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FLIPKART PRODUCT RECOMMENDATION SYSTEM

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Abstract
With the increase in the demand for the e-commerce websites, large amounts of information is available due to which the users face difficulty in finding the relevant information matching their preferences. Recommender systems solve this problem by searching through large volume of dynamically generated information to provide users with personalized content and services. There are many machine learning techniques which can be used to realize the recommendation system. Among all these techniques we are dealing with Content Based Filtering, Collaborative Based Filtering, Hybrid Content-Collaborative Based Filtering. Thus, we represent a system which will recommend products to the user based on the customer reviews.

Keywords: Recommender system, Content based, Collaborative based, Machine Learning

1. INTRODUCTION

Recommendation system is an application which is used for prediction in various domains throughout the internet. A large amount of data flows through the internet and it gives away a lot of information regarding the user searching activity[1][2]. The information extracted from the pattern of previously searched data can be molded into the prediction of relevant data for the user. The implementation of the system can be performed by various techniques. Different techniques like Content Based Filtering, Collaborative Filtering based are used. The Content Based Filtering approach takes into account a user's profile which is constructed based on his previous ratings. His ratings determine his inclination and interests, forming the basis for recommending a new item. A higher rating denotes a higher likelihood of the user to visit similar items[3][4]. So, a new item is recommended according to the maximum number of ratings given by the user in a genre.

In the Collaborative Based Filtering[5][6], recommendation for a user is governed by other users' profiles. An item is recommended based on the ratings of other users who have similar interests as the user under consideration[7][8]. In another approach, the content and collaborative based filtering are combined to form the Hybrid Content-Collaborative Based Filtering. It includes the advantages of both the methods [19][20]and outperforms both of them. In another approach, the content and collaborative based filtering are combined to form the Hybrid Content-Collaborative Based Filtering[9][10]. It includes the advantages of both the methods and outperforms both of them. Cold-start problem is one of the most commonly encountered challenges of the recommendation system. It is also known as the new user problem as it creates problem of generating recommendations for the new user.

When investigating recommendation mechanisms of the mobile version of an online shopping website for coupon deals, it is found that, in real business case, the information about customers is limited[11][12]. In most cases, information about customer profile,[17][18] product preference or product ratings, is not available. The most relevant information about a particular customer is her purchase history and current location.

A straightforward approach is to recommend deals that are in the vicinity[13][14] Such recommendation will suffer from a higher probability of inaccuracy. With regard to this problem, we propose a novel approach to analyze the purchase history of customers to find their purchase patterns, and apply them to location based recommendations. The

objective is to achieve higher accuracy for the recommendation system[15][16].

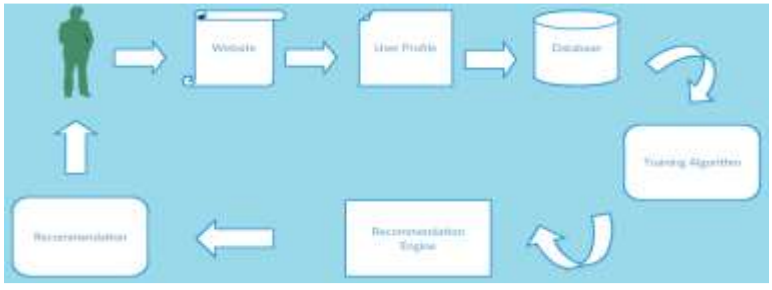

Fig.1 Recommendation System Architecture

2. LITERATURE SURVEY

There are generally four types of recommendation systems: content-based filtering, collaborative filtering, rule-based and hybrid approaches[21][22]. Content-based filtering system performs recommendation in steps. First, an item profile consisting of a set of features is extracted for each item. Second, user profiles are generated based on features of items that are purchased by each user. Then similarity scores between user profiles and item profiles are calculated to finally recommend items with top similarity scores[23][24]. This technique was used to recommend documents such as news, web pages, movies and books . The features used in building profiles are often a set of keywords. [25][26]The limitations of these systems are that recommendations are always similar to items that a user has already purchased, and it is difficult to recommend items for new users.

Collaborative filtering systems are built on the assumption that a good way to find interesting content is to find other people who have similar interests and then recommend items rated highly by those similar users[27][28] . There are two general classes of collaborative filtering algorithms. Memory based algorithms operate over the whole user database to make recommendations[29][30].

Model based collaborative filtering, in contrast, learns a model from the user database, which is then used for recommendations[31][32]. Collaborative filtering recommendation systems, however, also have limitations that it is difficult to recommend items for new users, to recommend items which have not been rated before, and to recommend when rating information is insufficient. Rule-based approach is a simple but popular way of recommendations. Rules are usually derived from database of previous transactions[33][34].

Anveshini Dumala[31] et al. discovered localized association rules among items that are purchased together, which are helpful for target marketing. R S M Lakshmi [27]et al. used data mining techniques such as web usage mining, decision tree induction, association rule mining to build a rule-based recommendation system& proposed a sequential pattern based system that predicts customer's time-invariant purchase behavior for food items in a super market [41] [42]. Hybrid approach combines multiple techniques to overcome the limitations of individual systems. For example, a linear combination of rule-based and collaborative filtering recommendations considers customers purchase sequences over time as well as their purchase data for latest period .When applying these recommendation techniques to mobile environment, we are facing some new challenges as well as new opportunities[35][36].

The mobile screens are smaller and thus few products are browsed. As a result, it is difficult to use users' browsing behavior in methods like collaborative filtering. However, more information can be obtained from users' mobile devices, such as location, dwell time and direction [43] [44]. Location has been widely used in mobile environment to provide value-add services. For recommendation systems related to location based business such as restaurants or tourist attractions, the information of location can be helpful[37][38].

For example, Lakshman Narayana [12]et al. aimed at recommending restaurants. Their system use a Bayesian network that models the probabilistic influences of the user's personal profile and contextual information on the restaurant attribute values. K.Santhi Sri[19]et al. used location history of

a user to derive personal preferences and social opinions mined from local experts to facilitate personalized location recommendations [45] [46]. In this paper, we are targeting at a problem with limited amount of user information[39]. User profiles, preferences, location histories, item ratings are not available. Furthermore, in the mobile shopping website for coupon deals, the life span of deals is only several days. All these limitations and constraints make it difficult to apply existing techniques to build recommendation systems [47] [48]. Therefore, we are proposing a novel approach to analyze the purchase history of the user, find their purchase patterns related to the user behavior and then predict information of the next possible purchase in a particular location[40].

3. PROPOSED METHOD

The proposed method uses the content based, collaborative based and hybrid filtering techniques to achieve accurate recommendations. Content-based technique is a domain-dependent algorithm and it emphasizes more on the analysis of the attributes of items in order to generate predictions. When documents such as web pages, publications and news are to be recommended. Content-based filtering technique is the most successful. In content-based filtering technique, recommendation is made based on the user profiles using features extracted from the content of the items the user has evaluated in the past. Collaborative filtering is a domain-independent prediction technique for content that cannot easily and adequately be described by metadata such as movies and music. Collaborative filtering technique works by building a database of preferences for items by users. It then matches users with relevant interest and preferences by calculating similarities between their profiles to make recommendations.

Collaborative filtering techniques can be

- Model-based filtering technique
- Memory-based filtering technique
  - User-based technique
  - Item-based technique

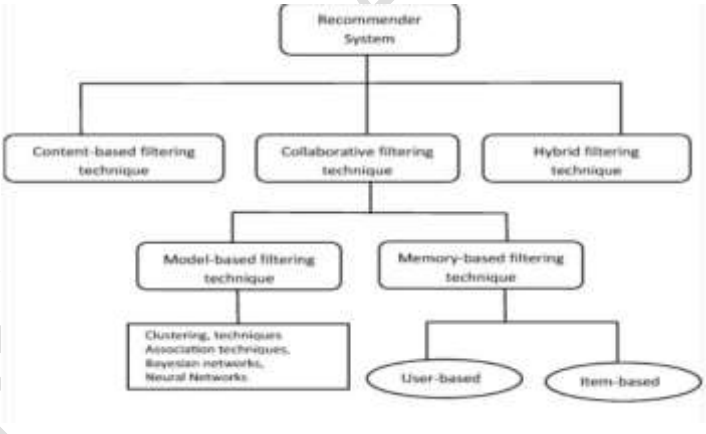

Fig.2.ProposedFramework

4. RESULTS

To make recommendations to a particular user in the test data set, the user's transaction history is divided into two parts. The first part is considered as purchase history and it is used by the conditional probability model to make recommendations. The second part is the next purchase after first part, and it is considered as recommendation ground truth. A strict setting is used in the experiment, such that the second part only contains 1 transaction. Assume that a user is located near a set of available coupon deals. The experiment aims to predict the correct category of the user's next purchase, so as to recommend the deals that are the most likely to be accepted.

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```
indices = pd.Series(smd.index)

def recommendations(title, cosine_sim = cosine_sim):

    recommended_item = []

    idx = indices[indices == title].index[0]

    score_series = pd.Series(cosine_sim[idx]).sort_values(ascending = False)

    top_10_indexes = list(score_series.iloc[1:11].index)

    for i in top_10_indexes:
        recommended_item.append(list(smd.index)[i])
    d_item=np.unique(recommended_item)
    dd=smd.loc[d_item][['product_name','product_category_tree','description','brand']]
    dd_1=dd[~(dd.product_name.duplicated(keep = False))]

    return dd_1[['product_category_tree','description','brand']]
```

Fig.3.Sample Code

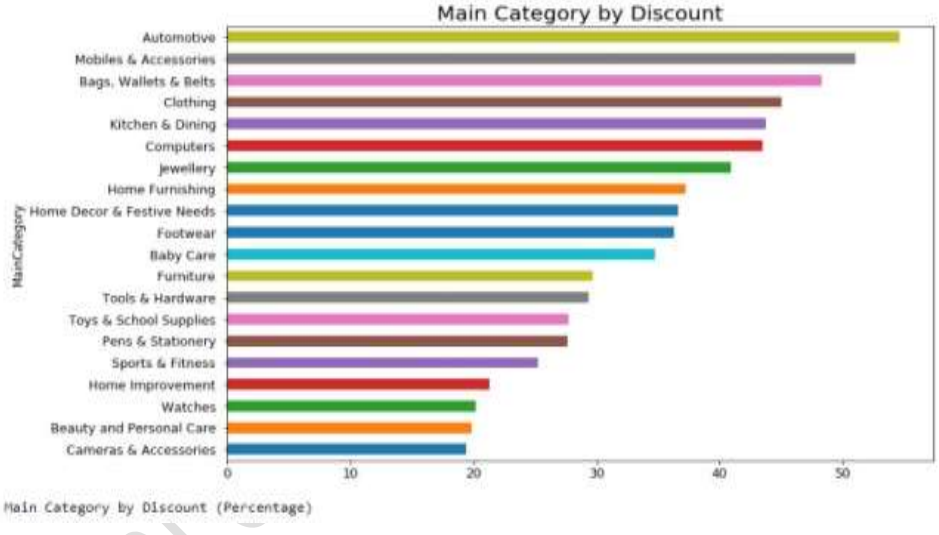

Fig.4. Main Category Classification

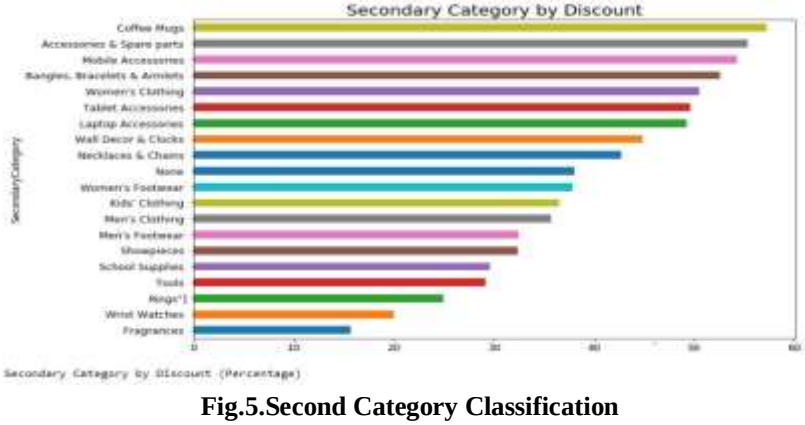

Fig.5.Second Category Classification

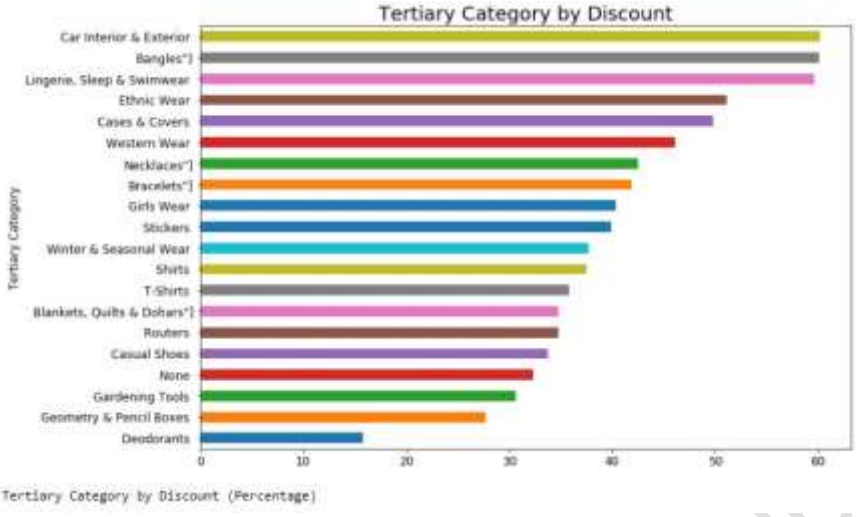

Fig.6. Tertiary Classification

5. CONCLUSION

Due to fast moving lifestyle, online shopping has been growing drastically through out the world. The increase of online shopping has become a trendy way for consumers to shop over internet. Machine learning techniques provide recommendation mechanisms to identify customer interests. Using recommendation techniques we can find the frequent products purchased by the customers and suggest products to customers or users.

References

[1]. Lakshman Narayana Vejendla and A Peda Gopi, (2019)," Avoiding Interoperability and Delay in Healthcare Monitoring System Using Block Chain Technology", Revue d'Intelligence Artificielle , Vol. 33, No. 1, 2019,pp.45-48.

[2]. Gopi, A.P., Jyothi, R.N.S., Narayana, V.L. et al. (2020), "Classification of tweets data based on polarity using improved RBF kernel of SVM" . Int. j. inf. tecnol. (2020). https://doi.org/10.1007/s41870-019-00409-4.

[3]. A Peda Gopi and Lakshman Narayana Vejendla, (2019)," Certified Node Frequency in Social Network Using Parallel Diffusion Methods", Ingénierie des Systèmes d' Information, Vol. 24, No. 1, 2019,pp.113-117.. DOI: 10.18280/isi.240117

[4]. Lakshman Narayana Vejendla and Bharathi C R ,(2018),"Multi-mode Routing Algorithm with Cryptographic Techniques and Reduction of Packet Drop using 2ACK scheme in MANETs", Smart Intelligent Computing and Applications, Vo1.1, pp.649-658. DOI: 10.1007/978-981-13-1921-1_63 DOI: 10.1007/978-981-13-1921-1_63

[5]. Lakshman Narayana Vejendla and Bharathi C R, (2018), "Effective multi-mode routing mechanism with master-slave technique and reduction of packet droppings using 2-ACK scheme in MANETS", Modelling, Measurement and Control A, Vol.91, Issue.2, pp.73-76. DOI: 10.18280/mmc_a.910207

[6]. Lakshman Narayana Vejendla , A Peda Gopi and N.Ashok Kumar,(2018)," Different techniques for hiding the text information using text steganography techniques: A survey", Ingénierie des Systèmes d'Information, Vol.23, Issue.6,pp.115-125.DOI: 10.3166/ISI.23.6.115-125

[7]. A Peda Gopi and Lakshman Narayana Vejendla (2018), "Dynamic load balancing for client server assignment in distributed system using genetic algorithm", Ingénierie des Systèmes d'Information, Vol.23, Issue.6, pp. 87-98. DOI: 10.3166/ISI.23.6.87-98

[8]. Lakshman Narayana Vejendla and Bharathi C R,(2017),"Using customized Active Resource Routing and Tenable Association using Licentious Method Algorithm for secured mobile ad hoc network Management", Advances in Modeling and Analysis B, Vol.60, Issue.1, pp.270-282. DOI: 10.18280/ama_b.600117

[9]. Lakshman Narayana Vejendla and Bharathi C R,(2017),"Identity Based Cryptography for Mobile ad hoc Networks", Journal of Theoretical and Applied Information Technology, Vol.95, Issue.5, pp.1173-1181. EID: 2-s2.0-85015373447

[10]. Lakshman Narayana Vejendla and A Peda Gopi, (2017)," Visual cryptography for gray scale images with enhanced security mechanisms", Traitement du Signal,Vol.35, No.3-4,pp.197-208. DOI: 10.3166/ts.34.197-208

[11]. A Peda Gopi and Lakshman Narayana Vejendla, (2017)," Protected strength approach for image steganography", Traitement du Signal, Vol.35, No.3-4,pp.175-181. DOI: 10.3166/TS.34.175-181

[12]. Lakshman Narayana Vejendla and A Peda Gopi, (2020)," Design and Analysis of CMOS LNA with Extended Bandwidth For RF Applications", Journal of Xi'an University of Architecture & Technology, Vol. 12, Issue. 3,pp.3759-3765. https://doi.org/10.37896/JXAT12.03/319.

[13]. Chaitanya, K., and S. Venkateswarlu,(2016),"DETECTION OF BLACKHOLE & GREYHOLE ATTACKS IN MANETs BASED ON ACKNOWLEDGEMENT BASED APPROACH." Journal of Theoretical and Applied Information Technology 89.1: 228.

[14]. Patibandla R.S.M.L., Kurra S.S., Mundukur N.B. (2012), "A Study on Scalability of Services and Privacy Issues in Cloud Computing". In: Ramanujam R., Ramaswamy S. (eds) Distributed Computing and Internet Technology. ICDCIT 2012. Lecture Notes in Computer Science, vol 7154. Springer, Berlin, Heidelberg

[15]. Patibandla R.S.M.L., Veeranjaneyulu N. (2018), "Survey on Clustering Algorithms for Unstructured Data". In: Bhateja V., Coello Coello C., Satapathy S., Pattnaik P. (eds) Intelligent Engineering Informatics. Advances in Intelligent Systems and Computing, vol 695. Springer, Singapore

[16]. Patibandla, R.S.M.L., Veeranjaneyulu, N. (2018), "Performance Analysis of Partition and Evolutionary Clustering Methods on Various Cluster Validation Criteria", Arab J Sci Eng ,Vol.43, pp.4379–4390.

[17]. R S M Lakshmi Patibandla, Santhi Sri Kurra and N.Veeranjaneyulu, (2015), "A Study on Real-Time Business Intelligence and Big Data",Information Engineering, Vol.4,pp.1-6.

[18]. K. Santhisri and P.R.S.M. Lakshmi,(2015), " Comparative Study on Various Security Algorithms in Cloud Computing", Recent Trends in Programming Languages ,Vol.2,No.1,pp.1-6.

[19]. K.Santhi Sri and PRSM Lakshmi,(2017), "DDoS Attacks, Detection Parameters and Mitigation in Cloud Environment", IJMTST,Vol.3,No.1,pp.79-82.

[20]. P.R.S.M.Lakshmi,K.Santhi Sri and Dr.N. Veeranjaneyulu,(2017), "A Study on Deployment of Web Applications Require Strong Consistency using Multiple Clouds", IJMTST,Vol.3,No.1,pp.14-17.

[21]. P.R.S.M.Lakshmi,K.Santhi Sri and M.V.Bhujanga Ra0,(2017), "Workload Management through Load Balancing Algorithm in Scalable Cloud", IJASTEMS,Vol.3,No.1,pp.239-242.

[22]. K.Santhi Sri, P.R.S.M.Lakshmi, and M.V.Bhujanga Ra0,(2017), "A Study of Security and Privacy Attacks in Cloud Computing Environment", IJASTEMS,Vol.3,No.1,pp. 235-238.

[23]. R S M Lakshmi Patibandla and N. Veeranjaneyulu, (2018), "Explanatory & Complex Analysis of Structured Data to Enrich Data in Analytical Appliance", International Journal for Modern Trends in Science and Technology, Vol. 04, Special Issue 01, pp. 147-151.

[24]. R S M Lakshmi Patibandla, Santhi Sri Kurra, Ande Prasad and N.Veeranjaneyulu, (2015), "Unstructured Data: Qualitative Analysis", J. of Computation In Biosciences And Engineering, Vol. 2,No.3,pp.1-4.

[25]. R S M Lakshmi Patibandla, Santhi Sri Kurra and H.-J. Kim,(2014), "Electronic resource management using cloud computing for libraries", International Journal of Applied Engineering Research, Vol.9,pp. 18141-18147.

[26]. Ms.R.S.M.Lakshmi Patibandla Dr.Ande Prasad and Mr.Y.R.P.Shankar,(2013), "SECURE ZONE IN CLOUD", International Journal of Advances in Computer Networks and its Security, Vol.3,No.2,pp.153-157.

[27]. Patibandla, R. S. M. Lakshmi et al., (2016), "Significance of Embedded Systems to IoT.", International Journal of Computer Science and Business Informatics, Vol.16,No.2,pp.15-23.

[28]. AnveshiniDumala and S. PallamSetty. (2020),"LANMAR routing protocol to support real-time communications in MANETs using Soft computing technique", 3rd International Conference on Data Engineering and Communication Technology (ICDECT-2019), Springer, Vol. 1079, pp. 231-243.

[29]. AnveshiniDumala and S. PallamSetty. (2019),"Investigating the Impact of Network Size on LANMAR Routing Protocol in a Multi-Hop Ad hoc Network", i-manager's Journal on Wireless Communication Networks (JWCN), Volume 7, No. 4, pp.19-26.

[30]. AnveshiniDumala and S. PallamSetty. (2019),"Performance analysis of LANMAR routing protocol in SANET and MANET", International Journal of Computer Science and Engineering (IJCSE) – Vol. 7,No. 5, pp.1237-1242.

[31]. AnveshiniDumala and S. PallamSetty. (2018), "A Comparative Study of Various Mobility Speeds of Nodes on the Performance of LANMAR in Mobile Ad hoc Network", International Journal of Computer Science and Engineering (IJCSE) – Vol. 6, No. 9, pp. 192-198.

[32]. AnveshiniDumala and S. PallamSetty. (2018),"Investigating the Impact of IEEE 802.11 Power Saving Mode on the Performance of LANMAR Routing Protocol in MANETs", International Journal of Scientific Research in Computer Science and Management Studies (IJSRCSMS) – Vol.7, No. 4.

[33]. AnveshiniDumala and S. PallamSetty. (2016),"Analyzing the steady state behavior of RIP and OSPF routing protocols in the context of link failure and link recovery in Wide Area Network", International Journal of Computer Science Organization Trends (IJCOT) – Vol. 34 No 2, pp.19-22.

[34]. AnveshiniDumala and S. PallamSetty. (2016),"Investigating the Impact of Simulation Time on Convergence Activity & Duration of EIGRP, OSPF Routing Protocols under Link Failure and Link Recovery in WAN Using OPNET Modeler", International Journal of Computer Science Trends and Technology (IJCST) – Vol. 4 No. 5, pp. 38-42.

[35]. VellalacheruvuPavani and I. Ramesh Babu (2019) ,"Three Level Cloud Storage Scheme for Providing Privacy Preserving using Edge Computing",International Journal of Advanced Science and Technology Vol. 28, No. 16, pp. 1929 – 1940.

[36]. VellalacheruvuPavani and I. Ramesh Babu,"A Novel Method to Optimize the Computation Overhead in Cloud Computing by Using Linear Programming" ,International Journal of Research and Analytical Reviews May 2019, Volume 6, Issue 2,PP.820-830..

[37]. Anusha Papasani and Nagaraju Devarakonda,(2016),"Improvement of Aomdv Routing Protocol in Manet and Performance Analysis of Security Attacks", International Journal Of Research in Computer Science & Engineering ,Vol.6,No.5, pp.4674-4685.

[38]. Sk.Reshmi Khadherbhi,K.Suresh Babu , Big Data Search Space Reduction Based On User Perspective Using Map Reduce ,International Journal of Advanced Technology and Innovative Research Volume.07, IssueNo.18, December-2015, Pages: 3642-3647

[39]. B.V.Suresh kumar,Sk.Reshmi Khadherbhi ,BIG-IOT Framework Applications and Challenges: A Survey Volume 7, Issue VII, JULY/2018 pg.no 1257-1264

[40]. P.Sandhya Krishna,Sk.Reshmi Khadherbhi,V.Pavani, Unsupervised or Supervised Feature Finding For Study of Products Sentiment ,International Journal of Advanced Science and Technology, Vol 28 No 16 (2019).

[41]. K.Santhi Sri, Dr.Ande Prasad (2013), "A Review of Cloud Computing and Security Issues at Different Levels in Cloud Computing" , International Journal on Advanced Computer Theory and Engineering Vol. 2,pp 67-73.

[42]. K.Santhi Sri, N.Veeranjaneyulu(2018), "A Novel Key Management Using Elliptic and Diffie-Hellman for Managing users in Cloud Environment", Advances in Modelling and Analysis B,Vol.61,No.2,pp 106-112.

[43]. K.Santhi Sri, N.Veeranjaneyulu(2019), "Decentralized Key Management Using Alternating Multilinear Forms for Cloud Data

Sharing with Dynamic Multiprivileged Groups", Mathematical Modelling of Engineering Problems,Vol.6,No.4,pp511-518.

[44]. S.Sasikala, P.Sudhakar, "interpolation of CFA color Images with Hybrid image denoising", 2014 Sixth International Conference on Computational Intelligence and Communication Networks, DOI 10.1109/.53 193 DOI 10.1109/CICN.2014.53, pp. 193-197.

[45]. Me. Jakeera Begum and M.Venkata Rao, (2015), "Collaborative Tagging Using CAPTCHA" International Journal of Innovative Technology And Research, Volume No.3, Issue No.5,pp,2436 – 2439.

[46]. L.Jagajeevan Rao, M. Venkata Rao, T.Vijaya Saradhi (2016), "How The Smartcard Makes the Certification Verification Easy" Journal of Theoretical and Applied Information Technology, Vol.83. No.2, pp. 180-186.

[47]. Venkata Rao Maddumala, R. Arunkumar, and S. Arivalagan (2018)"An Empirical Review on Data Feature Selection and Big Data Clustering" Asian Journal of Computer Science and Technology Vol.7 No.S1, pp. 96-100.

[48]. Singamaneni Kranthi Kumar, Pallela Dileep Kumar Reddy, Gajula Ramesh, Venkata Rao Maddumala, (2019), "Image Transformation Technique Using Steganography Methods Using LWT Technique" ,Traitement du Signalvol 36, No 3, pp. 233-237.