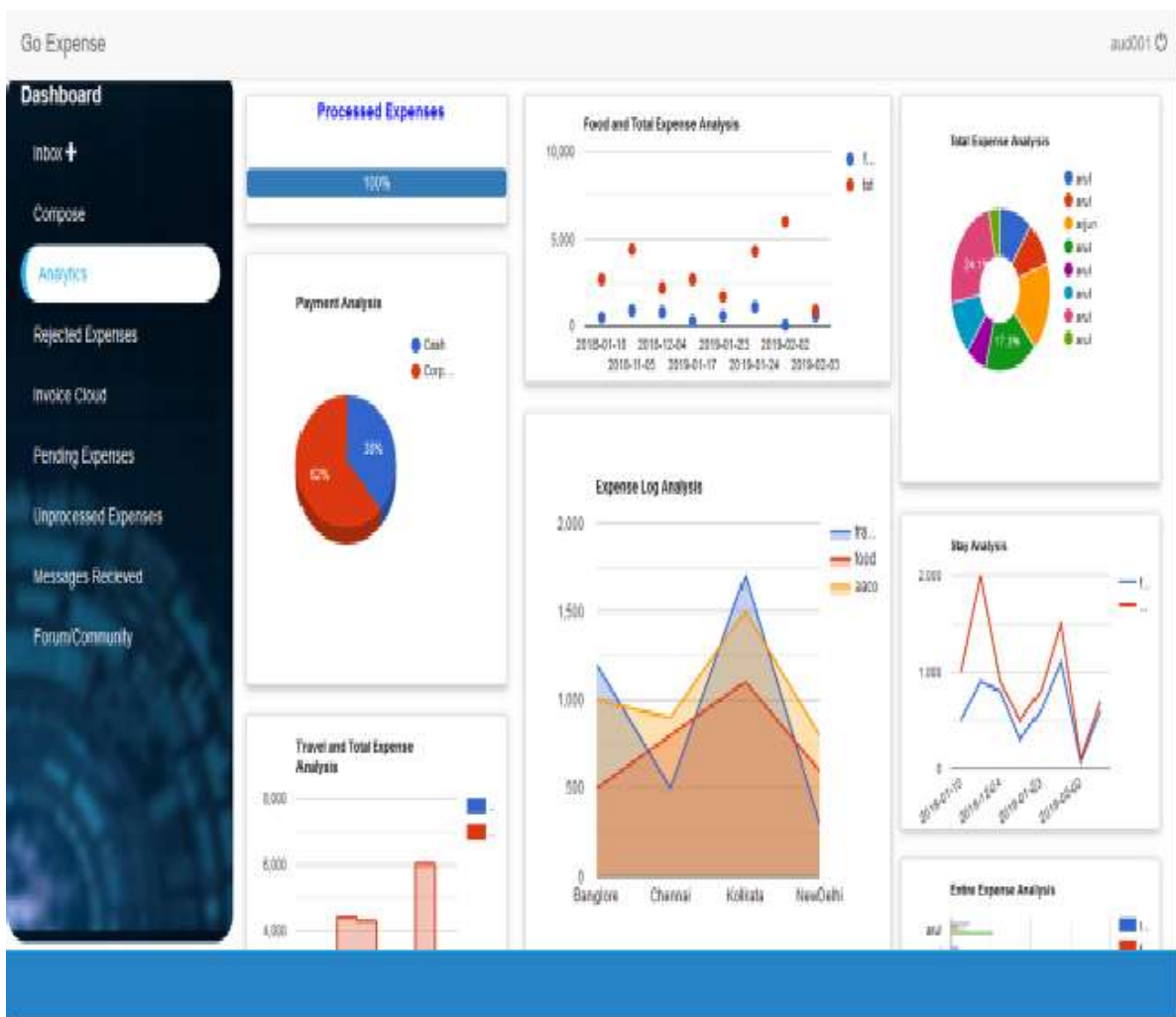
**RELATED APPROACHES**

There exist some approaches for claiming employee's expenses but they lack in technology and implementation as well. These existing works involve in person presence for claiming employee expense but this kind of approach is not applicable in all situations where in some situation this becomes more tedious and hectic process. The existing work also does not help in improving users' expenditure

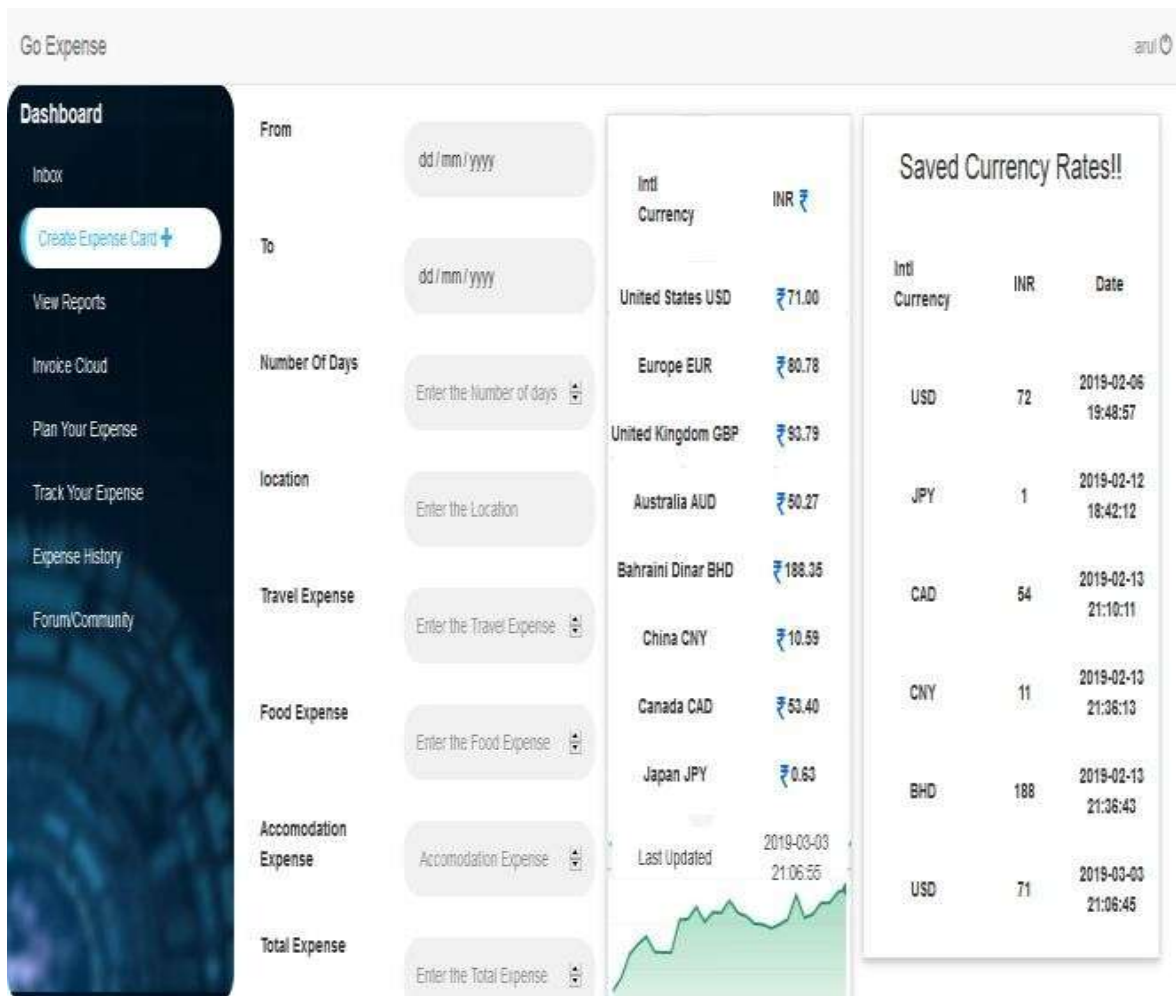
pattern in order for his/her expense to get approved. Thus all these issues are resolved by the current proposed system which helps users in all possible ways and serves as an omnipotent channel.

**PROPOSED SYSTEM**

This proposed system has resolved many challenges and issues in the current system providing greater legitimacy for the expense through multi stage verification process involving auditor and admin respectively. This system augments the efficiency of the application and also provides a best end user experience since every other feature that this application demands is provided by this application itself without the need of being dependent on third party tools or applications.



*Fig.5:-Abroad Expense*



**Fig.6:-Expense Analytics**

This system also reduces 1/8th of the time consumed by the predecessors since most of the functionalities are automated ones. The user need not regret after his expense being rejected after multilayer verification. Instead he can opt for plan your expense option where he can enter the expense he has planned for the forth coming visits and check the status of those planned visits.

The proposed system also provides deep insights about the expenditure and their usage through dynamic data analytics. This data analytics gives the expenditure of many users and their comparison results and also gives insights about how to improve their expense usage in forthcoming visits to avoid the probability of getting rejected. This application enables users alias submitters to download

the report as pdf of the latest expense that he/she claimed for so that it can be used for the offline purposes respectively. Based on the company’s scale the application can be configured such that expense cards evaluation can be split to many auditors based on the number of submitters by assigning auditor each employee or group of employee or all. This Contributes to a modularized workflow in this application.

**CONCLUSION**

Thus Expense Tracking and Management using data analytics and machine learning provides a revolutionary solution in finance sector in terms of managing company’s expenses more strategically and efficiently considering all types of real time use cases and priorly predicting the

status of expense using machine learning algorithm through plan your expense option thus improving the uniqueness of the application and also provides the horoscope of whole expenses, usage based on different categories for each person using dynamic data analytics. Thus this application has clearly an upper hand over technology, implementation and many other aspects that current system lacks.

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