International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-12 Issue-1, December 2022

Linear Regression Feature and Frog Leaping Algorithm based Web Page Recommendation

Pavithra. B., Niranjananmurthy M

Abstract: ***Website content and services attract surfers to visit page. Random visitor or first time visitor need more user suggestion for increasing the retaining of user. This work has worked in field of web page prediction as per user previous visits. Web mining logs and content features were further processed to extract the linear regression feature from the work. Extracted features were used for the page prediction in testing phase. Frog leaping genetic algorithm was used for the population generation and possible page prediction. Experiment was done on real dataset extracted from projecttunnel.com website. Results were compared with existing page prediction models and it was obtained that Web Page Prediction Frog Leaping Algorithm (WPPFLA) model has improved the work performance with respect to precision value, accuracy, Fitness measure and Metric values.***

Keywords: Information Extraction, Weblog, Neural Network, Regression, Recommendation.

I. INTRODUCTION

Using a web prefetching and caching architecture helps to reduce the load on the source servers. Individual web requests are analyzed and saved, and it operates as a proxy to answer to the clients' requests instead of the servers. Researchers have come up with a variety of web proxy cache solutions throughout the years (C. Li, M. Song, 2022, [1]). Clients and the collaboration server can communicate through a set of presenter devices (J. A. Toebes, 2017, [6]). It is dependent on the server answer and presenter context that a request is delegated between the devices and the individual sessions, a multi-user web session is established. The server dynamically responds to the presenter's context. As a result of these collaborative sessions, each participant is able to independently visualize the results in light of their own circumstances. The proxy requests/receives the resources from the web application and injects an executable script with it and sends it to the client in the sphere of web application computing (V. R. Chandaka, 2017, C. S. Joel, 2016, [7, 8]). In addition to the requested resource,

Manuscript received on 30 November 2022 | Revised Manuscript received on 07 December 2022 | Manuscript Accepted on 15 December 2022 | Manuscript published on 30 December 2022.

***** Correspondence Author (s)

Pavithra. B.*, Research Scholar, Department of Computer Applications, M S Ramaiah Institute of Technology, (Affiliated to Visvesvaraya Technological University, Karnataka), Bangalore (Karnataka), India. E-mail: Pavithra247@gmail.com

Dr. Niranjananmurthy M, Department of Artificial Intelligence and Machine Learning, BMS Institute of Technology and Management (Affiliated to Visvesvaraya Technological University, Karnataka), Bangalore (Karnataka), India. E-mail: niruhsd@gmail.com

The client can also run the script and collect analytic information on the network's servers and resources. It is possible to utilize these proxy types as enterprise solutions for monitoring resources in large networks Monitoring metrics from a single application or resource pool are collected using scripts. (R. J. Cohen,2016, [9]). For the web application and portal to work together, a reverse web proxy is used. It removes the need to physically locate sailing information. Network traffic evaluation and deep packet analysis are used to detect one or more features of a given application. These properties are used by the data discovery engine to detect patterns that describe an application's overall setup. In order to integrate the application with the reverse proxy web portal, this set of parameters is used. Web proxies aid in the reduction of page display latency (S. Reddy, 2015, [10]). A proxy server acts as a middleman between the browser and the origin server over the internet. In order to reduce the amount of time it takes to render a page, a page structure verifies assets based on the time they have been in the browser's cache.

II. RELATED WORK

(T. Bai et al.,2021, [11]) suggested an enhanced neural model based on the earlier framework called IRNet for NL query of datasets. To represent database entities and relationships, a Gated Graph Neural Network (GGNN) is used in this model. NL database queries may be done using this concept. This work defines and uses database variables in the prediction model in order to quickly create a valid SQL statement from a query supplied in an NL phrase. (Honey Jindal, 2020, [12]). Both Markov models, the All-Kth Modified Markov Model (KMMMG) and the All-Kth Modified Markov Model based on Branching Factor Threshold (ABFTH), both employ dynamic thresholds (KMMMBF). (X. Fan Wang, 2018, [5]) This study demonstrates that long navigations are highly rare and that they are obviously tied to one other. On the other hand, smaller navigations are becoming more and more disconnected. Fixed threshold models are less accurate than dynamic threshold models when it comes to producing predictions. An article by (Honey Jindal, 2020, [13]) evaluates the performance of models such as Neural Network (NN), Multiplayer Perceptron (MLP), and Long Short Term Memory (LSTM) for Web Navigation Prediction. A number of combinations were tested to discover the best NN parameters. Deep Learning models like MLP and LSTM, for example, have had their Web Navigation Prediction performance tested by varying various parameters. In order to find the optimal model for predicting internet user behavior, all of these models are evaluated on the same platform.

In (S.Reddy, 2015, [14]) supported the use of approaches for creating hierarchies from provided data to organize web genres by an expert. These techniques might be used to establish a web genre hierarchy. Data-driven approaches (D. Carra, 2022, [2]) would reduce the need for this time-consuming and error-prone technique since experts have difficulty constructing a single hierarchy that is acceptable to all of them. For the purpose of this study, HMC datasets were derived using two benchmark datasets for genre categorization: Predictive models' accuracy (T. Trinh D. Wu, 2019, [3]) is tested in relation to the online genre hierarchy, which is part of the study. Each page is annotated with a single genre and the genres are organized into a hierarchical structure in this work's four machine learning tasks: SLC, MLC, HSC, and HMC (HMC, each page is annotated with multiple genres organized into a genre hierarchy). (C. Fang, H. Yao, 2019, [4]) As a result of this study, all data used in it are now openly available for other researchers to use and the feed forward genetic algorithm has been used here in this approach. (Y. Lu, X. Huang, 2018, [15]) devised a WCGM-based three-stage approach for reducing data loss. In order to categories the context graphs created by the authors, they utilized a machine learning model that weighted the data's context. After that, they utilized a graph masking technique to erase any personal information from the graph. The method greatly increased prediction accuracy and timeliness. (Y. Lu, X. Huang, 2018, [16]) published similar findings in the Journal of Physics conference series to IILPs. The authors performed content-sensitive document classification and tested it using four different data sets. TD2V was used to create a vector representation of the papers in order to compare them to a collection of extremely sensitive documents that had already been analysed. According to (N. Papernot, 2016, [17]) ML can be applied in the field of information security. The study uses an adversarial paradigm to classify the many threats and responses that exist. A compromise must be made between model complexity, accuracy, and long-term usability in light of the planned use of the models.

III. PROPOSED METHODOLOGY

Web Page Prediction by Frog Leaping Algorithm (WPPFLA) is detailed in this section of paper. Whole proposed model has broadly divided into two section. First is data processing to extract features from raw data. In second module extracted features were uses for the page prediction by frog leaping algorithm. Figure 1 shows vlock diagram of work.
Algorithm used for the proposed algorithm:

Step a: In order to make a fair comparison between the total number of memeplexes (m) and the current count (im),
set im=0.

Step b: Put im+1=im.

Step c: Put iN=iN+1 into effect.

Step d: Raise the status of the lowest frog.

Adjustment to the frog's posture

$$Di=rand(m)\times(Pb-Pw) \backslash s(5)$$

Pw=currentposition; Pw+Di (Dmax Di Dmax)

Dmax is the maximum allowable change in a frog's position, and rand() is a random value between 0 and 1.
Step e: If this procedure yields a more desirable outcome (solution), then the undesirable one will be abandoned in favor of the more desirable one.
Levy flight will provide an updated position:

$$x(t+1)i=x(t)i+\alpha\oplus Levy(\lambda)i=1,2,\ldots,n$$

where x(t)i represents the xi predicted pages as most visited pages, denotes point-to-point multiplication, and is a step-size adjusting parameter

A. Feature Extraction

Web mining features were extract in form of web content, web log. Such data need few pre-processing steps that transform data into valuable information / feature. (J. A. Toebes ,2017, [6]) So in case of web log feature user page visiting sequence is present with different other information that might not useful for this page prediction work, hence such unwanted data is remove from the logs. For removal of weblog unwanted information data cleaning approach was used. URL and visitor ID, present in log was used for the webpage sequence. This sequence of logs were further analyzed for the pattern generation like rule having two or more page patterns were present.
Web content feature was also pre-process by removing stopwords from the dataset. Each webpage content was separately process to identify its word set. As per the URL content page title act as word set. This feature was further store in the matrix where each row and column represent a page. Cell represent a value that is a word similar count between pages (Row, Column).

3.1. Regression

Regression was used to learn from the URL pattern and association rules. As a result, similar sets of association rules from the left were gathered into a single bunch, which served as input to the association rule. Another input value is the URL pattern value for the two page similarities. As a result, the input matrix for regression has three rows and two columns (as per number of association rule).

$$R_{Input} = \begin{matrix} C_{rule1x}\{P_2, P_9\} & C_{rule1x}\{P_9, P_1\} & C_{rule1x}\{P_2, P_1\} \\ C_{rule1x}\{P_2, P_9\} & C_{rule1x}\{P_9, P_7\} & C_{rule1x}\{P_2, P_7\} \end{matrix}$$

As a result, the intercept β1, β2, and β3. are the outputs of this regression. As a result, the left-hand side values are stored in the association rule matrix RInput refers as per the rules. This is the process of extracting data from a dataset.
Hence output of this regression is intercept β1, β2, β3. So as per rules left hand side values are store in association rule matrix R. This is learning of data from the input dataset. P are referred to the parameters of chromosomal values used to integrate

Retrieval Number: 100.1/ijitee.A93811212122
DOI: 10.35940/ijitee.A9381.1212122
Journal Website: www.ijitee.org

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

3.2. Testing Module

The input testing dataset contains logs that must be preprocessed to determine the number of pages visited by a single user. As a result, a page sequence was created, which was then sent into the Intelligent Water Drop algorithm, which predicted the following page.

3.3. Generate population

In order to find the sub class of intrusion paper has reduce the dimension of model by this SFLA algorithm (Honey Jindal,2020[12]). Each frog is set of 0 and 1 element where selected feature in frog is shown by 1. Frog collection is population in the work. Chromosome having set of pages which act as predicted pages.

Knowing the dynamo of the frog leaping frequency it tells us how the frog leaps when there is insufficient information and then provided all the source of information in a proper way as adequate to full fill the frogs hunger its start its journey in a faster way, so the same concept is also inverted here as the coefficient values that is generated if its sufficient for the metrics value which is been set, that is if it's almost near to the paracentral value which is fixed then it considers it as a targeted value , the logic just follows by accepting the values and keep comparing it to the paper centric value which is fixed and whichever values lies near by clustering then it is accepted or it starts slowly moving forward until it gets the required or any nearby clustering values

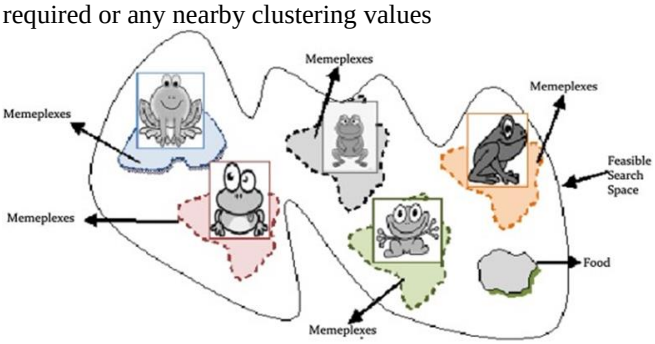

Fig 1: Frog leaping as memeplexes searching for the food with feasible search space

Figure 1 explains the frog leaping algorithm, the frog which is hungry and wants to be feed by the food is referred to as the memeplexes, we can see in the figure different types of memeplexes with different attributes and its lies with its own space referred to as a parameters, so whenever if its hungry or want to consume energy, it will try to achieve a feasible space so that it's the critical path to reach the food also it tries to create its own space so that it does not get influenced due to any affecting parameters .

When once it finds the feasible search space and it leaps to that space and targets the food to be consumed, so until then it keeps leaping to find out the suitable parabolic values. Group of collected frogs based on the same parameters will be collected. In the virtual reality the population is considered as one of the following parameters so based on some precession value then finding the fitness value for that generated population, by using fitness function, evaluate the generated fitness function weather it matches to the hyperbolic parameters

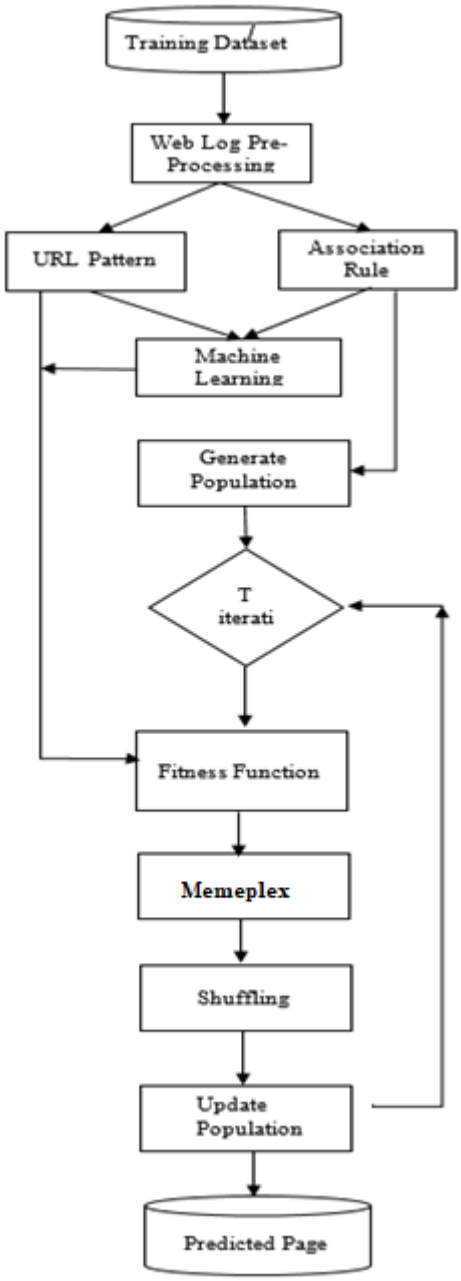

Fig. Figure 2: Block diagram of proposed model.

Figure 2 explains the architecture of the work carried out, hence the flow of the diagram has many steps to be carried out, firstly we work on the training the data set which is been collected and been implemented into the second phase of pre-processing the log files, for which we try to clean up the noisy data from the url pattern that is extracted and by applying the association rue ,either use the predefined url pattern or user the feed forward association rule and train the machine using water drop machine learning algorithm related to liner regression , the generate the population using Genetic Feed Forward Association Rule method , once generating the population is done then start iteration using the frog leaping algorithm and the frog as show in the figure 1, which the frog uses the feasible search space and start haunting for the food.

3.4. *Fitness Function*

Passing the R_{input} as directed on the chromosomal pages yielded the fitness of each chromosome. For Chromo = P7, P2, the values of X1 and X2 are calculated as follows:

$$M = \frac{1}{1 + e^{-(\beta_o + X_1 \times \beta_1 + X_2 \times \beta_2 + X_3 \times \beta_3)}}$$

$$F = \sum_{i=1}^{c} M_i$$

Here the chromosome's fitness value (F) is calculated by adding the probabilities of each page and (M) refers to the matrix value obtained by adding all the beta values of the chromosomal parameters and taking the inversely ratio of the value. As a result, a higher fitness value is thought to be a desirable option.

Memeplex: In the work, certain frogs are joined together in order to obtain food in a larger area. In the work, this group is referred to as memeplex. For group preparation, an index was created based on the fitness value.

3.5. *Shuffling*

Crossover occurs when a set of chromosomes is randomly replaced in the presence or lack of a characteristic, as in the common parent frog set. So, if the best set of Frogs is $\{f_1^0, f_2^0, f_3^1, f_4^1 \ldots\ldots\ldots\ldots f_n^0\}$, and the random feature position is three, the status of the third feature of the other frog is set to presence. Position and number of positions are chosen at random.

3.6. *Population Updation*

The fitness function was used to assess new frogs in the population. If the fitness value of each new frog was higher than that of any other frog in the memeplex, it may replace the memeplex frog. The term "population updating" refers to the replacement of frogs in the population.

3.7. *Final Solution*

Those pages are recommended as the best potential chromosomes for the proposed genetic algorithm model when a sufficient number of iterations are finished.

IV. EXPERIMENT AND RESULT

4.1. Experiment Setup

Implementation of proposed model was done on MATLAB software, experimental work was compared with existing methods proposed in WPP-IWD [web page prediction using intelligent water drop algorithm], FFO and PASO (R. Manikandan,2018, [18]) In April 2019, the projecttunel.com website provided us with a weblog that we used as the basis of our study. This weblog has been seen by 6240 unique users who have recorded 20000 sessions. Number of pages are 278.

In the experiment that was carried out, we compared it with the web page prediction using intelligent water drop algorithm for considering for finding the nearest optimal and this algorithm uses converging values and also its been compared with genetic feed forward association rule to have implemented with consecutive values of previous as input and forwarded to another incremental values so the name feed forward is considered. Then we have also compared it to particle swam optimization methodology for considering the independent gradient values and later on clustering the real values, so by using all three different methodologies and it has been compared with the proposed technique and also its

$$R_{Input} = \begin{matrix} X_1 & X_2 & X_3 \\ C_{rule1x}\{P_1, P_8\} & C_{rule1x}\{P_1, P_2\} & C_{rule1x}\{P_8, P_2\} \\ C_{rule2x}\{P_1, P_8\} & C_{rule2x}\{P_1, P_7\} & C_{rule2x}\{P_8, P_7\} \end{matrix}$$

results has been tabulated in the below given tables and a comparison chat is also been discussed to see the result effectively.

4.2 Result

Table 1: Precision value comparison of Page recommendation algorithms.

Testing Dataset Size Percentage	WPPFLA	WPPIWD	GFFAR	PASO
20	0.4474	0.4263	0.3458	0.5
30	0.44	0.412	0.1152	0.1022
40	0.3921	0.3921	0.1138	0.0912
50	0.3586	0.3629	0.0919	0.0901

In Table 1: it refers to all the precision values that has been extracted using varies methods such as WPPIWD,GFFAR, and PASO algorithm and has been compared to WPPELA algorithm, and it was found that 2.73% precision value has improved for possible page prediction set.

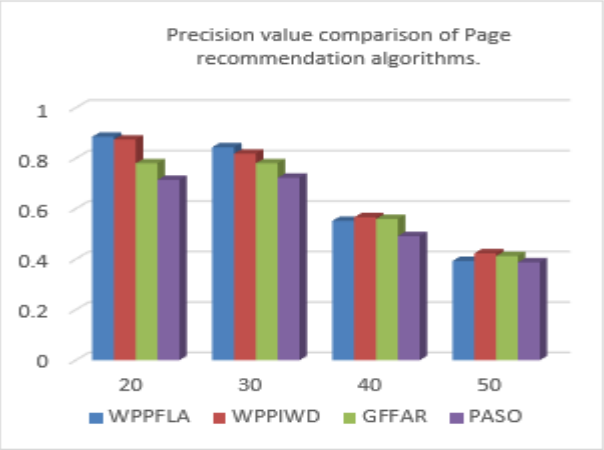

Fig 3: Comparison of Precission value of page Recommendations

Figure 3 represent the proposed system performed comparison with another 3 methodologies, to get to know the precision value obtained as a result using WPPFLA algorithm and The same values is compared with WPPIWD algorithm, GFFAR and also with PASO algorithm, by taking 20, 30 , 40 and 50 percent of the dataset an seeing its measure Precision values obtained from different dataset percentage is shown in table 1. It was shown that proposed WPPFLA algorithm has improved the value by 2.73% as compared to WPPIWD work. Use of weblog feature in the work for population generation has increase the work efficiency in WPPFLA and WPPIWD algorithm.

Table 2: Coverage Value Comparison of Page Recommendation Algorithms

Testing Dataset Size Percentage	WPPFLA	WPPIWD	GFFAR	PASO
20	0.8854	0.8438	0.5521	0.3931
30	0.8741	0.8182	0.5664	0.4233
40	0.78	0.7801	0.5594	0.4128
50	0.7143	0.7227	0.4916	0.3877

In table 2 the coverage parameter has been considered and shown that is possible set of pages that contain the user page. Compared to the PASO model, the suggested WPPFLA model's coverage value improved by 52.17 percent, as shown in Table 2. Use of genetic algorithm and linear regression model has improved the page prediction accuracy.
predicted values of the user behavior session can be improved by using the proposed WPPFL algorithm.

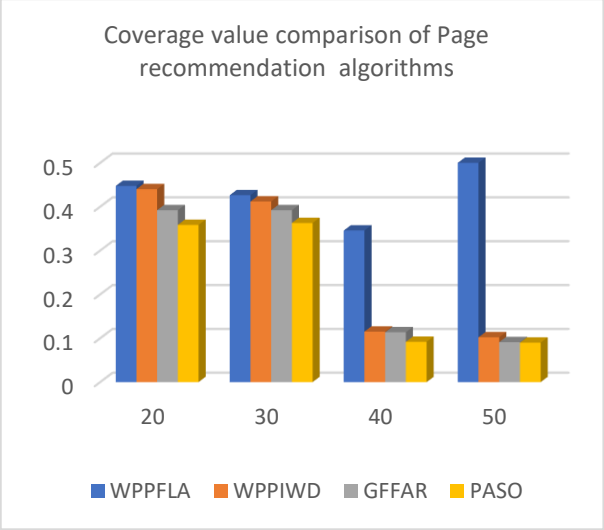

Fig 4: comparison of Coverage vaue of pages recommendation algorithms

In the figure 4, shows the compared values of the different algorithm used for predicting the web pages based on the hyperbolic values, considering the user behavioral interest as the collections of web pages so here in the figure a sample of the all the values of taking the data set of 20, 30, 40 and 50 percent simultaneously has been accumulated and tabulated the values again the graph so the graphical representation clearly gives an immense idea about different proposed algorithm and by taking some percent of data asset same data set in been incorporated to various algorithm and the results are compared and shown on the graph, we can clear see the difference among various algorithm so we can clearly say that WPPFLA has consistency throughout the different percentage of the data set and it have given an improvement for around 0.5% has shown the improvements in coverage value when compared to other algorithms.

Table 3: M-metric value comparison of Page recommendation algorithms

Testing Dataset Size Percentage	WPPFLA	WPPIWD	GFFAR	PASO
20	0.142	0.1818	0.2173	0.2846
30	0.103	0.1382	0.2302	0.3145
40	0.147	0.1441	0.2613	0.3328
50	0.2939	0.2995	0.3068	0.3302

In table 3, it depicts the comparison of WPPFL, WPPIWD, GFFAR and PASO algorithm by taking certain hyperbolic values and certain dataset size to be 20, 30, 40 and 50 percent respectively and also recommend data size has been compared with every algorithm and thus this comparison says that there is gradually consistence maintained throughout the result, the metric value for ever recommended page has shown the result of increasing the value by taking different data set as some percentage into consideration like 20 , 30 40 and 50 percent, also as long as increasing in the data set parameters the results show the great courage of balancing the hyperbolic parameters.

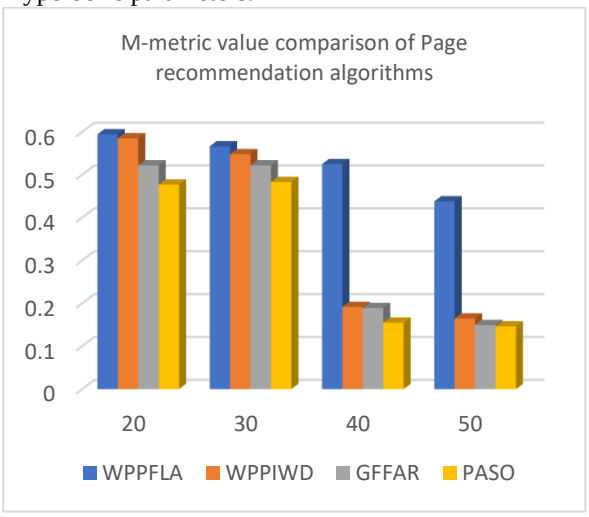

Fig 5: M-metric value comparison of Page recommendation algorithms

In figure 5 shows the graphical representation of the metric values has been compared with various other proposed algorithms including water droplet algorithm, genetic algorithm, a particle swam optimization algorithm amongst all the work shown when takes as the metric value and from the figure it gives a clear picture that metric values and proves that the proposed work had given better results and has maintenance consistency throughout for proposed work and also has improved the efficiency of the proposed work, that uniquely identifies that it can treated in an unambiguity preference said by the metrics value and improve the performance of the metrics value resided in the hyperbolic values .

Table 4: Mean Average Error value comparison of Page recommendation algorithms.

Testing Dataset Size Percentage	WPPFLA	WPPIWD	GFFAR	PASO
20	0.142	0.1818	0.2173	0.2846
30	0.103	0.1382	0.2302	0.3145
40	0.147	0.1441	0.2613	0.3328
50	0.2939	0.2995	0.3068	0.3302

Table 4 has shown that Frog Leaping genetic algorithm has increased the work M-metric value while reduces the Mean Average error value. Use of weblog and web content feature for web linear regression model has increase the accuracy of page prediction without any visitor history or reading the cache information

Retrieval Number: 100.1/ijitee.A93811212122
DOI: 10.35940/ijitee.A9381.1212122
Journal Website: www.ijitee.org

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

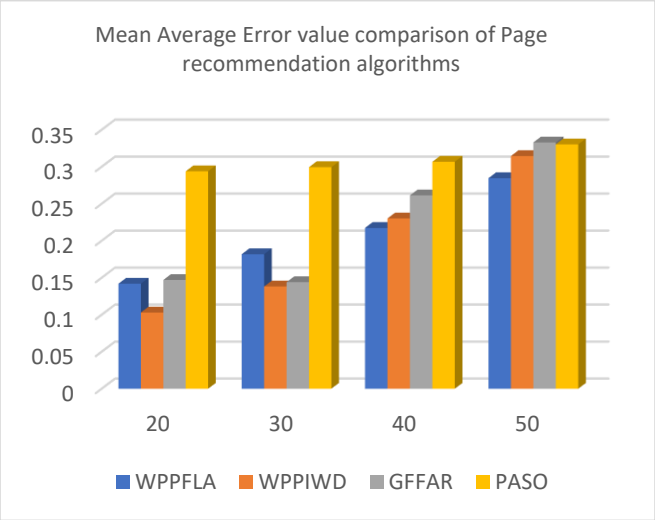

Fig 6: M-metric value comparison of Page recommendation algorithms

Figure 6 has shown that Frog Leaping genetic algorithm has increased the work M-metric value while reduces the Mean Average error value. Use of weblog and web content feature for web linear regression model has increase the accuracy of page prediction without any visitor history or reading the cache information.

V. CONCLUSIONS

User behavior analysis is a great field of research in web mining. This work has uses the weblog and web content page for linear regression feature generation.

Frog leaping genetic algorithm was used in testing phase for possible web page prediction. Results shown that Frog Leaping genetic algorithm has increased the work M-metric value while reduces the Mean Average error value. Use of weblog and web content feature for web linear regression model has increase the accuracy of page prediction without any visitor history or reading the cache information. In future scholar can use other feature of website and user for improving the prediction accuracy. The proposed work clearly says that web page prediction has been achieved by apparently increasing the metric values while considered to be a good descent values to be taken into consideration

The work has also proved by reducing the mean average error when compared to other particle swam optimization and WPPIWD, GFFAR methodologies.

Also the work has satisfactorily listed that it improves the accuracy of the proposed model and predicts the page accurately likely to be near to the predicted pages as per the user behavior.

REFERENCES

1. C. Li, M. Song, S. Du, X. Wang, M. Zhang, and Y. Luo, ‘‘Adaptive prioritybased cache replacement and prediction-based cache prefetching in edge computing environment,’’ J. Netw. Comput. Appl., vol. 165, Sep. 2020, Art. no. 102715. [CrossRef]
2. D. Carra, G. Neglia, and P. Michiardi, ‘‘Elastic provisioning of cloud caches: A cost-aware TTL approach,’’ IEEE/ACM Trans. Netw., vol. 28, no. 3, pp. 1283–1296, Jun. 2020. [CrossRef]
3. T. Trinh, D. Wu, and J. Z. Huang, ‘‘C3C: A new static content-based threelevel web cache,’’ IEEE Access, vol. 7, pp. 11796–11808, 2019. [CrossRef]
4. C. Fang, H. Yao, Z. Wang, P. Si, Y. Chen, X. Wang, and F. R. Yu, ‘‘Edge cache-based ISP-CP collaboration scheme for content delivery services,’’ IEEE Access, vol. 7, pp. 5277–5284, 2019. [CrossRef]
5. X. Fan and J. H. Wang, ‘‘Proxy engine for custom handling of web content,’’ U.S. Patent 9 906 549, Feb. 27, 2018.
6. J. A. Toebes, ‘‘Presenter device as web proxy for collaborative sharing of web content having presenter context,’’ U.S. Patent 9 781 175, Oct. 3, 2017.
7. V. R. Chandaka, M. Smacinih, S. Guha, R. Mahalati, A. J. Sanghvi, and V. A. Mushkatin, ‘‘Proxy-based web application monitoring through script instrumentation,’’ U.S. Patent 9 654 580, May 16, 2017.
8. C. S. Joel, J. T. W. Benterou, L. H. Holloway, M. B. Prince, and I. G. Pye, ‘‘Loading of web resources,’’ U.S. Patent 9 342 620, May 17, 2016.
9. R. J. Cohen, A. L. Bolgert, R. M. Forlenza, M. Sang, and K. K. Yellepeddy, ‘‘Auto-detection of web-based application characteristics for reverse proxy enablement,’’ U.S. Patent 14 487 414, Mar. 17, 2016.
10. S. Reddy, S. Togaru, and C. Trillo, ‘‘Reducing latencies in web page rendering,’’ U.S. Patent 9 158 845, Oct. 13, 2015.
11. T. Bai, Y. Ge, S. Guo, Z. Zhang and L. Gong, "Enhanced Natural Language Interface for Web-Based Information Retrieval," in IEEE Access, vol. 9, pp. 4233-4241, 2021. [CrossRef]
12. Honey Jindal, Neetu Sardana, Raghav Mehta. “Analyzing Performance of Deep Learning Techniques for Web Navigation Prediction”. Procedia Computer Science, Volume 167, 2020 [CrossRef]
13. Honey Jindal, Neetu Sardana, “Web navigation prediction based on dynamic threshold heuristics”. Journal of King Saud University - Computer and Information Sciences, 2020.
14. Gjorgji Madjarov, Vedrana Vidulin, Ivica Dimitrovski, Dragi Kocev. “Web genre classification with methods for structured output prediction”. Information Sciences, Volume 503, 2019. [CrossRef]
15. Y. Lu, X. Huang, Y. Ma, and M. Ma, ‘‘A weighted context graph model for fast data leak detection,’’ in Proc. IEEE Int. Conf. Commun. (ICC), May 2018.
16. K. Kaur, I. Gupta, and A. K. Singh, ‘‘Data leakage prevention: Email protection via gateway,’’ J. Phys., Conf. Ser., vol. 933, Dec. 2017 [CrossRef]
17. N. Papernot, P. McDaniel, A. Sinha, and M. Wellman, ‘‘Towards the science of security and privacy in machine learning,’’ 2016.
18. R. Manikandan. “A novel approach on Particle Agent Swarm Optimization (PASO) in semantic mining for web page recommender system of multimedia data: a health care perspective”. Springer Science Business Media, LLC, part of Springer Nature 10 January 2019. [CrossRef]

AUTHOR PROFILE

Mrs. Pavithra B, Research Scholar, Department of Computer Applications, M S Ramaiah Institute of Technology, (Affiliated to Visvesvaraya Technological University, Karnataka), Bangalore 560054, Karnataka, *India.*Bangalore. Completed her Master of Computer Applications from Banaglore University, during 2012 She has 10 years of teaching experience in VTU affiliated Colleges and current working as Assitant Professor at Dayananda Sagar College of Engineering affiliated to Visvesvaraya Technological University . She has published research articles in various National / International Conferences and Journals. She has participated/presented in National and International Level Conferences.

Dr. Niranjanamurthy M, Assistant Professor, Department of Artificial Intelligent and Machine Learning, BMS Institute of Technology and Management, Karnataka, India. He did Ph.D. Computer Science at JJTU, Rajasthan (2016), MPhil-Computer Science at VMU, Salem (2009), MCA at VTU, Belgaum, Karnataka (2007). He has 14 years of teaching experience and 2 years of industry experience as a Software Engineer. Published 4 books in Scholars Press Germany. He has published 56 papers in various National / International Conferences / International Journals. Filed 15 Patents in that 2 granted. Currently he is guiding four Ph.D. research scholars in the area of Data Science, ML, and Networking. He is working as a reviewer in 22 International Journals. Two times got Best Research journal reviewer award. Twice He Got Young Researcher award-Computer Science Engineering. His areas of interest are Data Science, ML, E-Commerce and M-Commerce related to Industry Internal tool enhancement, Software Testing, Software Engineering, Web Services, Web-Technologies, Cloud Computing, Big data analytics, networking.