**Mathematical Model**

Let S be the solution set for the given problem statement. S={Input,Function,Output, Terminate,Success,Failure}.

Where, Input =Input to the System.

Function =Functions of the system.

Output =Output of the system.

Terminate= Terminating Condition of the System.

Success =Success cases for the System.

Failure =Failure cases for the system.

1. Input ={UserName,Password,Data Packets}
   1. UserName : user\_id
   2. Password : user\_passsword
   3. Data Packets: A data packet is a unit of data made into a single package that travels along a given network path.
2. Function={Login\_auth,Network\_connection,train\_test,intrusion\_detection,Notification}
   1. Login\_auth: Authentication of user account.
   2. Network\_connection =Connection establishment between the nodes and the ids.
   3. train\_test: Training and testing of module.
   4. intrusion\_detection = Detecting the intrusion.
   5. Notification: Notifies the user.
3. Output = {display\_ intrusionmsg }
   1. display\_intrusionmsg =display error message if any intrusion occurs.
4. Intermediate Results
   1. Successful working of module.
   2. Successful Working of Network.
   3. Successful User authentication.
5. Terminate= {Invalid\_details, Network\_failure, Timeout }
   1. Invalid User Authentication.
   2. Network failure
   3. timeout

6. Success

1. Successful user login.
2. Successful connection establishment of nodes and ids.
3. Successful detection of intrusion.
4. Displaying the results.
5. Appropriate error messages in case of invalid input.

7. Failure

1. Web app Failure.
2. Hardware faults.
3. Network establishment failure.
4. Not displaying required results.