ARTIFICIAL IMMUNE SYSTEM BASED WEB USAGE PREFERENCE SYSTEM

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Abstract-An *artificial immunes ystem(AIS) models the natural immune system' sability to detect cells foreign to the body. The result is a new computational paradigm with powerful pattern recognition abilities ,mainly applied to anomaly detection. A new paradigm of artificial immune system has emerged and has proved to be successful for solving many real world computational problems. It has opened a new gateway of research in the area of computational intelligence. Artificial immune systems, is based on natural immune system principles, and thus uses the concept from it for computational paradigm for solving tasks. In this paper we borrow the concepts of artificial immune system for implementing a general web usage preference system which shall make a preference list of website based on the user action. This preference list is prepared using the ideas of artificial immune system. Preference system relies on classification and recognition.*

Keywords:

Artificial immune system, Recommender system, Natural Immune system

I. INTRODUCTION

The Artificial immune system is a mathematical paradigm that helps in solving problems using the inspiration obtained the theoretical perspectives of human immunology and immune system. It replicas the human immune system and through the mathematical model of the human immune system this model aims in solving some of the complex problems of the mathematics and computer world [1].

Immune system is a complex dynamical system capable of performing distributed recognition and detection, memory acquisition and learning, self organization, and generation of diversity. Hence in this field of AIS has been widely used for problem solving in areas of pattern recognition, Data Mining,

anomaly&machine learning etc. This paper presents a new area of application – solving website ranking problems using this new paradigm.

Natural Immune System has the features like self/non-self discrimination, adaptively, learning, memory, distributive, diversity, pattern recognition, anomaly detection, noise tolerance, predator-prey pattern, and self-organization which become base to solve computational problem. Definition of Preference System helps a user or an admin to gain knowledge about user choices and thus improvises the web usages and provides the intelligent web. It also helps website owners to improvise the content and thus improvise the website looks.

In this paper we use the concept of AIS for gaining the knowledge of web usages & thus improvises web site.

II. BACKGROUND
A. Web preference System

Web preference systems (RS) are used in predictions and recommendations of certain
Objects like multimedia content (web pages,
audio or video materials) or items of purchase (retail web shop merchandize) to end users. RS model consists of three parts:
• Input and output data,
• Recommendation methods,
• Model design[6]

These system generally make full details of user actions and rate the content of website accordingly based on its usage. These systems are used by many online shopping portals and other websites to make an sound digital marketing strategy so as to attract the online customers.

929

B. Artificial immune system

The immune system functions surveying of the organism in the search for malfunctioning cells from their own body cells. Thus immune system performs the identification of self cells (body cells) from nonself cells (pathogens). There are presences of *receptor molecules*, on the surface of immune cells, which are capable of recognizing almost limitless range of antigenic non self cells. This mechanism is similar to identification of patterns or recognition of patterns[2].

For recognition of antigenic nonself patterns immune system has basically two different kinds of cells known as T- Cells and B- Cells. Negative selection and clonal selection mechanism helps in identification of antigens from self cells for respective T –Cells and B- Cells [3],[2]

Differentviewsonhowthenatural immune

system(NIS)functionshavebeendevel-oped,causingsomedebateamongimmunologists. Thesemodelsincludetheclassical viewoflymphocytesthatareusedtodistinguishbetweensel fandnon-self,theclonal selectiontheorywherestimulatedB-Cellsproducemutatedclones,dangertheory, whichpostulatesthattheNIShastheabilitytodistinguish betweendangerousand non-dangerous foreigncells,andlastly,thenetworktheorywhereitisassu medthat B-Cellsformanetworkofdetectors.[1]

Computationalmodelshavebeendevelopedforallthesevie ws,andsuccessfullyap- pliedtosolvereal-worldproblems.[1] These theoriesinspiredthe modelingoftheNatural immune systemintoanartificialimmunesystem(AIS) forapplicationinnon- biologicalenvironments

C. Relativity Function

To understand mathematically the concept of AIS we need to define arelated function.
Related function is defined as a distance measured between two element .In this case the distance are measured between antigen & detector vector[4]

$$D_{EUCLIDEAN}(x, y) = \sqrt{\sum_{i=1}^{L}(x_i - y_i)^2} \quad (1)$$

$$D_{COSINE}(x, y) = \frac{\sum_{i=1}^{L} x_i \cdot y_i}{\sqrt{\sum_{i=1}^{L} x_i^2 \sum_{i=1}^{L} y_i^2}} \quad (2)$$

III. WEB USAGE PREFERENCE SYSTEM(WUPS)

Many of the current collaborative filtering techniquesuse the Pearson correlation coefficient to compare theitem ratings of different users. This suffers fromseveral limitations. For example, due to the extremely large amount of information to be rated, two usersmay only have a very small number of items incommon causing the correlation measure to be undulyinfluenced by those items. Further, there is potentiallyno difference between the correlation between twousers with three items in common and the measure fortwo users with 30 items in common, in terms of their"influence on the final prediction"[5]

Also website ranking systems available till date are cumbersome so in this paper a new method is proposed.

A. Proposed working model of WUPS

Web usage preference system proposed here works using the concept of Clonal selection algorithm. Web usage preference can be ranked if collaborated with the ideas of Danger theory.

Consider a similar websites of similar domain like online shopping, news portals etc. Theoriginal data consists of sets of web site addresses orURLs taken from bookmark collections.This data has to be pre-processed in order to removeunwanted information and superfluous characters.

Now make all the user profile with interesting objects of usage or visits. Assign an average rank to all or initialize each website URL rank to a nominal value.

Now whenever a user reads or performs any task over a website a *preference signal* is activated. The rating is done after calculating the affinity between features of incoming website URL to user action. The affinity

is calculated using relativity function explained above.

Now the website with highest affinity is given the highest preference followed by others and a preference list is suggested to a user.
But if an article or website which is having lowest affinity values or not recognized even once are given lowest preference or eliminated from preference list.

// *Algrothim for WUPS*

Initialisean WUPS
Encode website for whom to make predictions as antigen Ag
For i=all website URL
IF (WUPS is not stabilised) && IF (More websites are available)
DO
Website rank(i) =0
Add URL (read data) of website as an antibody Ab to a memory of preference data.
Calculate matching score between Ab and Ag using relativity function
Website rank(i) = websiterank(i) + 1 for those website whose were visited
WHILE (WUPS is stabilized) &(no more web usage data available)
Arrange the website URL with highest
Website rank
DO
Iterate WUPS
Prepare the preference list.

IV. CONCLUION & FUTURE WORK

A preference system or a ranking system usually predicts the website URL based on user response and interest. There are many methodologies to carry out this process. In this paper a new methodology of artificial immune system is used for web usage preference system and a algorithm is designed for WUPS.

As a part of future work the algorithm is to be implemented over a set of website and URL and is to be validated. Accuracy and efficiency of other approach is to be compared with this method. Also Danger Theory ideas are to be employed for enhancing the efficiency of algorithm.

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