I J C T A, 9(37) 2016, pp. 95-101

Bio-Inspired Blood Group Prediction

R. Rajkumar[*] and V. Ganapathy[**]

Abstract: Many researchers have endowed upon identifying the relationship between blood groups and personalities. Some of the interesting studies are already carried out to explore the link between the blood group and various personality traits. This is most prevalent amongst in North East Asian countries (Japan, Korea etc). In these countries employability, food habit, disease vulnerability, matrimonial decisions etc are mainly based on blood groups. Throughout the globe, researchers attempt to link the blood group with the various human characteristics such as psychological behaviour, emotional and mental stability, type of career, personal choices, disease identification etc. The proposed research is an attempt to the prediction of primary blood types (A/B/O/AB) from the responses provided for the questionnaires given to the individuals to respond. The questionnaires have been judicially prepared to cover the various important personal features which can be unambiguously answered by the respondents. The entire data collected are analyzed by using soft computing techniques. The estimation of the probability and standard deviations of the results are used to predict blood types from which to decide on the various human characteristics. The prediction model is designed based on the responses obtained through extensive survey conducted with the First year medical students of Sri Lakshmi Narayana Medical College, Pondicherry. The results obtained from our analysis using soft computing techniques are quite encouraging and we are able to classify the individuals belonging to different blood groups correctly.

Index Terms: Blood types, Psychological behaviour, Mental stability, Soft computing.

1. INTRODUCTION AND RELATED WORKS

Blood types are inherited and represented contributions from both parents. The frequency and purity of the four main ABO blood groups (A, B, AB, and O) vary in populations throughout the world. Unfortunately the reliability of the blood group data for assessing relationships between population groups is very limited. This is mostly due to the lack of availability and interchange of this important data. The data is compiled and maintained through confidential sources. The data is not published due to racial and ethnic differences in blood types, given the emotionally charged political climate. There are a lot of studies [1] carried out to find the link between the blood group and human characteristics. According to naturopathic physician Peter J. D'Adamo, in his book 'Eat Right 4 Your Type' [2], has said the missing link might be the variations in the four basic blood types: O, A, B, and AB. Blood type is the key that unlocks the door to the mysteries of health, disease, longevity, Learning style [3], physical vitality and emotional strength.

There are strong evidences that these four blood group individuals have different taste buds which are the bases for selection of foods which ultimately become nutrition of that individual. Blood group "A" has bland (lacking of strong taste), "B" has sweet, "O" has saltish, and "AB" has bitter and astringent taste. There are strong variations in blood group diet because all four blood group types have four different types of tissues [4]. The blood type determines the susceptibility to illness, which foods we should eat [2] and how we should exercise. It is a factor in our energy levels, the efficiency with which we burn calories, emotional response to stress and perhaps even individual's personality [5]. There also had to be an explanation for why some people were able to lose weight on particular diets, while others were not; why some people retained vitality later into life, while others deteriorated mentally and physically. Blood type analysis has given us a way to explain these paradoxes. And the more we explore the connection, the more valid it becomes. In

[*] Department of Computer Science & Engineering, SRM University, Kattankulathur, India. *Email: rajkumar.ra@ktr.srmuniv.ac.in*
[**] Department of Information Technology, SRM University, Kattankulathur, India. *Email: ranapathy.v@ktr.srmuniv.ac.in*

this paper, we have devised a knowledge based system using artificial neural network to discover the link between the human personality and blood types.

2. METHODOLOGY

To start with the research, the various questionnaires relating to personal choices, their likes and dislikes, favorable reading time, games etc., were asked and responses recorded from a group of willing subjects. We have used responses for the questionnaires from the respondents as input to Artificial Neural Networks (ANN). ANN is trained using Conjugate Gradient backpropagation algorithm to feed to train the neural network and to learn the characteristics inherent in the input data. Figure 1 represents the simple artificial neural network that we have used to develop the prediction model. This network is now capable of predicting blood group types for a set of input patterns.

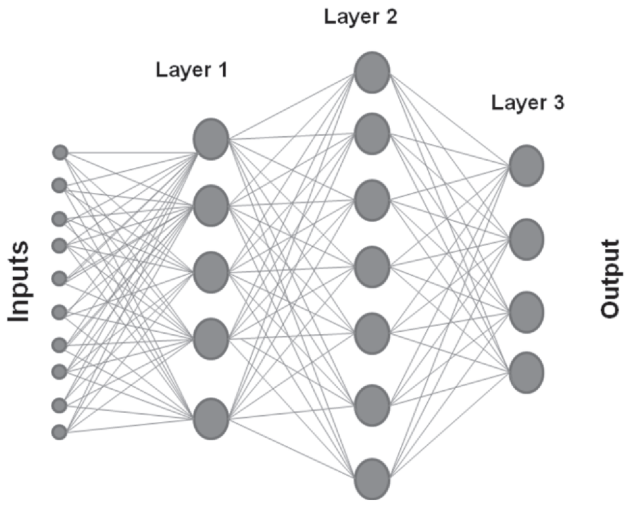

Figure 1: Simple Artificial Neural Network

Back propagation learning algorithm is used to adjust the layer weights and to change the dynamics of overall behavior of the network and gives a detailed insight of prediction model. The block diagram of the prediction model is given in Figure 2.

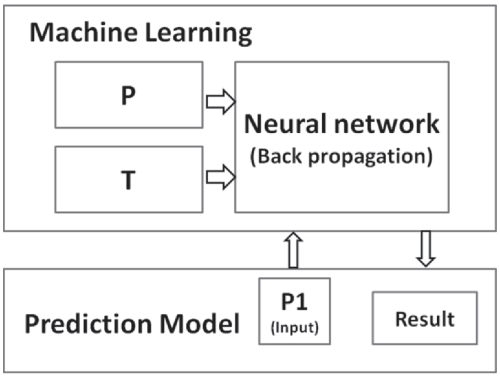

Figure 2: Proposed system block diagram

3. BACKPROPAGATION ALGORITHM

The backpropagation algorithm was originally introduced in the 1970s, but its importance wasn't fully appreciated until a famous 1986 paper by David Rumelhart, Geoffrey Hinton, and Ronald Williams. That paper describes several neural networks where backpropagation works far faster than earlier approaches to learning, making it possible to use neural nets to solve problems which had previously been insolvable.

Today, the back propagation algorithm is the workhorse of learning in neural networks. The approach fostered by us employs a network with two hidden layers. [7, 8, 9].

4. NEURAL NETWORK SETUP AND TRAINING

For training and setup of neural network for the prediction model the Neural Network tool box available in Matlab package is used [12]. In the architecture of the neural network shown in Figure.2 ten inputs are applied to the neural network and four outputs representing various blood groups are obtained at the output. There are two hidden layers have been used with 100 and 50 neurons respectively.

The following Matlab commands have been used to setup a neural network Object (model), to train the network and to setup the various parameters for training the neural network.

```
net = newff(P,T,[100 50],{},'traincgf');
net.divideFcn = '';
[net,tr] = train(net,P,T);
a = sim(net,p)
net.trainParam.show = 50;
net.trainParam.lr = 0.05;
net.trainParam.epochs = 300;
net.trainParam.goal = 1e-5;
```

Using the above commands the ANN model is trained with the backprobagation *traingd* algorithm and the network model *net* objectis obtained. Now the network is ready for testing.

Using the following simulation command a = sim (net, p) where net is the trained model, p is the testing input and a is the output obtained out of simulation of the neural network object *net*.

This is to check the validity of the network whether the network has been trained properly.

5. SIMULATION AND TESTING

The data were collected from 300 participants. 250 data have been used for training the ANN model, and the remaining 50 data are used to test the model whether it has learnt properly. One sample data given in Table 1.

Table 1
Sample values of 'P' to train the neural network

TRAINING INPUTS : P	*OPTIONS (O/1/2/3)*
LIKING COLOURS	0, 1, 2, 3
PREFER TIME FOR STUDIES	0, 1, 2, 3
LIKE / DISLIKE MATHEMATICS	0, 1, 2, 3
PREFER OF GROUP STUDY	0, 1, 2, 3
ABOUT THE HAND WRITING	0, 1, 2, 3
MOTIVATION FOR HOBBIES	0, 1, 2, 3
STUDY WITH MUSIC	0, 1, 2, 3
TYPE OF CONDENTS TO PREFER TO LEARN	0, 1, 2, 3
HONESTY	0, 1, 2, 3
CONFIDENT LEVEL	0, 1, 2, 3
TARGET VALUE (BLOOD GROUP)	A / B / AB / O

6. RESULTS AND DISCUSSIONS

Initially the ANN was trained using 250 data sets along with their respective target groups. Another 50 data sets were used for testing the model to check whether the system had learnt correctly.

Table 2
Value of 'T'(Target) to train the neural network

GROUPS	*TARGET : T*
O	1
A	2
B	3
AB	4

The data P and T were fed to the neural network for the training. We had used two hidden layers for improving accuracy. The Conjugate Gradient Backpropagation Algorithms was used and this had given much better result as compared to the other training algorithms.

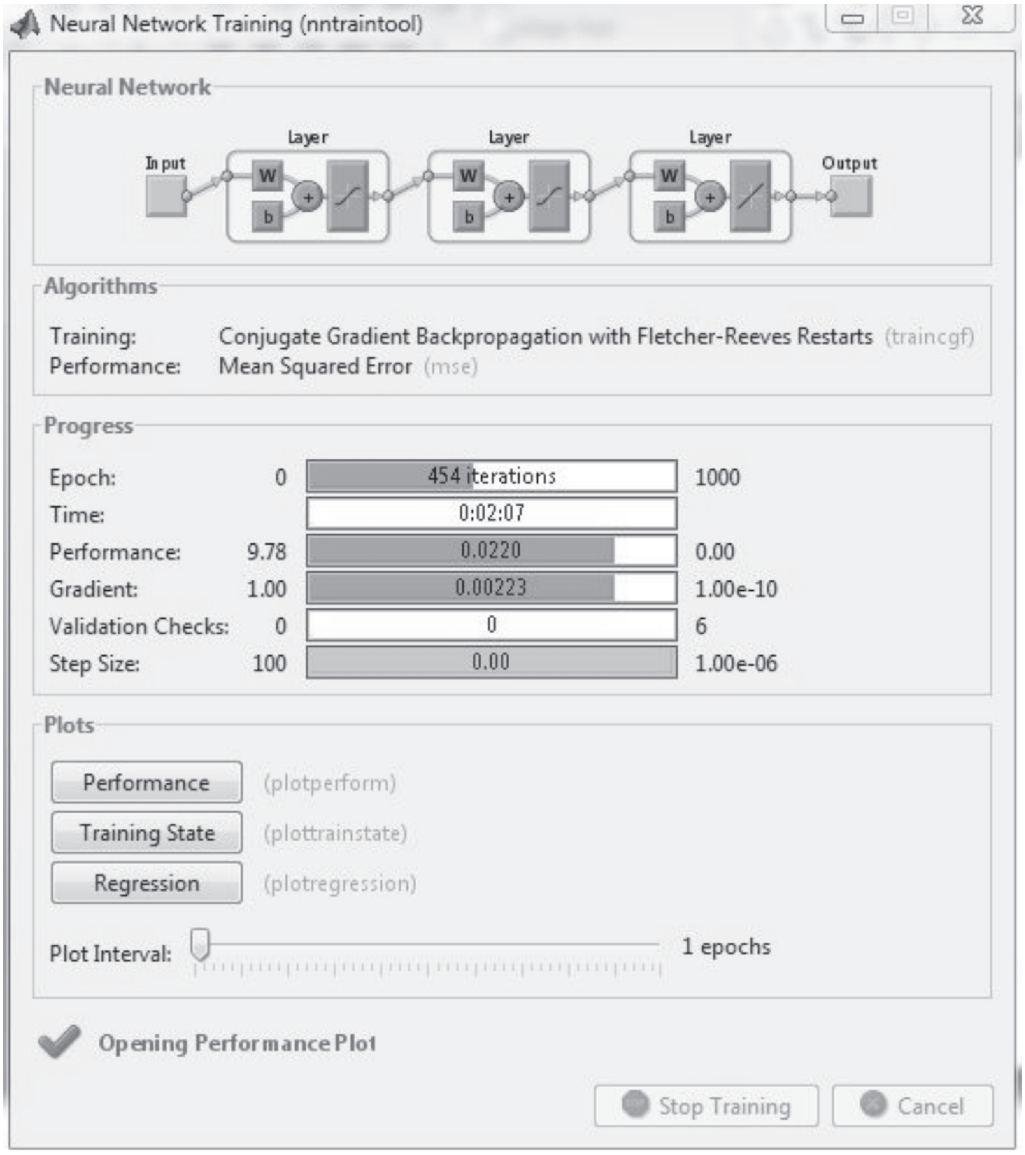

Figure 3: Training done by Neural network using Matlab

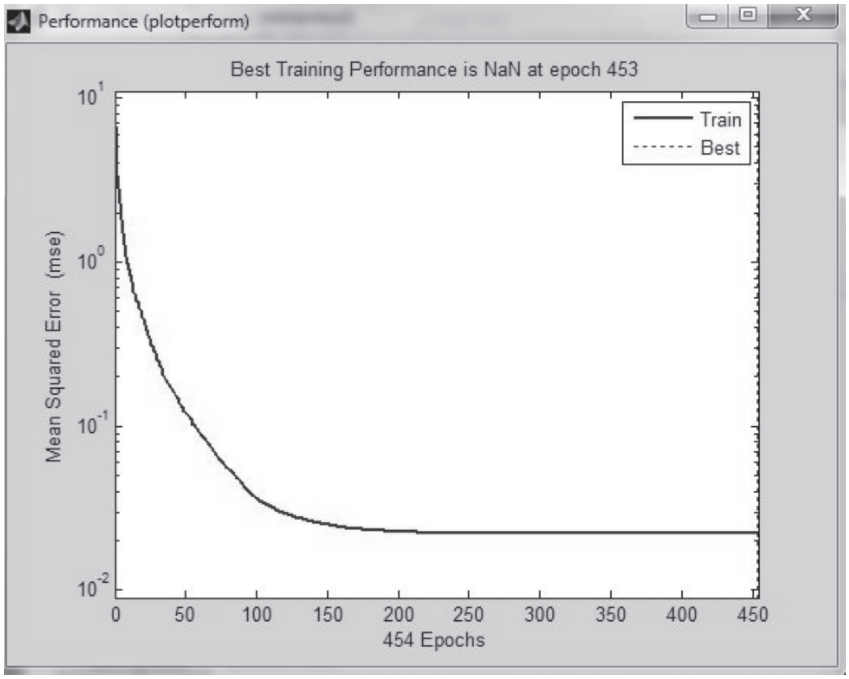

Figure 4: Performance plot of the training of ANN

Table 3
Prediction of blood group

No	*Actual group*	*a=sim(net, P)*	*Round (a)*	*Prediction*
1	O	0.9968	1	O
2	O	0.9987	1	O
3	O	1.0017	1	O
4	O	1.0003	1	O
5	O	0.9999	1	O
6	O	1.0012	1	O
7	O	1.0006	1	O
8	O	1.0006	1	O
9	O	0.5327	1	O
10	O	0.9999	1	O
11	O	0.999	1	O
12	O	0.9995	1	O
13	O	1.0005	1	O
14	O	0.9994	1	O
15	O	1.0002	1	O
16	B	1.9992	2	B
17	B	2.0001	2	B
18	B	2.0022	2	B
19	B	2.0012	2	B
20	B	2	2	B
21	B	1.9993	2	B
22	B	1.9998	2	B
23	B	2	2	B

No	*Actual group*	*a=sim(net, P)*	*Round (a)*	*Prediction*
24	B	1.9997	2	B
25	B	1.999	2	B
26	B	2.0004	2	B
27	B	2.0005	2	B
28	B	2.9996	2	B
29	B	2.0011	2	B
30	B	1.9992	2	B
31	A	3.0001	3	A
32	A	2.9992	3	A
33	A	3.0015	3	A
34	A	3	3	A
35	A	2.9992	3	A
36	A	2.9993	3	A
37	A	2.0008	3	A
38	A	2.9998	3	A
39	A	2.9986	3	A
40	A	3.0001	3	A
41	A	2.9994	3	A
42	A	3.0005	3	A
43	A	2.9997	3	A
44	AB	3.9993	4	AB
45	AB	3.9999	4	AB
46	AB	3.9995	4	AB
47	AB	3.9995	4	AB
48	AB	4.0008	4	AB
49	AB	4.0005	4	AB
50	AB	3.9993	4	AB

7. CONCLUSION

The types of blood groups play a major role in deciding the various characteristics of human beings. In this paper we have made an attempt to identify the blood groups without subjecting the persons to clinical tests. The idea is to get answers to 15 – 20 questionnaires from the person(s) concerned. The questionnaires have been framed to reflect the individual's nature such as liking of color, time of study, group study or not, etc. To start with, we had collected 300 samples (first year MBBS students) from Sri Lakshmi Narayana Medical College, Pondicherry and use 250 samples to train an artificial neural network with Conjugate Gradient backpropagation algorithm. The remaining 50 samples were used to test the validity of the system. The results are encouraging shown in Table 3. In future, we are planning to conduct extensive survey and get at least 50,000 samples, so as to make the model really valid.

Acknowledgement

We thank Dr. Rajasekar, Dean of Sri Lakshmi Narayana Medical College & Hospital, Pondicherry for agreeing to conduct the survey amongst the first year MBBS students and given us the data.

References

1. Seyedeh Zeynab Molaei Zadeh1, Maryam Molaei Zadeh, "*The Relationship between Blood Type A and Anxiety in the Students of Dezful Learning Centers*", Journal of Applied Environmental and Biological Sciences, 5(7) 361-366, 2015.
2. Retrieved from online: www.4yourtype.com/dr-peter-j-dadamo (Feb, 2016)
3. R. Rajkumar, M.K.Imad, "*Blot E-learning system*" IEEE- International Conference on Computer Communication and Informatics (ICCCI), 2012 Pages 1 – 6.
4. Sarfraz Hussain, "*Blood Group Research is the Key to get Precise Results to Improve Human Health*", Journal of food and dairy technology, Published on 12/09/2015.
5. Rogers, M., & Glendon, A. I. "*Blood type and personality*", Personality and individual differences, Elsevier, 34(7), 1099-1112, 2003.
6. DAVID E. RUMELHART, GEOFFREY E. HINTON† & RONALD J. WILLIAMS, "*Learning representations by back-propagating errors*" , Nature 323, 533 - 536 (09 October 1986); doi:10.1038/323533a0
7. P. Gaur, "*Neural Networks in Data Mining*", International Journal of Electronics and Computer Science Engineering (IJECSE, ISSN: 2277-1956), Vol. 1, (2012), pp. 1449-1453
8. J. Soni, U. Ansari, D. Sharma and S. Soni, "*Predictive data mining for medical diagnosis: An overview of heart disease prediction*", International Journal of Computer Applications, Vol. 17, (2011), pp. 43-48.
9. H. Lu, R. Setiono and H. Liu, "*Effective data mining using neural networks*", Knowledge and Data Engineering, IEEE Transactions, Vol. 8, (1996), pp. 957-961.
10. S. Nirkhi, "*Potential use of artificial neural network in data mining*", Computer and Automation Engineering (ICCAE), 2010 The 2nd International Conference on: IEEE, (2010), pp. 339-343.
11. Z. Chen, "*Research of Data Mining Based on Neural Network*", E-Product E-Service and EEntertainment (ICEEE), 2010 International Conference on: IEEE, (2010), pp. 1-3.
12. Maitha H. Al Shamisi, Ali H. Assi and Hassan A. N. Hejase, "*Using MATLAB to Develop Artificial Neural Network Models for Predicting Global Solar Radiation in Al Ain City*" – UAE, Journal of bio medicine, Vol. 5, 2015.