Project :- **Using fraud detection systems for Finances**

Theme:- **Finance**

Team Name:- **Taiga**

Team Members:- **Ashutosh Tiwari, Sai Tanusha**

Problem Statement

“ Using fraud detection systems for finances ”

Theme :- Finance

Software:- MATLAB

Concept Applied:- Fuzzy Logic

The finance fraud is dramatically increasing due to rise and rapid growth of E-commerce. Due to the huge number of transactions, finance fraud detection is a big challenge for banks to minimize their losses and for customers to feel secure. In this project fuzzy database is used to detect finance frauds.

Fraud detection involves monitoring user's behaviour to estimate, detect or avoid undesirable behaviours. To correctly identify a transaction as legitimate or fraudulent has been considered a data mining problem.So we used some concepts like the fuzzy logic method, fuzzy rules, membership functions, fuzzification and defuzzification. Later, these methods are implemented on the dataset using fuzzy logic toolbox in Matlab and the results indicates that the fuzzy logic logic method is 66% accurate.

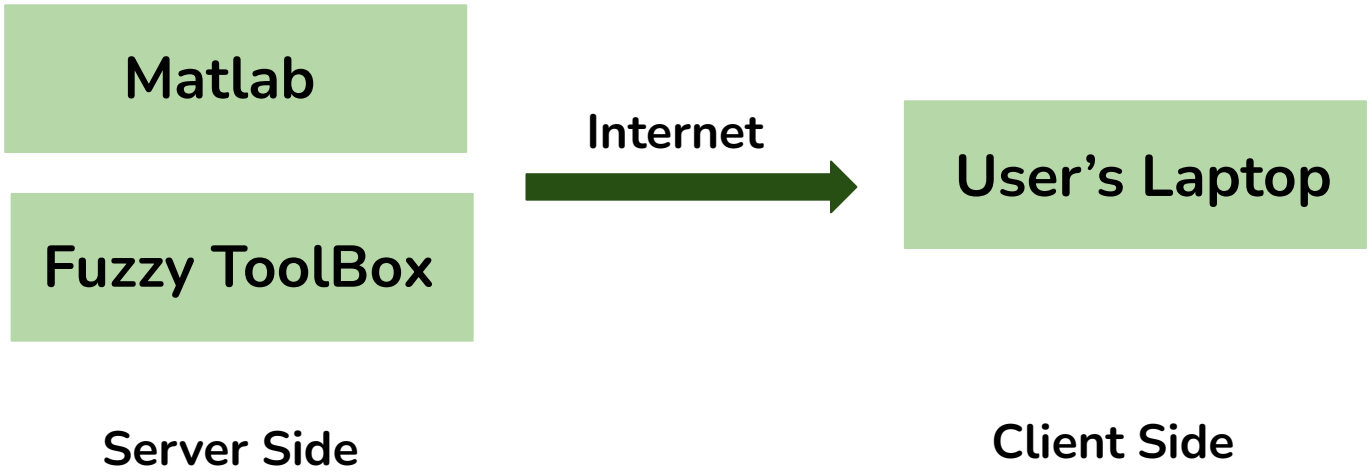
Our Solution

We came up with a solution by using some concepts as **fuzzy logic method, fuzzy rules, membership functions, fuzzification and defuzzification.** What is **approach** is that we are preprocessing the data using the behaviour based finance transaction model that detects the **user's behaviour based on the previous transactions.** The data is then clustered by creating membership function using fuzzy logic in Matlab. To validate the results, the data is fed into our system and the output is observed. Instead of only having two outputs: **legal and fraud, we have added a third output: suspicious.**

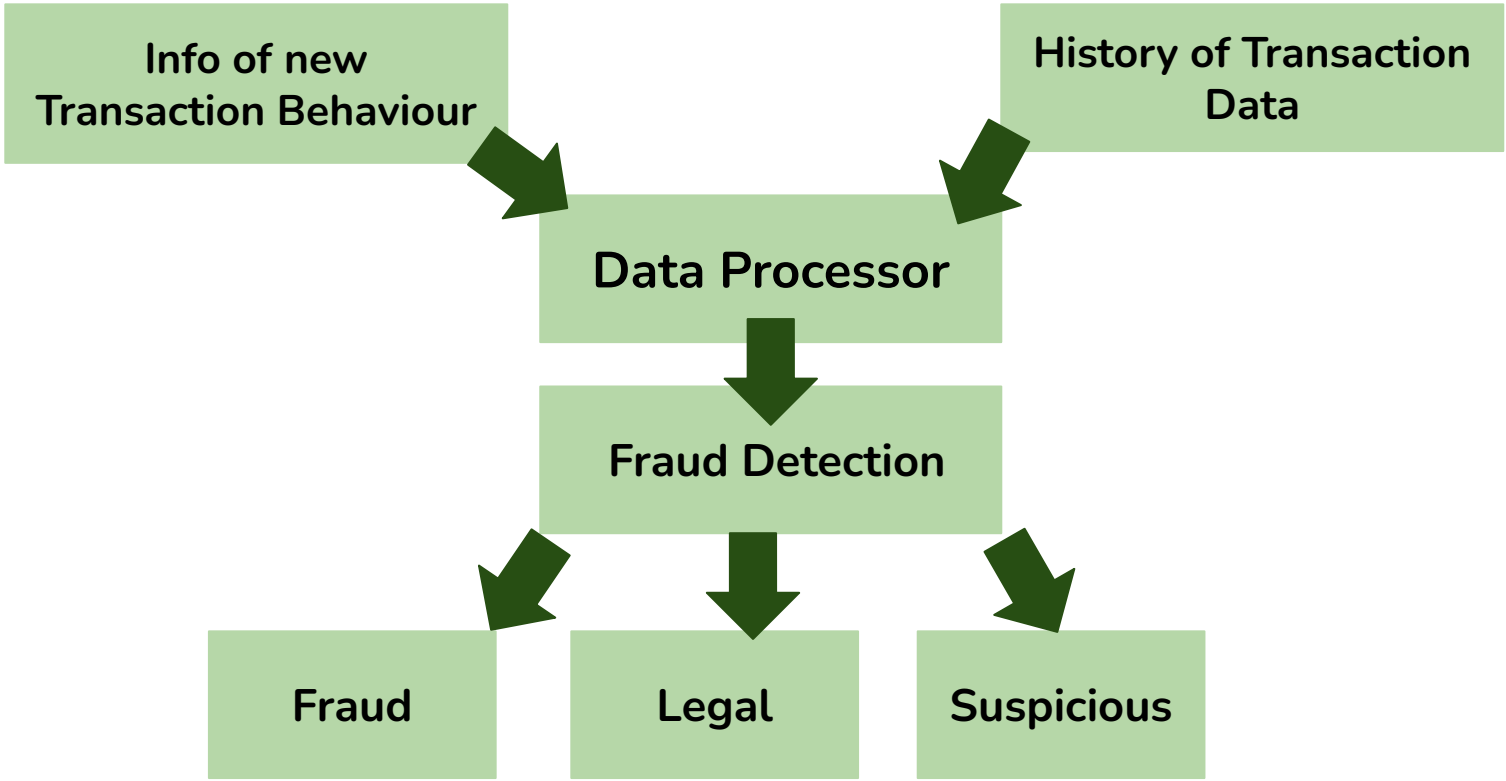
Impact

Since finance frauds have tremendously increased, it is very important to understand the method of identifying and discovering finance frauds. In real life, the data or operations with anomalies are not enough to efficiently detect fraud. Anomaly detection is complex and cannot be done without the help of technology. Usually, the systems are based on rules and parameters which are defined by the experts with great experience in the research areas. Fraud is a very big problem these days and concurrency of the Millions of purchases every month makes it impossible to check every one. The only **viable solution is automation by computer.** The computers can be used to access financial transactions as ‘suspicious” and this can be performed by simple statistical techniques. However, the fraudulent activities are diverse and complex. Thus, the traditional methods do not suffice and newer techniques like machine learning are needed. The objective of this project is to **improve and optimize the traditional methods and reach to automatic systems with higher efficiency.**

Technology Stack

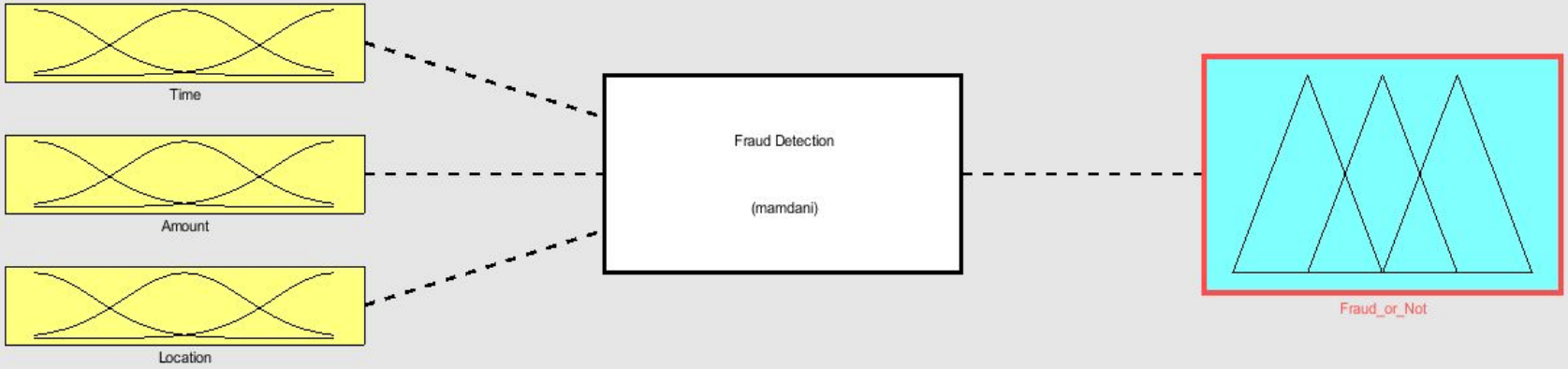


Proposed System



Fuzzy Logic Designer: Fraud Detection

File Edit View



FIS Name: Fraud Detection FIS Type: mamdani

And method min

Or method max

Implication min

Aggregation max

Defuzzification centroid

Current Variable

Name Fraud_or_Not

Type output

Range [0 3]

Help Close

Updating Rule Editor

Proposed Algorithm

The following needs to be calculated:

I. ***Average transaction time*** in hours

II. Average transaction ***amount ($)***

III. Average transaction ***location***

The derived dataset (set B) will then be

$xi=\{time,amount,location\}, xi \in B$

Next, the membership functions will be created using fuzzy logic toolbox in Matlab.

Fuzzy Logic Algorithm

i. **Five inputs**: time, amount, location, interval, and frequency of the financial transaction.

ii. **Output:** classification shown in linguistic terms.

iii. Each **input** has **fuzzy variables.**

iv. Each fuzzy variable is associated with a **membership Function**.

v. The membership function is calculated for each fuzzy variable.

vi. The **rules strength is calculated** based on the membership function of the fuzzy variable.

vii. Financial transaction classification is calculated by taking the **maximum of the selected output set as the final result.**

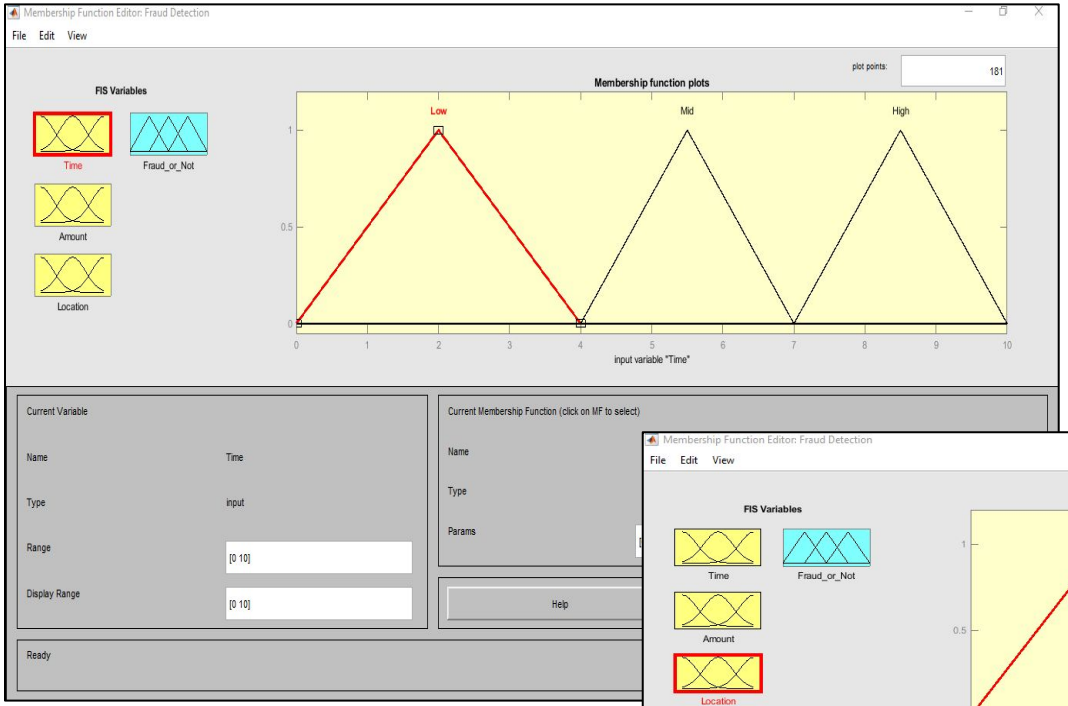

Membership Function Editor: Fraud Detection
File Edit View
FIS Variables
Time
Fraud_or_Not
Amount
Location
plot points:
181
Membership function plots
Low
Mid
High
input variable "Time"
Current Variable
Name
Time
Type
input
Range
[0 10]
Display Range
[0 10]
Current Membership Function (click on MF to select)
Name
Type
Params
Help
Ready

Fig (a)

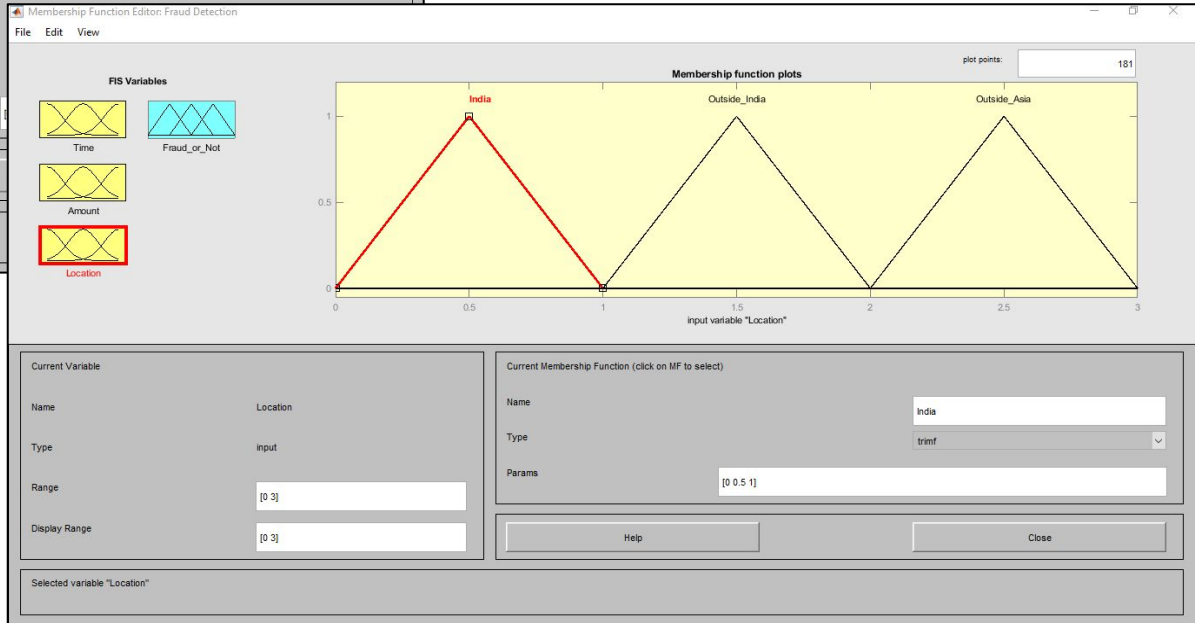

Membership Function Editor: Fraud Detection
File Edit View
FIS Variables
Time
Fraud_or_Not
Amount
Location
plot points:
181
Membership function plots
India
Outside_India
Outside_Asia
input variable "Location"
Current Variable
Name
Location
Type
input
Range
[0 3]
Display Range
[0 3]
Current Membership Function (click on MF to select)
Name
India
Type
trimf
Params
[0 0.5 1]
Help
Close
Selected variable "Location"

Fig (b)

Fig (c)

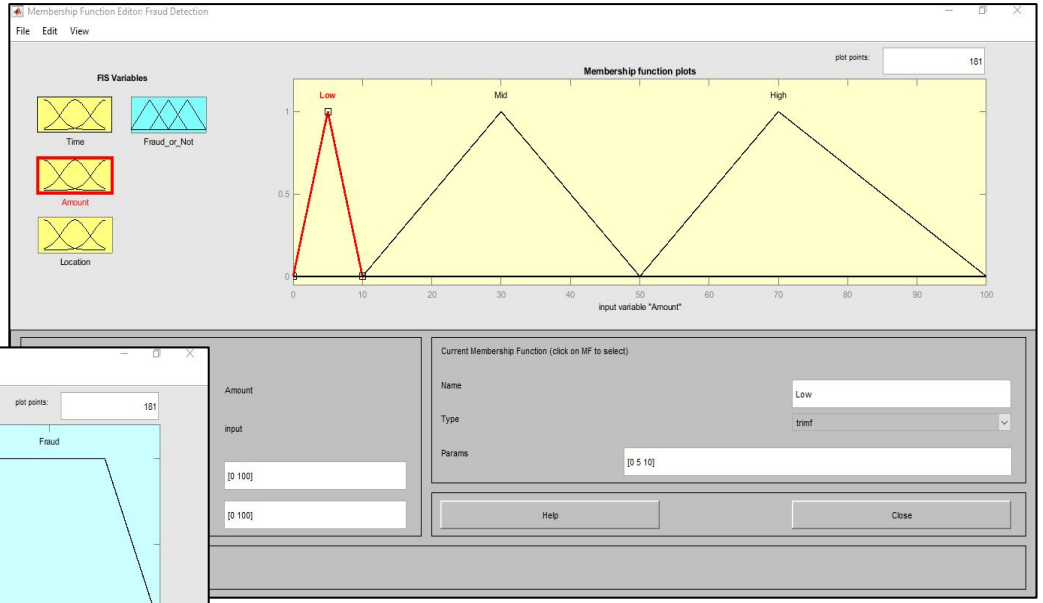
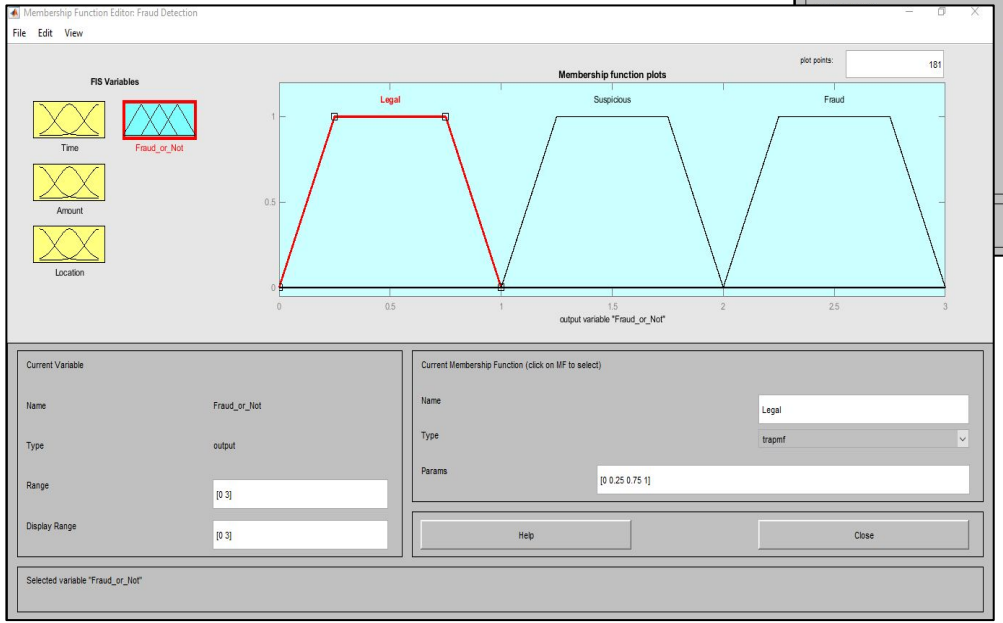
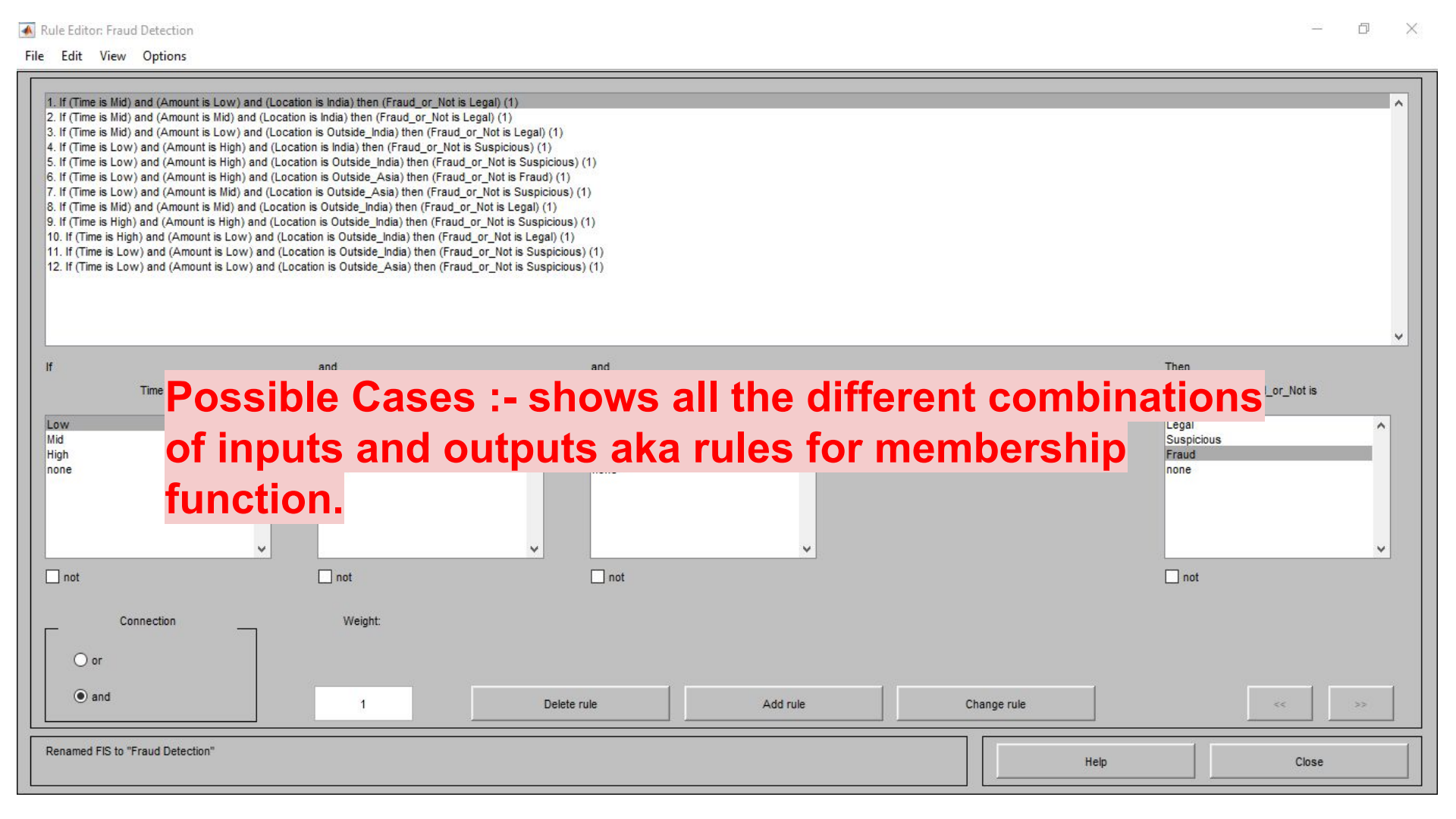


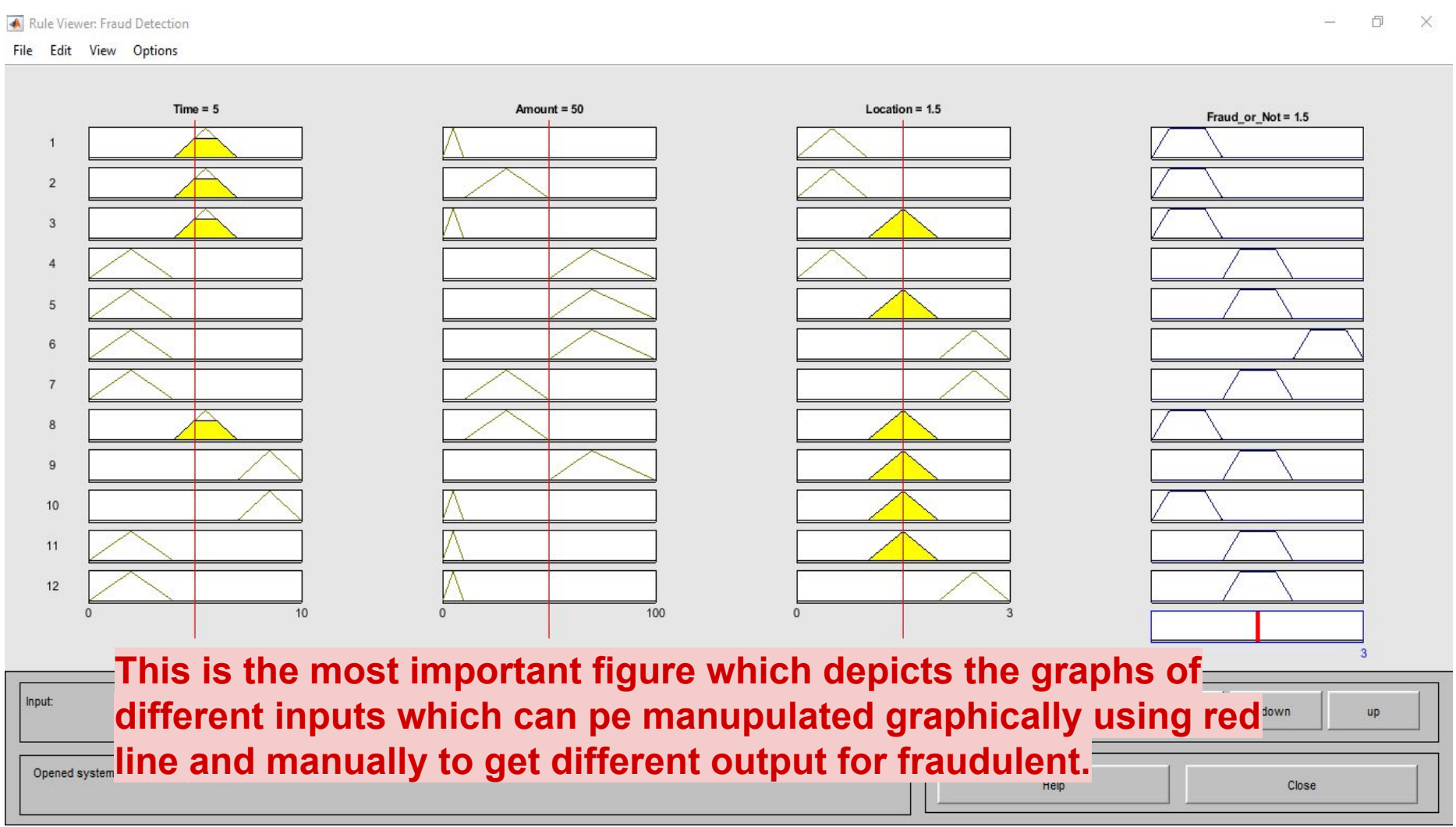
Fig (d)



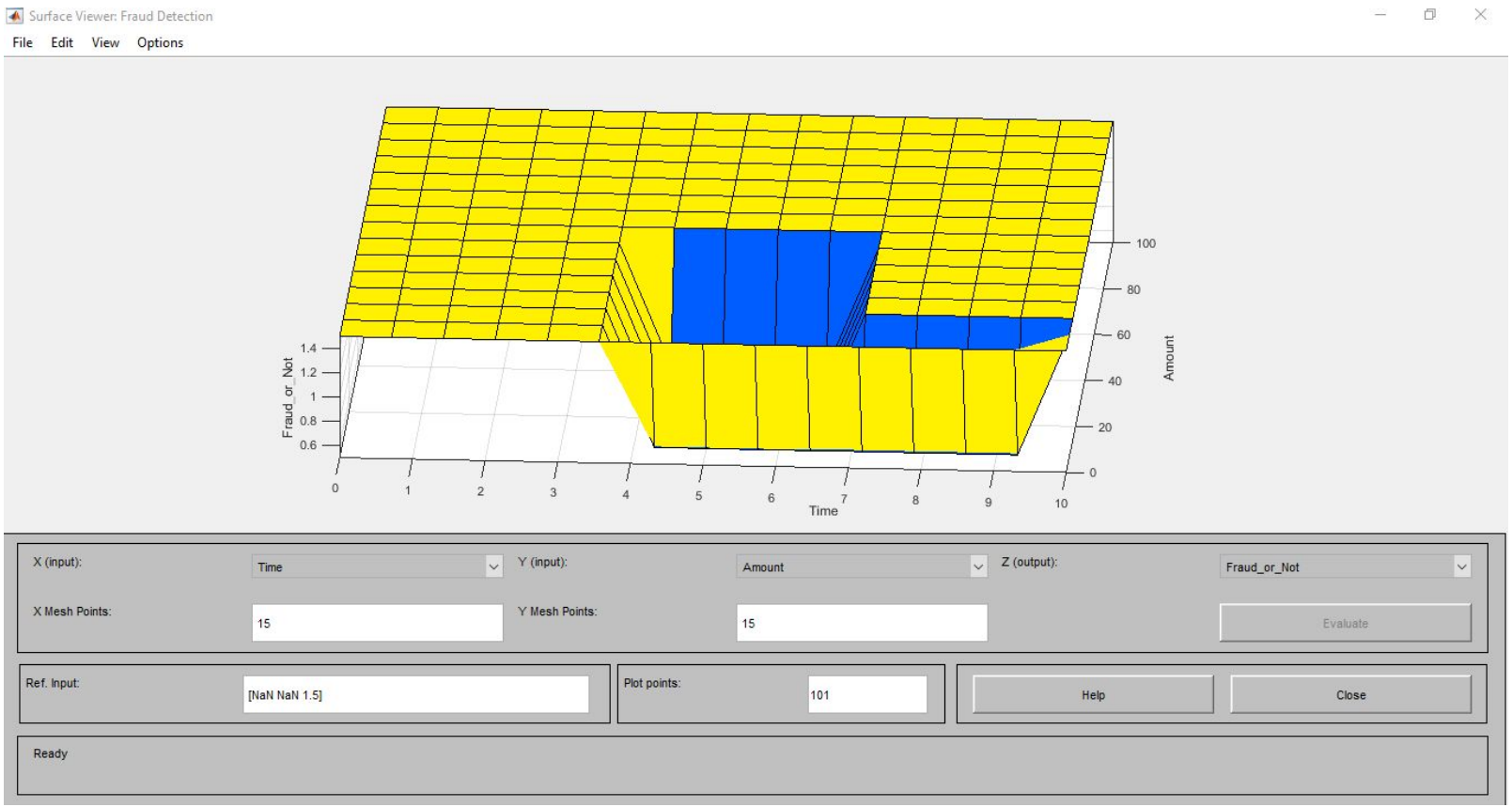
The above figures in (a),(b),(c),(d) shows different variables of time, amount location and output different combinations which results in different three outputs :- Fraud, Suspicious, Legal.



Possible Cases :- shows all the different combinations of inputs and outputs aka rules for membership function.


Rule Viewer: Fraud Detection
File Edit View Options
Time = 5
Amount = 50
Location = 1.5
Fraud_or_Not = 1.5
1
2
3
4
5
6
7
8
9
10
11
12
0
10
0
100
0
3
3
This is the most important figure which depicts the graphs of different inputs which can pe manupulated graphically using red line and manually to get different output for fraudulent.
Input:
down
up
Opened system
Help
Close

3D Graph of our Model



Innovation

Generally financial fraud detection system ***requires accurate and fast computing methods to reduce the computational time*** in determining fraudulent transactions and to reduce false alarms. In this particular project, we used behavior financial flow model to track the pattern of usage by the user.

The data were preprocessed to be ***categorized into useful attributes, then using fuzzy logic the membership functions*** were created for each attribute. The ***rules*** were also created and prioritized based on the weight of each input.

12 rules has been created and fed to the fuzzy logic toolbox. The strength of each rule depended on the membership function range specified. Also, the weight of the rules varied. For example, the input ‘location’ was given a higher priority as most online frauds occur in a location far from the user’s usual credit card usage.

Conclusion

The advantage of our system is that it ***uses the existing data in the transaction statement for decision making*** thus no special tools are needed for data preprocessing.

We plan on deploying our project for many financial transaction of multiple users and extend our research area to contain big data analysis representing the big number of transactions happening on daily bases.

Thank You...