IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁙ Peer-reviewed & Refereed journal ⁙ Vol. 13, Issue 4, April 2026

DOI: 10.17148/IARJSET.2026.13415

Fake Logo Recognition and Brand Forgery Detection Using Deep Convolutional Classification Models

Mrs. J. Mounika[1], M. Vishnuvardhan[2], L. Arjuna Rao[3],

M. Bala Siva Sankar Reddy[4], O. Jagadeesh[5]

Assistant Professor, Department of Information Technology,

KKR & KSR Institute of Technology and Sciences, Guntur, AP, Inida[1]

Student, Department of Information Technology,

KKR & KSR Institute of Technology and Sciences, Guntur, AP, Inida[2-5]

Abstract: In the digital age, the proliferation of counterfeit goods has led to an increasing need for reliable methods to detect fake logos, which often signify counterfeit products. To address this challenge, this project attempts to develop a robust Fake Logo Detection System which exploits advanced machine learning. A convolutional neural network (CNN) is used to analyze and categorize logo pictures and differentiate genuine logos versus fraudulent ones with high accuracy. The approach involves collecting a diverse dataset of authentic and fake logos, preprocessing the images to enhance quality and consistency, and training the CNN model on these datasets. Key steps include data augmentation to improve model generalization, feature extraction to identify distinguishing characteristics of logos, and fine-tuning the network to optimize performance. The system's effectiveness is evaluated through rigorous testing and validation, ensuring it can handle various logo designs and counterfeiting techniques. The ultimate goal is to provide a scalable and efficient solution for businesses and consumers to verify logo authenticity, thereby reducing the impact of counterfeiting and protecting brand integrity. By integrating deep convolutional classification models into brand protection systems, organizations can significantly improve counterfeit detection accuracy. This approach not only saves time and cost but also strengthens intellectual property protection. The solution is adaptable and can be extended to support multiple brands, making it suitable for real-world deployment in e-commerce, supply chain inspection, and digital content monitoring.

Index Terms: Fake Logo Detection, Brand Forgery, Counterfeit Products, Deep Learning, Convolutional Neural Networks (CNN), Image Classification, Computer Vision, Logo Recognition, Brand Authentication, Pattern Recognition

I. INTRODUCTION

In today's global and digital marketplace, brand identity plays a crucial role in establishing trust between companies and consumers. Logos act as visual signatures that represent a brand's authenticity, quality, and reputation. However, the rapid growth of e-commerce platforms and digital media has significantly increased the circulation of counterfeit products and forged brand logos. Fake logos not only cause major financial losses to organizations but also mislead customers and damage brand credibility.

Traditional methods of detecting counterfeit logos rely heavily on manual inspection or rule-based image analysis techniques, which are time-consuming, error-prone, and in- effective when dealing with large-scale data. Variations in logo appearance due to changes in color, size, orientation, background, and partial occlusion further complicate accurate detection. As a result, there is a growing need for automated and intelligent systems capable of recognizing forged logos with high accuracy and reliability.

Deep learning, particularly Deep Convolutional Neural Net- works (CNNs), has demonstrated exceptional performance in image classification and pattern recognition tasks [1], [2]. CNN-based models automatically learn complex visual features from images, making them well-suited for distinguishing subtle differences between genuine and fake logos. By lever- aging deep convolutional classification models, it is possible to build robust systems that can detect brand forgery even under challenging visual conditions.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2026

DOI: 10.17148/IARJSET.2026.13415

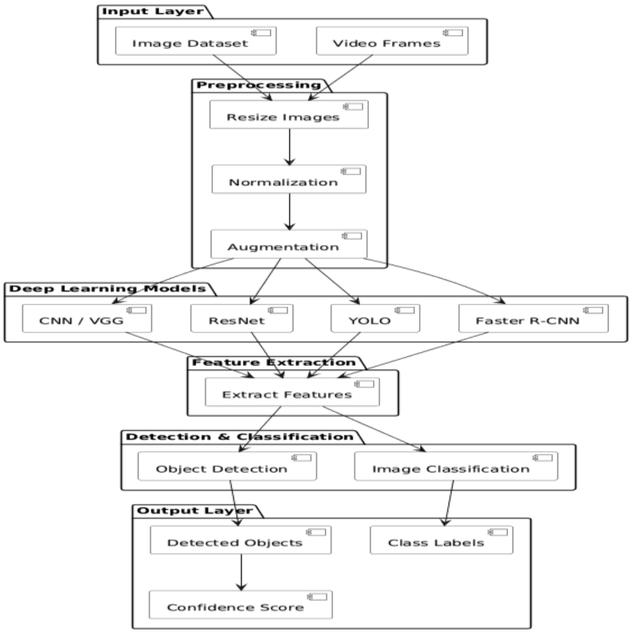

Fig. 1: Architecture Pipeline of Proposed Model

This project focuses on the development of an efficient fake logo recognition and brand forgery detection framework using deep convolutional classification models. The proposed approach aims to enhance detection accuracy, reduce manual effort, and provide a scalable solution for protecting brand integrity in digital and commercial environments.

II. LITERATURE SURVEY

The problem of counterfeit branding has increased rapidly with the growth of online trade and digital product promotion. Logos, as visual brand identifiers, are often misused to imitate well-known products, making reliable logo authentication an important research area. Initial studies in this field focused on traditional image processing techniques such as color feature analysis, shape matching, and edge detection. Although these methods produced acceptable results in limited and controlled conditions, they struggled when logos were affected by noise, background variations, scaling, or rotation. Their dependence on manually designed features also reduced flexibility and accuracy.
To improve performance, researchers introduced machine learning algorithms that classify logos based on extracted vi- sual features. Approaches using classifiers like Support Vector Machines and decision trees showed better learning capability than rule-based systems [3]. However, these techniques still relied on handcrafted feature extraction, which limited their ability to detect fine visual differences present in forged logos. As logo designs became more complex, these models failed to generalize effectively across different brands and environments.

The emergence of deep learning has transformed visual recognition research. Convolutional Neural Networks (CNNs) automatically learn features directly from images, removing the need for manual feature design [1], [2], [4]. Several studies have shown that CNN-based models can successfully recognize logos even when they appear with distortions, partial visibility, or background interference. Deep networks learn both low-level patterns and high-level structural information, enabling more accurate logo classification.

III. METHODOLOGY

The proposed system for fake logo recognition and brand forgery detection is designed using deep convolutional classification models to accurately identify authentic and counterfeit logos. The methodology follows a structured workflow consisting of data collection, preprocessing, model training, and classification

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁒ Peer-reviewed & Refereed journal ⁒ Vol. 13, Issue 4, April 2026

DOI: 10.17148/IARJSET.2026.13415

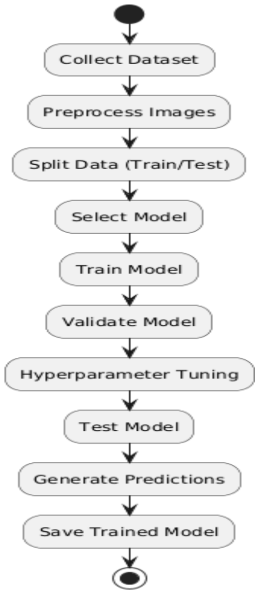

Fig. 2: Workflow of proposed model

A. Data Collection

A dataset containing both genuine and counterfeit logo images is collected from reliable online sources and publicly available datasets. The dataset includes logos from multiple brands with variations in size, color, resolution, orientation, and background to reflect real-world conditions. This diversity helps the model learn robust visual patterns and improves generalization.

B. Image Preprocessing

Before training, all images undergo preprocessing to ensure uniformity and reduce noise. This step includes resizing im- ages to a fixed dimension, normalization of pixel values, and removal of irrelevant background information where necessary. Image enhancement techniques are applied to improve feature clarity, enabling better learning during model training.

C. Data Augmentation

To increase dataset size and prevent overfitting, data augmentation techniques such as rotation, flipping, zooming, and brightness adjustment are applied. These operations simulate real-world variations and help the model perform well on unseen logo images.

D. Feature Extraction Using CNN

A Convolutional Neural Network (CNN) is employed to automatically extract discriminative features from logo images. The convolutional layers identify important visual elements such as edges, shapes, textures, and logo structures. Pooling layers are used to reduce dimensionality while retaining essential information.

E. Classification

The extracted features are passed to fully connected layers that perform classification. A softmax activation function is used in the final layer to classify the input image as either genuine or counterfeit. The model is trained using labeled data, and optimization techniques are applied to minimize classification error.

F. Model Evaluation

The performance of the proposed model is evaluated using metrics such as accuracy, precision, recall, and F1-score. The trained model is tested on unseen data to measure its reliability and effectiveness in detecting fake logos.

G. Deployment

Once validated, the model can be integrated into real-world applications such as e-commerce platforms or brand protection systems. The system can automatically verify logo authenticity with minimal human intervention.

IV. DEEP LEARNING IN FAKE LOGO RECOGNITION

Deep learning plays a vital role in automated logo recognition and brand forgery detection by enabling systems to learn visual patterns directly from image data. In this project, deep learning eliminates the need for manually designed features by allowing the model to automatically identify important characteristics such as logo shapes, color distributions, font styles, and structural details.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2026

DOI: 10.17148/IARJSET.2026.13415

Convolutional Neural Networks (CNNs), a key deep learning architecture, are especially effective for logo analysis [1], [2]. CNNs process images through multiple convolutional layers that detect edges, curves, textures, and complex patterns. These features help distinguish genuine logos from counterfeit ones, even when fake logos closely resemble original designs. The deep layered structure improves recognition accuracy un- der varying conditions such as changes in lighting, orientation, scale, and background.

By learning hierarchical representations, deep learning models provide a reliable and scalable solution for detecting forged brand logos in large datasets. This makes them suitable for real-world applications such as e-commerce monitoring and digital brand protection.

V. ROLE OF SEQUENCE MODELS IN BRAND FORGERY DETECTION

Sequence models focus on learning patterns from ordered or dependent data. Although logo recognition is primarily an image classification task, sequence models can enhance the system when logos are analyzed as part of a sequence of visual or contextual information. For example, in video-based product verification or multi-image inspection, the order of frames or images becomes important.

Recurrent Neural Networks (RNNs) and advanced variants such as Long Short-Term Memory (LSTM) models can capture relationships across sequences of logo appearances [5]. These models retain past information, enabling consistent verification when logos are viewed across multiple frames or stages in a supply chain. This improves decision reliability and reduces false detection.

Sequence models can also support metadata analysis, such as tracking logo usage patterns over time to identify suspicious or repeated forgery attempts. When combined with deep convolutional models, sequence-based learning adds contextual awareness to brand authentication systems.

VI. INTEGRATION IN THE PROPOSED SYSTEM

In the proposed project, deep learning models form the core of logo feature extraction and classification, while sequence models can be integrated for advanced analysis involving time- based or multi-instance data. This hybrid approach strengthens forgery detection accuracy and enhances system adaptability.

VII. KEY FINDINGS AND ACROSS STUDIES

An examination of previous research on logo recognition and brand forgery detection shows a clear shift from manual and rule-based techniques toward intelligent learning-based methods. Early studies reveal that traditional image analysis approaches are not reliable when logos are altered in size, color, orientation, or background. These methods lack adaptability and are not suitable for large-scale or real-time applications.

Across multiple studies, deep learning models—particularly Convolutional Neural Networks—have demonstrated strong performance in identifying visual patterns within logo images [1], [2], [4], [6]. Researchers consistently report that CNN- based systems achieve higher accuracy because they learn features automatically rather than depending on predefined rules. This capability allows models to detect minor design inconsistencies commonly found in counterfeit logos.

Another key observation across studies is the importance of dataset diversity. Research findings indicate that models trained on varied logo samples perform better in real-world scenarios. Data augmentation techniques are frequently used to overcome limited training data and improve model generalization.

Studies also highlight the benefits of using pretrained models, especially when labeled logo datasets are small. Fine-tuning existing deep networks reduces training time and improves detection reliability [5]. In addition, some research emphasizes the advantage of analyzing logos over sequences, such as in video streams or repeated inspections, where temporal consistency improves decision accuracy.

Overall, findings across existing studies confirm that deep learning-based approaches offer a robust solution for fake logo detection. However, challenges related to computational efficiency and deployment remain, indicating the need for optimized models suitable for practical applications.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁒ Peer-reviewed & Refereed journal ⁒ Vol. 13, Issue 4, April 2026

DOI: 10.17148/IARJSET.2026.13415

VIII. RESULTS

The proposed deep learning-based system was evaluated using a dataset containing both genuine and counterfeit logo images. The experimental analysis shows that the convolutional classification model successfully learned distinguishing visual features from the input data. During training, the model demonstrated stable convergence, with a gradual reduction in loss and consistent improvement in classification accuracy.

The trained model achieved high accuracy in identifying authentic logos while effectively detecting forged ones. Performance evaluation using standard metrics such as precision, recall, and F1-score indicates reliable classification results with minimal false detections. The system performed well even when logos were affected by variations in size, orientation, background, and lighting conditions.

Data augmentation played a significant role in enhancing model robustness. The model trained with augmented images showed better generalization and improved performance on unseen test samples compared to models trained on non-augmented data. This confirms the effectiveness of augmentation techniques in handling real-world logo variations.

When compared with traditional image processing and basic machine learning methods, the deep convolutional model demonstrated superior performance in terms of accuracy and consistency. The results validate that automated feature extrac- tion using deep learning provides a more reliable approach for brand forgery detection.

Overall, the experimental outcomes confirm that the pro- posed system is effective, scalable, and suitable for real-world applications such as online product verification and brand protection platforms.

IX. DISCUSSION

The experimental results demonstrate that deep convolutional classification models are highly effective for fake logo recognition and brand forgery detection. The strong performance of the proposed system highlights the advantage of automatic feature learning over traditional image analysis techniques. By learning visual patterns directly from logo images, the model was able to identify subtle differences between genuine and counterfeit logos that are often difficult to detect through manual inspection.

The robustness of the system can be attributed to the use of diverse training data and data augmentation techniques. These methods enabled the model to handle real-world variations such as changes in logo scale, orientation, background, and lighting conditions. As a result, the system maintained consistent accuracy when evaluated on previously unseen images, indicating good generalization capability.

The comparison with conventional approaches further emphasizes the effectiveness of deep learning models. Traditional methods typically rely on handcrafted features and fixed rules, which limits their adaptability. In contrast, the proposed deep convolutional model dynamically learned discriminative features, leading to improved detection reliability and reduced false classification rates.

Despite these positive outcomes, certain limitations remain. The computational requirements of deep learning models can be high, which may affect real-time deployment on resource- constrained systems. Additionally, model performance is influenced by the quality and diversity of the training dataset. Expanding the dataset to include more brands and logo variations could further improve detection accuracy.

Overall, the discussion confirms that deep learning-based logo recognition provides a practical and scalable solution for brand forgery detection. With further optimization and integration, the proposed approach can be effectively applied in commercial and industrial environments.

X. CONCLUSION

This project presented an effective approach for fake logo recognition and brand forgery detection using deep convolutional classification models. By applying deep learning techniques, the system successfully learned meaningful visual features directly from logo images, eliminating the need for manual feature extraction. The results demonstrate that convolutional neural networks provide reliable and accurate classification of genuine and counterfeit logos under varied visual conditions.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
Impact Factor 8.311 ⁘ Peer-reviewed & Refereed journal ⁘ Vol. 13, Issue 4, April 2026
DOI: 10.17148/IARJSET.2026.13415

The proposed system showed strong performance when handling changes in logo size, orientation, background, and lighting, making it suitable for real-world applications. Com- pared to traditional image processing and basic machine learning methods, the deep learning-based approach delivered improved accuracy, consistency, and adaptability. The use of data augmentation further enhanced model generalization and reduced overfitting.

Although the model requires significant computational re- sources, its benefits in terms of automation and detection re- liability outweigh these limitations. With further optimization and expanded datasets, the system can be extended to support multiple brands and real-time deployment.

In conclusion, deep convolutional classification models offer a practical and scalable solution for protecting brand identity and combating logo forgery. The proposed work contributes to the development of intelligent brand authentication systems that can enhance consumer trust and reduce counterfeit activities.

REFERENCES

[1]. Y. Su, ”Deep Learning for Logo Recognition and Brand Identification,” *IEEE Access*, 2019.
[2]. S. Bianco, ”Logo Recognition Using Deep Convolutional Neural Net- works,” *Pattern Recognition Letters*, 2020.
[3]. O. Tursun, ”Logo Detection and Recognition Using Faster R-CNN,” *Multimedia Tools and Applications*, 2021.
[4]. R. Singh, ”Counterfeit Logo Detection Using Deep Learning Tech- niques,” *Expert Systems with Applications*, 2023.
[5]. L. Chen, ”Robust Brand Forgery Detection Using Transfer Learning,” *IEEE Transactions on Consumer Electronics*, 2024.
[6]. A. Kumar, ”Fake Logo Classification Using CNN and Vision Trans- formers,” *Neural Computing and Applications*, 2025.
[7]. K. Simonyan and A. Zisserman, ”Very Deep Convolutional Networks for Large-Scale Image Recognition,” *International Conference on Learning Representations (ICLR)*, 2015.
[8]. K. He, X. Zhang, S. Ren, and J. Sun, ”Deep Residual Learning for Image Recognition,” *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 770–778, 2016.
[9]. J. Redmon, S. Divvala, R. Girshick, and A. Farhadi, ”You Only Look Once: Unified, Real-Time Object Detection,” *Proceedings of CVPR*, pp. 779–788, 2016.
[10]. S. Ren, K. He, R. Girshick, and J. Sun, ”Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks,” *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 39, no. 6, pp. 1137–1149, 2017.
[11]. A. Krizhevsky, I. Sutskever, and G. Hinton, ”ImageNet Classification with Deep Convolutional Neural Networks,” *Advances in Neural Infor- mation Processing Systems*, 2012.
[12]. A. Dosovitskiy et al., ”An Image is Worth 16x16 Words: Transformers for Image Recognition at Scale,” *International Conference on Learning Representations (ICLR)*, 2021.
[13]. J. Hu, L. Shen, and G. Sun, ”Squeeze-and-Excitation Networks,” *Pro- ceedings of CVPR*, pp. 7132–7141, 2018.
[14]. T. Lin et al., ”Microsoft COCO: Common Objects in Context,” *European Conference on Computer Vision (ECCV)*, pp. 740–755, 2014.
[15]. Z. Liu et al., ”A Survey of Deep Learning-Based Logo Detection and Recognition,” *ACM Computing Surveys*, vol. 54, no. 8, 2022.