Classification of Saving Services by ANN

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ABSTRACT
In today's modern life style investment of money plays very important role. Savings were available for use whenever needed, but it also involved the risk of loss by theft, robbery and other accidents.

This paper presents the classification of available saving services for those users, who want to invest their money. One can invest the money after consulting the post office employees or going through the features of the available saving services. But most of the clients face the problem of selecting the best saving service for investment of their money as number of saving services exist. Moreover, it is a time consuming process to select one of the best saving service by the use of traditional method. In this paper, an ANN based method has been developed for the selection of best saving service based on some quantitative and qualitative parameters. This method is very user friendly and less time consuming.

General Terms
Saving Services

Keywords
Artificial Neural Network, Saving Services, Classification

1. INTRODUCTION
People were in need of a place where money could be saved safely and would be available, whenever required. Banks and post offices are such places where people can deposit their savings with the assurance that they will be able to withdraw money from the deposits whenever required various saving services provide the basis of protection and benefits on the money invested under the particular scheme [2]. For this, one can either consult various post offices or bank employees or use the Internet sites to gather the large amount of knowledge and get the guidance for investment. While the use of bank employees and Internet to have the complete knowledge about the best saving service is time consuming and tedious process.
A lot of work have been done on banking credit system [3] [4]. Bt none of the researchers have developed system for the classification of available saving services.

The main objective of this paper is to deploy ANN model for the classification of saving service. The services are classified in four categories: very good (VG), good (G), moderate (M) and bad (B).
ANN model is used by many researchers for classification in various domains such as in medicine: detection of acute myocardial infarction [1].

The organization of the paper as follows. section 2 presents the description of various features that a saving service have, section 3 describes the ANN model for calculating the output for particular input and the table showing the results generated by calculation of ANN model. Section 4 includes the implementation and result Section 5 include conclusion.

2. PROBLEM DESCRIPTION
The problem description table (Table.1) describes six saving services with sixteen important parameters: Interest on Tax (IOT), Qualified for Rebate (QFR), Rate of Interest (ROI), Interest Compound for Period (ICFP),Bonus Percentage (BP), Withdrawal Restrictions (WR), Loans/Advance Against Deposit (LAD), Nomination facility (NF), Maturity Period (MP), Premature Closure (PC), Payment of Returns (POR), Payment Rules (PR),Transferability (T), Minimal Deposit (MD), Maximum Deposit(MXD) [5].

These parameters have a value high (H=2), medium (M=1) and low (L=0). The First column in table 1 is saving service and the rest of columns are the features of the saving service.

A survey has been done for finding the priorities of parameters for selecting the services. The weights assigns to the features are on a scale of (0-1) according to their priorities in selecting the services such as: higher priority is given to IOT (0.2) as it is the first parameter chosen by all the customers using saving services are surveyed. QFR (0.1) and ROI (0.1) are secondly chosen parameters [6]. IOT has assigned the weight 0.2 which is the highest priority among other features and then QFR is assigned with 0.1, ROI with 0.1, ICFP with 0.09, BP with 0.08, WR with 0.07, LAD with 0.06, NF with 0.05, MP with 0.05, PC with 0.04, POR with 0.04, PR with 0.04, PE with 0.03, T with 0.02, MD with 0.02 and the least priority is given to the MXD with assigning the weight as 0.01. Priorities are assigned to the features after conducting a survey.

3. IMPLEMENTATION
3.1 Heuristic Method
The services are classified in four categories: very good (VG), good (G), moderate (M) and bad (B). The services are classified by heuristic method using following formula: $class(C) = \sum_{i=1}^{n} L * W$
Where L is value of level assigned to feature into weight of that feature.
I=1 to n is number of features.
Those service whose value of C lies in the range of 0-0.29 are classified as Bad, 0.3-0.59 are Moderate, 0.6-0.89 are Good and 0.9-1 are Very Good as shown in Table 1.
Table 2 is obtained from Table 1 by dividing corresponding numerical value of each cell by 3, which is sum of numerical value of H (2), M (1), L (0) (2+1+0=3). In case of L the value should be 0 which we have replaced with 0.01 as shown in Table 2.

3.2 ANN Model
ANN model is used for classification of saving service. ANN is trained with approximately 4000 different sets of input–output

sets, which are generated with the slight variation in the input elements of input matrix and corresponding elements in the output matrix as shown in Table2. The ANN model is implemented using MATLAB 6.1 neural network tool. Table 2 is used for training and testing of ANN model. Three layer architecture with bak propagation algorithm was deployed with Levenberg Marquardt learning rule. ANN with 16-16-4: input-hidden-output layer was found to be optimum model for classification. Training was terminated at a training error of 10^{-4} after 88epochs.

4. RESULTS

ANN model is tested for five new input set T1, T2, T3, T4, T5 as shown in Table3. For T2 the input set is {0.67,0.67,0.01,0.01,0.01,0.33,.01,0.67,0.01,0.33,0.33,0.67,0.33 ,0.67,0.33,0.01}. The output with heuristic method is {0.96} whereas the output with ANN method is {1.04}. So we get error of {0.04} which is significant. Similarly for each test input the error is calculated which is shown in Table3. In a Table3 the output obtained by Heuristic method is shown in the row headed by Heuristic, the output obtained by the ANN is shown in the row headed by ANN and the error between them is shown in the row headed by error in an error column

5. CONCLUSION

The selection of best saving service is very time consuming and tedious process. In this paper an ANN based method has been developed for the selection of best saving services based on some quantitative and qualitative parameters. This method is very user friendly and less time consuming.

6. REFERENCES

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Table 1: Problem Description Table

Features (FE) (weights)/ saving service	**IOT 0.2**	**QFR 0.1**	**ROI 0.1**	**ICFP 0.09**	**BP 0.08**	**WR 0.07**	**LAD 0.06**	**NF 0.05**	**MP 0.05**	**PC 0.04**	**POR 0.04**	**PR 0.04**	**PE 0.03**	**T 0.02**	**MD 0.02**	**MXD 0.01**	**Output**
S1	L	L	L	L	H	L	L	H	H	H	H	L	L	H	H	M	Good
S2	L	H	L	L	L	L	H	H	H	L	L	L	L	H	M	H	Good
S3	H	H	L	L	L	M	L	H	L	M	M	H	M	H	M	L	Very Good
S4	L	L	H	H	L	H	H	H	M	L	M	L	H	H	L	H	Very Good
S5	L	L	M	L	L	H	M	L	L	H	M	L	M	H	L	L	Medium
S6	L	L	L	L	L	M	L	M	M	L	L	L	L	H	L	L	Bad

Table 2: Training Data

IOT 0.2	**QFR 0.1**	**ROI 0.1**	**ICFP 0.09**	**BP 0.08**	**WR 0.07**	**LAD 0.06**	**NF 0.05**	**MP 0.05**	**PC 0.04**	**POR 0.04**	**PR 0.04**	**PE 0.03**	**T 0.02**	**MD 0.02**	**MXD 0.01**	**Output**
0.01	0.01	0.01	0.01	0.67	0.01	0.01	0.67	0.67	0.67	0.67	0.01	0.01	0.67	0.67	0.33	0.61
0.01	0.67	0.01	0.01	0.01	0.01	0.67	0.67	0.67	0.01	0.01	0.01	0.01	0.67	0.33	0.67	0.60
0.67	0.67	0.01	0.01	0.01	0.33	0.01	0.67	0.01	0.33	0.33	0.67	0.33	0.67	0.33	0.01	1
0.01	0.01	0.67	0.67	0.01	0.67	0.67	0.67	0.33	0.01	0.33	0.01	0.67	0.67	0.01	0.67	0.99
0.01	0.01	0.33	0.01	0.01	0.67	0.33	0.01	0.01	0.67	0.33	0.01	0.33	0.67	0.01	0.01	0.45
0.01	0.01	0.01	0.01	0.01	0.33	0.01	0.33	0.33	0.01	0.01	0.01	0.01	0.67	0.01	0.01	0.21

Table 3: Error Table

FE/Test	IOT	QFR	ROI	ICFP	BP	WR	LAD	NF	MP	PC	POR	PR	PE	T	MD	MXD	Error	Output
T1	0.01	0.67	0.01	0.01	0.01	0.01	0.67	0.67	0.67	0.01	0.01	0.01	0.01	0.67	0.33	0.67	ANN HEUR ERROR	0.60 0.63 0.03
T2	0.67	0.67	0.01	0.01	0.01	0.33	0.01	0.67	0.01	0.33	0.33	0.67	0.33	0.67	0.33	0.01	ANN HEUR ERROR	1 1.04 0.04
T3	0.01	0.01	0.01	0.01	0.01	0.33	0.01	0.33	0.33	0.01	0.01	0.01	0.01	0.67	0.01	0.01	ANN HEUR ERROR	0.21 0.22 0.02
T4	0.33	0.01	0.01	0.01	0.67	0.01	0.01	0.67	0.67	0.67	0.67	0.01	0.01	0.67	0.67	0.33	ANN HEUR ERROR	0.61 0.65 0.04
T5	0.67	0.01	0.33	0.01	0.01	0.67	0.33	0.01	0.01	0.67	0.33	0.01	0.33	0.33	0.01	0.01	ANN HEUR ERROR	0.45 0.47 0.02