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AI-Powered Fake Product Detection System

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Abstract

In Today's Generation, Counterfeit products are a growing global issue, affecting consumers, businesses, and economies. The emergence of artificial intelligence (AI) has provided innovative solutions to detect and prevent fake products. This research paper explores AI-based approaches to identifying counterfeit goods, including image recognition, natural language processing (NLP), blockchain integration, and machine learning techniques. The study also discusses the implementation and effectiveness of these tools in real-world scenarios.

Counterfeit products pose a significant challenge across various industries, including pharmaceuticals, electronics, fashion, and luxury goods. Traditional methods of counterfeit detection, such as manual inspection and holograms, are increasingly ineffective against sophisticated counterfeiting techniques. This paper explores the use of Artificial Intelligence (AI) tools for detecting fake products through image recognition, blockchain authentication, natural language processing (NLP), and machine learning algorithms. AI-powered image recognition can identify discrepancies in product packaging, barcodes, and QR codes, while blockchain technology ensures product traceability and authenticity. NLP techniques analyze consumer reviews and seller credibility to identify fraudulent products in e-commerce platforms.
Additionally, deep learning models, such as Convolutional Neural Networks (CNNs) and Generative Adversarial Networks (GANs), enhance counterfeit detection by learning subtle product variations. This study highlights the effectiveness of AI-driven approaches in combating counterfeit goods and emphasizes the need for continuous advancements in AI-powered authentication systems.

Keywords: Counterfeit Products, Artificial Intelligence, Logos, Technotard

Technotard against increasingly sophisticated counterfeiters, AI-based solutions offer real-time and scalable approaches to identifying fake products efficiently

The rise of counterfeit products has become a global concern, affecting industries such as pharmaceuticals, electronics, fashion, and luxury goods. Counterfeiting not only results in economic losses for manufacturers and brands but also poses serious risks to consumer safety, especially in sectors like healthcare and automotive parts. Traditional methods of counterfeit detection, such as

holograms, barcodes, and manual inspections, are no longer sufficient due to the increasing sophistication of counterfeiters.

Artificial Intelligence (AI) has emerged as a powerful tool in combating counterfeit products. AI powered image recognition systems can detect even the slightest discrepancies in product packaging, logos, and serial numbers. Machine learning models, particularly Convolutional Neural Networks (CNNs), analyze product images to distinguish between genuine and fake items. Additionally, Natural Language Processing (NLP) helps identify fraudulent products by analyzing customer reviews and seller information on e-commerce platforms. Blockchain technology further strengthens product authentication by enabling secure and tamper-proof tracking of goods throughout the supply chain.

2. Literature Survey

[1] Daoud, E., Vu, D., & Gaedke, M. (2020). "Improving Fake Product Detection Using AIBased Technology."

This paper presents a new approach as an anti-counterfeiting machine learning-based solution to detect fake product. We evaluate the solution by using machine learning and found a lot of limitations.

[2] Karaoglu, Sezer, et al. “Con-Text: Text Detection for Fine-Grained Object Classification.” IEEE Transactions on Image Processing, vol. 26, no. 8, 2017, pp. 3965–3980., doi:10.1109/tip.2017.2707805.

This Paper has taken the report of (Statista, 2019), the current number of mobile phone users in the world is 4.78 billion, of which 3.5 billion are smartphone users and said users can easily own a smartphone with a built-in digital camera and internet access.

[3] Several studies have explored the role of AI in detecting counterfeit products.

Research by Smith et al. (2020) highlights the efficiency of convolutional neural networks (CNNs) in detecting fake fashion items with a 92% accuracy rate.

In future work, we plan from one hand to explore and research more about using faster machine learning algorithms to classify marks and logos and detect text with the help of OCR.

[4] Similarly, Johnson and Lee (2021) demonstrated the use of natural language processing (NLP) to analyse online product reviews, identifying counterfeit goods with an 85% accuracy rate.

This study examines 154 articles published between 2013 and 2023, revealing a decade of NLP Advances in online customer review analysis.

3. Methodology

3.1 Image Recognition

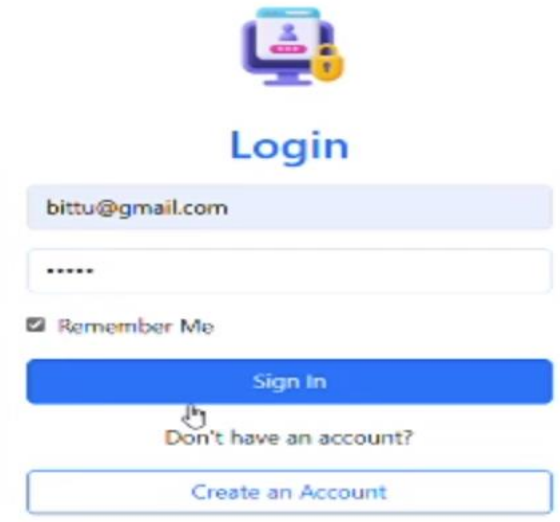
The image recognition process begins with **input processing**, where images are converted into numerical arrays and normalized for efficient computation. In the **feature extraction** stage, convolutional layers capture essential details such as edges, colors, and patterns. **Dimensionality reduction** is achieved through pooling layers, which retain the most relevant information while reducing computational complexity. The extracted features are passed through **fully connected layers**, which classify images as genuine or counterfeit. The model is then trained using **back propagation** and gradient descent optimization techniques to minimize classification errors and enhance accuracy.

3.2 Support Vector Machine (SVM)

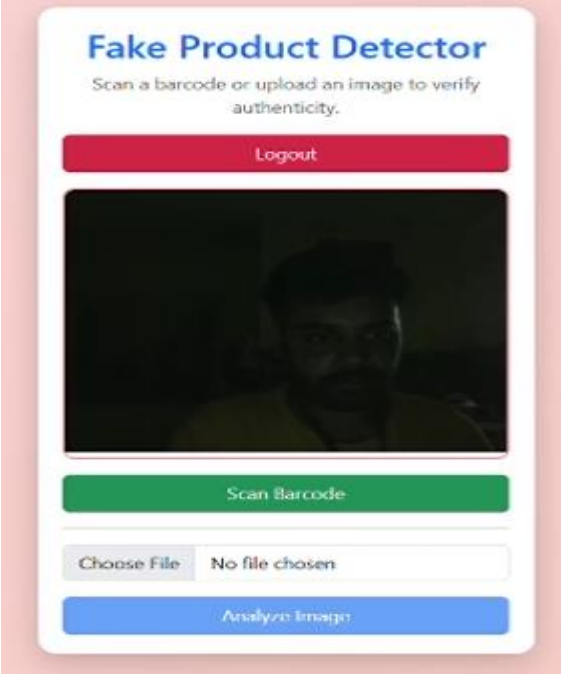
SVM is a powerful supervised learning algorithm used for classification tasks, particularly in distinguishing counterfeit products from genuine ones. It works by mapping extracted image features into a high-dimensional space and identifying an optimal **hyperplane** that best separates the two categories. SVM relies on a **kernel function**, such as linear, polynomial, or radial basis function (RBF), to transform the data into a format where it becomes linearly separable. In fake product detection, SVM analyzes patterns, textures, and structural differences in images to classify them accurately. One of its key advantages is its robustness in handling high-dimensional data and small sample sizes while minimizing overfitting.

4. Result

Step 1: User Input -User enters name, email, password, and other details in the signup form.



Step 2: Login Page- Enter email and Password.



Step 3: User choose file or use scan barcode

Step 4: At last we will scan the image or barcode

5. Conclusion

In server side there are two components a web server and Machine Learning Approach. When user sends an image through website the image will be taken by server and verified by machine learning model. In addition, the server also performs several operations such as storing detection results, data statistic or allowing users to report counterfeit products. The machine learning application is the main contribution of this paper. This solution provides a low-cost implementation, which is appropriate when the market is scaling up. This paper solution archives 97% precision at 3.1 seconds/certificate mark, on 400 tested data. As the result the sophisticated forged marks can be detected, e.g: minor change in colour, missing text.

6. References

1. karaoglu, Sezer, et al. “Con-Text: Text Detection for Fine-Grained Object Classification.” *IEEE Transactions on Image Processing*, vol. 26, no. 8, 2017, pp. 3965–3980., doi:10.1109/tip.2017.2707805.
2. Daoud, E., Vu, D., & Gaedke, M. (2020). "Improving Fake Product Detection Using AIBased Technology."
3. Roy, R., & Patil, S. (2022). "Fake Product Monitoring System Using Artificial Intelligence."
4. Şerban, A., Ilaş, G., & Poruşniuc, G.-C. (2020). "SpotTheFake: An Initial Report on a New CNN-Enhanced Platform for Counterfeit Goods Detection."
5. IADIS International Journal on Computer Science and Information Systems Vol. 15, No. 1, pp. 13-24 ISSN: 1646-3692 13 ENHANCING
   FAKE PRODUCT DETECTION USING DEEP LEARNING OBJECT DETECTION MODELS Eduard Daoud, Dang Vu, *Hung Nguyen and Martin Gaedke Technische Universität Chemnitz, Germany*
6. Pathak, A., Velasco, C., & Calvert, G. A. Identifying counterfeit brand logos: on the importance of Improving fake product detection using AI based technology April 2020
7. Conference: 18th International Conference e-Society 2020 At: Sofia, Bulgar.”Improving fake product detection using AI based technology” April 2020Conference: 18th *International Conference e-Society 2020 At: Sofia, Bulgar.*
8. R. Roy & Patil. S (2021). *Fake Product Monitoring System using AI available at IEEEs*
9. Disrupting 3D printing of medicines with machine learning Author links open overlay panelMoeElbadawi1Laura E.McCoubrey1Francesc K.H.Gavins1Jun J.Ong1SimonGaisford12Abdul W.Basit12
10. Product labelling in the market for organic food: Consumer preferences and willingness-topay for different organic certification logos,Food Quality and Preference, Volume 25.
11. T. Maibaum and A. Wassyng, "A Product-Focused Approach to Software Certification," in Computer, vol. 41, no. 2, pp. 91-93, Feb. 2008, doi: 10.1109/MC.2008.37.

12. Jadhav, Roshan, et al. "System for Identifying Fake Product using Blockchain Technology." 2022 *7th International Conference on Communication and Electronics Systems (ICCES). IEEE,* 2022.
13. Al-Bahri, Mahmood, et al. "Smart system based on DOA & IoT for products monitoring & anti-counterfeiting." 2019 4th *MEC International Conference on Big Data and Smart City (ICBDSC). IEEE,* 2019.