

## Prediction of transmission counts by a radial basis function neural network

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**Abstract.** The microblog as a platform used to serve the communication of the internet, has been developing rapidly. The blog has become an important way to get information and to transmit information [1]. The blog message can be transmitted, and we as consumer can transmit them by a few simple and convenient operation. As to the suddenly happened situation, the transmission can cause a very direct influence to the transmission and spread of the situation itself. Here we set an example of the topic, the share of the photography course, and we also refer *rbf* neural network to the research of the transmission of the relevant situations, and we will continue the optimization of width status in the kernel function combining Fruit fly Optimization Algorithm. First, this essay analyzes different factors effecting blog's rewet counts in many different aspects. On this base, we classify the blogs according to the rewet counts, and we predict the blogs' rewet counts by *rbf* basing on the *foa*, which has been optimized. Under different numbers' samples, the experimental result has certain reference value by contrasting and analyzing the predicted result of *foa-rbf* model.

### 1. Introduction

The blog, as the most rapidly developed products in China's social internet, has been gradually becoming the important platform, which helps people get and share message. Many relevant departments of our government have also set their official blog, and the blog message can enlarge the message spreading range by transmitted by netizen. Especially for the sudden situation, once an opinion is transmitted broadly, it will attract more and more people to pay attention to, so it will cause large effect to the guidance of the transmission of the public opinion. So as you can see, studying the transmitting system has significance for government's relevant departments to guide the public opinion.

To analyze the critical factors, which causes significance to blogs' rewet count, and to predict blogs' rewet count are the two key steps to study blogs' rewet count. In the aspect of studying the factors that affect rewet count [2], Morchid has analyzed critical influencing factors to blogs' rewet count basing on *pca* in the two aspects of blog's content and consumer. Wu Kai has put forward 4 blogs' rewet count influencing index, basing on social influence and interest, he also constructs message spreading model basing on behavior prediction. Zuo Xiaona has studied blog's influence in the point of view of blog's transmitting system and procedure.

This essay uses pattern classification to transform the problem of blogs' rewet count. We analyze critical factors that influent blogs' rewet count basing on *rbfnn*. Targeting at the option of width index of Radial basis function in *rbf* neural network, we use Fruit fly Optimization Algorithm to optimize width index, and we use radial basis neural network of *foa* to predict blogs' rewet count.

### 2. Theory introduction

**2.1 Fruit fly Optimization Algorithm, FOA.** *foa* is a new swarm intelligence optimization algorithm put forward by Taiwan learner Wen-Tsao Pan in 2011 [3]. *foa* is a globally optimized evolutionary algorithm, evolved from the foraging process of fruit flies. Fruit fly's visual and olfactory organs are very keen. It can locate its food within 40 kilometers by searching and

recognizing its smell in the atmosphere. Using olfactory, fruit flies locate their food roughly and fly to that sphere; then they find its exact position depending on their keen visual sensation. The fundamental of Fruit Fly Optimization is simulated from the foraging process above and figure 1 illustrates it.

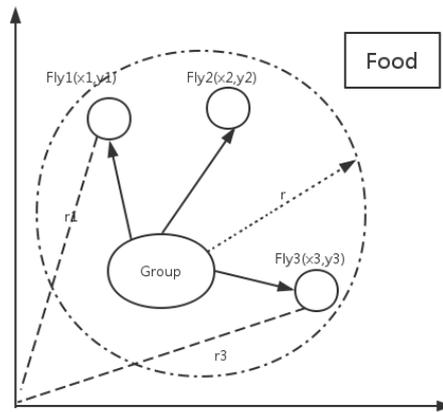


Fig.1 The iterative group search for food

**2.2 RBF natural network.** *rbf* natural network is a multilayer feed-forward neural network. It is consisted of the input layer, the hidden layer and hidden layer. The RBF natural network's superiority is that it can transfer the nonlinear divisible multi-parameter data to high-dimensional space to accomplish the approximation, which is for classification and regression [4]. The high computing speed and high precision are its characteristic. The network topology of the radical basis function is as shown in the figure 2. This text uses Gaussian function as the radical basis function, as shown in formula 1.

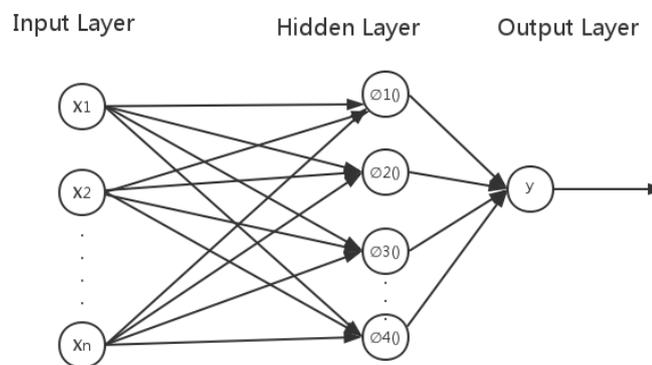


Fig.2 The structure of the RBF neural network

The  $x$  in it is a multi-dimensional input vector quantity.  $\phi$  express the width of the radical basis function.  $L$  is the neuron number of the radical basis function. The maximum output of the transfer function is 1. For multi-dimensional input vector quantity  $x$ , the hidden layer achieves the nonlinear map from  $x$  to  $\phi$  ( $\cdot$ ). The output layer achieves the linear map from  $\phi$  to  $y$ . The function of the neuron output is as shown in formula 2.

### 3. RBF neural network index optimization basing on FOA

We use Fruit fly Optimization algorithm of *rbf* neural network, basing on radial basis function optimized width Spread [5, 6]. Spread value can have many effects on RBF Neural network performance. The bigger Spread value, the smoother function fitting is, but it also means more neurons, so the calculation turns up. Spread value is too small it will there have been adaptations, seriously affecting the performance of neural networks. So when making *rbfn* model, we should ensure that the Spread is moderate. Try a different method to determine the Spread value is usually

Spread to determine the optimal value, it does not guarantee optimal value Spread, but also spend a lot of time. Optimization algorithm in optimization of *rbf* Neural network using Fruit Fly width of kernel function function to predict microblog forward and the actual forward as concentration levels of error sum of squares function, to search the Spread value. Specifics are as followed.

Step 1: Initialize the scale (size-pop) of Fruit fly melanogaster. Set the initial position coordinate of the population(X axis, Y axis). Set the maximum iterations (max-Gen).

Step 2: The direction and distance to search food for the individual of Fruit fly melanogaster, according to its olfactory sensation.

Step 3: Calculate the distance between the individual of Fruit fly melanogaster and the coordinate origin. Expressed it as the distance between the Fruit fly melanogaster and the coordinate origin. Put the reciprocal of the distance as the decision value of the taste concentration.

Step 4: Commend . Bring Spread value to the expression Take the average root error as the concentration decision function and work out at the best concentration.

Step 5: Save the maximum of the concentration and the position of the individual of Fruit fly melanogaster who own it. Now the group of Fruit fly melanogaster concentrate on the best position.

Step 6: Repeat the steps 2 to 4. When the taste concentration calculated is better than the best of it recorded before, carry out the step 5. Stop iteration when it gets the maximum iterations.

## 4. Experimental Party

**4.1 Input layer parameters.** Through the analysis of micro blog forwarded behavior, the text believed that the amount of micro blogging forwarded had influenced by both post person and the micro blog content [7]. Selected user influence, user activity, micro blogging release time, year of the registration and micro blog level of these 5 characteristics as influencing factors. Among them, the user influence calculation for the number of fans the user has divided by the number of friends that user followed. User activity is the total number of the user relapsed micro blogging.

In order to prevent some low value features being ignored. Using the method of maximum and minimum normalization. is the sample value. S is the output value.

**4.2 Experimental results.** Using *foa-rbf* neural network model to forecast the forwards capacity of the Sian Web topic for the photography tutorial sharing micro blogging. Extraction of the 80 micro blog, including 60 were optimized, and the number of iterations of margin was 40, the population size was 30. Initialize flight directing and distance of fruit flies interval -1 to 1, with the *rmse* as the evaluation parameter. Figure 3 is the convergence of *rmse* after optimization of *foa*.

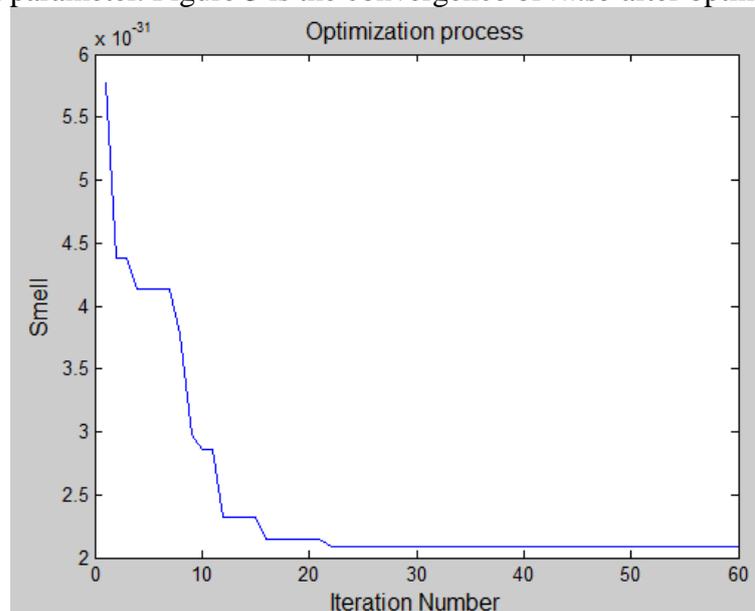


Fig.3 the convergence of *rmse* after optimization of *foa*

Can be seen from the figure above, the Fruit fly population begins to converge in the eleventh

generation, the value of  $rmse$  is  $2.1 \times 10^{-3}$ . The position of the eleventh generation Fruit fly (13.7, 9.2). Fruit fly optimization algorithm can quickly find the best value of odor concentration, then determine the optimal solution. Optimization of spread parameters in the radial basis function neural network. The prediction of rbf neural network is compared with the optimized spread parameters, give the result as figure 4.

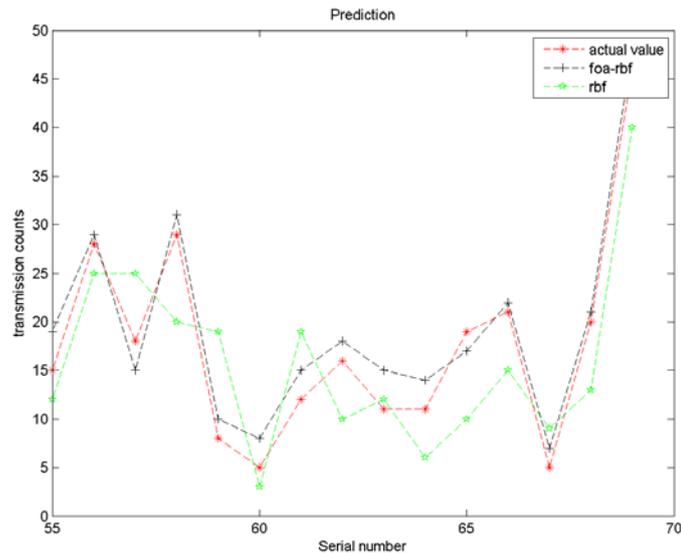


Fig.4 Comparison of experimental results

## 5. Conclusion

(1) In this paper, the factors affecting the amount of micro blog were analyzed, 5 indexes were selected as factors influencing the amount of micro blog forwarding.

(2) The problem of width parameter orientation of RBF neural network is analyzed it points out the defects of the traditional selection method.

(3) Optimization algorithm of the fruit flies, the method can be used to establish the RBF-RBF model.

4. Using the forbs model to share the micro blog in the hot event photography tutorial, the number of forwarding, the validity of the *foa-rbf* model is verified.

## References

- [1]. JIANG H, DONG Y, WANG J Z, *et al.* Intelligent optimization models based on hard-ridge penalty and RBF for forecasting global solar radiation[J]. *Energy Conversion and Management*, 2015, 95:42-58.
- [2]. SEYED M M, NAJMEH A, SEYED T, *et al.* Ardeshir Bahreininejad, Optimizing a location allocation-inventory problem in a two-echelon supply chain network: A modified fruit fly optimization algorithm[J]. *Computers & Industrial Engineering*, 2015, 87:543-560.
- [3]. Wen-Tsao Pan. A new fruit fly optimization algorithm: taking the financial distress model as an example [J]. *Knowledge-Based Systems*, 2011.
- [4]. Rudat A, Buder J, Hesse F W. Audience design in Twitter: Retweeting behavior between informational value and follows' interests [J]. *Computers in Human Behavior*, 2014, 35: 132-139.
- [5]. ZHANG Tianyun, CHEN Kui, WEI Wei, *et al.* The determination of index werghts for comprehensive evaluation engineering materials with BP neural network [J]. *Materials Review*, 2012, 26(2): 159-163. (in Chinese)
- [6]. ZHANG Yiwen, QI Jiayin, FANG Binxing, *et al.* The indicator system based on BP neural

network model for net-mediated public opinion on unexpected emergency [J]. China Communications, 2011, 8(2): 42-51.

[7]. Suh B, Hone L, Pirolli P, et al. Want to be retweeted? Large scale analytics on factors impacting retweet in twitter network [C]. // 2011 IEEE Second International Conference on Social Computing (SocialCom). Minneapolis, USA: IEEE, 2011.