

A COMPARATIVE ANALYSIS OF DEEP LEARNING AND ITS IMPACT ON CUSTOMER SERVICE IN E-COMMERCE TO GAIN COMPETITIVE ADVANTAGE

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ABSTRACT

Nowadays, a rising number of individuals use online social networks, e-commerce, and applications to not only socialize and engage, but also to express their ideas. Deep Learning is an area of machine learning dealing with neural representations of procedures, most frequently shown as neural networks, neural beliefs, and so on. When evaluating sentiments for a given datasets, it is critical to choose the most practical and precise approach possible because this impacts both buyers and sellers. Deep Learning (DL) approaches have been used to identify important data and make recommendations from enormous data sets. The effectiveness and results of various deep learning techniques may change based on the data sets utilized, as well as the techniques' appropriateness to the information and applications domains under discussion. To meet this demand, a comparative examination of well-known deep learning techniques was conducted. E-commerce was the first business to capitalize on the advantages of Deep Learning (DL). Firms now have whole DL departments, which is not uncommon. Because digital transactions have become the usual means of acquiring products and services, top E-commerce businesses are investigating how DL may improve customer satisfaction and company profitability. The idea is that they contain a massive volume of information, and making use of that information is difficult. E-commerce firms spend a lot of money to automating tedious procedures, enhance the customer experiences, tailor offers for specific customers, and gain a deeper understanding of their customers.

Keywords: Deep Learning, Machine Learning, E-commerce, Customer Service, Algorithms, Firms

Introduction

Deep Learning (DL) is a recommendation system in e-commerce that performs the very same thing for internet purchasing. Its usual duty is to make item-to-item suggestions. This is when an E-commerce store or publication website suggests another commodity or types of information that is comparable to the one the customer is presently seeing. A recommendation engine discovers the various trends and structures by analyzing gathered big information on social website traffic. A recommendation engine takes in past user behavior analytics information as training phase and discovers the distinct structures and trends by analyzing gathered big information on social website traffic (Supervised Learning). Following the collection of data on users' shopping patterns, the findings will be shown on a customized web page with recommended goods that are effective in convincing them. When the customer submits their transaction, the suggestion will consider whether or not its suggestions were effective

and will update its algorithms (Reinforced Learning). Users, items, and interactions between them are the primary objects of any recommendation systems. These interactions are often represented as a matrix with cells holding contact data. The conventional way of generating a prediction is mutual information. The method's fundamental premise is that comparable user evaluations of particular things in the past likely to be equivalent in the future. A content-based optimization algorithm with a DL design is intimately connected to the system's factual substance.

A COMPARITIVE ANALYSING OF DEEP LEARNING

Deep learning has facilitated change and innovation in a wide range of sectors. Firms have been able to use artificial intelligence to obtain a strategic advantage and sometimes even transform the way their industries perceive the user experience, ranging from outlier detection to video assessment. Deep learning, a specialized and sophisticated kind of machine

learning, conducts what is known as "end-to-end learning." Deep neural networks (DNN) are convolutional neural networks having several hidden layers of modules between the output and input layers that are used to build deep learning models. Artificial neurons are roughly modelled after an artificial brain, while each neuron linked to so many others and each neural component implementing a summing algorithm that aggregates the values of all its inputs. Given enough training data and time, it is feasible to

train systems to be self-learning and capable of performing certain activities. These methods frequently outperform standard computer algorithms in situations where the solution or feature detection is difficult to explain. Convolutional neural networks (CNN) simulate animal vision and may be used to perform image processing tasks. CNNs can benefit from the 2D structure of the input data. Convolutional neural networks outperformed other deep designs in picture and voice recognition [1].

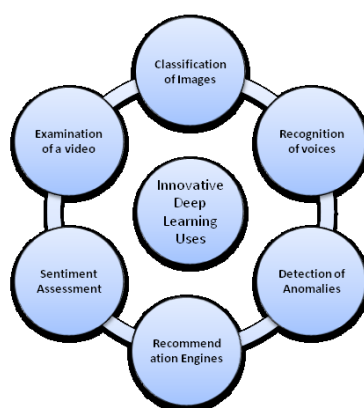


Fig 1. Deep Learning Innovative Uses

Classification of Images

This is the technique by which an artificial intelligence program recognizes and detects an item or characteristic in a digital picture or video. Deep learning models are being used to swiftly analyze and evaluate in-store images to instinctively predict inventory movement in the retail vertical. This has resulted in more efficient operations, lower expenses, and new sales prospects [2].

Detection of Anomalies

Out of millions of transactions, this deep learning approach attempts to identify anomalous structures that do not match the anticipated behaviors for a certain system. These implementations can indicate the presence of a financial network assault, fraud prevention in insurance files or credit card transactions, production management, power consumption optimization, and even the isolation of sensor data in industrial plants indicating a safety concern.

Recognition of Voices

This is a deep learning model's capacity to accept and understand dictation or understanding and execute out oral directions. Models can translate recorded voice instructions to texts and then apply natural language processing to determine what is being said and in what circumstances. This has resulted in significant advantages for businesses such as automotive, healthcare, and customer service, among others [3].

Recommendation Engines

Such models evaluate user behaviors in order to provide suggestions based on user behavior and purchasing history. E-commerce sites rely heavily on recommendation engines [4]. This significantly lowers complexity for the customer while also providing efficient income streams for the firm.

Examination of a Video

With the use of deep learning models, it is now feasible to scan and assess enormous streams of video sequences for a variety of

purposes, such as for intrusion detection in airports surveillance systems, banks, or sporting events, among other applications. In order to minimize latency and enhance the customer experience, media firms utilize video monitoring.

Sentiment Assessment

To get a comprehensive knowledge of customer opinions, customer mood, and the effectiveness of promotional activities, deep learning methods such

as natural language processing and text classification are used. In the healthcare business, it may be used to acquire information of the patients and their disorders.

USE CASES FOR ECOMMERCE DEEP LEARNING

Deep learning's commercial benefits have been discussed in broad terms [5]. Time to be more precise about the influence of technology on internet purchasing. In Table 1. We show E-Commerce deep learning may be applied to the following six application scenarios.

STEPS FOR ADOPTING DEEP LEARNING (DL) IN YOUR ECOMMERCE BUSINESS

With this information, you should have a better understanding of how Deep Learning (DL) can be used in eCommerce [8][9]. The personal online store may perhaps occur to you. This is excellent, but how do you begin to adopt the technology? As

a starting point, in table 2. here are six simple steps.

Table 1. E-Commerce deep learning six application scenarios.

Personalization.	Consumers of today don't want to be addressed as one of many. A fully customized client experience is preferred. The personalization of your brand is what maintains loyal customers. A rival who can supply it will take your place if you cannot.
Site search.	Search engines have come a long way in recent years, as anybody who has used Google recently will attest to. All too often, though, website queries on eCommerce sites fall short of expectations. If you don't know exactly what to type, finding the items you're looking for might be frustrating. In the age of big data and machine learning, there is no justification for this. When intelligent techniques are used appropriately, intelligent searches are a breeze to execute.
Managing supply and demand.	It's all about production and consumption in eCommerce, just as it is in many other sectors of the economic world. It is your responsibility as an online merchant to guarantee that you have the proper inventory in the right quantities to meet the demands of your customers. Those needs alter with time, as do the circumstances [6]. As a result, the greater your inventory and supply chain management, the more active you can be. Therefore, demand forecasting is extremely important to online retailers. Your competitive edge comes from being able to anticipate shifting consumer demands. In order to produce these real-time, precise predictions, you need to use deep learning techniques.
Churn prediction.	Business-to-business (B2B) companies frequently discuss customer turnover. In other words, it's the pace at which customers quit a brand in favor of the other. E-commerce is also a viable option. Clearly said, selling to an existing customer is easier. Because of this, internet merchants find recall marketing to be quite useful. But what if you could enhance your marketing approach by anticipating which clients are most likely to leave? Machine learning provides this potential [7].

Scam detection.	Many people today believe that eCommerce scam is a thing of the past. However, you'd be incorrect in your assessment of this situation. As scam costs online merchants more and more money, this trend is expected to continue. Scam detection and prevention are thus vital operations for any online shops. As a result of deep learning techniques, these procedures may be accelerated and made more effective.
Improved customer service.	A customer care strategy is a priority for all e - commerce firms, regardless of their size. Describe the characteristics of world-class customer care. In today's competitive retail environment, customer service must be provided when and how the customer wants it. The hiring of additional employees is one approach to provide 24-hour, omni-channel assistance. Even for the biggest companies, however, this is not always possible.

Familiarize yourself with anything related to deep learning.	First, you must grasp the possibilities of deep learning. That involves spending the time necessary to investigate the current status of the technology in order to make an informed decision. Research AI-enabled technologies and how machine learning may enhance procedures.
Profit from third-party knowledge and experience.	Ask current specialists in the subject for assistance, especially if you can't uncover all the answers yourself. You may also ask a professional for some general guidance. An engineer with machine learning expertise might be hired for further in-depth work. This means that they'll be capable of managing adoption throughout your business.
Identify the challenges that you would like deep learning to help you with and describe them.	You must first identify your goals before implementing any technology solutions. For machine learning, it's the same store. To simplify your eCommerce shop is not enough [10]. You must establish specific goals. This means that your official website has a high conversion rate, for example. If you want to minimize the conversion rates, you may do so by improving your personalization. Such a goal can be achieved with the aid of a machine learning-based solution.
Recognize that you have a technological and capacity gap.	When doing this step, it's preferable to do it in conjunction with the one before it. Your organization's abilities should be taken into consideration while setting your machine learning objectives. Be realistic about your workforce and technical capabilities [11]. Adoption of many machine learning systems is rather easy. However, this isn't always the case. Machine learning applications, on the other hand, should be approached with caution.
Create a team dedicated to implementing machine learning technology.	You may begin the adoption of machine learning by setting clear, attainable goals. An organized procedure may be maintained by creating a team. It keeps your present personnel from being overburdened with tasks. He or she also makes sure that he or she attracts the recognition he or she needs.
The terms measure and scale are used interchangeably in this.	If you're going to implement a new machine learning technology, you should start small. To learn how to use a new tool or software, begin by analyzing a small, specialized data set. Using this method, you may test the conclusions you've drawn, your forecasts, or your outcomes. As soon as you're satisfied with the performance of your new machine learning application, you may scale that up. In addition, by demonstrating its effectiveness at a shorter length, you'll be able to get the support of important groups. When the adoption rate is increased, it will be easier to get their support.

CHALLENGE FOR DL IS PRICING FOR PRODUCTS

They are influenced by a variety of things and can change widely. Due to the large number of goods and variations, as well as the hundreds of elements involved in their pricing, it is sometimes impossible for humans to determine the best prices quickly and completely [12]. Three among the most frequent price setting strategies employ dynamic pricing:

- It allows prices to be adjusted dynamically in response to company expenditures, while maintaining profitability at a specific level.
- Pricing based on competitors takes into consideration pricing decisions made by competitors.
- As customer demands grows and supply decreases, prices rise.

E-commerce companies may get a competitive edge by employing DL prediction models to find the optimum price for each commodity.

Fraud is a threat to e-commerce firms. Payment fraud results in charge backs, which are only the beginnings of its negative effects. Reputational harm may ruin a reputation of the company forever in specific situations. In order to prevent fraudulent activities from occurring, anomaly detection DL models can analyze the repetitious, tiresome information at a quick rate. Only one transaction of importance may be retrieved from a sea of transactions.

In the world of e-commerce, providing great customer service may be a challenge. Bots that use machine learning to learn can address the problem. Bots that utilize speech recognition to engage with customers, detect problems, and

resolve them are known as intelligent chatbots. Users' inquiries can be interpreted by them, and they can answer to each one personally [13]. Users of e-stores can benefit from virtual assistants by imitating the most successful advisers. Data is derived from the website and presented to customers. In addition, bots are frequently employed to update customers via instant messaging services.

These are only a few examples of DL uses in e-commerce, but the possibilities are endlessly varied. Difficulty learning is no anymore a frightening black box thanks to tools such as Amazon's AI services, Google's AutoML, and Microsoft's Cognitive Services. Now is a great moment to use it in an E-commerce business.

DEEP LEARNING AND THE CUSTOMER EXPERIENCE

The use of deep learning in eCommerce helps firms to provide a more customized experience for customers. It is no longer an option for people to interact with their favorite companies on an individual basis, but rather, they demand it [14].

Businesses can personalize each contact with their consumers using artificial intelligence and machine learning, resulting in a better result for their customers.

Businesses may decrease customer service issues before they arise by utilizing deep learning. This should lead to a decrease in cart desertion percentages as well as an uptick in sales [15]. In addition, customer care bots are able to respond to inquiries 24 hours a day, seven days a week, without bias.

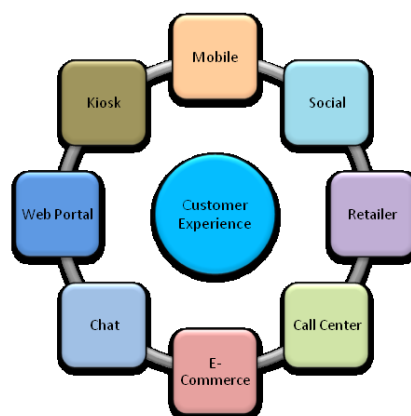


Fig 2. Customer Experience in Deep learning

DEEP LEARNING IN ECOMMERCE – INSIGHTS UP FRONT

Current DL applications that top industry leaders are employing most often include: [16]

- **Chatbots/AI assistants:** Natural language engagements include replying to client questions, reacting to voice instructions for simple activities, and offering product suggestions.
- **Smart logistics:** Data is being analyzed using machine learning techniques to enhance inventory management.
- **Recommendation engines:** Customer activity on websites is being analyzed by companies, which are employing techniques to forecast which goods would be popular with consumers as well as provide suggestions.

In this section, we'll examine the DL applications of each eCommerce business. We'll start with Amazon, the number one eCommerce company.

Amazon Deep learning – Amazon Go

Prime Now and Amazon Go are both new initiatives that are part of the company's larger food drive, as seen by its projected \$14 billion purchase of Whole Foods Market. "When products are removed from or returned to shelves," the business says, using deep learning and computer vision and sensor technology. A digital shopping cart keeps track of items, and clients are paid through their Amazon accounts. As a result of this procedure, a typical check-out system would be eliminated. Amazon's headquarters in Seattle, Washington, inaugurated its first Amazon Go shop in December 2016. However, a project of this nature is not without its difficulties. Over 15-20 consumers at a time were reported to be having technical issues with the program. A small shop architecture and a specific number of public employees on location to oversee processes and give tech assistance may be required as Amazon attempts to enhance its business.

Machine learning – Recommendation Engine

Alexa, which has been around for a few years, is Amazon's most prominent AI application. It's much less obvious and much more fundamental to the company's operations, however, that AI is one of its most lucrative uses. In Amazon's

focused marketing approach, machine learning is at the heart of its technologies, which enable the business to anticipate which goods would be most appealing to buyers and to give personalized suggestions based on their queries. Amazon's recommendation system is believed to be responsible for 40 per cent of all purchases.

EBay AI assistant – eBay Shop Bot

It is a successful eCommerce firm that is aiming to employ artificial intelligence to retain customer engagement and a competitive advantage. It was originally trialed in October 2016 as an eBay Shop bot, a chat bot accessible through Facebook Messenger. Using natural language, the bot acts as an AI assistant to help consumers locate goods of relevance. Users may connect with the chat bot by text, speech, or by taking photographs of images relevant to a certain product with their smartphones. There is no public indication that the chat bot is a substantial income generator for the firm. As a result, eBay's business plan appears to include deep learning.

CONCLUSION

The Research explores DL is gaining traction in the retailing industry's eCommerce market, where it is being used to handle customer support inquiries, goods packing and shipping, and internal processes. Machines that can understand without human intervention were formerly considered scientific fiction. It has become very much a part of everyday life. And their influence is just rising. If your ecommerce company isn't on line with machine learning, you're falling ahead. After all, the benefits of technology to your industry are vast. Machine learning can improve everything from customer service to inventory management. Utilizing technologies in the field is also simpler than you would imagine. In this study, we compare Deep Learning and its novel applications. In this research, we have also gone through the methods for implementing Deep Learning (DL) in e-commerce firm, as well as use cases for e-commerce deep learning. We also investigate the difficulty for DL in product pricing and the

consumer experience, as well as Deep Learning in eCommerce - Insights Up Front.

REFERENCES

1. C. Fourie, "Deep learning? What deep learning?", South African Journal of Higher Education, vol. 17, no. 1, 2003. Available: 10.4314/sajhe.v17i1.25201.
2. "Systematic Review on Machine Learning and Deep Learning Approaches for Mammography Image Classification", Journal of Advanced Research in Dynamical and Control Systems, vol. 12, no. 7, pp. 337-350, 2020. Available: 10.5373/jardcs/v12i7/20202015.
3. "Voice Based Retrieval using Convolution Neural Network in Deep Learning", International Journal of Innovative Technology and Exploring Engineering, vol. 8, no. 12, pp. 1829-1831, 2019. Available: 10.35940/ijitee.I2857.1081219.
4. [4] R. Zitar, A. EL-Hassan and O. AL-Sahlee, "Deep Learning Recommendation System for Course Learning Outcomes Assessment", Journal of Advanced Research in Dynamical and Control Systems, vol. 11, no. 10-, pp. 1491-1478, 2019. Available: 10.5373/jardcs/v11sp10/20192993.
5. M. Pawłowski, "Machine Learning Based Product Classification for eCommerce", Journal of Computer Information Systems, pp. 1-10, 2021. Available: 10.1080/08874417.2021.1910880.
6. Y. Yalan and T. Wei, "Deep Logistic Learning Framework for E-Commerce and Supply Chain Management Platform", Arabian Journal for Science and Engineering, 2021. Available: 10.1007/s13369-021-05894-z.
7. M. Pondel et al., "Deep Learning for Customer Churn Prediction in E-Commerce Decision Support", Business Information Systems, pp. 3-12, 2021. Available: 10.52825/bis.v1i.42.
8. R. W. C., "Evaluating and Adopting e-Learning Platforms", International Journal of e-Education, e-Business, e-Management and e-Learning, 2013. Available: 10.7763/ijeeee.2013.v3.229.
9. M. Bourne, "Six steps to improving your planning and budgeting system", Measuring Business Excellence, vol. 9, no. 1, 2005. Available: 10.1108/mbe.2005.26709aab.001.
10. Jain, A. Yadav and Y. Shrivastava, "Modelling and optimization of different quality characteristics in electric discharge drilling of titanium alloy sheet", Materials Today: Proceedings, vol. 21, pp. 1680-1684, 2020. Available: 10.1016/j.matpr.2019.12.010.
11. A. Jain and A. Kumar Pandey, "Modeling And Optimizing of Different Quality Characteristics In Electrical Discharge Drilling Of Titanium Alloy (Grade-5) Sheet", Materials Today: Proceedings, vol. 18, pp. 182-191, 2019. Available: 10.1016/j.matpr.2019.06.292.
12. A. Jain and A. Pandey, "Multiple Quality Optimizations in Electrical Discharge Drilling of Mild Steel Sheet", Materials Today: Proceedings, vol. 4, no. 8, pp. 7252-7261, 2017. Available: 10.1016/j.matpr.2017.07.054.
13. V. Panwar, D. Kumar Sharma, K. Pradeep Kumar, A. Jain and C. Thakar, "Experimental investigations and optimization of surface roughness in turning of en 36 alloy steel using response surface methodology and genetic algorithm", Materials Today: Proceedings, 2021. Available: 10.1016/j.matpr.2021.03.642 [Accessed 27 July 2021].
14. K. Mehta and S. Panda, "Customer Reviews' Sentiments Analysis using Deep Learning", International Journal of Computer Applications, vol. 175, no. 30, pp. 27-31, 2020. Available: 10.5120/ijca2020920842.
15. S. Ramaswamy and N. DeClerck, "Customer Perception Analysis Using Deep Learning and NLP", Procedia Computer Science, vol. 140, pp. 170-178, 2018. Available: 10.1016/j.procs.2018.10.326.

16. M. Hettich, "Algorithmic Collusion:
Insights from Deep Learning", SSRN

Electronic Journal, 2021. Available:
10.2139/ssrn.3785966.