Using Neural Networks to Improve Emotional State of Person

Samat Bukenov* and Askar Akshabayev

Kazakh - British Technical University, Almaty, Kazakhstan

Abstract: Emotions is a big field of scientific research in psychology. There are a lot of scientific papers and methods on how to improve your emotional state. Projects in field of neural networks that are related to emotions usually try to simulate human emotions, but not so much done on using neural networks to improve emotional state of human being.

Keywords: emotions, neural, network, self-organizing map

1 Introduction and psychological background

In this paper we will discuss human emotions and the ways to work with them by using neural networks. Usually we dont think about where do emotions come from. But psychology gives basics for this paper. As we know animals have emotions too. Emotions are part of our nature, because they helped us to survive. We have emotional bonds with other people, because emotions keep us together. In order to survive we need to be together. There are a lot of other emotions that help us to survive. Fear activates our organisms to be very effective as heart rate goes up and reaction speed increases. Emotions have helped us to survive. When we lived in the wild with monkeys and mastodons and tigers we needed emotions in order to react quickly to dangerous stimuli Ilana Simons Ph.D. [1] Negative emotions help us to stay away from situations and not to repeat them. Positive emotions tend us to repeat such situations. So our emotions are more part of our nature, organism than unique quality of human beings. Emotions have a strong connection with our body. Thats why a lot of people have diseases that came from their emotions. We dont live in natural world anymore. Our worries are not predators or other things that can be dangerous only for a short time. In modern world we have situations that may make us anxious for a long time. And that is not what nature prepared us for. As negative emotions influence our body in long time period it can cause problems. Chronic stress from negative attitudes and feelings of helplessness and hopelessness can upset the body's hormone balance and deplete the brain chemicals required for feelings of happiness, as well as have a damaging impact on the immune system. New scientific understandings have also identified the process by which chronic stress can actually decrease our life span by shortening our telomeres (the end caps of our DNA strands, which play a big role in aging). Poorly managed or repressed anger (hostility) is also related to a slew of health conditions, such as hypertension, cardiovascular disease, digestive disorders, and infection Karen Lawson, MD. So if our emotions have such influence on our bodies and modern world created a lot of situations where people may have worries we need something to understand. As we know there are people that have more positive emotions in particular situation than others. For example for some people financial problems can make them work harder as a result of love for close ones but for the other it can make person surrender to situation. Our emotions have strong relation to our effectiveness too. Depending on emotions that arises in us in particular situation we can have different effectiveness. Why the same situations can create different emotions in different people? It is very important question. But there is a simple answer. It all depends on previous experience of a human. People respond with different emotions to the same situations depending on how they appraise the situation Matthias Siemer, James J. Gross, Iris Mauss [2]. We will have a brief look at their experiment in this field later. When a human being comes

* Corresponding author e-mail: s.bukenov@gmail.com

to a situation for the first time where there is no emotions associated with it he just lives through it. But when some emotion arises during or after the situation then he has an emotion that is associated to such situations. For example, if you decided to go by bus for the first time and there are a lot of people there that are arguing and driver drives bus like crazy you will have stressful emotion that will be associated with bus. And our emotional association with situation is a sum of all experiences. But each next situation is affected by previous emotional experiences so that human will see this situation through all previous emotions. Thats why people are so dependent on emotions and not objective when emotions come into play. But emotions are everywhere so there is a very little possibility to be objective for a human. Almost all situations we faced in our lives were faced by others. Almost in all cases we have something to learn from others and we can find better ways to deal with it. Such neural network will help people to do it.

2 Problem and proposed solution

The background about human emotions and neural networks leads us to creating a system that can help people to cope with emotional and psychological problems. We all have faced hard times in our lives. We all have faced depression and strong unwillingness to be in circumstances you are in right now. Today in order to find something that can help you in such situation either you need to find a wise person that can help you or psychologist. Or if you will be lucky enough you can stumble upon a similar situation in a book. And as we said before, almost all of the situations in our lives are not unique. Other people faced same situation, other people faced same emotions. And people that had good experiences in these situations can really help other people facing the same situation in life. So we want to build a system to connect these experiences of wise people with other people. At first we need to build a database of positive stories about dealing with particular situations. We can get a big part of this database from books. Books are really a great source of wisdom. Then system can be launched to help people with situations that are covered by this database. After that we let people teach our neural network and help each other by telling their positive stories and experiences in their situations. In this way we can fill the gap of situations we didnt get from books. Basically for user system looks like this: he goes to a site, or mobile application, or whatever the client side may be. He writes his life situation in a text field and submits it. The system returns stories and experiences, videos and other materials in ordered way. All information is ordered by rating people gave it.

3 Using neural network for solution

We want to change appraisals of human beings depending on his situation. If we can change appraisal of human being then we will be able to change emotions related to specific situation. Neural network will provide stories that will change the appraisal of user and then he will feel better in his situation. So if we look at emotions from perspective of neural networks then our neural network gives certain emotions associated with certain situation. But the most effective way for a human is when his neural network gives good emotions on all situations. So the people that have positive emotions in same situations where other people have negative emotions are just programmed in different way, they have different neural network. So in order to change neural network of a human that has bad experiences with certain situation we need to provide experiences of people that have good emotions associated with same situations. In order to do it we need to create a neural network that takes the situation and returns the experiences and stories of other people that had good results and emotions associated with this situation. Bad emotions are also needed for human beings but most of situations that create anxieties in people nowadays shouldnt have bad emotions associated with them. Once human being is in this situation he should be effective. Bad emotions are useful to avoid situations, not to being in a situation. Most of modern papers that are related to neural networks and emotions are thinking about the ways and use of creating neural network with emotions. There is a big question whether it is useful or not, because in modern world bad emotions are not helpful in many situations. But the aim of this paper is to create a neural network that will help people that have bad emotions associated with their situation to have a more positive look on it. By reading the experiences and ways other people dealt with same situations it can show the right and effective ways to deal with it and also ways to have good emotions from same situations. Thats why Dale Carnegies book gives such a big impression on people, because it provides tons of examples of people going through hard situations and dealing with them in a good way. By reading such experiences people can change their neural network and begin to associate their life situations with positive emotions. It can change life of people and affect quality of their life. It can help people deal with hard situations. It can help to share your own experiences and ways to deal with your emotions. So the main entity in a network is a story that may give another vision, approach to situation. All stories will be separated by topics. So depending on a story we give to neural network we will tell it to which topic this story falls. One great thing about it is that there are already a lot of books and other sources of wise people giving their perspective on particular situation. And because we have these sources we can teach this neural network a lot. We can also attach videos, exercises and techniques that can help it particular situation. We know that mind and body are

connected, that's why I want to give a note on exercising, because it can also change state of our minds. Neural networks have different uses. In this case we'll use it's ability of pattern recognition. When user wants to read the stories from neural network first he has to describe his situation. The more details he will give the more accurate will be the output of neural network. Pattern recognition here is used to find to which topic does his situation apply. After system recognizes the topic it will give the stories that are related to this topic that hopefully will help the person. All stories should also have ratings. Single story can be related to several topics at the same time.

4 Neural network structure

For this purpose we use Kohonen Neural Network. This neural network is a self-organizing map. It is one of the competitive learning methods. It is able to find similar patterns in the input data of network. [4] This neural network is typically used for clustering and getting large dimensional data into format of smaller dimensions. In this case we need it for clustering of texts and finding closest texts within text that is mapped to neural network. Two main operations that will be used with this net are training and mapping new text to net. Training is used to feed new text to network. And mapping is used to find similarities between new input text and existing texts. The big advantage of using Kohonen NN in comparison to other algorithms is that it can learn iteratively. We can train the net time while mapping new text to the net. In order to feed text to network we need to present text in a form that will be easily understood by net. For this purpose we get list of unique nouns in text and number of its appearances in the text. Then we normalize number of appearances (popularity) by dividing each value in vector of number of appearances by the biggest value in this vector. Other thing that is important is vector of words that neural network knows. The net will take as an input a vector of all words that it knows with their popularities. So it is a single vector where index is a word itself and value is its popularity. After training the net we map the text of user to net and find close texts to it from existing set of texts. This network will take words as an input. To obtain words from input text of a user we take roots of all words and take n most popular words. After this process we have a vector of words, associated with the frequency of its' occurrence in the text, normalized to a value from 0 (didn't appear in text) to 1 (most popular word in text). Each input of net has an index that is associated with a word. Number of inputs of neural net is a total number of words that net knows. Neural network is not totally connected. When vector of n words comes to neural network only n inputs of network are activated. Hidden layer has same number of neurons as input layer. Each neuron of output layer represents a text that neural network knows. Each neuron in hidden layer is connected to neurons in output layer if this word occur in this text.

Weight of connection between neuron of output layer (text) and neuron of hidden layer (word) is frequency of occurrence if this word in the text, generated the same way as with input words. So the more likeliness we have in popular words of input text and popular words of output text - the more the value of output neuron will be.

5 Experiments done in this area

Big and interesting source of experiment that checks whether our appraisal (or previous emotional experience) affects our emotion is paper of Matthias Siemer, James J. Gross and Iris Mauss. They had very interesting results in this section (see Figure 1):
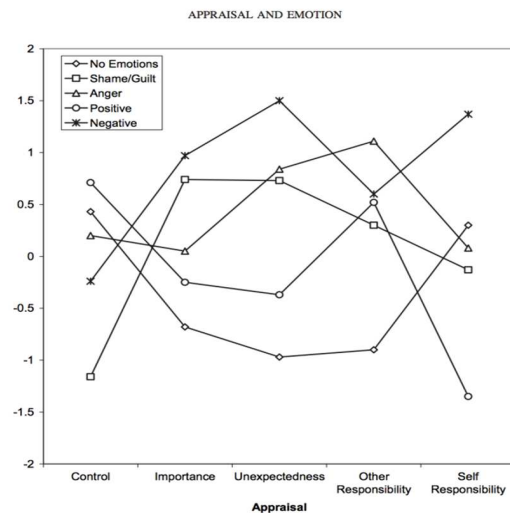

Fig. 1: Connection between appraisal and resulting emotion.

They say that each emotional response profile is associated with a distinctive appraisal profile. So there is a big connection between emotion and our appraisals. And depending on our appraisals we can predict the emotional reaction of human to specific situation. If you want to take a closer look at this experiment you can dive into the paper, its very interesting. Another big part of such system is topic recognition. As I said we use neural networks to do it. Earlier I wrote about using supervised learning when working with neural network. But if there will be a lot of information then we will need a system that will learn without supervisor. Basics of such system is described by K. Rajaraman and Ah-Hwee Tan in their paper Topic Detection, Tracking and Trend Analysis Using Self-organizing Neural Networks [3]. Their neural network detects and creates new topics from text, it tracks the topic if it is already in the system. They also use fuzzy set theory in their algorithm. Results of their experiment were pretty good. They were able to recognize trending

topics from news sites and count the number of appearances of these topics (see Figure 2).
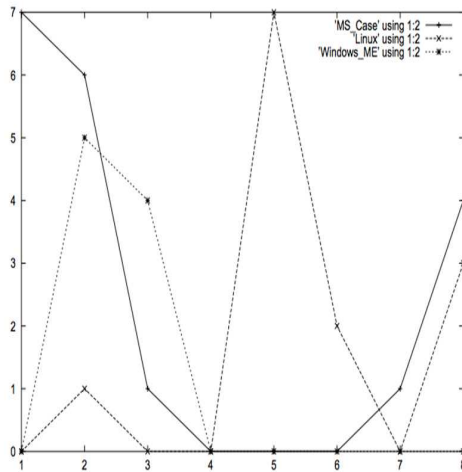

Fig. 2: Results of trending topics detection at different times. X-axis is time and Y-axis is popularity.

So we can create such system using the best from both fields artificial intelligence and psychology.

6 Future work

In production we also will be able to gather statistical information about what topics bother people and cause emotional or psychological problems. We can correspond this information with place (country), economical situation in country, political situation in country and other information to see how outer factors affect emotions of people. It is also a good idea to make this system interactive to allow people help each other and find wise and positive people in our generation. We can also look deeper into question of what is the better way to change appraisal of a human on a certain situation. Experimentally we can find the better ways and help people more effectively.

7 Conclusion

As a conclusion we want to say that such system can give connection of most wise people with people that have emotional problems. In may help emotionally and also practically, because it gives information about how to cope with situation. It can have great impact on worldview of people and make them more effective and happy.

References

[1] I. Simons. (2009, Nov). Why Do We Have Emotions? The Literary Mind.

[2] Matthias Siemer, James J. Gross, Iris Mauss. "Same SituationDifferent Emotions: How Appraisals Shape Our Emotions", 2007.

[3] K. Rajaraman and Ah-Hwee Tan. "Topic Detection, Tracking and Trend Analysis Using Self-organizing Neural Networks".

[4] Ching-Yi Chen, Jen-Shiun Chiang, Kuang-Yuan Chen, Ta-Kang Liu and Ching-Chang Wong. An Approach for Fuzzy Modeling based on Self-Organizing Feature Maps Neural Network, Applied Mathematics & Information Sciences, (2014).

Samat Bukenov received the bachelor degree in Information Systems at Kazakh-British Technical University in Almaty. His main research interests are: artificial intelligence, mobile application development, project management, web application development.

Askar Akshabayev is Associate Professor at Kazakh-British Technical University in Almaty. His main research interests are: human machine interface, computer vision, highload systems, web application development, artificial intelligence.