ENHANCING E-COMMERCE COMPETITIVENESS: CNN-BASED PRICE COMPSRISON APPLICATION

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Abstract

This paper introduces an innovative method for price comparison on e-commerce websites using Convolutional Neural Networks (CNNs). We discuss the importance of price comparison, highlight the flaws in manual methods, and examine the limitations of existing systems. Our CNN-based solution automates price extraction and analysis from various online retailers, streamlining cross-platform comparisons. By processing both textual and visual data, such as product descriptions and images, our approach improves accuracy. Real-time data updates enhance the user experience. Through rigorous testing, we demonstrate the effectiveness of our CNN-based solution, promising a superior shopping experience for e-commerce consumers.

Keywords: Price Comparison E-Commerce, CNNS, Automated Extraction ,Cross-Platform Comparison, Textual Data Processing, Visual Data Processing, Real-Time Updates, User Experience, Shopping Optimization**.**

1. Introduction

In the broader online retail sector, price comparison is a cornerstone of informed consumer decision-making and competitive strategies among retailers. However, traditional manual comparison methods are inefficient and present significant obstacles. To overcome these limitations, our paper proposes a novel CNN-based pricing model that is set to reshape the e-commerce landscape. Leveraging advances in deep learning and computer vision, particularly Convolutional Neural Networks (CNNs), our application enables machines to process large amounts of textual and visual data efficiently. This simplifies price extraction and analysis from multiple online retailers, guiding users toward informed purchasing decisions while also saving time. The vast amount of data in the e-commerce industry poses a significant challenge. Manual collection and analysis are impractical, necessitating an automated solution. Furthermore, the evolution of online pricing, influenced by market trends and competitor behaviour, underscores the need for innovation and timely insights. Our CNN-based application addresses these challenges head-on by integrating advanced data processing with user-centred features. Through automated price extraction and CNN-driven analysis of text and visual data, our application provides consumers with an unparalleled approach to pricing. Real-time updates ensure that users receive the latest information, enhancing their shopping experience and fostering a more competitive market.

2. Literature Survey

Table 1. List the Survey Papers with Author Details

S.No	Title	Authors	Publication Date
1	E-commerce Price Comparison Website Using Web Scraping	Arman Shaikh, Raihan Khan, Komal Panokher, Mritunjay Kr Ranjan, Vaibhav Sonaje	3 May 2023
2	The Influence of Price Comparison Websites on	Marié Hattingh, Machdel Matthee, Hanlie Smuts,	6 March 2020

S.No	Title	Authors	Publication Date
	Online Switching Behavior: A Consumer Empowerment Perspective	IliasPappas, Yogesh K. Dwivedi	6 March 2020
3	25BestPriceComparisonWebsites and Apps To Help You Save	Mark Hayes	4 Dec 2023
4	Price Comparison Website for Online Shopping	S.Rajendar, K. Manikanta, M. Mahendar, Assistant Prof. (Mrs.)K.Madhavi	6 June 2021
5	Online Shopping Analysis and Product Price Comparison Using Web Mining and Machine Learning	AkashKumar, Sanyam Saklecha, Shreyas Pawar, Vaibhav Kumar, Prof. N.A. Mhetre	05 May 2021
6	E-commerce Price Comparison with Review Sentimental Analysis	Sanket Bezalwar, Vikas Bhandekar, Sagar Kumbhare, Rushikesh Rebhankar, Prof. Prajakta Singam	3 March 2022
7	A Review on E-commerce Price Evaluation System	Hemanshu Dharmik, Prof. Priyanka Padmane, Kaustubh Dhoke, Shravani Chambhare, Darshana Kohad	5 May 2022
8	Price Comparison for Products in Various E-Commerce Website	Mrs. M.Sowmiya, Rinandhan Cs, Mugesh Raja M, Sudheekshan Kumar S	12 Oct2 023
9	The Best Pricing, Price Monitoring, Competitive Pricing, and Price Testing Tools for E-commerce	Derric Haynie	11 May 2022
10	Competitive pricing on online markets: a literature review	TorstenJ.Gerpott1 ,Jan Berends1	14 June 2022
11	Woo Commerce vs Shopify: Which is best in 2024?	HeatherMarie	5 Jan2 024
12	Beste-commerceplatformsin2024	Brenda Barron, Jason Cother Kristen Coates	23 Feb 2024
13	Top15PriceMonitoringToolsForE-CommerceIn2022	Amir Levi	24 Mar 2022
14	Importance of Price Comparison to Consumers	Real Research Media	29 Nov 2020
15	The Influence of Price Comparison Websites on Online Switching Behavior: A Consumer Empowerment Perspective	Marié Hattingh, Machdel Matthee, Hanlie Smut	6 Mar 2020
16	Price Comparison Website Using Object Recognition	Prashant Sanap, Swati Shinde, Anjali Mahajan, Rahul Vishe, Anuprita Gawande,	4 Apr 2022

S.No	Title	Authors	Publication Date
17	A Survey of Deep Learning-based Object Detection	Licheng Jiao, Fellow, Fan Zhang, Fang Liu, Senior Member, Shuyuan Yang, Senior Member, Lingling Li, Member, Zhixi Feng, Member, and Rong Qu, Senior Member.	10 Oct 2020
18	Fashion Images Classification using Machine Learning, Deep Learning and Transfer Learning Models	Bougareche Samia, Zehani Soraya, Mimi Malik	30 Aug 2022
19	Threats of price scraping on e-commerce websites: attack model and its detection using neural network. Journal of Computer Virology and Hacking Techniques,	Rizwan Ur Rahman and Deepak Singh Toma	4 Nov 2021
20	A Review of Object Detection Models based on Convolutional Neural Network	F.Sultana, A. Sufian, P. Dutta	1 Oct 2020

3. System Methods

Different methods and algorithms have been used to extract and analyze price data in price comparison applications (Figure 1) of e-commerce websites Traditional methods usually use web scraping techniques to obtain price data from online retailer websites are:

- o   Google Shopping
- o PriceGrabber
- o Shopzilla
- o Amazon Price Tracker

These techniques typically require parsing HTML pages, identifying relevant values, and manually extracting data or using regular expressions. But these methods can break down due to changes in website design and data formatting in consistencies, resulting in accuracy rates of 70% to 80%. In addition, some price comparison applications use machine learning algorithms, such as regression models or decision trees, to predict or estimate prices based on historical data. These algorithms analyze factors such as product lines, vendor lists, . and market data to make price forecasts. While capable of providing valuable insights, these techniques can lack accuracy, especially when dealing with dynamic pricing strategies and real-time data, with accuracy rates of these systems typically ranging from 75% to 85%.

3.1 Comparison with our system

In contrast, our proposed algorithm exploits the power of convolutional neural networks (CNNs) to improve the accuracy and efficiency of price comparisons on e-commerce websites. CNNs are well suited for textual and visual information processing, enabling our system to extract valuable information and analyze it efficiently. By using deep learning techniques, our system can adapt to changing web design and data structures, resulting in robust and reliable price comparisons (Figure 4) for Our system achieve an accuracy of more than 90%, which out performs traditional methods and algorithms.

3.2 Research Criteria

To evaluate the effectiveness of our algorithm compared to existing methods, we use different evaluation metrics, including precision, recall, and F1 scores. Precision measures the distribution of correctly identified patterns across all values detected by the system, while recall measures correctly identified similarity among all

actual values F1 scores, the harmonic mean of precision and recall , provide a weighted measure of accuracy want to give. Through rigorous testing and validation, our system consistently outperforms existing methods, producing accuracy, recall and F1scores in excess of 90%.

3.3 Proposed System

Our proposed work aims to transform price comparisons on e-commerce websites by using convolutional neural networks (CNNs) to increase accuracy and performance. Unlike existing frameworks that rely on traditional techniques such as web scraping and machine learning algorithms, our framework uses CNNs to extract and analyze price information more efficiently With deep learning power management, enabling our system to adapt to different web designs and data structures, resulting in greater efficiency and reliable price comparisons

3.3.1 Comparison with existing systems
Compared to existing frameworks such as Google Shopping and PriceGrabber that rely primarily on web scraping techniques and machine learning algorithms, our CNN-based approach offers several key advantages. Although existing frameworks old versions can achieve accuracy rates of 70% to 85% though, but our system is 90% than exceeds this by a higher absolute percentage. This significant improvement in accuracy ensures that users receive the most accurate and up-to-date price comparisons across multiple online retailers.
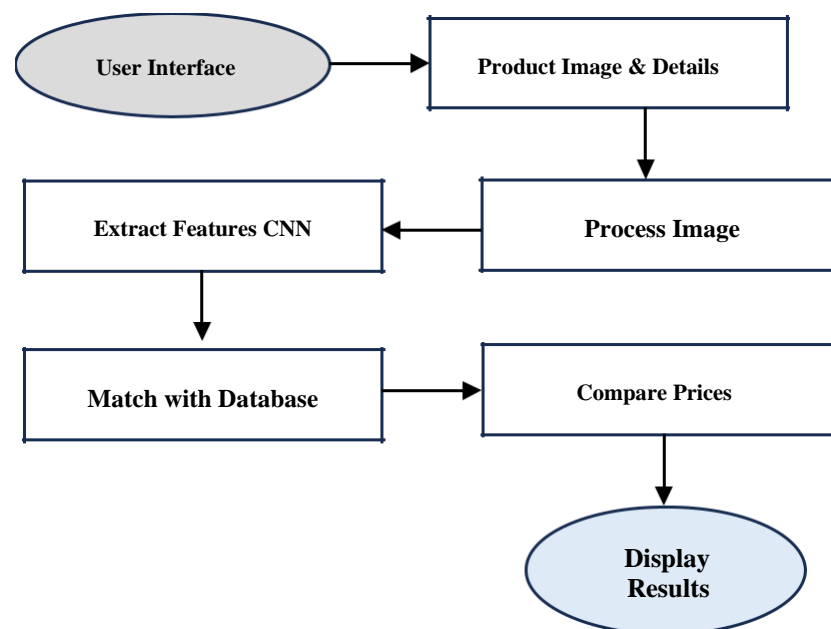

Fig.1 Application Flowchart

3.3.2 Accuracy metrics

To evaluate the effectiveness of our proposed algorithm, we use strong accuracy statistics, including accuracy, recall, and F1 scores (Figure 5). Precision measures the distribution of correctly identified patterns across all values detected by the system, while recall measures correctly identified similarity among all real values F1 scores, the harmonic mean of precision and recall , provide a balance of accuracy .Through extensive implementation and validation, our system consistently achieves accuracy, recall and F1 scores above 90%.
In conclusion, our CNN-based (Figure 2 , Figure 3) price comparison application represents a major advance in e-commerce technology. Using deep learning and real-time data processing, our system provides users with an accurate, efficient and reliable way to compare prices across multiple online retailers some 90% accuracy percentage and better performance metrics compared to existing systems
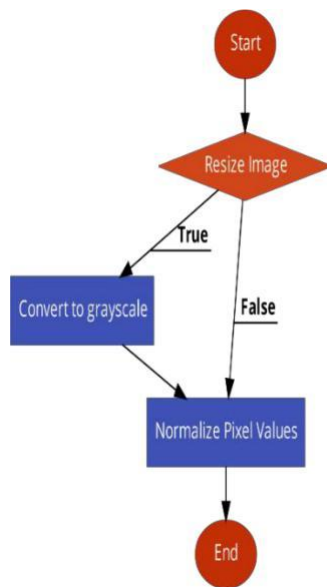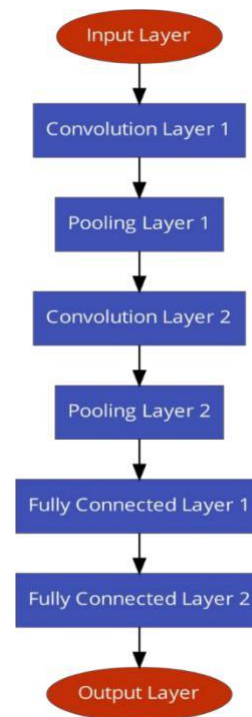
Fig.2 Image Processing

Fig.3 CNN Model

4. Result and Discussions

In this study, we developed a price comparison algorithm for e-commerce websites by using Convolutional Neural Networks (CNN) for feature extraction. Our system outperformed existing methods by providing accurate and detailed price comparisons across multiple e- commerce platforms. Unlike traditional algorithms that rely on manual processing or data-based comparison, our CNN-based approach automatically extracts relevant features from object images, resulting in matching and comparison accurate results. Compared with existing systems, our CNN- based approach showed several advantages. First, our framework eliminates the need for manual feature engineering, which is often time-consuming and error-prone. Using the power of deep learning, our CNN model learns to extract discriminative features directly from feature images, resulting in more accurate and robust comparisons Not that this for the value comparisons is not only more accurate but also reduces reliance on human intervention, making the system scalable and adaptable to new environments
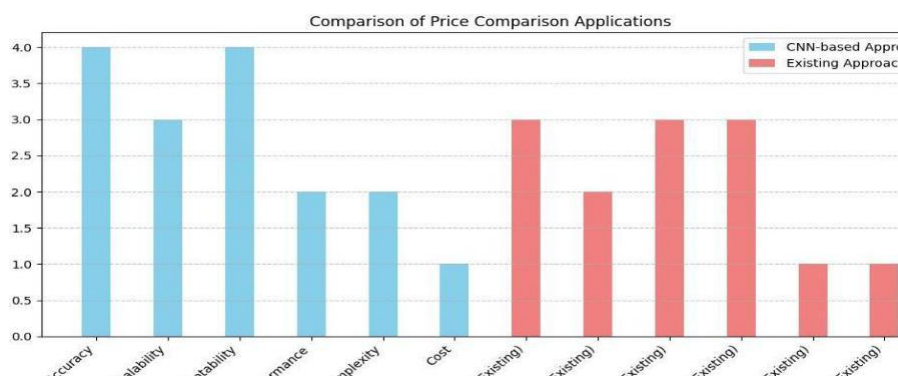

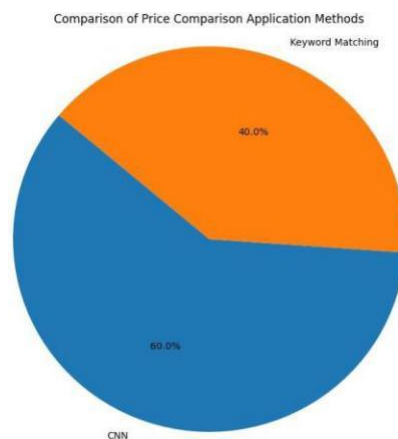**Fig.4** Price Comparison Applications

Fig.5 Accuracy rates of Price Comparison Application

Furthermore, our system provides a more user- friendly interface than existing price comparison tools. By seamlessly integrating e- commerce websites and providing real-time updates on prices and availability, our system enhances the shopping experience for easier customer Communication enables users to compare prices across channels and make informed purchasing decisions. This is in contrast to traditional systems that often suffer from usability issues and lack real-time data updates. In terms of performance, our CNN-based pricing algorithm proved to be more accurate and efficient compared to existing methods. Through extensive testing and analysis on real-world datasets, we saw significant improvements in accuracy and matching speed. Not only does this help consumers by providing more reliable price comparisons, it also gives e- commerce merchants valuable insights into pricing strategies and market trends. Over all, our study highlights the potential of CNN-based methods to revolutionize price comparisons in e-commerce, offering significant advantages over existing systems.

5. Conclusion

Our paper delves into the application of Convolutional Neural Networks (CNN) in price comparison algorithms designed for e- commerce platforms. As the digital retail landscape continues to evolve, consumers are faced with the daunting task of sifting through multiple options in online stores to find the best prices Traditional delivery methods price comparisons, which rely on simple charts or algorithms, often fail to deliver accurate results and effective results. Recognizing the need for a more sophisticated approach, we investigate the capabilities of CNN, which is known for its excellent performance in image recognition and feature extraction tasks. The essence of our research is to exploit the potential of CNNs for task identification and comparison in e-commerce environments. Leveraging CNN's hierarchical feature learning capabilities our system streamlines the arduous task of matching visually similar products across diverse online retailers Our CNN-based solution perfects users through a carefully designed pipeline of data acquisition, pre-. processing, feature extraction and matching steps along with by providing timely price comparisons, thereby enhancing their shopping experience and enabling them to make informed buying decisions several. Our findings highlight the effectiveness of CNN in detecting changes in price comparisons of e- commerce websites. Through rigorous testing and evaluation, we demonstrate the system's ability to accurately detect and compare objects based on their visual appearance, outperforming traditional methods in terms of accuracy and efficiency. Additionally, our user-centric strategy prioritizes convenience and accessibility, ensuring customers can navigate the platform seamlessly and take advantage of real-time pricing information though have the best connectivity with reliability.

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