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Survey Paper on Artificial Intelligence in Retail and E-commerce

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Abstract: **This survey paper provides a comprehensive overview of the applications, challenges, and prospects in the retail and e-commerce industries, artificial intelligence (AI) plays a significant role. The retail industry has been transformed by AI technologies, which have facilitated customized customer experiences, streamlined supply chain, and inventory management, and boosted operational efficiency. By examining a wide range of AI techniques and their applications in various areas of retail and e-commerce, this paper aims to shed light on the present stage of AI adoption, as well as highlight possible benefits and challenges associated with its implementation. Furthermore, this survey paper identifies emerging trends and future research directions that can further drive innovation in this domain.**

Keywords: Technologies, Recommendations, Innovation, Recurrent

I. Introduction

The retail and e-commerce sectors have undergone substantial changes since the introduction of artificial intelligence (AI) technologies. The emergence of AI has completely transformed the business landscape by providing valuable insights into consumer behavior, streamlining operations, and enhancing customer experiences through personalized services. AI techniques have proven to be highly effective in various areas of the retail and e-commerce industries, including machine learning, natural language processing, computer vision, and robotics.

Here are the top 5 institutions that published the most paper.

Institutions	Number of Publishing Articles
Beijing University of Posts and Telecommunications	88
Hong Kong Polytechnic University	84
Northeastern University	73
Wuhan University	72
Tsinghua University	63

Table 1 Top 5 institutions publishing on AI in e-commerce

Machine learning algorithms, such as recommender systems and personalization techniques, have played a crucial role in enhancing customer experiences and driving sales. Sophisticated algorithms are utilized to scrutinize massive amounts of data with the aim of offering tailored recommendations, enhancing search outcomes, and refining product suggestions according to individual preferences and browsing habits.

Motivation

The motivation behind conducting a survey on AI in retail and e-commerce lies in the growing importance of AI technologies in these industries and businesses can harness their full potential to drive innovation, optimize operational efficiency, and elevate customer experiences.

II. Objectives

The paper will identify and discuss the specific applications of AI in retail and e-commerce, including customer experience and personalization, demand forecasting, inventory management, pricing optimization, fraud detection, supply chain management, visual search, chatbots, and autonomous delivery systems. This paper will identify emerging trends and future research directions in AI for retail and e-commerce. It will explore potential areas of growth, such as AI-powered physical stores, augmented reality, edge computing, blockchain, social commerce, and sustainability.

III. AI Techniques in Retail and E-commerce

Machine Learning

Recommender Systems: By utilizing machine learning algorithms, customer data can be analyzed to generate highly personalized recommendations, allowing businesses to recommend appropriate products or services based on individual preferences and browsing behavior. Recommender systems are widely used in e-commerce platforms to enhance the customer experience and drive sales.

Personalization: Machine learning models are employed to personalize the shopping experience by customizing product

recommendations, targeted advertisements, and personalized offers based on individual customer data.

Natural Language Processing

Sentiment Analysis: One way to understand how customers feel about products, brands, and services is by analyzing their feedback, social media posts, and online reviews using NLP techniques. By utilizing this feature, businesses can obtain valuable insights into the preferences of their customers, detect emerging trends, and enhance overall customer satisfaction.

Chatbots and Virtual Assistants: Chatbots and virtual assistants utilize NLP algorithms to offer automated customer support, help customers search for products, respond to inquiries, and carry out transactions. These AI-powered assistants enhance customer service and provide a seamless shopping experience.

Computer Vision

Visual Search: With the help of computer vision techniques, customers can now search for products by simply uploading images instead of typing text. Through the analysis of visual data, algorithms for image recognition can efficiently identify products or similar items, thereby simplifying the search process and enhancing product discovery.

Object Detection: Computer vision algorithms are used for object detection to automate tasks such as inventory management, shelf monitoring, and loss prevention. These algorithms can identify and track products, analyze shelf layouts, and detect anomalies or out-of-stock items.

Robotics and Automation

Warehouse Automation: Robotics and automation technologies, such as autonomous robots, are used in warehouses to optimize order fulfillment, inventory management, and product tracking. Robots can navigate warehouses, pick, and pack items, and streamline logistics operations, improving efficiency and reducing human error.

Autonomous Delivery Systems: Self-driving vehicles and drones are employed for last-mile delivery, enabling faster and more efficient transportation of products to customers' doorsteps.

Deep Learning

Image and Speech Recognition: Convolutional neural networks (CNNs) and recurrent neural networks (RNNs) are examples of deep learning models, that are used for image and speech recognition tasks. In retail and e-commerce, these techniques can be applied to analyze images of products, identify attributes, and enable voice-controlled shopping experiences.

Virtual Assistants and Chatbots

Virtual assistants and chatbots utilize a combination of AI techniques, including NLP and machine learning, to provide personalized and automated interactions with customers. These AI-powered conversational agents assist customers in product recommendations, order tracking, and resolving queries, improving customer satisfaction and engagement.

IV. Applications of AI in Retail and E-commerce

The use of AI has become increasingly prevalent in both retail and e-commerce, with numerous applications being found. These applications leverage AI techniques to enhance various aspects of the customer journey, operational efficiency, and decision-making processes. Some key applications include:

Customer Experience and Personalization

Recommender Systems: Personalized product recommendations can greatly improve customer satisfaction and boost sales. AI-powered recommender systems analyze customer data to provide tailored suggestions, making the shopping experience more enjoyable and efficient.

Inventory Management and Demand Forecasting

By analyzing past sales data, market trends, and external factors, AI algorithms can accurately predict demand. This is beneficial for retailers as it allows them to optimize inventory levels, minimize stockouts, and reduce excess inventory.

Fraud Detection and Security

Anomaly detection and pattern recognition are two examples of AI approaches that are used to identify fraudulent activities, detect payment fraud, and protect against cyber threats.

Biometric Authentication: AI-based biometric systems, including facial recognition and fingerprint scanning, enhance security in online transactions and access control.

Supply Chain Management

AI improves supply chain efficiency through demand forecasting, inventory optimization, and route optimization for logistics and transportation, reducing costs and improving delivery speed.

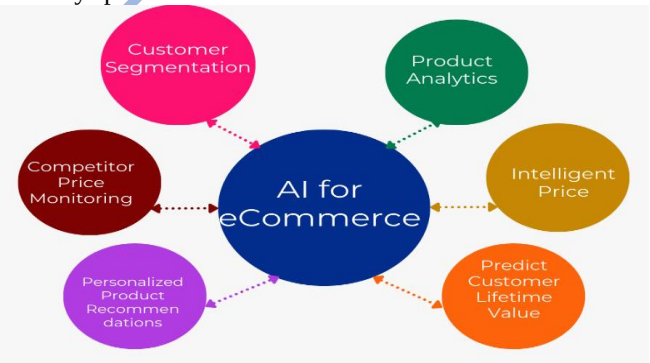

Fig 1 Application of AI in eCommerce

V. Challenges and Limitations

AI presents numerous opportunities for the retail and e-commerce industries. There are various issues and constraints that must be handled.

Data Quality and Privacy: For training and accurate forecasts, AI algorithms rely substantially on enormous amounts of high-quality data. Retailers may face challenges in ensuring data quality, data completeness, and data integration from various sources. Additionally, privacy concerns arise when handling sensitive customer information, requiring businesses to adhere to data protection regulations and maintain customer trust.

Integration and Infrastructure:

Legacy Systems: The integration of AI technologies with legacy systems can be a challenging process that may require substantial technical modifications or infrastructure upgrades. Scalability and Performance: As data volumes grow, AI systems need to scale to handle increased computational requirements and maintain real-time performance.

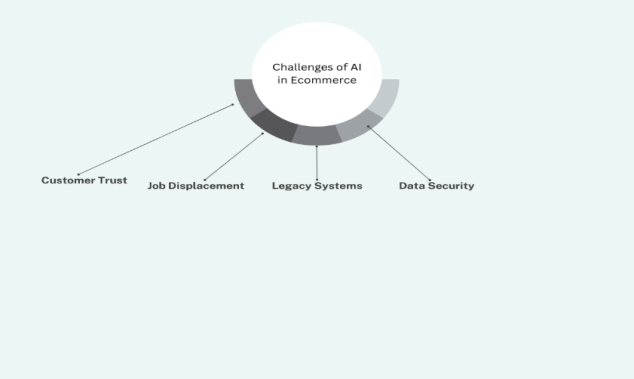

Fig 2 Challenges of AI in eCommerce

VI. Future Trends and Research Directions

The future of AI in retail and e-commerce holds exciting possibilities. Several emerging trends and research directions are shaping the landscape of AI in these industries.

Virtual Reality (VR) and Augmented Reality (AR): The use of augmented and virtual reality technologies has the potential to transform the shopping experience for customers and revolutionize how they interact with products. With augmented reality (AR), customers can superimpose digital information onto the physical world. VR, on the other hand, offers immersive virtual shopping experiences and virtual showrooms.

Blockchain in Supply Chain Management: The use of blockchain technology enhances transparency, traceability, and security in managing supply chains. Retailers can benefit from using blockchain technology to track and authenticate their products, as well as verify their origins and authenticity. This can lead to streamlined transactions, increased trust, and decreased occurrences of counterfeiting.

Edge Computing: Edge computing refers to the process of data processing closer to its source, which results in reduced latency and improved real-time decision-making abilities. In retail and e-commerce, edge computing can enable faster and more efficient data analysis, leading to quicker responses in personalized recommendations, inventory management, and customer interactions.

Research theme	Corresponding keywords
Sentiment analysis	Machine learning, natural language processing, text mining, sentiment analysis, opinion mining
Trust and personalization	Collaborative filtering, clustering algorithms, case-based reasoning, electronic commerce system
Optimization	Optimization, electronic commerce, genetic algorithm
AI concepts and related technologies	Neural networks, machine learning, deep learning, artificial intelligence, data mining, random forest, fuzzy logic, classification, etc.

Table 2 The research theme of AI in e-commerce

VII. Case Study

Case Study 1: Amazon and Personalized Recommendations

Amazon, the e-commerce giant, is well-known for its effective use of AI in delivering personalized product recommendations. Amazon's recommendation system processes extensive customer data, which includes browsing history, purchase patterns, and demographic details, to provide tailored recommendations to each customer. By leveraging machine learning algorithms, Amazon can suggest relevant products, increasing customer engagement and driving sales. The personalized recommendation system has played a significant role in Amazon's success and its ability to provide a highly personalized shopping experience.

Case Study 2: Walmart and AI for Inventory Management

Walmart, a multinational retail corporation, has implemented AI technologies to optimize inventory management and improve operational efficiency. With the help of machine learning algorithms, Walmart can predict demand, improve replenishment, and avoid stockouts. The AI system examines past sales data, market trends, and other variables to produce precise demand forecasts. This enables Walmart to optimize inventory levels and decrease carrying expenses. Walmart has also employed computer vision technology for shelf monitoring, enabling automated detection of out-of-stock items and ensuring shelves are properly stocked. These AI-driven inventory management solutions have helped Walmart streamline operations, improve product availability, and enhance customer satisfaction.

VIII. Conclusion

AI has transformed the retail and e-commerce industries, enabling businesses to deliver personalized experiences, optimize operations, and make data-driven decisions. AI has a wide range of applications in various industries, including personalized recommendations, demand forecasting, inventory management., fraud detection, and supply chain optimization. Amazon, Alibaba, Walmart, and Stitch Fix are among the companies that have effectively utilized AI technologies to enhance customer experiences, optimize operational efficiency, and foster business expansion.

IX. REFERENCES

1. McAfee, A., Brynjolfsson, E., Davenport, T. H., Patil, D. J., & Barton, D. (2012). Big data: The management revolution. Harvard Business Review, 90(10), 60-68.
2. Verhoef, P. C., Kannan, P. K., & Inman, J. J. (2015). From multi-channel retailing to omni-channel retailing: Introduction to the special issue on multi-channel retailing. Journal of Retailing, 91(2), 174-181.
3. Lazer, D., Kennedy, R., King, G., & Vespignani, A. (2014). The parable of Google Flu: Traps in big data analysis. Science, 343(6176), 1203-1205.
4. Chen, H., Chiang, R. H., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. MIS Quarterly, 36(4), 1165-1188.
5. Chui, M., Manyika, J., & Bughin, J. (2016). A strategy for retailing in the 21st century. McKinsey Quarterly. Retrieved from https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/a-strategy-for-retailing-in-the-21st-century.
6. Gburová J (2019) Consumer shopping behavior in the e-commerce environment. J Global Sci 4(2):1–6
7. Khrais L (2020) Role of artificial intelligence in shaping consumer demand in e-commerce. Future Internet 12(12)
8. Delina R, Vajda V (2006) Theory and practice of electronic commerce. Grafotlaˇc, Prešov
9. Hagberg J, Sundstrom M, Egels-Zandén N (2016) The digitalization of retailing: an exploratory framework. Int J Retail Distrib Manage 44:694–712 Boboc PC (2020) VAT and e-commerce. Current legal framework and the 2021 changes. Cluj Tax F.J., 39
10. Menaka B, Seethal K (2018) Recent trends in E-commerce. Shanlax Int J Commerce 6(1):40–44
11. Dalal, S., Poongodi, M., Lilhore, U. K., Dahan, F., Vaiyapuri, T., Keshta, I., ... & Simaiya, S. Optimized LightGBM model for security and privacy issues in cyber-physical systems. Transactions on Emerging Telecommunications Technologies, e4771.
12. Dalal, S., Manoharan, P., Lilhore, U. K., Seth, B., Simaiya, S., Hamdi, M., & Raahemifar, K. (2023). Extremely boosted neural network for more accurate multi-stage Cyber attack prediction in cloud computing environment. Journal of Cloud Computing, 12(1), 1-22.
13. Malik, A., Onyema, E. M., Dalal, S., Kumar, U., Anand, D., Sharma, A., & Simaiya, S. (2023). Forecasting students' adaptability in online entrepreneurship education using modified ensemble machine learning model. Array, 100303.
14. Shetty, S., & Dalal, S. (2022, December). Bi-Directional Long Short-Term Memory Neural Networks for Music Composition. In 2022 Fourth International Conference on Emerging Research in Electronics, Computer Science and Technology (ICERECT) (pp. 1-6). IEEE.
15. Dalal, S. (2023, April). The Smart Analysis of Poisson Distribution Pattern Based Industrial Automation in Industry 4.0. In 2023 International Conference on Distributed Computing and Electrical Circuits and Electronics (ICDCECE) (pp. 1-6). IEEE.
16. Dalal, S., Seth, B., Radulescu, M., Cilan, T. F., & Serbanescu, L. (2023). Optimized Deep Learning with Learning without Forgetting (LwF) for Weather Classification for Sustainable Transportation and Traffic Safety. Sustainability, 15(7), 6070.
17. Onyema, E. M., Lilhore, U. K., Saurabh, P., Dalal, S., Nwaeze, A. S., Chijindu, A. T., ... & Simaiya, S. (2023). Evaluation of IoT-Enabled hybrid model for genome sequence analysis of patients in healthcare 4.0. Measurement: Sensors, 26, 100679.
18. Dalal, S., Manoharan, P., Lilhore, U. K., Seth, B., Simaiya, S., Hamdi, M., & Raahemifar, K. (2023). Extremely boosted neural network for more accurate multi-stage Cyber attack prediction in cloud computing environment. Journal of Cloud Computing, 12(1), 1-22.
19. Dalal, S., Goel, P., Onyema, E. M., Alharbi, A., Mahmoud, A., Algarni, M. A., & Awal, H. (2023). Application of Machine Learning for Cardiovascular Disease Risk Prediction. Computational Intelligence and Neuroscience, 2023.
20. Dalal, S., Seth, B., Radulescu, M., Secara, C., & Tolea, C. (2022). Predicting Fraud in Financial Payment Services through Optimized Hyper-Parameter-Tuned XGBoost Model. Mathematics, 10(24), 4679.
21. Dalal, S., Onyema, E. M., & Malik, A. (2022). Hybrid XGBoost model with hyperparameter tuning for prediction of liver disease with better accuracy. World Journal of Gastroenterology, 28(46), 6551-6563.
22. Edeh, M. O., Dalal, S., Obagbuwa, I. C., Prasad, B. V. V., Ninoria, S. Z., Wajid, M. A., & Adesina, A. O. (2022). Bootstrapping random forest and CHAID for prediction of white spot disease among shrimp farmers. Scientific Reports, 12(1), 1-12.
23. Zaki, J., Nayyar, A., Dalal, S., & Ali, Z. H. (2022). House price prediction using hedonic pricing model and machine learning techniques. Concurrency and Computation: Practice and Experience, 34(27), e7342.
24. Dalal, S., Onyema, E., Romero, C., Ndufeiya-Kumasi, L., Maryann, D., Nnedimkpa, A. & Bhatia, T. (2022). Machine learning-based forecasting of potability of drinking water through adaptive boosting model. Open Chemistry, 20(1), 816-828. https://doi.org/10.1515/chem-2022-0187

25. Onyema, E. M., Dalal, S., Romero, C. A. T., Seth, B., Young, P., & Wajid, M. A. (2022). Design of Intrusion Detection System based on Cyborg intelligence for security of Cloud Network Traffic of Smart Cities. Journal of Cloud Computing, 11(1), 1-20.
26. Dalal, S., Onyema, E. M., Kumar, P., Maryann, D. C., Roselyn, A. O., & Obichili, M. I. (2022). A Hybrid machine learning model for timely prediction of breast cancer. International Journal of Modeling, Simulation, and Scientific Computing, 2023, 1-21.
27. Dalal, S., Seth, B., Jaglan, V., Malik, M., Dahiya, N., Rani, U., ... & Hu, Y. C. (2022). An adaptive traffic routing approach toward load balancing and congestion control in Cloud–MANET ad hoc networks. Soft Computing, 26(11), 5377-5388.
28. Edeh, M. O., Dalal, S., Dhaou, I. B., Agubosim, C. C., Umoke, C. C., Richard-Nnabu, N. E., & Dahiya, N. (2022). Artificial Intelligence-Based Ensemble Learning Model for Prediction of Hepatitis C Disease. Frontiers in Public Health, 847.
29. Seth, B., Dalal, S., Jaglan, V., Le, D. N., Mohan, S., & Srivastava, G. (2022). Integrating encryption techniques for secure data storage in the cloud. Transactions on Emerging Telecommunications Technologies, 33(4), e4108.
30. Malik, M., Nandal, R., Dalal, S., Maan, U., & Le, D. N. An efficient driver behavioral pattern analysis based on fuzzy logical feature selection and classification in big data analysis. Journal of Intelligent & Fuzzy Systems, 43(3), 3283-3292.
31. Malik, M., Nandal, R., Dalal, S., Jalglan, V., & Le, D. N. (2022). Deriving driver behavioral pattern analysis and performance using neural network approaches. Intelligent Automation & Soft Computing, 32(1), 87-99.
32. Shetty, S., & Dalal, S. (2022, December). Bi-Directional Long Short-Term Memory Neural Networks for Music Composition. In 2022 Fourth International Conference on Emerging Research in Electronics, Computer Science and Technology (ICERECT) (pp. 1-6). IEEE.
33. Onyema, E. M., Shukla, P. K., Dalal, S., Mathur, M. N., Zakariah, M., & Tiwari, B. (2021). Enhancement of patient facial recognition through deep learning algorithm: ConvNet. Journal of Healthcare Engineering, 2021.
34. Dalal, S., & Khalaf, O. I. (2021). Prediction of occupation stress by implementing convolutional neural network techniques. Journal of Cases on Information Technology (JCIT), 23(3), 27-42.
35. Dalal, S., Jaglan, V., & Le, D.-N. (Eds.). (2021). Green Internet of Things for Smart Cities: Concepts, Implications, and Challenges (1st ed.). CRC Press. https://doi.org/10.1201/9781003032397.
36. Dahiya, N., Dalal, S., & Jaglan, V. (2021). 8 Mobility in Green Management IoT. Green Internet of Things for Smart Cities: Concepts, Implications, and Challenges, 125.
37. Dahiya, N., Dalal, S., & Jaglan, V. (2021). 7 Efficient Green Solution. Green Internet of Things for Smart Cities: Concepts, Implications, and Challenges, 113.
38. Seth, B., Dalal, S., & Dahiya, N. (2021). 4 Practical Implications. Green Internet of Things for Smart Cities: Concepts, Implications, and Challenges, 61.
39. Malik, M., Nandal, R., Dalal, S., Jalglan, V., & Le, D. N. (2021). Driving pattern profiling and classification using deep learning. Intelligent Automation & Soft Computing, 28(3), 887-906.
40. Jindal, U., Dalal, S., Rajesh, G., Sama, N. U., Jhanjhi, N. Z., & Humayun, M. (2021). An integrated approach on verification of signatures using multiple classifiers (SVM and Decision Tree): A multi-classification approach.
41. Seth, B., Dalal, S., Le, D. N., Jaglan, V., Dahiya, N., Agrawal, A., ... & Verma, K. D. (2021). Secure Cloud Data Storage System Using Hybrid Paillier–Blowfish Algorithm. Computers, Materials & Continua, 67(1), 779-798.
42. Vijarania, M., Dahiya, N., Dalal, S., & Jaglan, V. (2021). WSN Based Efficient Multi-Metric Routing for IoT Networks. In Green Internet of Things for Smart Cities (pp. 249-262). CRC Press.
43. Goel, M., Hayat, A., Husain, A., & Dalal, S. (2021). Green-IoT (G-IoT) Architectures and Their Applications in the Smart City. In Green Internet of Things for Smart Cities (pp. 47-59). CRC Press.
44. Chawla, N., & Dalal, S. (2021). Edge AI with Wearable IoT: A Review on Leveraging Edge Intelligence in Wearables for Smart Healthcare. Green Internet of Things for Smart Cities, 205-231.
45. Dahiya, N., Dalal, S., & Jaglan, V. (2021). Efficient Green Solution for a Balanced Energy Consumption and Delay in the IoT-Fog-Cloud Computing. In Green Internet of Things for Smart Cities (pp. 113-123). CRC Press.
46. Dahiya, N., Dalal, S., & Jaglan, V. (2021). Mobility Management in Green IoT. In Green Internet of Things for Smart Cities (pp. 125-134). CRC Press.
47. Seth, B., Dalal, S., & Dahiya, N. (2021). Practical Implications of Green Internet of Things (G-IoT) for Smart Cities. In Green Internet of Things for Smart Cities (pp. 61-81). CRC Press.
48. Dalal, S., Agrawal, A., Dahiya, N., & Verma, J. (2020, July). Software Process Improvement Assessment for Cloud Application Based on Fuzzy Analytical Hierarchy Process Method. In International Conference on Computational Science and Its Applications (pp. 989-1001). Springer, Cham.
49. Seth, B., Dalal, S., Jaglan, V., Le, D. N., Mohan, S., & Srivastava, G. (2020). Integrating encryption

techniques for secure data storage in the cloud. Transactions on Emerging Telecommunications Technologies.

50. Hooda, M., & Shravankumar Bachu, P. (2020). Artificial Intelligence Technique for Detecting Bone Irregularity Using Fastai. In International Conference on Industrial Engineering and Operations Management Dubai, UAE (pp. 2392-2399).
51. Arora, S., & Dalal, S. (2019). An optimized cloud architecture for integrity verification. Journal of Computational and Theoretical Nanoscience, 16(12), 5067-5072.
52. Arora, S., & Dalal, S. (2019). Trust Evaluation Factors in Cloud Computing with Open Stack. Journal of Computational and Theoretical Nanoscience, 16(12), 5073-5077.
53. Shakti Arora, S. (2019). DDoS Attacks Simulation in Cloud Computing Environment. International Journal of Innovative Technology and Exploring Engineering, 9(1), 414-417.
54. Shakti Arora, S. (2019). Integrity Verification Mechanisms Adopted in Cloud Environment. International Journal of Engineering and Advanced Technology (IJEAT), 8, 1713-1717.
55. Sudha, B., Dalal, S., & Srinivasan, K. (2019). Early Detection of Glaucoma Disease in Retinal Fundus Images Using Spatial FCM with Level Set Segmentation. International Journal of Engineering and Advanced Technology (IJEAT), 8(5C), 1342-1349.
56. Sikri, A., Dalal, S., Singh, N. P., & Le, D. N. (2019). Mapping of e-Wallets With Features. Cyber Security in Parallel and Distributed Computing: Concepts, Techniques, Applications and Case Studies, 245-261.
57. Seth, B., Dalal, S., & Kumar, R. (2019). Hybrid homomorphic encryption scheme for secure cloud data storage. In Recent Advances in Computational Intelligence (pp. 71-92). Springer, Cham.
58. Seth, B., Dalal, S., & Kumar, R. (2019). Securing bioinformatics cloud for big data: Budding buzzword or a glance of the future. In Recent advances in computational intelligence (pp. 121-147). Springer, Cham.
59. Jindal, U., & Dalal, S. (2019). A hybrid approach to authentication of signature using DTSVM. In Emerging Trends in Expert Applications and Security (pp. 327-335). Springer, Singapore.
60. Le, D. N., Seth, B., & Dalal, S. (2018). A hybrid approach of secret sharing with fragmentation and encryption in cloud environment for securing outsourced medical database: a revolutionary approach. Journal of Cyber Security and Mobility, 7(4), 379-408.
61. Sikri, A., Dalal, S., Singh, N. P., & Dahiya, N. (2018). Data Mining and its Various Concepts. Kalpa Publications in Engineering, 2, 95-102.
62. Sameer Nagpal, S. (2018). Analysis of LrMu Power Algorithm in the Cloud Computing Environment using CloudSim Toolkit. International Journal of Research in Electronics and Computer Engineering (IJRECE), 6(3), 1175-1177.
63. Nagpal, S., Dahiya, N., & Dalal, S. (2018). Comparative Analysis of the Power Consumption Techniques in the Cloud Computing Environment. Journal Homepage: http://www. ijmra.us, 8(8), 1.
64. Kumar, N., Dalal, S., & Dahiya, N. (2018). Approach of Lion Optimization Algorithm for Efficient Load Balancing in Cloud Computing. Journal Homepage: http://www. ijmra.us, 8(8), 1.
65. Sameer Nagpal, S. (2018). Comparison of Task Scheduling in Cloud Computing Using various Optimization Algorithms. Journal of Computational Information Systems, 14(4), 43-57.
66. Arora, S., & Dalal, S. (2018). Hybrid algorithm designed for handling remote integrity check mechanism over dynamic cloud environment. International Journal of Engineering & Technology, 7(2.4), 161-164.
67. Kukreja, S., & Dalal, S. (2018). Modified drosophila optimization algorithm for managing re-sources in cloud environment. International Journal of Engineering & Technology, 7(2.4), 165-169.
68. Jindal, U., Dalal, S., & Dahiya, N. (2018). A combine approach of preprocessing in integrated signature verification (ISV). International Journal of Engineering & Technology, 7(1.2), 155-159.
69. Nagpal, S., Dahiya, N., & Dalal, S. (2018). Comparison of Task Scheduling in Cloud Computing Using various Optimization Algorithms. Journal of Computational Information Systems ISSN, 1553-9105.
70. Jindal, U., Dalal, S., & Dahiya, N. (2018). A combine approach of preprocessing in integrated signature verification (ISV). International Journal of Engineering & Technology, 7(1.2), 155-159
71. Shakti Arora, S. (2018). Resolving problem of Trust context in Cloud Computing. International Journal of Engineering Research in Computer Science and Engineering (IJERCSE), 5(1), 138-142.
72. Dalal, S., Dahiya, N., & Jaglan, V. (2018). Efficient tuning of COCOMO model cost drivers through generalized reduced gradient (GRG) nonlinear optimization with best-fit analysis. In Progress in Advanced Computing and Intelligent Engineering (pp. 347-354). Springer, Singapore
73. Seth, B., & Dalal, S. (2018). Analytical assessment of security mechanisms of cloud environment. In Progress in Advanced Computing and Intelligent Engineering (pp. 211-220). Springer, Singapore.

74. Kukreja, S., & Dalal, S. (2018). Performance analysis of cloud resource provisioning algorithms. In Progress in Advanced Computing and Intelligent Engineering (pp. 593-602). Springer, Singapore.
75. Rani, U., Dalal, S., & Kumar, J. (2018). Optimizing performance of fuzzy decision support system with multiple parameter dependency for cloud provider evaluation. Int. J. Eng. Technol, 7(1.2), 61-65.
76. Dahiya, N., Dalal, S., & Khatri, S. (2017). An Enhanced Bat Algorithm for Data Clustering Problems. International Journal of Advanced Research in Computer Science, 8(3).
77. Dahiya, N., Dalal, S., & Khatri, S. (2017). Data clustering and its Application to numerical function optimization algorithm. International Journal of Advanced Research in Computer Science, 8(1).
78. Arora, S., & Dalal, S. (2017). Adaptive Model For Integrity Verification In Cloud Computing System. International Journal of Advanced Research in Computer Science, 8(1), 233-236.
79. Neeraj Dahiya, S. (2017). Numerical Function Optimization: Model, Procedure And Uses. International Journal of Engineering Science and Technology (IJEST), 9(4), 266-270.
80. Dahiya, N., Dalal, S., & Khatri, S. (2016). Refinement with Image clustering using Self-Organizing Map and Numerical Function Optimization. International Journal of Computer Science and Information Security, 14(11), 909.
81. Neeraj Dahiya, S. (2016). A Review on Numerical function optimization Algorithm and its Applications to Data Clustering & Classification. International Journal of Recent Research Aspects, 3(3), 115-121.
82. Arora, S., & Dalal, S. (2016). Novel Approach of Integrity Verification in Dynamic Cloud Environment. International Journal of Computer Science and Information Security, 14(8), 207.
83. Dalal, S., & Kukreja, S. (2016). Genetic Algorithm based Novel approach for Load Balancing problem in Cloud environment. International Journal of computer science and information security, 14(7), 88.
84. Arora, S., & Dalal, S. (2016). Study of Integrity Based Algorithm in Decentralized Cloud Computing Environment. International Journal of Institutional & Industrial Research, 1(1), 15-17.
85. Vishakha, S. D. (2016). Performance Analysis of Cloud Load Balancing Algorithms. International Journal of Institutional and Industrial Research, 1(01), 1-5.
86. Dalal, S., & Jindal, U. (2016, March). Performance of integrated signature verification approach. In 2016 3rd International Conference on Computing for Sustainable Global Development (INDIACom) (pp. 3369-3373). IEEE.
87. Dahiya, N., Dalal, S., & Tanwar, G. (2016, March). Refining of image using self-organizing map with clustering. In AIP Conference Proceedings (Vol. 1715, No. 1, p. 020064). AIP Publishing LLC.
88. Dahiya, N., Dalal, S., & Khatri, S. (2016). A Review on Numerical function optimization Algorithm and its Applications to Data Clustering & Classification. International Journal of Recent Research Aspects, 3(3), 111-115.
89. Arora, S., & Dalal, S. (2016). Enhanced Privacy Preserving Access Control in the Cloud. International Journal of Recent Research Aspects, 3(4), 66-70.
90. Dahiya, N., Dalal, S., Khatri, S., & Kumar, Y. (2016). Cat Swarm Optimization: Applications And Experimental Illustrations To Data Clustering. International Journal of Control Theory and Applications, 9(41), 759-765.
91. Rani, U., & Dalal, S. (2016). Neural Network Applications in Design Process of Decision Support System. International Journal of Recent Research Aspects, 4(2), 40-44.
92. Seth, B., & Dalal, S. (2016). Designing Hybrid Security Architecture in Multi Cloud System. International Journal of Control Theory and Applications, 9(41), 767-776.
93. Seth, B., & Dalal, S. (2016). Analysis of cryptographic approaches. International Journal of Recent Research Aspect, 3(1), 21-24.
94. Jindal, U., & Dalal, S. (2016). Survey on Signature verification and recognition using SIFT and its variant. International Journal of Recent Research Aspects, 3(3), 26-29.
95. Sharma, D., Sharma, K., & Dalal, S. (2014). Optimized load balancing in grid computing using tentative ant colony algorithm. International Journal of Recent Research Aspects, 1(1), 35-39.
96. Jindal, K., Dalal, S., & Sharma, K. K. (2014, February). Analyzing spoofing attacks in wireless networks. In 2014 Fourth International Conference on Advanced Computing & Communication Technologies (pp. 398-402). IEEE.
97. Dalal, Surjeet & Srinivasan, S, Approach of multi agent system in controlling bullwhip effect of supply chain management system using case based reasoning, Department of Computer Science, Suresh Gyan Vihar University, 20/01/2014, http://hdl.handle.net/10603/36464
98. Sharma, S., & Dalal, S. (2014). Recognition and identification schemes for the development of Eigen feature extraction based iris recognition system. International Journal of Recent Research Aspects ISSN, 2349-7688.
99. Sharma, P., Sharma, K., & Dalal, S. (2014). Preventing Sybil Attack in MANET using Super nodes approach. International Journal of Recent Research Aspects, 1(1), 30-34.

100. Simi Gupta, D., & Dalal, S. (2014). Efficient broker scheduling in Cloud Computing. International Journal of Recent Research Aspects, 1(2), 74-77.
101. Sharma, S., & Dalal, S. (2014). Feature Recognition from Histogram and Eigen Algorithm in Digital Image Processing.
102. Mittal, A., & Dalal, S. (2014). Implying p-Cure algorithm in case retrieval stage of the case-based reasoning. International Journal of Recent Research Aspects, 3(3), 91-98.
103. Mittal, A., Sharma, K. K., & Dalal, S. (2014). Approach of BPEL in supply chain activities for managing bullwhip effect of SCM system. Int. J. Res. Asp. Eng. Manag, 1(2), 26-30.
104. Sharma, P., & Dalal, S. (2014). Shortest Path Algorithms Technique for Nearly Acyclic Graphs. International Journal of Recent Research Aspects, 3(3), 36-39.
105. Dalal, S., Jaglan, V., & Sharma, K. K. (2014). Designing architecture of demand forecasting tool using multi-agent system. International Journal of Advanced Research in Engineering and Applied Sciences, 3(1), 11-20.
106. Sheikh, M., Sharma, K., & Dalal, S. (2014). Efficient method for WiMAX soft handover in VOIP and IPTV. International Journal of Research Aspects of Engineering & Management, 1(2), 5-48.
107. Kumar, S., & Dalal, S. (2014). Optimizing Intrusion Detection System using Genetic Algorithm. International Journal of Research Aspects of Engineering and Management ISSN, 2348-6627.
108. Mittal, A., Sharma, K. K., & Dalal, S. (2014). Applying clustering algorithm in case retrieval phase of the case-based reasoning. International Journal of Research Aspects of Engineering and Management, 1(2), 14-16.
109. Dalal, S., Jaglan, V., & Sharma, K. K. (2014). Integrating Multi-case-base-reasoning with Distributed case-based reasoning. International Journal of Advanced Research in IT and Engineering ISSN, 2278-6244.
110. Saini, A., Sharma, K. K., & Dalal, S. (2014). A survey on outlier detection in WSN. International Journal of Research Aspects of Engineering and Management ISSN, 2348-6627.
111. Sharma, P., Sharma, D. K., & Dalal, S. (2014). Preventing Sybil Attack In MANET Using Super Node Using Approach. International Journal of Recent Research Aspects, ISSN, 2349-7688.
112. Chahar, P., & Dalal, S. (2013). Deadlock resolution techniques: an overview. International Journal of Scientific and Research Publications, 3(7), 1-5.
113. Dalal, Surjeet, Keshav Jindal, and Monika Nirwal. "Developing Flexible Decision Support Systems Using Case-Base Reasoning System." International Journal of Engineering and Management Research (IJEMR) 3.4 (2013): 13-17.
114. Dalal, S., & Sharma, K. K. (2013). Simulating supply chain activities in multi-agent based supply chain management system with plasma simulator. International journal of Computer Science & Communication, 4(1), 80-85.
115. Dalal, S., Tanwar, G., & Alhawat, N. (2013). Designing CBRBDI agent for implementing supply chain system. system, 3(1), 1288-1292.
116. Dalal, S., & Athavale, V. (2012). Challenging Bullwhip Effect of Supply Chain Through Case Based Multi Agent System: A Review. International Journal of Advanced Research in Computer Science and Software Engineering, 2(12), 267-272.
117. Dalal, S., Tanwar, G., & Jindal, K. (2012). Agent Oriented Programming In Trading System Automation. International Journal of Research in IT, Management and Engineering, 2(8), 51-59.
118. Dalal, Surjeet, and Vijay Athavale. "Analysing Supply Chain Strategy Using Case-Based Reasoning." Journal of Supply Chain Management Systems 1.3 (2012).
119. Jindal, K., Dalal, S., & Jaglan, V. (2012). Comparative Study On IEEE 802.11 Wireless Local Area Network Securities. International Journal of Advanced Research in Computer Science, 3(1).
120. Jindal, K., Dalal, S., & Tanwar, G. (2012). Congestion Control Framework in Ad-Hoc Wireless using Neural Networks in QoS. International Journal of Research in Computer Engineering and Electronics, ISSN, 15-18.
121. Dalal, S., Athavale, V., & Jindal, K. (2012). Designing Case-based reasoning applications with Colibri Studio. International Journal of Research in Computer Engineering and Electronics, 1(1), 15-18.
122. Jaglan, V., Dalal, S., & Srinivasan, S. (2011). Improving performance of business intelligence through case based reasoning. International Journal of Engineering Science and Technology, 3(4), 2880-2886.
123. Jaglan, V., Dalai, S., & Srinivasan, S. (2011). Enhancing security of agent-oriented techniques programs code using jar files. International Journal on Computer Science and Engineering, 3(4), 1627-1632.
124. Dalal, S., Athavale, V., & Jindal, K. (2011). Case retrieval optimization of Case-based reasoning through Knowledge-intensive Similarity measures. Int. J. Comput. Appl, 34(3), 12-18.
125. Surjeet Dalal, V., & Kumar, S. (2010). Designing of business tool using intelligent agent. In National Conference Advanced Computing & Communication tech ACCT (pp. 751-754).

