iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** V **Month of publication:** May 2018

DOI: http://doi.org/10.22214/ijraset.2018.5087

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue V, May 2018- Available at www.ijraset.com

Kernel Optimized Regression Model for Product Recommendation Connecting Social media to E-Commerce

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Abstract: ***Today, many e-commerce sites are accessible through the use of user social network accounts like Facebook, Weibo, etc. Users of social media can post their recently purchased products. The product is recommended to the user based on microblogging features. The microblogging features such as demographic attributes, Text attributes, Network attributes and temporal attributes. Based on demographic attributes (age, gender, marital status, education, and carrier) the product is recommend to the users in cold start recommendation. The LDA is used to extract the topics of each user from microblog. In order to increase the number of topics the NLP is used. After extracting microblogging features the MART (Multiple Additive Regression Tree) is performed. The SVM (Support Vector Machine) is used to learn the dataset. The similarities between the users are evaluated and product is recommended. Here the optimization problem very complex and the tuning of parameters are not done properly. Hence Genetic algorithm is used to obtain the parameters of SVM. Through iterative process the fitness of every solution is evaluated. Using simple cross over and mutation operation a most fitted solution is suggested. In this scenario, the most suited ranked products for each user is recommended.***
Keywords: Microblogging features, LDA, NLP, MART, Genetic algorithm.

I. INTRODUCTION

At present, the recommendation system is designed to serve users and achieve relevant and eye-catching things in the knowledge age. It is widely studied and applied to various fields ranging from e-commerce to medication prediction. Lately, the link between electronic commerce and social media has become more blurred. E-commerce Sites like eBay have many features of social support systems, including timely status updates and the connection across buyer and the seller. Some e-commerce sites also support social login devices, allowing new users to store access information for their existing social marketing software programs as Facebook or MySpace, Twitter or Google+. Both Facebook and Twitter also launched a new feature last year that allows users to buy the products from their websites by clicking on the "Buy" button to get items in campaigns or other posts [1].In this thesis, a link is established between social media application and e- commerce portal, so as to recommend the product based on microblogging features. Here microblogging features such as demographic attributes, text attributes, network attributes and temporal attributes. It is an interesting issue for users of social networking sites who recommend the products of an e-commerce site to those who do not have a history of purchase records (i.e., in a "cold start" situation). This is known as a cross-site cold start product recommendation. The customer's social networking information is obtainable and it is an interesting task to convert the social networking information into latent user features which can be successfully used for product recommendation. In response to this challenge, it recommends users on social media application and e-commerce portal as a bridge, mapping the user's social networking capabilities to the potential features of product recommendations. The product is recommended to the users in cold start situation based on demographic attributes such as age, marital status, education, gender [1]. The LDA is used to extract the topics of each user from microblog. In order to increase the number of topics the NLP is used.

After extracting microblogging features the MART (Multiple Additive Regression Tree) [19] is performed. The SVM (Support Vector Machine) [22] is used to learn the dataset. After that, the similarities between the users are computed based on their microblogging features. The product is recommended to the customer's based on rank. Here the optimization problem very complex and the tuning of parameters are not done properly. Hence genetic algorithm is used. The Genetic algorithm [17] is used to obtain the parameters of SVM. Through iterative process the fitness of every solution is evaluated. Using simple cross over and mutation operation a most fitted solution is suggested. In this scenario, the most suited ranked products for each user is recommended.

The main contributions of this thesis are:

A. To establish a link between social media application and e - commerce portal and recommend the product to the users in cold start situation.
B. LDA is used to obtain the topics. In order to increase the number of topics the NLP is used. It helps to identify latent groups of users to share similar interests and improve the product recommendation.
C. The MART is used for prediction probability. The SVM is used to train the dataset. The product is recommended to the users based on rank. This makes the optimization problem many complexes and tuning of parameter is not properly done. Hencegenetic algorithm is used to choose the parameters of SVM. Using simple cross over and mutation operation a most fitted solution is suggested. In this scenario, the most suited ranked products for each user is recommended. Objectives: In today's digital life people gives more importance to recommendation system. Recommendation system is based on user's preference or likes. User's likes or preference will be changed over time so it will greatly affects recommendation system. The main objective of the system is [1]: To establish the link between social media application and e – commerce portal and provide more accurate product recommendation to user
D. To recommend the product to the users based on microblogging features
E. To recommend the product to the users, those who do not have a history of purchase records (i.e., in a "cold start" situation) based on demographic attributes
F. By applying NLP, it helps to extract more latent user groups sharing similar interest
G. By applying MART and Genetic algorithm, the most suited ranked products for each user is recommended
H. The scope of this project is
I. Increase revenue by making the right recommendations to customers
J. Increase conversion rate and average order size and value
K. Understand the customer's needs according to the customer's behavior and improve customer loyalt Improve profitability by reducing marketing cost Easily promote product progress in e-commerce website
L. Increase the interaction between users and social media
M. This project can have profound impact on each analysis and business communities.

II. SYSTEM OVERVIEW

A. *Existing System*

In existing systems, users can view products, ratings, and their details. The user reviews product details, rates and features, and then he/she purchases the product through online payment to purchase these things. Existing activities such as online sales can target consumers or other businesses, involve online sales of goods, serve and provide information directly to consumers, and refer to online sales of items, services, or data between businesses. The availability of a huge number of online product assessments makes it possible to obtain definite demographic information of product adopters from a review document. This article proposes a new method referred to by product adopters from online reviews. Product adopters are taken out and then categorized into various demographic user groups. The associated demographic attributes of various product adopters can be used to describe the features of products and users, which can be integrated into the recommended method using weighted regularization matrix decomposition. Most researchers are aware of their awareness when building solutions in an e-commerce website and specifically use the user's ancient transaction data. In order to obtain satisfactory expertise, there have been few studies that have previously recommended the delivery of cold-start products. There are also a lot of research paintings that focus on the trouble of starting cold advice. Seroussi et al. [6] propose to use the customer common profile and subject data extracted from the user-generated content material for the matrix decomposition model in order to make a new user's rating prediction. Zhang et al. [7] recommend a semi-supervised set-awareness algorithm. Schein [8] proposes a method of combining content and collaborative records in the framework of unmarried probability. Lin et al. [5] solved the cold-start problem suggested by the application.

B. *Drawbacks of Existing System*

1) Due to poor application of electronic commerce, there may be a deficiency of system security, accuracy or standards.
2) The availability of a huge number of online product reviews makes it possible to obtain definite demographic attributes of product adopters from a review document.
3) They only awareness on emblem or class-degree purchase desire based on a skilled classifier, which cannot be at once carried out to our go-website online bloodless begin product advice assignment. Their features only consist of gender, age and Facebook likes, as opposed to an extensive range of capabilities explored in our approach. They do now not don't forget how to

transfer heterogeneous statistics from social media web sites into a form that is prepared for use on the e-trade facet, that is the key to address the cross-web page bloodless-begin recommendation problem.

C. Proposed System

Kernel optimized Regression Model for product recommendation connecting social media to e - commerce is a framework for product recommendation. The main objective of this thesis is to establish a link between social media application and e- commerce portal, so as to recommend the product based on microblogging features. Here microblogging features such as demographic attributes, text attributes, network attributes and temporal attributes. The demographic attributes such as age, gender, marital status, education, carrier of each user. It is an interesting issue for users of social networking sites who recommend the products of an e-commerce site to those who do not have a history of purchase records (i.e., in a "cold start" situation). This is known as a cross-site cold start product recommendation. Although online product recommendations have been widely studied, most studies only focus on building solutions within certain e-commerce sites, and primarily utilize the user's historical transaction records. The user's social networking information is available and it is a challenging task to transform the social networking information into latent user features which can be effectively used for product recommendation. In response to this challenge, it recommends users on social media application and e-commerce portal as a bridge, mapping the user's social networking capabilities to the potential features of product recommendations. The product is recommended to the users in cold start situation based on demographic attributes. In this thesis LDA is used to extract the topics of each user from microblog. In order to increase the number of topics the NLP is used. It helps to find out the latent user groups sharing similar interests. After extracting microblogging features the MART (Multiple Additive Regression Tree) [19] is used for prediction probability (whether or not the user belongs to class 0 or class 1). The SVM (Support Vector Machine) [22] is used to train the dataset. And then find the rank between two users. The product is recommended to the user based on rank. Here the completeness feature of recommended product is presently obtained by a set of instances based on multiple parameters like pair wise ranking, feature value, fitted value etc. It makes the optimization problem very complex and the tuning of parameters is not done properly. To avoid such situation the genetic algorithm is used. The Genetic algorithm [17] is used to obtain the parameters of SVM. Through iterative process the fitness of every solution is evaluated. Using simple cross over operation a most fitted solution is suggested. In this scenario, the most suited ranked products for each user is recommended.

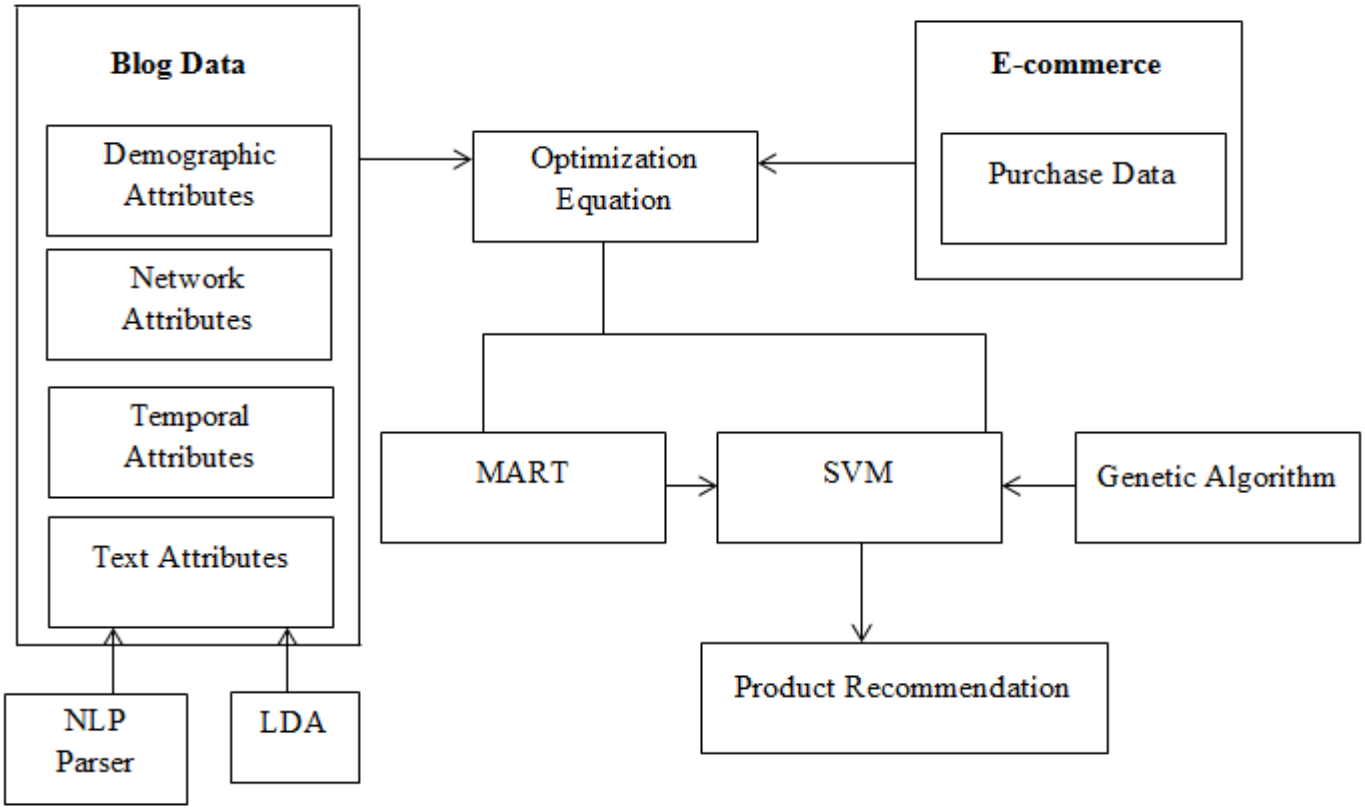

Fig 1: System Architecture

D. Advantages of Proposed System

The proposed framework is certainly powerful in addressing the move-website online cold-begin product advice trouble. Agree with that look at can have profound effect on both studies and industry groups. It formulate a unique trouble of recommending merchandise from an e-commerce website to social networking users in "cold-begin" conditions. To the quality of understanding, it's been hardly ever studied earlier than.

1) Getting customer information like what they are, what they like, etc. can change our business.
2) Customers can comment on products and review other customers' purchases.
3) To increase brand awareness, more people will be directed to e-commerce.
4) Run customer-facing ads with real-time results.
5) Generate valuable clues to convert ad viewers to customers.
6) Increase website traffic and search rankings.
7) Find out information about how competitors behave and change accordingly.
8) Sharing content is faster and easier.

III.SYSTEM DESIGN

A. Modules And Their Functionalities

Kernel optimized regression model for product recommendation connecting social media to e-commerce consists of three modules.

B. E-commerce Module

1) *Register:* This module allows the new user to get registered in the E-commerce site by providing the basic necessary information
2) *Login:* The registered users provide their username and password and login in this module to access the E-commerce site
3) *Search Products:* The users can also search desired products in this module and liked products are either purchased or add to card
4) *Add or Update Profile:* The users can either add or update their profile such as age, gender, marital status, education etc
5) *View Recommendation:* The user can view their product recommendation in this module. There are three types of recommendation:

C. Blog Module

1) *Register:* This module allows the new user to get registered in the social media site by providing the basic necessary information
2) *Login :* The users login in this module by using their similar e-commerce identities**.**
3) *Search Friend*: In this module, if users are registered on the same media, users can find the friends they are looking for in social media
4) *Post Comments*: The uses can post their comments based on either purchased product or general
5) *Views Others Comments*: Each user can view the other user's comments and purchased products.

D. Admin Module

The main part of the proposed system is admin module. Admin controls overall process of the system. Users posted their comments on newly purchased products on Weibo. Its main purpose is to recommend products to users of e-commerce websites based on the characteristics of microblogs, such as demographic attributes, text attributes, network attributes, and time attributes. Based on demographic attributes the product is recommended to the user in cold start situation. After extract the microblogging a feature, MART (Multiple Additive Regression Tree) [19] is used for probability prediction and SVM (Support Vector Machine) [22] is used to learn the test data. The similarities between the users are evaluated and it is taken as rank. Finally, the product is recommended to each user based on rank. The completeness feature of recommended product is presently obtained by a set of instances based on multiple parameters like pair wise ranking, feature value, fitted value etc. It makes the optimization problem very complex and the tuning of parameters is not done properly. To avoid such situation the genetic algorithm [17] is used. Through iterative process, it selects the best fit completeness for each item per user.

1) *Microblogging Feature Selection:* The user information is extracted from the microblogs. Based on this information the product is recommended to each user. The microblogging features are grouped into four attributes: Demographic attributes, Text attributes, Network attributes and Temporal attributes [1].
2) *Demographic Attributes:* A demographic profile shortened as "a demographic". The demographic attributes of a user such as gender, age, marital status, education, and carrier are extracted from their profile. Demographic attributes have confirmed to be very essential marketing, especially in providing products to consumers. Based on this demographic attributes the product is recommended to each user in cold start situation (the user has no purchase history of records)
3) *Text Attributes:* It proposes a topic modelling using Latent Dirichlet Allocation (LDA) with MALLET [21]. First aggregate all the microblogs by a user into a document. The topic model is a statistical model that discovers the topics that appear in the collection of documents. MALLET is a tool written in Java for applying machine learning such as natural language processing, document classification, clustering, topic modeling, and information extraction to text. Topic models use different types of algorithms to extract *topics* from document. It uses potential Dirichlet distribution (LDA) based on Gibbs sampling, pachinko disk allocation and hierarchical LDA implementation [21]. Three simple step of topic modelling with MALLET:

After inserting document into MALLET, it creates topics (topics.txt) and calculates the topic proportion (topic-composition.txt). The topics.txt consists of topics and weight of the topics. The topic-composition.txt files listing the composition of each text under the topics listing in topic.txt. The MALLET theme model package contains an extremely fast and extremely scalable Gibbs sampling implementation, an efficient method for hyper-parameter optimization of document topics, and a tool for recommending new document topics for a given training model [21]. To increase the topic count of each user, the NLP (Natural Language Processing) is used. It is used to identify the synonyms of each word. It helps us to extract more latent user groups sharing similar interest (i.e., topics). After obtaining the topics, the stop word removal is used. The stop word removal is used to remove the any group or list word such as "is", "an", "on" and so on.

4) *Network Attributes:* In social media the customers are linked with each other and they share similar interest i.e. the users in the same group share the similar purchase preferences. The topic of each user is extracted from their blogs. Then find out the users who share the similar topics. By using NLP, it helps to increase the count of topics and latent user groups [1].
5) *Temporal Attributes:* It shows the living habitats and behavior of the microblogging users. They are two types of temporal activity distribution: daily activity distribution and weekly activity distribution. The blog login frequency count of each user is calculated based on daily activity distribution. The daily activity distribution of a user is characterized by a distribution of 24 ratios. It represent the tweets published within the *i* th hour of a day by the user. The weekly activity distribution is characterized by a distribution of 7 ratios. It represents the tweets generate within the *i* th day of a week by the user. After construct the microblogging features the MART (Multiple Additive Regression Tree) is performed [1].

Demographic Attributes	Gender, Age, Marital status, Education, Carrier.
Text Attributes	Topic modelling using LDA with MALLET, Stop word removal
Network Attributes	Latent group preference
Temporal Attributes	Daily activity distribution and weekly activity distribution

Table.1 Microblogging Features

6) *MART (Multiple Additive Regression Tree):* Multiple Additive Regression Trees (MART) is a new method used to solve prediction problems based on the large datasets typically found in Data mining applications. It has greater accuracy than CART (Classification and Regression Tree). MART tends to resist changes in predictor and response variables, eccentric, mislaid values, and potentially large numbers of irrelevant predictors without affecting the response. MART is one of a class of methods commonly mentioned as boosting. MART is a series of very simple classification trees and each taking very little computational effort [19].

The MART classifier is related on linear combination. By using MART the users are undergoes either “class 0” or “class 1”. Then SVM (Libsvm) is used to learn the test data. Libsvm is effortless, easily operated and powerful SVM classification and regression software. In Libsvm the svm type and kernel type are default set as C SVC and radial bias function (rbf). The cosine similarity is used to compute the relation between two users. The topics of each user (for example: user 1 and user2) is extracted. The dot product of topics of user1 and user2 is calculated and find the power of each topic. The similarity of two topics is calculated by divide the result of dot product of each topics and product of square root of power of two user’s topics. And this similarity is taken as rank. Based on this rank the product is recommended to the user. The completeness feature of recommended product is presently obtained by a set of instances based on multiple parameters like pair wise ranking, feature values, fitted values etc. It makes the optimization problem very complex and tuning of parameters is not properly done. In order to overcome such situation the genetic algorithm is used. A genetic algorithm based approach may select the best fit completeness for each item per user.

7) *Genetic Algorithm:* Genetic algorithm is a global optimization search procedure. It became a tool to solve the optimization problems of complex systems. The support vector machine is depending on its kernel parameters. In SVM kernel functions are linear, sigmoid, radial bias function, polynomial. The SVM map the non-linearly raw information into higher dimensional feature space. The genetic algorithm is effective in finding kernel parameters for SVM [22]. It proposes the solution for product recommendation function can be executed using a genetic algorithm to improve optimization. In the optimization process, the genetic algorithm generates a population size and starts the search. The genetic operation consists of selection, crossover and mutation. The fitness function is used to guide the search. Through iterative process the fitness of every solution is evaluated. Using simple crossover and mutation operation a most fitted solution is evaluated. The most suited ranked product for each user is recommended. Optimization is the method of making things better. Optimization states that, to finding the input value by obtaining the "best" output value. The definition of "best" varies from question to question, but in mathematics it denotes the maximizing or decreasing one or more objective functions by changing input parameters [17].

a) *Population :* Population is a subset of contemporary people's solutions. It can also be determined as a set of chromosomes

b) *Fitness Function:* The simply defined fitness function is a function that takes the candidate solution to the problem as input and creates "good" how to "fit" our solution for the problem under consideration. The calculation of the fitness value is repeated in GA, so it should be fast enough. Slow calculations of fitness values can have an adverse effect on GA and make it unusually slow

c) Crossover*:* Crossover operators are similar to replication and biological crossover. Among more than one parent, choose one or more progeny to use their parents’ genetic material

d) Mutation: It is defined as a small random adjustment in the chromosome to obtain a new solution. It is used to keep and introduce genetic diversity

e) Advantage of genetic algorithm is:

i) The concepts are easy to understand.

ii) Genetic algorithms are essentially parallel.

iii) Regularly gives an answer.

iv) Inherently parallel.

v) It require less time for computation.

The basic step of genetic algorithm as follow:

The aim of genetic algorithm is to find the kernel parameters.

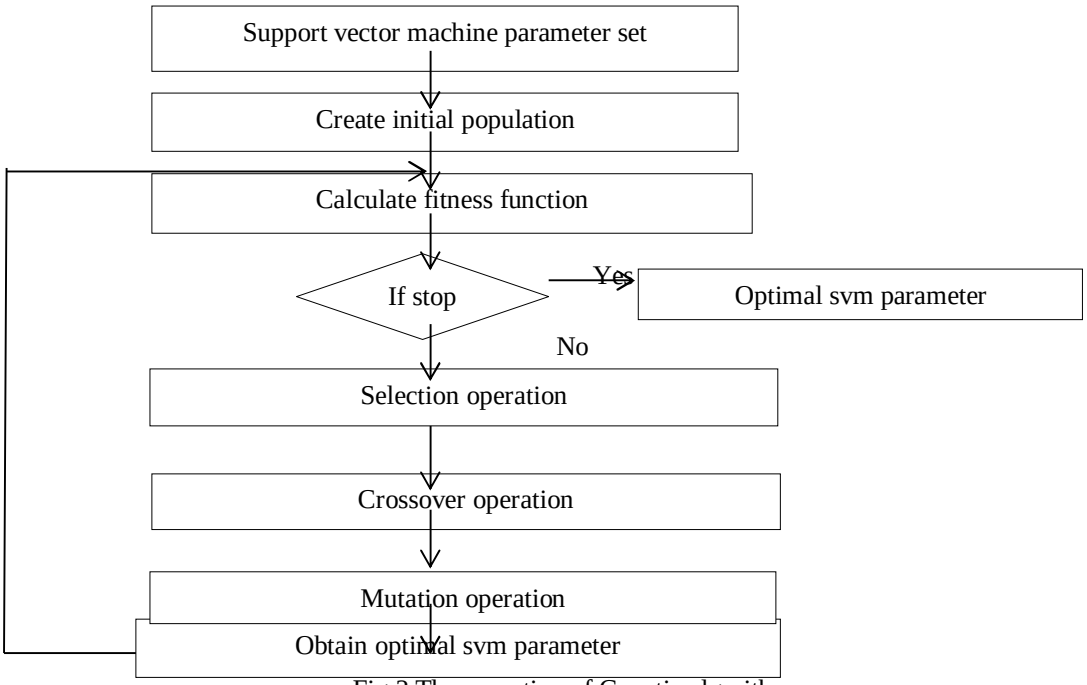

Fig.2 The operation of Genetic algorithm

IV. RESULTS AND ANALYSIS

A. Results

The experimental results of the proposed system kernel optimized regression model for product recommendation connecting social media to e-commerce are discussed in this section. Here the system using the operating system of version windows 10 and platform using is c# .net. And the database created is SQL server. Proposed system using synthetic data for result evaluation. Synthetic data are data which are created. Synthetic data are created for obtaining specific requirements or certain criteria that may not be found in the original real data. Synthetic data are very useful for designing system of any type because this data can be used as a simulation.

In the proposed system implemented by using many modules and sub modules. The input of the system is blog which are given by users to different purchased product. The product is recommended to the user based on microblogging features such as demographic attributes, text attributes, and network work attributes, temporal attributes. Using demographic attributes the product is recommended to the registered users who do not purchase any product. After extracting the microblogging features the MART is performed. It is used for probability prediction. The SVM is used to learn the test data and find the rank between the users. The product recommended to the user based on rank. This makes the optimization problem very complex and tuning of parameter is not properly done. Hence genetic algorithm is used. Through iterative process the fitness of every solution is evaluated and most suited ranked products for each user is recommended.

B. Recommendation based on Demographic Details

	pdtmodel	image
	Apple	~\prod_images\458.jpg
	axr	~\prod_images\plates2.jpg
	belkin	~\prod_images\3.jpg
	boya	~\prod_images\ca11.jpg
	dove	~\prod_images\dove.jpg
	epson	~\prod_images\epson.jpg
	fair and lovely	~\prod_images\fair and lovely.jpg

Fig.3 Product recommendation based on demographic features

C. Recommendation Based on Regression Model (MART)

Fig.4 Product recommendation based on regression model (MART)

D. Recommendation Based on Regression Model (Genetic algorithm)

Fig.5 Product recommendation based on Regression model (GA)

E. Analysis

This system shows accurate product recommendation to users based on their microblogging details. It also shows analysis based on topic modelling with NLP and without NLP. By using with NLP the number of topics increases and find out more latent user preferences. Also analysis product recommended to the user based on MART and MART with genetic algorithm. In genetic algorithm, through iterative process the fitness of every solution is evaluated and most suited ranked products for each user is recommended.

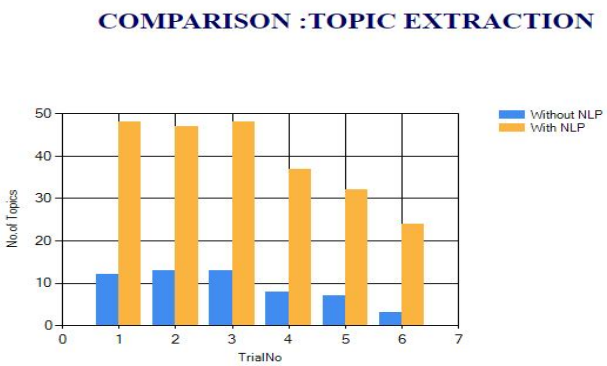

Fig.6 Topic modelling with NLP and without NLP

Fig.7 Product recommendation with MART and MART with GA

V. CONCLUSIONS AND FUTURE WORK

It proposes to establish the link between social media application and e- commerce portal, so as to recommend the product based on microblogging features. Here microblogging features such as demographic attributes, text attributes, network attributes and temporal attributes. It is an interesting issue for users of social networking sites who recommend the products of an e-commerce site to those who do not have a history of purchase. In network attributes, extract the latent user groups sharing similar topics. The topics are extracted from the microblog by using LDA. In order to improve the count of topics, the NLP is used. It helps to find out the synonyms of each topic. After extracting microblogging features, MART is performed. The SVM is used to learn the test data and find the rank between the users. The product is recommended to the customer based on rank. This makes the optimization problem very complex and tuning of parameter is not properly done. Hence genetic algorithm is used. Through iterative process the fitness of every solution is evaluated and most suited ranked products for each user is recommended.

This also opens new possibilities for future work:

A fuzzy tree structure user preference technology and personalized recommendation method are proposed. The recommendation system application focuses mainly on making recommendations to individual users. A tree matching method was developed. The tree matching method can meet two tree structure data and recognize their corresponding parts.

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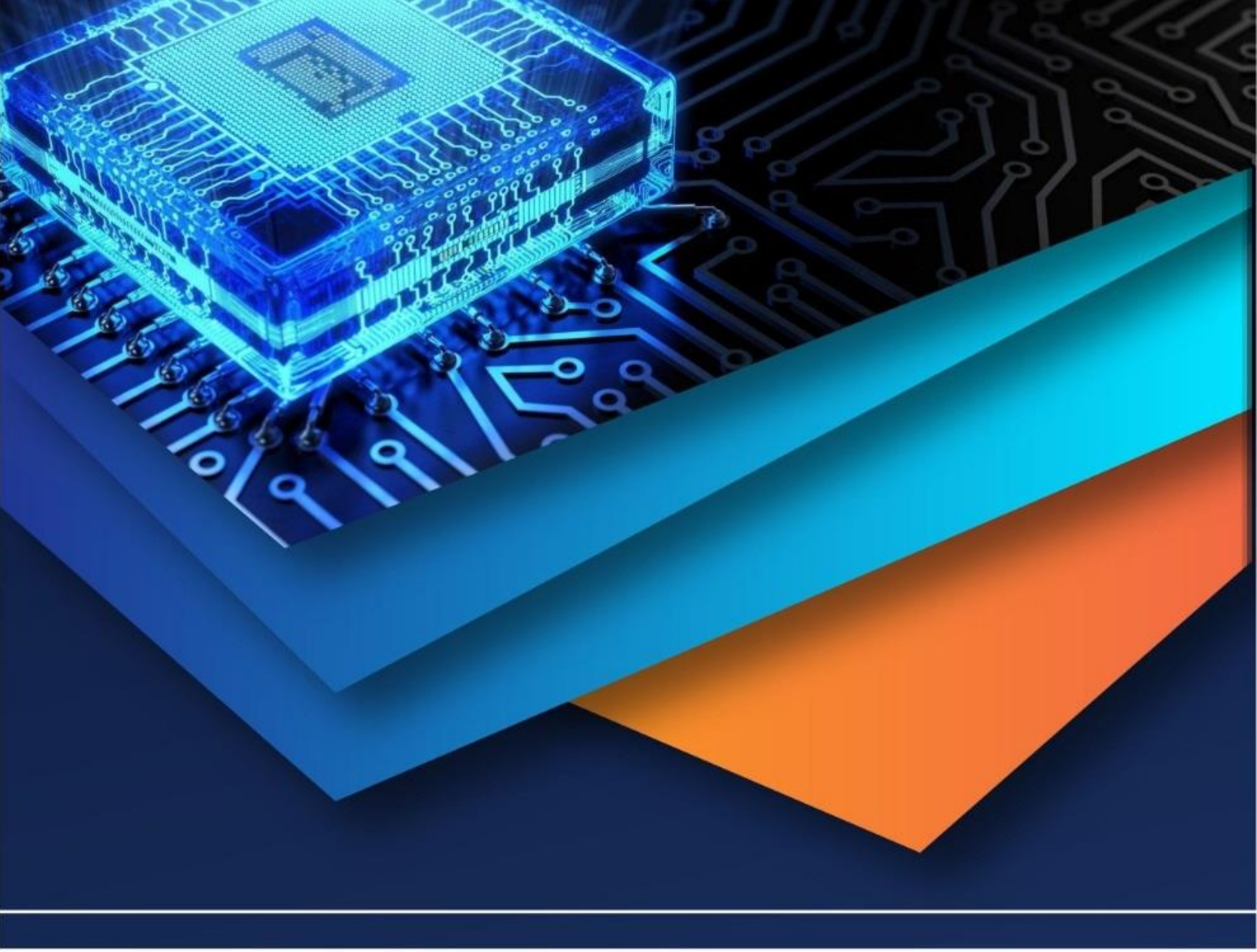

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