



# APPLICATION OF NEURAL NETWORK ALGORITHMS TO IMPLEMENT DRUG ABUSE RESEARCH ON IDENTIFYING NICOTINE USE DISORDER THROUGH ANALYSING PERSONALITY TRAITS

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## Abstract

Nicotine addiction arises when a person need nicotine and unable to quit using it. Nicotine is identified as a chemical present in tobacco. The use of nicotine will certainly bring temporary pleasing enjoyment in the human brain. This brings the user to become addicted to the use of nicotine. The Smokers alone are not the victims of NUD. The Second hand smoke breath of nicotine by non-smoker is also the victims. If the children and persons with high blood pressure and or cholesterol are exposed to second hand smoke are having superior risks of being affected by heart sicknesses. Possibly everyone are aware regarding the association among smoking and lung cancer. It is unfortunate that many person were little aware that smoking also connected with heart diseases, stroke and enduring diseases. Smoking can uplift risk of getting cancer in many parts of human body, comprising bladder, throat, mouth, kidneys, cervix, and pancreas. The aim of this paper is to investigate the most influential features origins the NUD among the nicotine user's personality trails. Depending on the self-extracted data collected from 1885 individuals three of the NN models were built. These three NN models apply the 10-Fold cross validation and 30-70 Hold-Out validation methods to provide the reliability of the prediction results. Among the three methods the RNN Hold-Out method achieves 99.19% as best accuracy results.

**Keywords:** Nicotine Consumption, NUD, Neural Network, FFNN, CFNN, PNN.

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## 1. Introduction

The various computing advances that computer science offers are opening doors to fields as diverse as medicine, military, and business. Most of the improvements relate to the analysis of data accumulated in the field. This data is used for active interpretation and results. Various learning algorithms are used to complete this exercise. These learning algorithms are grouped into different categories called supervised, unsupervised and semi-supervised [1] learning algorithms. The mentioned group of learning algorithms use the collected data to perform multiple tasks such as prediction, classification and clustering.

Neural network (NN) algorithms are one part of machine learning principles. Also, NNs are considered as the heart of deep learning algorithms. A NN is a set of procedures used to identify and understand fundamental relationships among collected data sets, reflecting the principles that tune the human brain. A NN adapts to changing inputs. Because of this feature, this network always finds the best fit without having to change its inference principles. Feedforward NNs are essentially a very simple kind of neural network. Input is passed through the activation of the input node. Passed inputs remain forward-sorted unless they go to outputs. FFNNs [2] can also have hidden layers for

their features, and this form is most commonly used in facial recognition techniques. An additional complex form of NN, known as a recurrent neural network, takes the output of a processing node and feeds the returned statistics to the network.

Neural networks are composed of easy factors working in parallel. These factors are stimulated through biological human nervous systems. In the real world the NN function is decided in large part through the connections among factors. We can able to make learn the NN function to carry out a specific characteristic through modifying the values of the connections which is otherwise known as weights among factors. The proposed model is shown in Figure. 1. Generally NN are adjusted or trained in the order that a particular input to be identified to a selected final output [3]. The NN is modified primarily based totally on the assessment of the output which identifies the class until the NN output suits the particular class. The learning of a NN function is performed through many such input or target pairs in supervised learning method. Batch learning of a NN proceeds through making weight and bias adjustments primarily based totally on a whole set of training vectors. Successive learning modifies the weights and biases of a NN as required after presentation of every individual training vector. Successive learning is infrequently identified as 'on-line' or 'adaptive' learning.

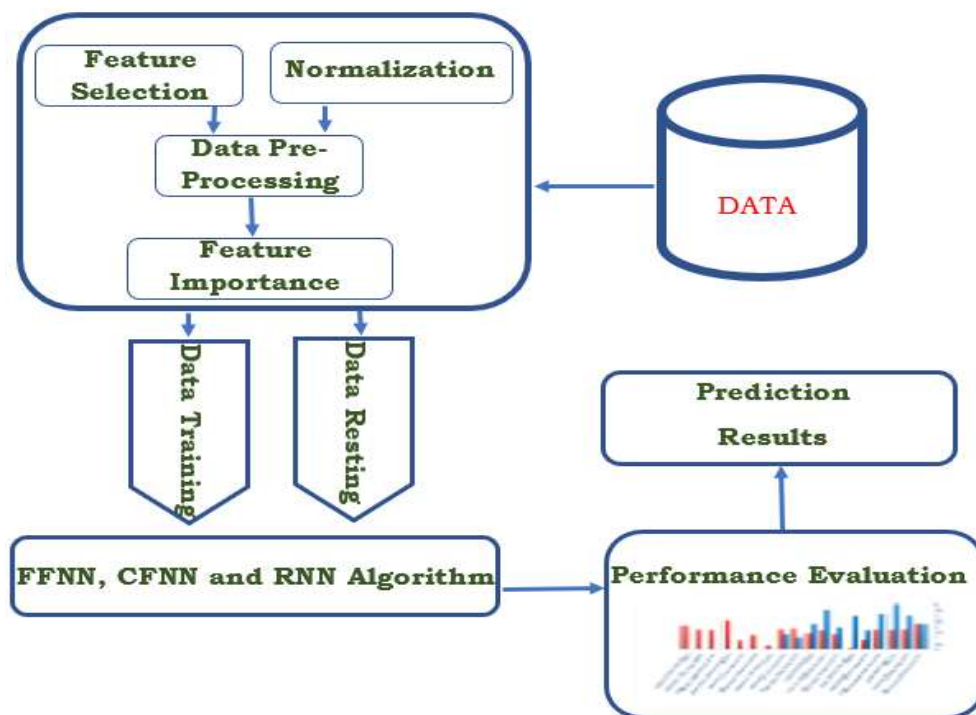


Fig. 1 Proposed Model

Neural networks had been learned to carry out complicated executions in various fields such as pattern identification, identification of sentiment in

social media, classification, speech and image identification. Today neural networks may be applied as a remedy which is complicated for the

traditional computing systems and the human beings. Now-a-days the NN paradigms are good enough to be used in engineering, economic and different sensible fields. The supervised learning strategies are typically used, however different networks can be received from unsupervised learning strategies or from direct layout strategies. Unsupervised networks may be used as instance to discover groups of data. Certain forms of linear networks and Hopfield networks are developed directly. There are several algorithms designed to perform learning strategies [4] that increase the alternatives that a user can perform. The discipline of neural networks has a record of a few 5 many years however has found strong software simplest beyond fifteen years, and the sector remains developing rapidly.

Drugs have been a major motivator for various crimes in society and a cause of serious harm to many young people. Substance abuse is addictive and can lead to death. Nicotine is a wonderfully addictive substance found in tobacco factories. This substance is found in all tobacco products. A handful of e-liquids also contain this ingredient. Nicotine can also be produced synthetically in the laboratory. People also use this substance to kill insects in agriculture. Any product containing tobacco contains nicotine. This includes cigarettes, heated tobacco products, cigars and, at best, e-cigarettes. Nicotine is no longer a cause of cancer. At the same time, cigarette smoke contains 69 potentially carcinogenic chemicals. This means they are cancer causing chemicals. Nicotine is obtained from plants in the class *Nicotiana*. These rivers may be tobacco flowers and may be part of the nightshade family. Tobacco originates from South America. Then it starts to spread to North America, Africa and Australia. Indigenous people of the region first chewed the leaves of the tobacco flower, smoked it, or used it in spiritual ceremonies. European colonists exported tobacco plants for income and turned their interest in tobacco to recreational use. It is a toxic substance that can cause poisoning. If nicotine poisoning is suspected, immediate medical attention may be required. A report [5] (National Institute on Drug Abuse-NIDA) suggests that nicotine addiction causes the largest number of people who smoke regularly to use tobacco. Nicotine addiction poses numerous health risks. They bring increased risk of cardiovascular, respiratory and gastrointestinal diseases. The immune response is reduced, further affecting reproductive health.

It affects cell proliferation, oxidative transformation, and apoptosis and DNA mutation through various mechanisms leading to cancer. It further affects tumour spread, metastasis, and conflicts with chemo and radiation treatments. Nicotine is a dangerous and addictive chemical and

requires some regulation. Blood pressure, heart rate, blood stagnation in the heart, and narrowing of the blood vessels that supply it may occur. Nicotine poisoning hardens arterial walls and causes heart attacks. This chemical can settle in the body within 6-8 hours, depending on how regularly a person smokes. Nicotine causes short-term feelings of well-being and relaxation. This increases your heart's activity and the amount of oxygen your heart needs. When nicotine enters the body, it produces hormones that help reduce pressure and pain, resulting in a discriminating [6] mood. The body captures nicotine from the bloodstream quickly enough to affect the brain. The intensity of nicotine increases rapidly after entering the human body, after which the excitement of pleasure does not last long. They are created to continue the human cycle with smoke to maintain the feeling of pleasure. Adequate nicotine use changes the way the brain functions in relation to self-control, anxiety and learning. When someone stops smoking, long-term fixes can lead to compulsion and withdrawal. According to the report [7] (NIDA-2020), approximately 23.6 million people aged 12 years and older had NCD in the last 30 days. Treatment for NUD [8] may include nicotine replacement therapy (NRT). NRT converts small amounts of nicotine to low levels of nicotine, which bind to multiple nicotinic receptors in the body. NRT can also consist of nicotine supplements, sprays, tablets, or adhesives.

## **2. Literature Review**

The proposed work uses the data collected by National Survey on Drug Use and Health (NSDUH) – SAMHSA [9] in the year 2020. Relatively a lot of major findings were extracted from this dataset. This data set consist 1885 instances to figure out several reasonable classification model. It consist 31 attributes. Among them 5 are demographics features. They address the features related to education status, age limit, gender, country belongs to and ethnicity factor. The neuroticism (Nscore), extraversion (Escore), openness to experience (Oscore), agreeableness (Ascore), and conscientiousness (Cscore) attributes value is generated by self-extracted from the participants of this survey. Normally these five features are called as Big-Five Personality Model [10]. The Impulsivity and sensation seeking are the other two person's personality attributes. In total there 12 attributes were used to build the classification models. There is several research works have been constructed with this dataset [11].

At the coronavirus disease 2019 (COVID-19) spread period in US 54% of growth in the sale of alcohol associated with previous year. WHO advised that the use of alcohol in the pandemic might

possibly affect the health concerns and increase in danger producing behaviours of individuals? Harold D. Green, et al. [12] examines the specific level of changes in alcohol use and significances associated with alcohol usage in US population. They also examined the demographic inequalities earlier to COVID-19 epidemic. The alcohol consumption produces several difficulties to many countries. It not only affects the people and also the nation. Subramaniam, M., et al [13] conducted a Door-to-door home investigation with adult in Singapore resident's age between 18 s and above. The individuals were randomly identified by means of a inconsistent layer of selection method. They are evaluated with WHO WHO-CIDI 3.0 consultation type. They observed increase in the occurrence of lifetime GAD (0.9% to 1.6%) and alcohol abuse (3.1% to 4.1%). The 12-month occurrence of GAD (0.8% vs. 0.4%) and OCD (2.9% vs. 1.1%) remained grater in SMHS 2016 correlated with SMHS 2010. Rani, K., et al [14] applied three networks designed on the principle of ANN Algorithm to predict the breast cancer occurrence is benign or malignant. The employed three various networks are feedforward back prop, Cascade forward and layer recurrent. They conclude that between these networks, feedforward algorithm has healthier performance associated with other two networks. It is also observed that the ANN is very powerful when the analysis is carried out with non-linear connections among the input and output to be projected. The outcomes express that accuracy of the ANN to perform prediction is healthier than the other methods. [15] Meheretie, Daniel Limenew, et al implemented the learning by applying feedforward backpropagation, cascade forward backpropagation, feedforward distributed time delay, and layer recurrence neural networks. In the network they used TRAINLM, TRAINRP, TRAINSCG, TRAINGDX, and TRAINOSS as their training functions autonomously. The architecture of the network is built with 1 hidden layer and 12 neurons. Finally, it is observed that the feedforward backpropagation neural network accomplished improved accuracy compared with other three neural networks models.

### **3. Research Method**

#### **3.1 Data and study sample**

The data set used in this study included data from 1885 respondents. For each respondent, 12 attributes were identified as personality measures consisting of NEO-FFI-R-neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness [16]. All available properties are specific and computed first. After quantification, all properties are calculated as true values. Members

were also puzzled by the use of 18 illegal databases, including 18 classification problems. Each label variable contains 7 classes: unused, used for more than 10 years, used in last 10 years, used in last year, used in last month, used in last week, and "used in last day".

Nscore is NEO-FFI-R Neuroticism. Neuroticism is one of the five major personality tendencies considered in psychology. People with excessive neuroticism are much more likely than usual to be depressed and enjoy emotions such as anxiety, sadness, panic, irritation, disappointment, anger, distrust, innocence, unhappiness, and loneliness. Escore is an additional version of NEO-FFI-R. It shows human behavior in society and in public. When a person becomes excessively extroverted, his lifestyle is surrounded by celebration. They love to socialize, participate in social events and are always full of energy. Oscore is the openness of NEO-FFI-R. It shows how open a person is. A person who is too open to enjoy a test of character loves trying new things. They are creative, curious and open-minded. People with low openness to pleasure may instead stop trying new things. They are intolerant and enjoy everyday life literally. Ascore is the strength of NEO-FFI-R. Excessive degrees of gaiety are generally friendly, kind, and caring. They usually have a positive attitude towards human nature and get along well with others. Cscore is the conscience of NEO-FFI-R. An overestimation of conscientiousness usually indicates an extra level of self-discipline. These people support the implementation of plans and do not act unexpectedly. Their planning and determination usually bring significant success in their chosen business. Impact properties are measured using BIS-11. Impulsivity is feeling compelled to act. It shows a character with little expectations and consideration [17]. If you think a person is impulsive, make it clear that they do something out of the blue without thinking. SS - visual sensation measured using ImpSS. Sensation is the value of a response achieved by our sensory structures. Perception is the brain's practice of selecting, classifying, and understanding these sensations. That is, emotions are the physiological basis of perception.

#### **3.2. Neural Network**

In this advanced digital environment, everything revolves a lot around the patterns hidden in the sample data. The hidden pattern is identified either physically or mathematically making use of numerous algorithms. In the field of digital environment, the sample is characterised via values called function vector. The technique to learn the hidden patten from sample data by making use of numerous training algorithms is popularly termed as

the process of pattern recognition. This is accomplished by means of the class of learning built by means of prior knowledge generated. Additional measures are to be mine statistical evidence existing inside the sample and their illustrations. The utilization possibility of this process regularly attracts the attention of the researches in the direction of it [18]. The unprocessed data is converted to perform a selected principles which a computer system to categorize and use it. This pattern recognition comprises both classification and grouping of similar identical patterns in to one. The process carried out to perform Classification is recognized as supervised learning. While performing the classification task the appropriate class label is appointed to identical gatherings through the knowledge produced by means of training. In the case of clustering, the information is accomplished by means of grouping the data from training set. The Clustering is recognized as unsupervised learning. A right pattern recognition procedure should efficiently differentiate the maximum of important prominent patterns successfully and quickly. It should have capable to categorize and classify unknown similarity of the data belongs to. The successes of any NN model heavily rely on the features of an object. These features are identified as function of measurements. These features may contain the property continuous, isolated, or diverse binary variable measure. The feature or otherwise known as properties generated from object enumerates almost a few crucial behaviours. The object can be our face, eyes, ears, nostril and etc the set of properties generated from those items will be provided to the NN model as input or training set. This input training set which comprises the properties is termed as feature vector. The knowledge achieved by the NN model through training by means of various data-mining algorithms is popularly identified as learning or training. Further the trained model converts its learned knowledge to gain new findings in precise manner.

The appropriate learning is the highest crucial task to be achieved by any algorithm. Basically, the overall performance of the machine is evaluated by the given training set. It is basically relying upon the suitable algorithm which is built to carry out the learning. Usually, every dataset will always divide into two groupings. The initial one is used to perform the training task with the built model and the next one is to perform test. The method to correlate the training set used to identify the hidden knowledge is accomplished by means of learning principles of the utilized data-mining algorithms to represent suitable class. The test set carry out the examination to identify appropriate suitable class. This guarantee whether or not the system become aware of the correct output after performing the

training or not. The important motivation behind the test set is to evaluate the accuracy which the built NN model achieves.

### **3.3. Feed Forward Neural Network**

Feedforward neural- network algorithms are basically working on the principle of biologically inspired to attain the classification task. It includes excellent wide variety of basic element called neuron matching the processing unit in a computer system. The input layer, output layer and the hidden layer of the NN are structured by these neurons. Every neuron withinside the layer is connected by all neurons accessible in subsequent layers. The construction among the neurons certainly contains variation among weights. These weights determined to build the network will decide the quality of knowledge attained by any network. These neurons in each neural network always identified as nodes. A certain part of dataset is split in to training set considered as input is progresses thru every layer which are available in the network. To conclude a class, it ends at the output layer. This set of rules is referred as feedforward NN [19] for the reason that through the algorithm's progression any feedback among the layers will not be available since the usual operation begins. The advancement of this network is carried out by including two phases. The preliminary one is the gaining knowledge through training or learning and the next one is classification through testing. One important aspect of this FFNet is that the weight among the neuron could be revised all thru preliminary stage. The neuron weights are adjusted in a manner that the algorithm is able to diagnose hidden pattern in the dataset. As expected, the output which attains the correct class, will accomplish with a maximum output rate.

### **3.4. Cascade Forward Neural Network**

The essential and valuable setbacks in demonstrating a neural network is to figure out the appropriate quantity of hidden layers. To conquer this difficulty CFNN rules engage a new element in line with excess of expected error. The algorithm plays properly with the aid of using a structure to the network. In addition, it minimises the learning time required to clear up the proposed task. The technique to construct a network starts with the aid of using the single-layer network and the specified hidden neurons are future added. After achieving the training, one additional hidden neuron is added and the weights are modified to increase the scope. This is to reduce the correlation achieved from output of added hidden neuron compared with the network generated left-over error. The CFNN [20] highly recognized as a sequential layered network. The CFNN mostly built with the aid of input/output layers and a single hidden layer intermediate to both

input/output layers. All those layers are constructed thru inclusion of several groups of neurons. The dissimilarity among CFNN and FNN structure is achieved by the weight connection which takes place within the input and all prior layers. The

$$y_p = \sum_{i=1}^n f^1 \omega_i^0 x^i + f^0 \left( \sum_{j=1}^n \omega_i^0 x^j f_j^H \left( \sum_{i=1}^n \omega_{jh}^H x_i \right) \right) \quad (1)$$

$$y_p = \sum_{i=1}^n f^1 \omega_i^0 x^i + f^0 \left( \omega^b + \sum_{j=1}^n \omega_i^0 x^j f_j^H \left( \omega_i^0 + \sum_{i=1}^n \omega_{jh}^H x_i \right) \right) \quad (2)$$

$$= \frac{1}{2} \sum_{p=1}^n (y_p - q_p) = \frac{1}{2} \sum_{p=1}^n (e_p)^2 \quad (3)$$

### 3.5. Recurrent Neural Network

The human mind is the best example of effective recurrent network construction. To preserve this behaviour energetic this algorithm occupies a major position by means of influencing our dynamics with inside leading towards perceiving, reacting and understanding the hidden patterns. To carry out the prediction the recurrent networks react reflecting the working principle as like as the human mind. The recurrent networks are constructed by using only single-feedback connectivity with the network. In contrast with the feedforward networks overall accuracy estimation of this network may be accomplished by means of the size of compressed network. Primarily MLP is limited to attain the expected result while headlining the topologic connection problem. With the help of the associative remembrances the developers provide focused determination to attain dependency found among the created input and output. A temporal nation illustration in the dynamic network connection activates the recurrent network. The RNN [21] comprise effective computation measures to offer way to numerous temporal processing models and applications. Always the recurrent networks are constructed with normal differential equations. Concurrently it is also discovered that they are capable to be applied in the digital environment with fashionable software program by means of integrating the differential equations. The RNN may be categorized in to 2 different categories. The preliminary one is the globally recurrent networks (GRNet). The next one is locally recurrent globally feedforward network (LRGFFNet).

The GRNet contain the capability to accept FFNet between every neuron. The LRGFFNet is constructed with the dynamics unspoken restricted neuron system. The difficulty with GRNet is they regularly conflict with achieving balance during the learning process. They additionally involve complicated and time captivating training algorithms. At the same time, they are constructed

CFNN include the capability to understand and classify the relationship which exists among the set of linear or nonlinear input/output. The mathematical equation regarding the proposed work is illustrated as follows:

just as like as the MLP. The construction of dynamic neuron systems includes inside feedbacks. The inter-connection between these neurons is certainly a feedforward inter-connection. They comprise much less difficulty in building and achieving the training. A certain improvement in this algorithm is that the previously determined knowledge can be integrated and feed into this execution without much effort.

## 4. Results and Discussion

This article includes two critical aspects. The initial part is the detailed information regarding the dataset. The second analyse the generated output from the execution of three NN algorithms. The determined algorithm here is to generate the results are Feed Forward NN (FFNN), Cascade Forward NN (CFNN) and the Recurrent NN (RNN). This research is basically aimed at determining the essential necessities regarding the determination of the predictor variables from the dataset. This research further provides focus on the features which provide healthy contribution to identify the class. This provides a certain help in the feature selection process. A variety of predictor variables incorporate direct connection in finding output categories. The Big Five personality traits are applied to understand [22] the association stuck between personality and practical actions. This model developed through quite a lot of investigators. They investigate vocal self-explanations of people behaviour. This investigation developed through analysing connections concerning huge amount of vocal explanations related to personality traits. In proposed work the accumulated scores Nscore, Escore, Oscore, Cscore, Impulsive and Sensation seeing incorporate the direct connection to identify the particular class. This is presented in Table 1. Rest of the data contain the indirect contribution. The Figure 2 represents the graphics view of the NEO – 5 factor feature importance.

Nscore	Escore	Oscore,	Ascore,	Cscore
0.000289	9.03E-05	0.000195085	0.00027	0.000562

Table 1: NEO-Five Factor Feature importance in classification

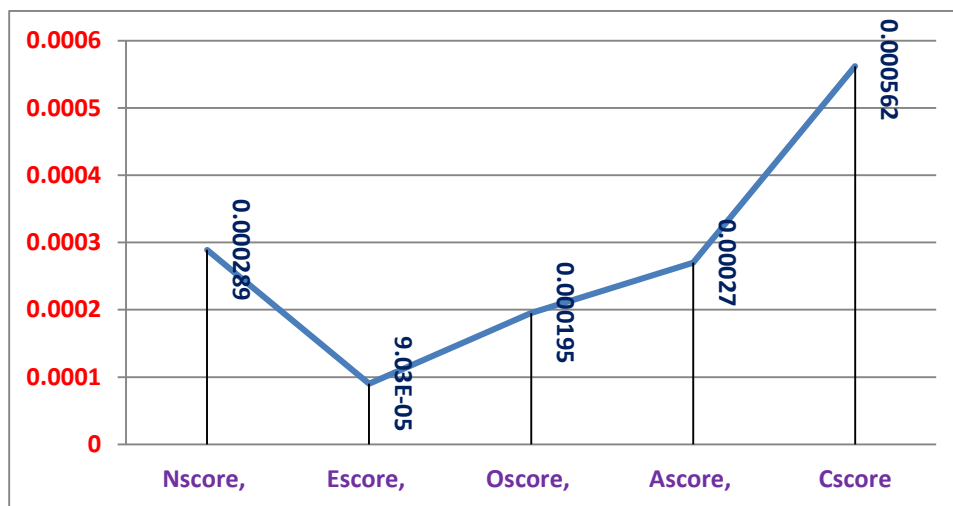


Fig.2 NEO-Five Factor Feature Importance

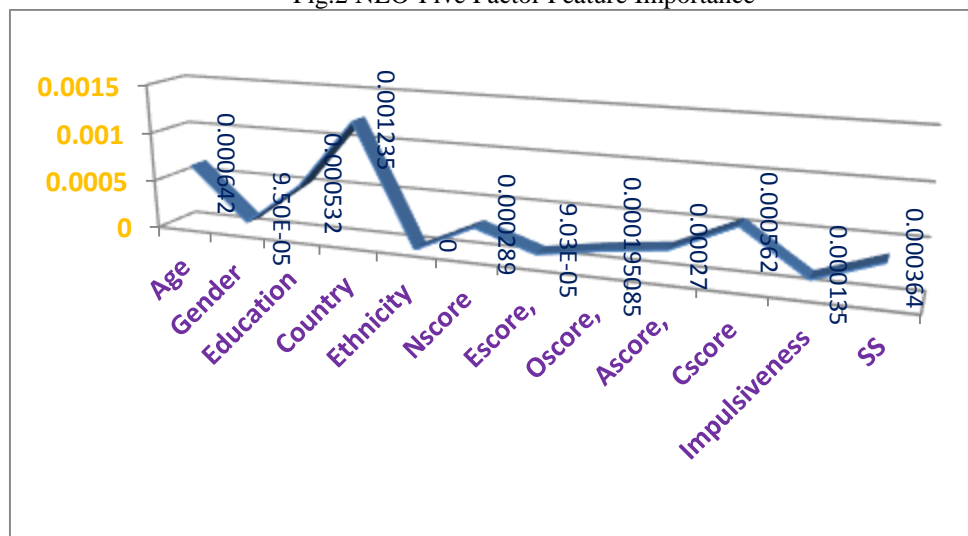


Fig 3 Feature Importance in Classification Process.

The Figure 3 represents the feature significance as a bar diagram for all our 12 attributes. Here the intention is to present the unique description nearly around the data involved in this study.

#### 4.1. Experimental evaluation

The training and testing in this research work is carried by considering all of the 12 features to distinguish the appropriate class which the testing data belongs to. We transformed the seven-class presented in the dataset as binary-class dataset. Out of the two groupings the initial one 'drugs never used' belongs to class one. The next 'drugs used' belongs to class two. From the available 18 drugs in

the dataset the drug "Nicotine" alone given focus in this research. The successful expected outcome from this model through the incoming new data is evaluated by means of few of the performance metrics. The performance is measured through validating the confusion matrix. The Matrix achieved in this research are Accuracy, Precision, Specificity and F-Score. The corresponding formula utilized is listed below.

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} \quad (7)$$

$$\text{Precision} = \frac{TP}{TP+FP} \quad (8)$$

$$\text{Specificity} = \frac{TN}{TN+FP} \quad (9)$$

$$\text{F - Score} = \frac{2 \cdot \text{PRE} \cdot \text{REC}}{\text{PRE} + \text{REC}} \quad (10)$$

#### 4.2. Neural Network Predictive Models

NUD remains one of the most long-sighted classes of substance abuse and a main motive of receiving death. Much stays to be found out mechanisms underlying NUD in order to capture treatment. Treatments that growth efficacy past that performed with presently authorised nicotine patch and gum formulations are truly needed. To investigate the important features which influence a person to be affected by NUD, we used neural network to examine the drug consumption dataset. The data set consist of 1885 instances and 12 important features. It also includes 18 drug types [23]. Among them in this study we have utilized

only the nicotine. This approach does not require specifying measures should be used. Reasonably, the neural network determines by the aforementioned which features have additional predictive to influence NUD. In this proposed work we have utilized three NN models namely feed forward, cascade forward and recurrent neural network. Both the 70/30 hold out validation and the 10 fold cross validation methods are performed. The output of the NN models were tabulated in table-1. We investigated which features supply most informative for the evaluation of the NN model. The corresponding results are tabulated in table-2

Model	Feed Forward		Cascade Forward		Recurrent	
	HO	CV	HO	CV	HO	CV
Accuracy	77.52	78.08	77.52	77.55	76.99	77.98
Precision	51.51	57.57	66.66	52.25	32.81	42.52
Specificity	96.33	97.11	99.77	96.36	79.01	79.33
F-Score	21.11	21.63	30.76	21.52	20.73	22.71
Training Time	27.014897	22.418673	6.474476	16.570401	5.019651	16.786112

Table 2: Classification Results

We adjusted the number of neurons and number layers in all six models. Up to five hidden layers and 12 input neurons were added to the network. we evaluated the training and testing with the same data. The revised networks also established identical results compared with the original network. We suggest that this network methodology could be useful for the analysis of behaviour of other human who are in danger NUD. The application of NN models to drug consumption dataset has shown significant promise. A number of admirable predictive performance across a number of use cases and data types can be achieved. However, the performance of NN models reviewed here is also somewhat uneven, ranging from accuracy in the more than 75% range to chance performance with a wide range of results between these two extremes.

#### 4.3. Comparison of Results

The proposed work performs learner-based feature selection to select the best features for training our model. The important goal of performing the training is to predict the personality traits through self-extracted drug consumption report. From the dataset the Alcohol is chosen as the drug and three NN methods namely FFNN, CFNN and the PNN were taken in to consideration to perform the training and testing. MATLAB is used to train the models with 30-70, training-test, hold out and validation 10-fold cross validation. For each classifier, The Accuracy, Precision, specificity, F-score and Training time were observed and stored. These results were shown in the Figure 4 and Figure 5. Among the three classifiers the FF Cross validation method provides a best accuracy (78.08%) out performed all other two classifiers.



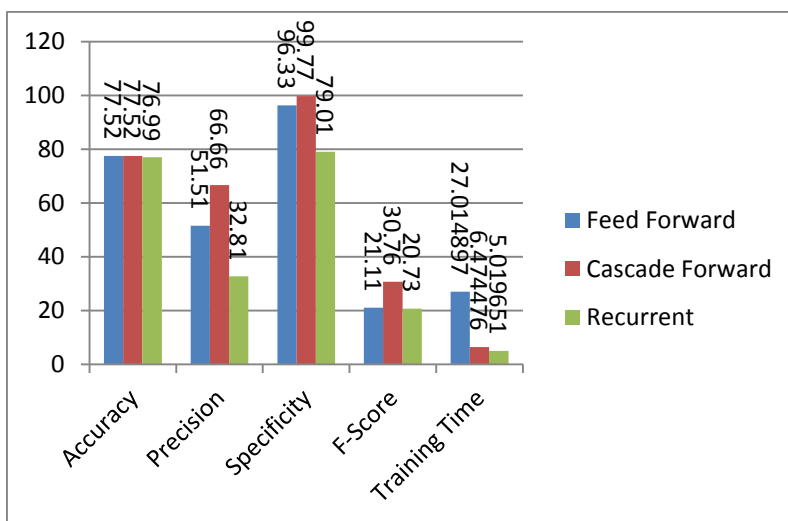


Fig.4 Hold out validation

This research identifies through indication that nicotine is a crucial addictive molecule which is present in tobacco and remains vulnerable to people. Various studies identify that tobacco smoke plays an essential role in the NUD. NUD contains other pharmacologically active agents that can enhance or facilitate mental disorder.

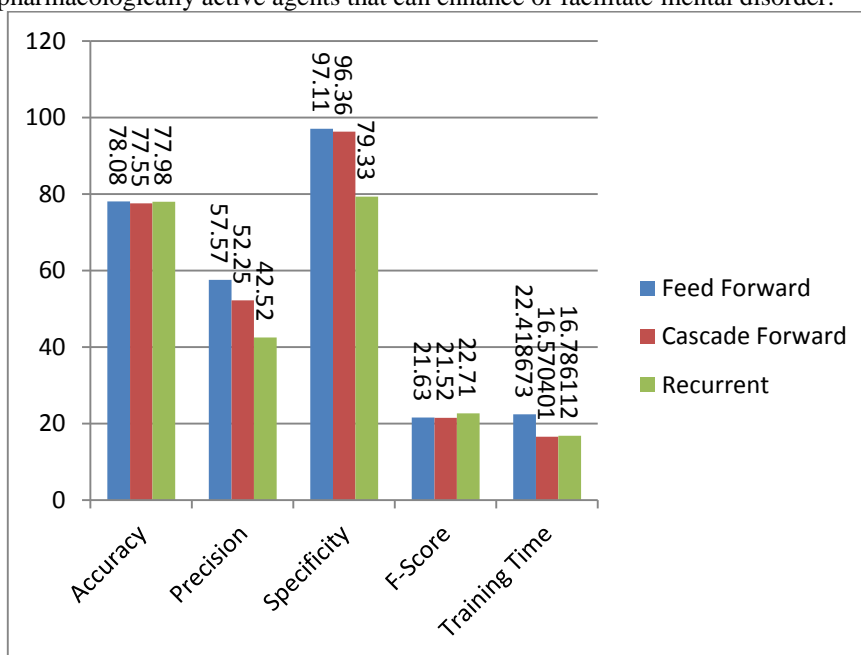


Fig. 5 10-Fold Cross validation

Additionally, it would seem that the dependence upon nicotine is facilitated by the close association with sensory cues within NUD, which both greatly enhance nicotine-seeking behaviour. They will maintain the smoking habit and nicotine consumption. Future improvements in the treatment for NUD and setback will need to discourse about nicotine compulsion.

### 5. Conclusion Future Work and Limitations

The proposed research article explores the sights of personality traits prediction from alcohol consumption dataset. The exploitation of vulnerable risk-producing nicotine is found that the personality traits can be projected through self-extracted data collection. Through the drug consumption dataset,

the training and testing were performed to conclude a best performing NN model. It is observed that among the three of the FFNN, CFNN and RNN models the FF Cross validation method provides the best classification results. It is also observed that the young male adults were more vulnerable at risk of being addicted to the nicotine drug. One of the important factors that physiologists consider is that

the drug addiction habit is for some level can be identified through the growth of population and personal aspects. By considering this point it is observed that some other reasons can also play important role in achieving the prediction.

This research article also provides future scope to improve the prediction of Drug-Use vulnerability risk. In future the harmfulness of the drug addiction may be analysed through the ranking or the drug using risk by analysing the harmfulness of the particular drug. Probably work direction may be redefined towards the direction of some other useful analytical modelling method through extending the dimensionality of the current collected data. There are few limitations exist in the proposed work. Initially the dataset does not bring into consideration about the drug consumption period into account. The age group of the drug consuming persons is also not taken to consideration in this research work. In most cases, the weaker results likely reflect insufficient data rather than inherent deficiencies in the models, a limitation acknowledged by many of the authors reviewed here. The field will significantly profit from higher and supplementary multidimensional datasets. These limitations may be rectified in future.

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