CONVERSATIONAL AI FOR ECOMMERCE

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Abstract: Electronic commerce or e-commerce includes the service and good exchange through electronic support like the Internet. It plays a crucial role in today's business and users' experience. The ultimate goal of the project is to involve AI(Recommendation System and Voice-based searching) with E-commerce-based systems. The system aims to provide Voice based Image Search technology for searching the required materials from the collection.

Keywords- artificial intelligence, voice-based searching, NLP, convolutional neural network, E-commerce, Recommendation system, conversational AI

I. INTRODUCTION

Nowadays, E-commerce is the basic requirement for any B2B or B2C, e-commerce store uses various technologies to grow business like trending products, most viewed products, best review products, and so on. We are planning to build a recommendation system that will analyze the data for existing products and their images, will extract the color, features, and pattern from the image, and then will show similar products to the product which the user is looking for. This will increase the variety of products for users & they will explore more.

The Chatbot will recognize the speech given as input and apply machine learning algorithms to extract the text format of the given voice input. The product will be then identified by collaborating with the image searching algorithm to result in similar products available in the store. Speech recognition is the process of converting a speech signal to a sequence of words by means of an al4gorithm implemented as a computer program. It has the potential of being an important mode of interaction between humans and computers.

II. LITERATURE SURVEY

Conversational AI has become a crucial part of the personalized user experience for any digital brand. Leading companies, most notably Amazon, Youtube, and Netflix, have definitively demonstrated their value and have radically transformed what customers expect from any digital experience. The utility and RoI of recommendations are unquestionable. Amazon, for example, directly attributes an estimated 35% of sales to its recommender system. High-quality recommendations generated by such systems can transform the user experience from annoying to delightful while also building long-term trust and loyalty. Two decades of production deployment at Amazon reveals the key aspects behind engineering a successful recommender system.

Pegah Malekpour Alamdari [1] develops an image-based RS using deep learning techniques. To perform the research, they used five convolutional neural network (CNN) models to extract the features of the products' images. Then, the system uses the features to calculate the similarity between images. Khetanshu Chauhan [2] The paper uses the convolution network to classify the input image to one of the product categories. The similarity is calculated using Jaccard Similarity. The paper emphasizes the method to improve the performance of the product recommendation with Sparse Data. Luyang Chen[3] uses a Convolutional Neural Network(CNN) model to classify the category that this object probably belongs to and uses the input vector of the last fully connected layer as a feature vector to feed in a similarity calculation CNN model to find the closest products in their database. B. Smith[4] said that the algorithm was systematically underestimating the baseline likelihood that someone who bought A would also buy B. Joeran Beel[5] speculated that minor variations in datasets, algorithms, or user populations inevitably lead to strong

variations in the performance of the approaches. Richard Fedorko [6] describes the essence of e-commerce and artificial intelligence and their benefits. The paper also provides insight into the evaluation of the importance of artificial intelligence and its future use in the context of e-commerce based on available studies on this issue. Khoali [7] paper provides a comprehensive review of deep learning techniques that have been applied to the problem of recommendation covering techniques that have been applied to research and industrial problems. Shyan Kakkar [8] studies different applications of Artificial Intelligence in various sectors of the E commerce industry. They have developed a systematic approach of distinct AI tools applied in various business domains.They focus more on customer relationship management and customer support. Caldarini, G [9] have researched the Search Results from Scopus, from 1970 to 2021 for the keywords "chatbot" or "conversational agents" or "conversation system". They have studied implementation approaches, available public databases used in previous data-driven approaches to chatbot implementation. Änäkkälä, Tuomas[10] this literature review indicated that with machine vision it's possible to recognize elements from image and video. Qualitative case study was chosen as a research method. Aim of this study is to answer how AI applications create value for eCommerce merchants and what are the value propositions of recommendation systems. Charuta Pande [11] carried out a quantitative and qualitative analysis of Conversational AI publications from two scientific sources – DBLP and Scopus. They have taken the interdisciplinary nature of Conversational AI into account. Vishal Dineshkumar Soni [12] studied that the use of Artificial Intelligence will help E commerce companies to improve customer service, satisfaction and ensure higher sales. They truly agree that understanding that Artificial Intelligence can help people excel in their high sales and customer relationships in the ecommerce business, day by day people are getting more drawn towards AI. Mausami Sahu [13], a new plagiarism technique has been proposed based on the K-NN method. This method clusters the string and matches words with neighbors. The set of words which are matched are selected as copied words and shown as output. Ashish [14] artificial intelligence based cheque signature verification system has been proposed. The first step in the proposed system is to acquire the signature image. In proposed work, Actual and forged signature images of 10 persons have been used to train the neural network. Features are selected from the image like stroke, color dominant, histogram, moment invariants, GLCM.

III. METHODOLOGY

1. Feature extraction It is a technique used to reduce a large input data set into relevant features. This is done with dimensionality reduction to transform large input data into smaller, meaningful groups for processing. Feature extraction can prove helpful when training a machine learning model. It leads to:
- A Boost in training speed
- An improvement in model accuracy
- A reduction in risk of overfitting
- A rise in model explainability
- Better data visualization

2. OCR algorithms Optical character recognition is a technology that converts typed or handwritten text and printed images containing text into a machine-readable digital data format.

3. URL to image conversion Two methods to convert a URL to an image using Python, OpenCV, urllib, and scikit-image.

4. Image filtration First, the image is converted into base64 format. After conversion, pixel to pixel comparison is done. The comparison engine gets the color of pixels that have the same coordinates within the image and compares this color. If the color of each pixel of both images coincides, TestComplete considers the two images to be identical.

5. Grayscale conversion Grayscaling is the process of converting an image from other color spaces e.g. RGB, CMYK, HSV, etc. to shades of gray. It varies between complete black and complete white. Importance of grayscaling
- Dimension reduction: For example, In RGB images there are three color channels and three dimensions while grayscale images are single-dimensional.
- Reduces model complexity: Consider training neural articles on RGB images of 10x10x3 pixels. The input layer will have 300 input nodes. On the other hand, the same neural network will need only 100 input nodes for grayscale images.

6. Resnet Model ResNet-50 is a pre-trained Deep Learning model for image classification of the Convolutional Neural Network(CNN, or ConvNet), which is a class of deep neural networks, most commonly applied to analyzing visual imagery.

7. Array extraction Now feature coordinates are stored in an array and are extracted. This array when extracted is in 2D dimension. After this feature conversion is carried out. In feature conversion, the array is converted from a 2D to a 1D matrix. This is also called flattened features. In this way, the final feature array is determined and a recommendation is done on the basis of features present in the final feature array.

8. Pickle file formation All the features present in the final feature array are loaded in a pickle file. The advantage of using pickle is that it can serialize pretty much any Python object, without having to add any extra code. It's also smart in that it will only write out any single object once, making it effective to store recursive structures like graphs.

IV. TECHNOLOGY

Problem Statement: Every Online shop has a wide range of products available, but only some can showcase the exact products to the client which they are looking for. In the materials Market, we look for very small features as well. Which makes it difficult to gather the exact product as per the clients requirement. It takes weeks to find the perfect product.

To show the perfect product to the client is the problem which many e-commerce stores are currently facing. We are planning to build a recommendation system which will analyze the data for existing products and their images, will extract the color, features, pattern from the image and then will show the similar products to the product which the user is looking for. This will increase the variety of products for users & they will explore more.

The voice based search Engine will recognise the speech given as an input and apply machine learning algorithms to extract the text format of the given voice input. The product will be then identified by collaborating with the image searching algorithm to result in the similar products available on the store.

Proposed Solution: To show the perfect product to the client is the problem which many e-commerce stores are currently facing. We are planning to build a recommendation system which will analyze the data for existing products and their images, will extract the color, features, pattern from the image and then will show the similar products to the product which the user is looking for. This will increase the variety of products for users & they will explore more. Along with this, we are planning to create a voice based search Engine which will take the input from user via speech and will convert that speech into the features of products and will find the similar products to the demand of products which will make a user-friendly and fast experience for clients.

Key Features of the proposed system:
● A recommendation system based on the image mapping.
● An eye-catching User Interface that lists all the products i.e material library (tiles, carpets, wallpapers,etc)
● Algorithms used: KNN (K Nearest Neighbors), Resnet50 model, Euclidean Distance Algorithm
● Text based searching where users can search the product by specifying the color, shape or type of the product.
● Voice Recognition module that identifies what a user wants to search.
● Voice based searching where a user can manually use the chatbot to search the required product.
● Database management using the Firebase powered by Google cloud platform to manage and store the data.
● Machine learning model created for image feature extraction and recommending precise results.

V. PROPOSED DESIGN

1. *Block diagram representation of the proposed system*

Block Diagram Representation
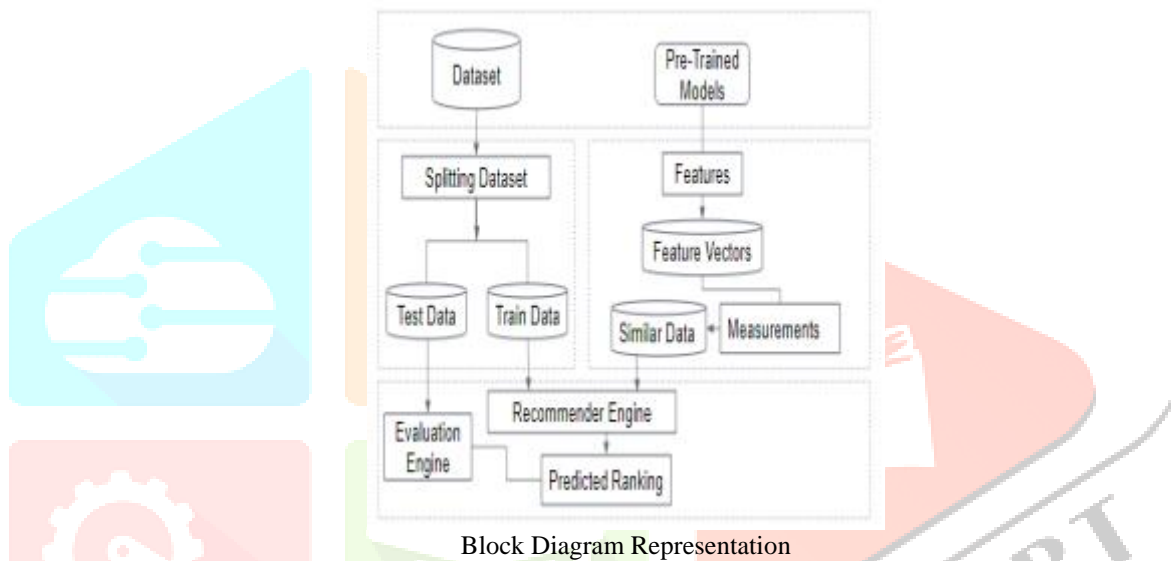
Firstly, the large Dataset is divided into two parts Testing Data, and Training Data. Test Data is kept for the Evaluation Process of the model, to check whether it predicts the expected output or not. There are some Pre-Trained Models used in the system which extract the features from the products, read the features, and map them into points. Now, we have all the points of all the data present in the database. Post plotting, the user will pass the input into the system, plotting the points of the input, we can find out similar nearest neighbors in the Data points. then these nearest data points are converted into the feature vector. Now feature coordinates are stored in an array and are extracted. This array when extracted is in 2D dimension. After this feature conversion is carried out. In feature conversion, the array is converted from a 2D to a 1D matrix. This is also called flattened features.

2. Modular diagram representation of the proposed system
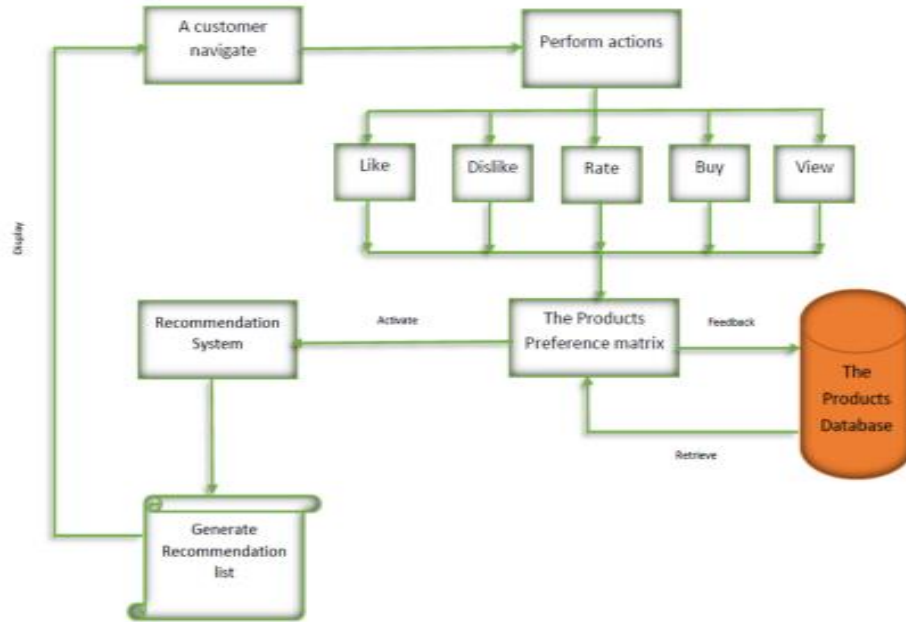
Modular diagram representation

The above Figure describes collecting, updating, and retrieving the customer actions to be used in generating a recommendation list for him/her; these operations are performed for the customers who have accounts on the e-commerce site. In case the customer doesn't have an account, then the products will be recommended to the user, by sorting the products List.

A matrix is computed for each customer and updated according to the last accessed time by comparing the last access with the latest one to measure preference degree since the last access. If there are any changes in product preferences, then the customers' preference degree is updated.
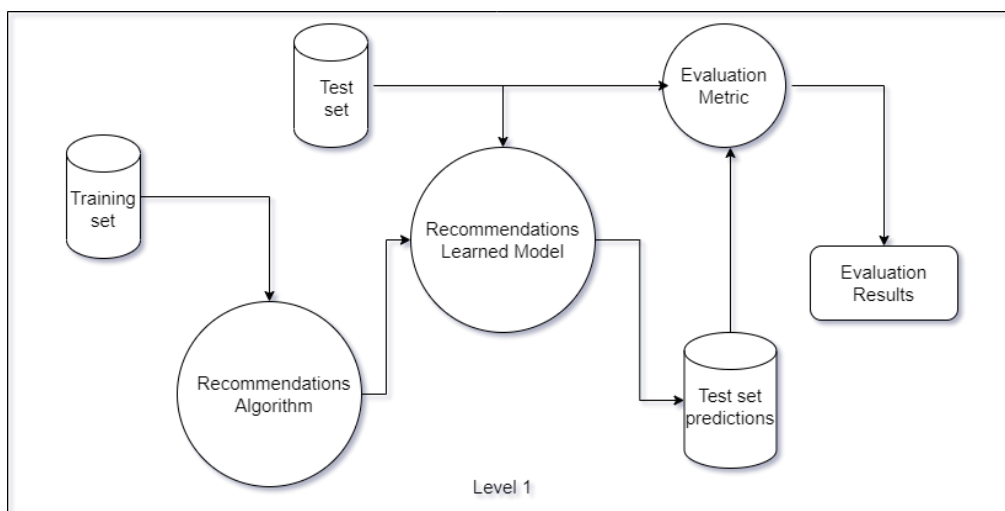
VI. DESIGN OF PROPOSED SYSTEM

1. *Data Flow Diagram (Level 0,1,2)*

DFD Level 0

This level demonstrates the flow of the system, User has to input text in the search bar or Image through the camera. After undergoing some processes through the input, the Recommendation Engine will render Similar Products present in the Database.


DFD Level 1

In Level 1 DFD, we expand our recommendation engine from level 0 DFD. First we take the image input from the training dataset, then the dataset undergoes some recommendation algorithms to generate features of image and the output of this goes to pre-trained recommendation models and using CNN we predict the results for the test dataset which is also given to the recommendation model. The result of the recommendation model is now evaluated with the test set predictions from test dataset and then evaluation results are generated.
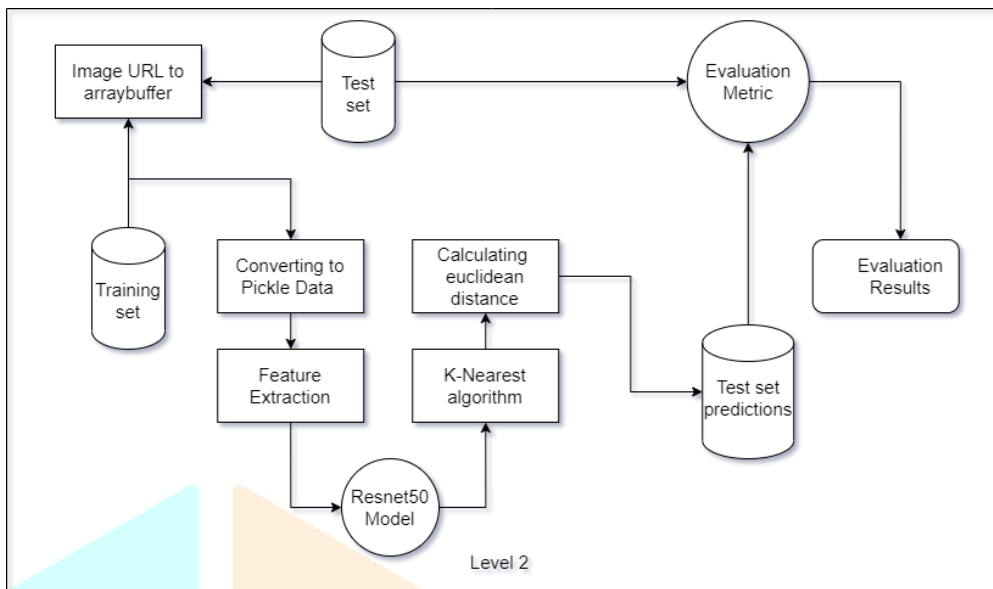
DFD Level 2

In level 2 DFD, we expand the recommendation algorithms and recommendation models. First we take data from training dataset and test dataset, then we convert that data (images) into arraybuffer for doing complex calculations using numpy and sklearn, after that we converted the training data buffer into Pickle data for storing the large features of images in compressed format. In the end, we evaluate the results using evaluation Metric, and we get the most similar products to the input image.

2. Flowchart for the proposed system
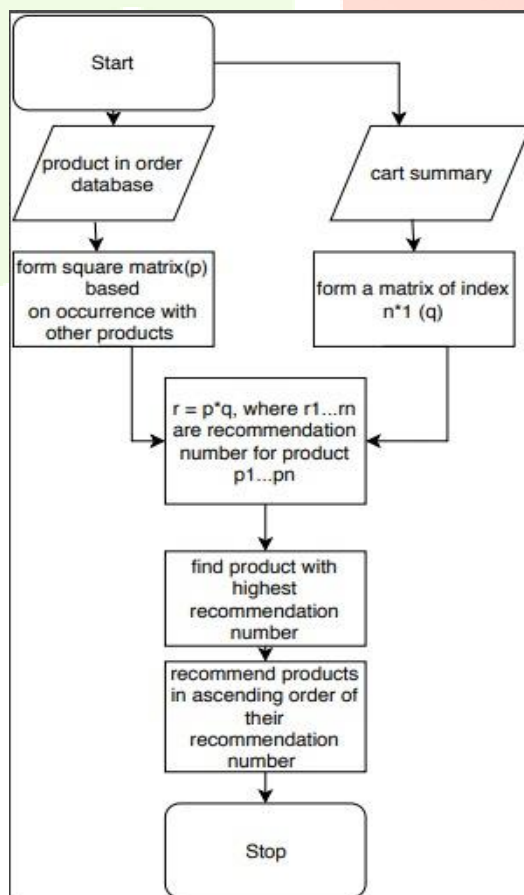
Flowchart

Figure is a flowchart that explains the working of the recommendation system based on collaborative filtering which uses co-occurrence matrix. The recommendation algorithm starts with the products in the order database which is used to form a square matrix(p) based on occurrence of one product with others. cart summary(q) which is used to form a matrix of order n*1. These matrices are used to find 'r matrix' such that r = p*q where r1…rn are the recommended number of products p1…pn. Using this matrix, the product with the highest recommendation number is considered. The products are recommended based on the ascending order of recommendation number i.e. product with recommendation number as 1 is recommended first and so on.

VII. CONCLUSION

In this project, we use Conversational Artificial Intelligence(AI) for Ecommerce i.e Conversational recommender systems (CRS) that take a different approach and support a richer set of interactions. These interactions can, for example, help to improve the preference elicitation process or allow the user to ask questions about the recommendations and to give feedback. The interest in CRS has significantly increased in the past few years. This development is mainly due to the significant progress in the area of natural language processing. E-Commerce companies have been at the forefront of leveraging the power of Conversational AI. Of the many functions virtual assistants help to automate, one of the major use cases is Sales. The advancements in Natural Language Processing (NLP) and Natural Language Understanding (NLU) have spearheaded the development of Virtual Assistants for Sales Automation. The growing use of Conversational AI in eCommerce to automate their sales function end-to-end is a testament to the capabilities of the technology to positively impact businesses. While this provides consumers a long list of options to choose from, it becomes particularly difficult for them to find exactly what they are looking for. Virtual Assistants can assist the customer in finding the best product available as per their needs.

AI Assistants help users in the product search journey and even recommend products to users by understanding their requirements. They are capable of answering product questions that the user may ask before making a purchase.

E-Commerce companies have been at the forefront of leveraging the power of Conversational AI. Of the many functions virtual assistants help to automate, one of the major use cases is Sales. The advancements in Natural Language Processing (NLP) and Natural Language Understanding (NLU) have spearheaded the development of Virtual Assistants for Sales Automation.

VIII. REFERENCES

1. Pegah Malekpour Alamdari , Nima Jafari Navimipour , Mehdi Hosseinzadeh , Ali Asghar Safaei , Aso Darwesh "Image-based Product Recommendation Method for E-commerce Applications Using Convolutional Neural Networks" in Acta Informatica Pragensi , vol. no. 11, issue 1, pp. 15–35 doi: 10.18267/j.aip.167

2. Khetanshu chauhan, Uma Surakod, Vamshik Bellur, Dayanand Karthik Basavaraju, Sushruth Radhakrishna "IMAGE BASED PRODUCT RECOMMENDATION SYSTEM" in IEEE computing vol. 12 no. 2, pp. 58-90

3. Luyang Chen,Fan Yang, and Heqing Yang "Image-based Product Recommendation System with Convolutional Neural Networks" in IJRT Cloud Computing vol.14, no. 3, pp. 55-60

4. G. Linden, B. Smith and J. York, "Amazon.com recommendations: item-to-item collaborative filtering," in IEEE Internet Computing, vol. 7, no. 1, pp. 76-80, Jan.-Feb. 2003, doi: 10.1109/MIC.2003.1167344.

5. Joeran Beel, Bela Gipp, Stefan Langer3, Corinna Breitinger "Research-paper recommender systems: a literature survey" in International Journal on Digital Libraries Vol 17 (2016), 4. - S. 305-338 doi:10.1007/s00799-015-0156-0

6. Fedorko, Richard & Kráľ, Štefan & Bačík, Radovan. (2022). Artificial Intelligence in E-commerce: A Literature Review. 10.1007/978-981-16-9113-3_50.

7. Khoali, Mohamed & Tali, Abdelhak & Laaziz, Yassin. (2021). A Survey of Artificial Intelligence-Based E-Commerce Recommendation System. 10.1007/978-3-030-53440-0_12.

8. Shyna K and Vishal M (2017). "A Study on Artificial Intelligence in ECommerce", International Journal of Advances in Engineering & Scientific Research, Volume 4,(Issue 4, Jun-2017), pp 62-. ISSN: 2349 –3607 (Online) , ISSN: 2349 –4824

9. Caldarini, G, Jaf, S, McGarry, K(2022). A Literature Survey of Recent Advances in Chatbots. Information 2022, 13, 41. https://doi.org/10.3390/info13010041

10. Änäkkälä, Tuomas(2021). Exploring value in eCommerce artificial intelligence and recommendation systems, Jyväskylä: University of Jyväskylä, 2021, 75 pp. Information Systems, Master's Thesis

11. Charuta Pande, Hans-Georg Fill & Knut Hinkelmann. A Computational Literature Analysis of Conversational AI Research with a Focus on the Coaching Domain.

12. Vishal Dineshkumar Soni (2020). "Emerging Roles of Artificial Intelligence in ecommerce" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-5, August 2020, pp.223- 225

13. Mausami Sahu, "Plagiarism Detection Using Artificial Intelligence" International Journal of Scientific & Technology Research, Volume 5, Issue 04, April 2016

14. Ashish, A.Dongare, Prof.R.D. Ghongade, "Artificial Intelligence Based Bank Cheque Signature Verification System" International Research Journal of Engineering and Technology (IRJET) Volume 03, Issue 01, Jan-2016

15. Unnati Dhavare, Prof. Umesh Kulkarni ,"Natural language processing using artificial intelligence" International Journal of Emerging Trends & Technology in Computer Science (IJETTCS) ,Volume 4, Issue 2, MarchApril 2015

16. Radhika Pillarsethy and Pratika Mishra, "A Review of AI (Artificial Intelligence) Tools and Customer Experience in Online Fashion Retail".

17. DIETMAR JANNACH, AHTSHAM MANZOOR, WANLING CAI, LI CHEN, "A Survey on Conversational Recommender Systems", ACM Computing Surveys, Vol. 54, No. 4, Article 105. Publication date: May 2021.

18. Babak Daneshvar Rouyendegh, "Development of an E-Commerce Chatbot for a University Shopping Mall", Volume 2021, Article ID 6630326.

19. Dietmar Jannach,Li Chen, "Conversational recommendation: A grand AI challenge", published on 23 June 2022, Volume43.
20. Sudarshan Lamkhede, Cristoph Kofler, "Recommendations and Results Organization in Netflix Search",publication date: September 13, 2021.