DIVORCE PREDICTION USING ARTIFICIAL NEURAL NETWORK

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1. ABSTRACT

The abstract should give the reader some idea of what the paper is about. You may want to briefly mention what you have learned, potential uses and novel aspects. (100-150) words.

Keywords: Artificial Neural Network, Divorce prediction.

2. INTRODUCTION

There have been a lot of studies in the field of psychology and psychiatry that used ANN

This is a prediction researches trying to predict if a couple will get divorce or no.

3. COMPARISON

This study is a continue of Yöntem, Adem, İlhan, and Kılıçarslan (find paper) paper. In that paper it was proven that the most accurate predictions of whether a couple will get a divorce or not, are made while using the Artificial Neural Network (ANN), over using the Radial Basis Function (RBF) and the random forest learning method (look into that a bit more), and the 6 most important features, having an accuracy of **98.82% (change with kappa value, also what is kappa value)**.

However, all the test that were conducted while using the ANN, used the same starting weight, hidden layers, momentum, and learning rate. This paper, building on the discovery of the team mentioned and using the same dataset, examines if the ANN can learn and give better results by using both all the 54 and the 6 most important attributes while changing the parameters mentioned earlier, and tries to recreate the showings that using the 6 rather than the 54 attributes results in more accurate predictions, hence is more effective.

Moreover, Yöntem et al. did not take into account the speed of learning, a factor that sometimes may be very vital. This paper will also consider and examine how fast the network can learn, stating the epochs required to learn, while avoiding overfitting to the training data.

4. DATA

3.1 Data Collection

All the data used in this researched were obtained by the UCI data repository (https://archive.ics.uci.edu/ml/datasets/Divorce+Predictors+data+set) which were donated by Yöntem, Adem, İlhan, and Kılıçarslan, the team that conducted the similar research mention in the previous section. This team obtained this data by having the participants on their own research complete the Divorce Prediction Scale (DPS) form.

3.2 Data Set Information

The data set consist of 170 subjects, 84 (49%) of which were divorced and 86 (51%) were happily married couples, without any thoughts of divorce.

The data set during the learning was split in three major categories, the training set that was used for learning, the validation set that was used to tune the parameters of a classifier to decide when to stop learning, and the unseen set that was used to assess the actual performance of a fully-specified classifier (reference lecture notes).

The rate that the subjects were split between the three categories, was based on the research of Isabelle Guyon (http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.33.1337&rep=rep1&type=pdf) , using 75% of the data for training and 25% of the data for the validation and the unseen set, equally been split to 12.5% each, favoring the unseen data in case that the split could not be done exactly equally. This rate was applied to the 84 divorced subjects and the 86 married one's to make sure that data from both

categories are split following the 75-25 analogy Guyon suggested. This led to the results in table 1

TABLE 1 THE AMOUNT OF DATA THAT WAS USED FOR EACH CATEGORY

	TRAIN	VALID	UNSEEN
DIVORCED	63	10	11
MARRIED	65	10	11

Overall, the ANN used 54 different attributes as inputs, which are the questions of the DPS (Appendix A) with a range of values from 0 to 4, representing the 4 possible answers that the subjects could pick, and 1 output that was either that this couple was divorced with a value of 0 or married with a value of 1.

5. NECESSARY INFORMATION FOR THE EXPERIMENATION

4.1 Artificial Neural Network

The artificial neural network that was used in these experiments was developed, as an assignment of the module neurocomputation, over 3 labs sessions, on the university of Reading by the writer of this paper and the lecturer of the module, Richard Mitchell. Talk about the code, stop training when the unseen SSE rised

4.2 System used for the experimentation

The system that was used in this study has an Intel Core i7 8750H 2.2 GHZ processor, an NVIDIA GeForce GTX 1060 GPU, and an 16GB RAM.

4.3 Parameters of the experimentation

All the experiments where conducted using 4 different parameters:

1. The number of hidden neurons – with values [5, 7, 10, 15] because it is important to test the data with different amounts of hidden neurons (find lecture).

2. The learning rate – with values [0.2, 0.5] following the rule $0.2 \leq \eta \leq 0.6$ (find lecture).

3. The momentum – with values [0, 0.7] to see the impact on the results with no momentum and with relative high momentum

4. The starting weights (using a random seed) – with values [100, 1000]

All the experiments were conducted using as many numbers of epochs necessary to reach the lowest possible Sum of Squares of Errors (SSE).

6. EXPERIMENTATION

The SSE of the unseen data

TABLE 2 THE TEST AND RESULTS WHILE USING THE **54** ATTRIBUTES

HIDDEN NEURONS	RANDOM SEED	LEARNING RATE	MOMENTUM	SSE	EPOCHS REQUIRED
5	100	0.2	0	0.0058	40
7	100	0.2	0	0.0073	40
10	100	0.2	0	0.0017	80
15	100	0.2	0	0.0044	490
5	1000	0.2	0	0.0076	60
7	1000	0.2	0	0.0029	70
10	1000	0.2	0	0.0027	70
15	1000	0.2	0	0.0017	30
5	100	0.5	0	0.0048	30
7	100	0.5	0	0.0059	30
10	100	0.5	0	0.0036	100
15	100	0.5	0	0.0036	210
5	1000	0.5	0	0.0029	40
7	1000	0.5	0	0.0015	40
10	1000	0.5	0	0.0024	40
15	1000	0.5	0	0.0016	30
5	100	0.2	0.7	0.0044	30
7	100	0.2	0.7	0.0050	30
10	100	0.2	0.7	0.0036	40
15	100	0.2	0.7	0.0031	190
5	1000	0.2	0.7	0.0030	40
7	1000	0.2	0.7	0.0012	40
10	1000	0.2	0.7	0.0023	30
15	1000	0.2	0.7	0.0019	30
5	100	0.5	0.7	0.0021	30
7	100	0.5	0.7	0.0014	100
10	100	0.5	0.7	0.0019	100
15	100	0.5	0.7	0.0017	100
5	1000	0.5	0.7	0.0015	30
7	1000	0.5	0.7	0.0005	30
10	1000	0.5	0.7	0.0020	30
15	1000	0.5	0.7	0.0020	30

TABLE 3 THE TEST AND RESULTS WHILE USING THE **6** ATTRIBUTES

HIDDEN NEURONS	RANDOM SEED	LEARNING RATE	MOMENTUM	SSE	EPOCHS REQUIRED
5	100	0.2	0	0.0027	70
7	100	0.2	0	0.0020	60
10	100	0.2	0	0.0018	90
15	100	0.2	0	0.0046	40
5	1000	0.2	0	0.0022	120
7	1000	0.2	0	0.0022	70
10	1000	0.2	0	0.0016	60
15	1000	0.2	0	0.0048	40

5	100	0.5	0	0.0029	40
7	100	0.5	0	0.0022	40
10	100	0.5	0	0.0025	60
15	100	0.5	0	0.0094	30
5	1000	0.5	0	0.0014	70
7	1000	0.5	0	0.0012	50
10	1000	0.5	0	0.0028	40
15	1000	0.5	0	0.0093	30
5	100	0.2	0.7	0.0027	40
7	100	0.2	0.7	0.0022	40
10	100	0.2	0.7	0.0031	50
15	100	0.2	0.7	0.0124	30
5	1000	0.2	0.7	0.0012	60
7	1000	0.2	0.7	0.0011	40
10	1000	0.2	0.7	0.0040	40
15	1000	0.2	0.7	0.0128	30
5	100	0.5	0.7	0.0003	70
7	100	0.5	0.7	0.0004	100
10	100	0.5	0.7	0.0003	100
15	100	0.5	0.7	0.0004	120
5	1000	0.5	0.7	0.0040	40
7	1000	0.5	0.7	0.0004	70
10	1000	0.5	0.7	0.0003	450
15	1000	0.5	0.7	0.0004	110

7. CONCLUSION

At the end of your paper, you will need to sum up what you have said in the form of a conclusion.

8. REFERENCES

9. APPENDIX A – THE DIVORCE PREDICTION SCALE QUESTION

1. If one of us apologizes when our discussion deteriorates, the discussion ends.
2. I know we can ignore our differences, even if things get hard sometimes.
3. When we need it, we can take our discussions with my spouse from the beginning and correct it.
4. When I discuss with my spouse, to contact him will eventually work.
5. The time I spent with my wife is special for us.
6. We don't have time at home as partners.
7. We are like two strangers who share the same environment at home rather than family.
8. I enjoy our holidays with my wife.
9. I enjoy traveling with my wife.
10. Most of our goals are common to my spouse.
11. I think that one day in the future, when I look back, I see that my spouse and I have been in harmony with each other.
12. My spouse and I have similar values in terms of personal freedom.
13. My spouse and I have similar sense of entertainment.
14. Most of our goals for people (children, friends, etc.) are the same.
15. Our dreams with my spouse are similar and harmonious.
16. We're compatible with my spouse about what love should be.
17. We share the same views about being happy in our life with my spouse
18. My spouse and I have similar ideas about how marriage should be
19. My spouse and I have similar ideas about how roles should be in marriage
20. My spouse and I have similar values in trust.
21. I know exactly what my wife likes.
22. I know how my spouse wants to be taken care of when she/he sick.
23. I know my spouse's favorite food.
24. I can tell you what kind of stress my spouse is facing in her/his life.
25. I have knowledge of my spouse's inner world.
26. I know my spouse's basic anxieties.
27. I know what my spouse's current sources of stress are.
28. I know my spouse's hopes and wishes.
29. I know my spouse very well.
30. I know my spouse's friends and their social relationships.
31. I feel aggressive when I argue with my spouse.
32. When discussing with my spouse, I usually use expressions such as 'you always' or 'you never' .
33. I can use negative statements about my spouse's personality during our discussions.
34. I can use offensive expressions during our discussions.
35. I can insult my spouse during our discussions.
36. I can be humiliating when we discussions.
37. My discussion with my spouse is not calm.
38. I hate my spouse's way of open a subject.
39. Our discussions often occur suddenly.
40. We're just starting a discussion before I know what's going on.
41. When I talk to my spouse about something, my calm suddenly breaks.
42. When I argue with my spouse, ı only go out and I don't say a word.
43. I mostly stay silent to calm the environment a little bit.
44. Sometimes I think it's good for me to leave home for a while.
45. I'd rather stay silent than discuss with my spouse.
46. Even if I'm right in the discussion, I stay silent to hurt my spouse.
47. When I discuss with my spouse, I stay silent because I am afraid of not being able to control my anger.
48. I feel right in our discussions.
49. I have nothing to do with what I've been accused of.
50. I'm not actually the one who's guilty about what I'm accused of.
51. I'm not the one who's wrong about problems at

home.
52. I wouldn't hesitate to tell my spouse about her/his inadequacy.
53. When I discuss, I remind my spouse of her/his inadequacy.
54. I'm not afraid to tell my spouse about her/his incompetence.