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Preventing Fraudulent Vehicle Listings: Digital ADS Detection

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Abstract: ***With the increasing popularity of online selling platforms for vehicles, the risk of fraudulent advertisements has also risen significantly. This research paper addresses the challenge of detecting and preventing digital fraud ads, particularly those related to vehicle listings, on typical online vehicle selling web portals. The proposed approach leverages advanced algorithms to identify and filter out fraudulent vehicle ads, including unregistered vehicles and unnecessary spam ads posted by sellers. One of the key techniques employed in this research is pattern matching, which involves comparing the details of posted vehicles with the records from Regional Transport Offices (RTOs) to determine their registration status. By analyzing the vehicle details provided in the ads and cross-referencing them with RTO data, the system can flag unregistered vehicles, thus mitigating the risk of fraudulent listings. Additionally, the study incorporates the use of the You Only Look Once (YOLO) algorithm for object detection in the images accompanying the ads. By applying YOLO, the system can accurately identify vehicles in the images and extract relevant information, such as make, model, and license plate details. This allows for further validation of the authenticity of the listings and helps in filtering out spam ads containing irrelevant or misleading images.***

Overall, the proposed approach offers an effective solution for detecting and preventing digital fraud ads on online vehicle selling platforms. By combining pattern matching and object detection techniques, the system provides enhanced security and trustworthiness for both buyers and sellers, thereby improving the overall user experience and reliability of the platform.

Keywords: Digital fraud ads detection; Pattern matching; Unregistered vehicles; You Only Look Once (YOLO) algorithm

I. INTRODUCTION

The proliferation of online selling platforms has revolutionized the way vehicles are bought and sold, offering convenience and accessibility to both buyers and sellers. However, along with the convenience comes the risk of fraudulent advertisements, which has become increasingly prevalent in the online vehicle marketplace. This research paper aims to address this challenge by proposing a robust solution for detecting and preventing digital fraud ads, particularly those related to vehicle listings, on typical online vehicle selling web portals. The proposed approach leverages advanced algorithms to identify and filter out fraudulent vehicle ads, including unregistered vehicles and unnecessary spam ads posted by sellers. A key technique employed in this research is pattern matching, which involves comparing the details of posted vehicles with the records from Regional Transport Offices (RTOs) to determine their registration status. By analyzing the vehicle details provided in the ads and cross-referencing them with RTO data, the system can flag unregistered vehicles, thus mitigating the risk of fraudulent listings.

Additionally, the study incorporates the use of the You Only Look Once (YOLO) algorithm for object detection in the images accompanying the ads. By applying YOLO, the system can accurately identify vehicles in the images and extract relevant information, such as make, model, and license plate details. This allows for further validation of the authenticity of the listings and helps in filtering out spam ads containing irrelevant or misleading images.

II. LITERATURE REVIEW

Some of the literature discussed in this study is a paper that has discussed You Only Look Once (YOLO). You only look once: Unified, real-time object detection (Redmon et al., 2016). The basic YOLO model processes images in real time at 45 frames per second. The smaller online version, Fast YOLO, processes an incredible 155 frames per second and still achieves twice the map speed of other real-time detectors. Compared to advanced detection systems, YOLO has large localization errors but is less likely to predict false positives. Finally, YOLO is a common object representation. YOLO9000: Better, faster, stronger (Redmon & Farhadi, 2017). YOLO9000, a state-of-the-art, real-time object detection system that can detect over 9000 object categories. First, we propose various improvements to the YOLO detection method, both novel and drawn from prior work. The improved model, YOLOv2, is state-of-the-art on standard detection tasks like PASCAL VOC and COCO (Rationings et al., 2020), (Tong & Wu, 2023), (Wedha, Helmi, et al., 2022). Using a novel, multi-scale training method the same YOLOv2 model can run at varying sizes, offering an easy tradeoff between speed and accuracy. At 67 FPS, YOLOv2 gets 76.8 mAP on VOC 2007.

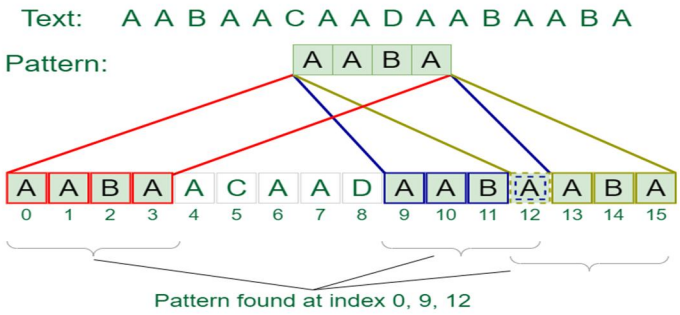
A. Modules Description

1) *Authentication:* Both user and administrator logins fall under this category. A username and password will be required to access the system and administer the administrator's functionalities. To post advertisements on this application, users must sign in.
2) *Registration:* Users can register with the application with the aid of this module. Since they need to register before they can post any advertisements, registration is essential. At the time of registration, the user must choose a username and password, and the username must be unique.
3) *Administration Control:* This course is for administrators only. Since the administrator will have complete control over the postings and files, when a posting is made, the administrator can choose whether it should be displayed as a public post or as a private post. He can also determine whether or not the post is spam. He has the authority to delete any posts that are invalid. Administrators can respond to posts so that the user receives a response.
4) *Digital ADS Advertising:* Brand advertising and performance advertising are the two main categories of digital advertising. A marketer essentially wants to promote their brand through brand advertising by reaching a large audience. Brand advertising has long dominated traditional form of advertising, such as television, print media, billboards, and hoardings, even before the development of digital marketing.
5) *Filtering Fake ADS:* The datasets for this application's analysis, training, and evaluation are included in this module. Based on the training data, the goal was to forecast whether a particular set of click ids will convert for each one or not. Low conversion probability for a click can be a fantastic indicator of whether a click is fake or spam.

B. Pattern Matching

Algorithm Workflow

1) *Data Verification:* When a user submits an advertisement, the algorithm first verifies the provided data against the backend database. The backend database contains records of vehicles registered with the RTO, ensuring authenticity and legality.
2) *Pattern Matching:* Utilizing advanced pattern matching techniques, the algorithm compares the submitted advertisement data with the information stored in the backend database. It identifies discrepancies, inconsistencies, or mismatches between the two sets of data. Key attributes such as vehicle identification numbers (VINs), registration numbers, and other pertinent details are meticulously analyzed.



3) *Decision Making:* Based on the pattern matching results, the algorithm makes a decisive determination regarding the legitimacy of the advertisement. If the submitted data aligns with the backend records, indicating a valid and RTO-registered vehicle, the advertisement is approved for posting. Conversely, if discrepancies are detected, signaling a potential fraud or non-RTO registered vehicle, the advertisement is flagged as fraudulent and withheld from posting.
4) *Implementation:* The algorithm is meticulously implemented using the Python programming language, leveraging its flexibility, efficiency, and extensive libraries for data manipulation and pattern matching. Python's robust ecosystem facilitates seamless integration with the web page's backend infrastructure, ensuring swift and reliable fraud detection capabilities.

C. Benefits

Enhanced Security: By systematically scrutinizing advertisement submissions, the algorithm fortifies the web page against fraudulent activities, safeguarding users' interests and maintaining the platform's credibility. Streamlined Process: Automated pattern matching expedites the verification process, enabling swift and accurate decision-making, thereby enhancing the overall efficiency of the advertisement approval system.

D. Reduced Risk

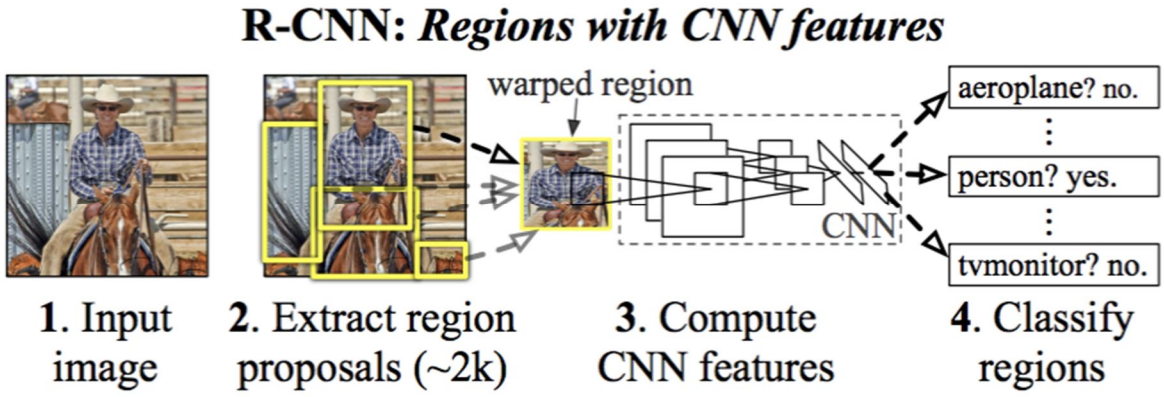
By preemptively identifying and rejecting fraudulent advertisements, the algorithm mitigates the risk of potential legal and financial repercussions associated with facilitating the sale of unauthorized or misrepresented vehicles. In essence, the Pattern Matching Algorithm serves as a robust safeguard mechanism, ensuring the integrity and authenticity of vehicle advertisements on the web page, thereby fostering trust and reliability among users.

III. YOLO ALGORITHM FOR IMAGE DETECTION

Understanding YOLO Algorithm

A. Single Unified Model

YOLO is a state-of-the-art object detection algorithm that operates by dividing the input image into a grid and predicting bounding boxes and class probabilities for each grid cell simultaneously. Unlike traditional detection algorithms, YOLO adopts a single neural network model that directly predicts the bounding boxes and class probabilities, resulting in faster and more efficient detection. In the YOLO (You Only Look Once) algorithm, the computation of Convolutional Neural Network (CNN) features is a critical step in the object detection process. the computation of CNN features in the YOLO algorithm plays a crucial role in extracting discriminative features from the input image, facilitating accurate object detection and localization. This approach enables YOLO to achieve real-time performance while maintaining high detection accuracy, making it well-suited for various applications, including object detection in the context of vehicle selling web pages.



B. Real-Time Performance

YOLO is renowned for its real-time performance, capable of processing images swiftly while maintaining high accuracy. This efficiency makes it well-suited for applications where rapid and accurate object detection is paramount, such as the vehicle selling web page.

IV. INTEGRATION INTO THE PROJECT

A. Image Verification

Upon submission of an advertisement containing an image, the YOLO algorithm is employed to analyze the image and determine its contents. The algorithm is trained on a dataset comprising vehicle images, enabling it to recognize and distinguish vehicles from other objects or irrelevant imagery.

B. Detection and Decision Making

YOLO precisely locates and identifies vehicles within the submitted image, providing bounding box coordinates and corresponding class probabilities.

If the algorithm detects a vehicle with high confidence, indicating that the image aligns with the advertisement's context, the advertisement is deemed suitable for posting. Conversely, if the image does not contain a recognizable vehicle or is deemed inappropriate (e.g., irrelevant content, spam, etc.), the advertisement is rejected, preventing its posting on the web page.

V. ADVANTAGES AND IMPACT

1) *Enhanced Content Relevance:* By leveraging the YOLO algorithm, the web page ensures that only images relevant to vehicle advertisements are approved for posting, thereby enhancing the overall quality and relevance of content.
2) *Spam Prevention:* YOLO's robust object detection capabilities effectively mitigate the risk of spam or inappropriate content being associated with advertisements, safeguarding the integrity and reputation of the web page.
3) *User Experience:* By maintaining a high standard of image quality and relevance, the integration of YOLO contributes to a positive user experience, fostering trust and engagement among users.

In essence, the YOLO algorithm serves as a formidable tool for image detection and verification, bolstering the fraud detection mechanisms of the vehicle selling web page and ensuring the authenticity and appropriateness of posted advertisements.

VI. RELATED WORKS

Here are some related works or projects that are relevant to the use of pattern matching and object detection in online platforms:

1) *Fraud Detection in Online Marketplaces:* Many e-commerce platforms employ similar techniques for fraud detection, including pattern matching and image analysis, to verify product listings and prevent fraudulent activities such as counterfeit goods or misleading advertisements.
2) *Vehicle Recognition Systems:* Various projects focus specifically on vehicle recognition and detection using advanced computer vision techniques. These systems are used in traffic surveillance, parking management, and automated toll collection, among other applications.
3) *Social Media Content Moderation:* Social media platforms utilize algorithms for content moderation, including image analysis and pattern recognition, to identify and remove inappropriate or harmful content such as spam, hate speech, or graphic imagery.
4) *Real-time Object Detection in Autonomous Vehicles:* Object detection algorithms, similar to YOLO, are used in autonomous vehicles for real-time detection of objects in the vehicle's surroundings, ensuring safe navigation and collision avoidance.
5) *Document Verification Systems:* Pattern matching algorithms are employed in document verification systems to authenticate documents such as IDs, passports, and driver's licenses. These systems compare document images against templates or databases to detect forgeries or alterations.
6) *Online Advertising Fraud Detection:* Advertisers and online advertising platforms use pattern matching and machine learning algorithms to detect fraudulent activities such as click fraud, impression fraud, and ad stacking, ensuring the effectiveness and integrity of online advertising campaigns.

These related works demonstrate the broad applicability of pattern matching and object detection algorithms across various domains, including online marketplaces, transportation systems, social media platforms, and document verification

VII. CONCLUSION

In conclusion, the integration of pattern matching and the YOLO algorithm in the vehicle selling web page project represents a significant advancement in fraud detection and content validation. By leveraging these sophisticated algorithms, the project ensures the authenticity of advertisements by comparing submitted data against backend records and verifying image content for relevance and appropriateness. This robust system not only safeguards the integrity of the web page but also enhances user trust and confidence, ultimately improving the overall experience for both buyers and sellers in the online vehicle marketplace.

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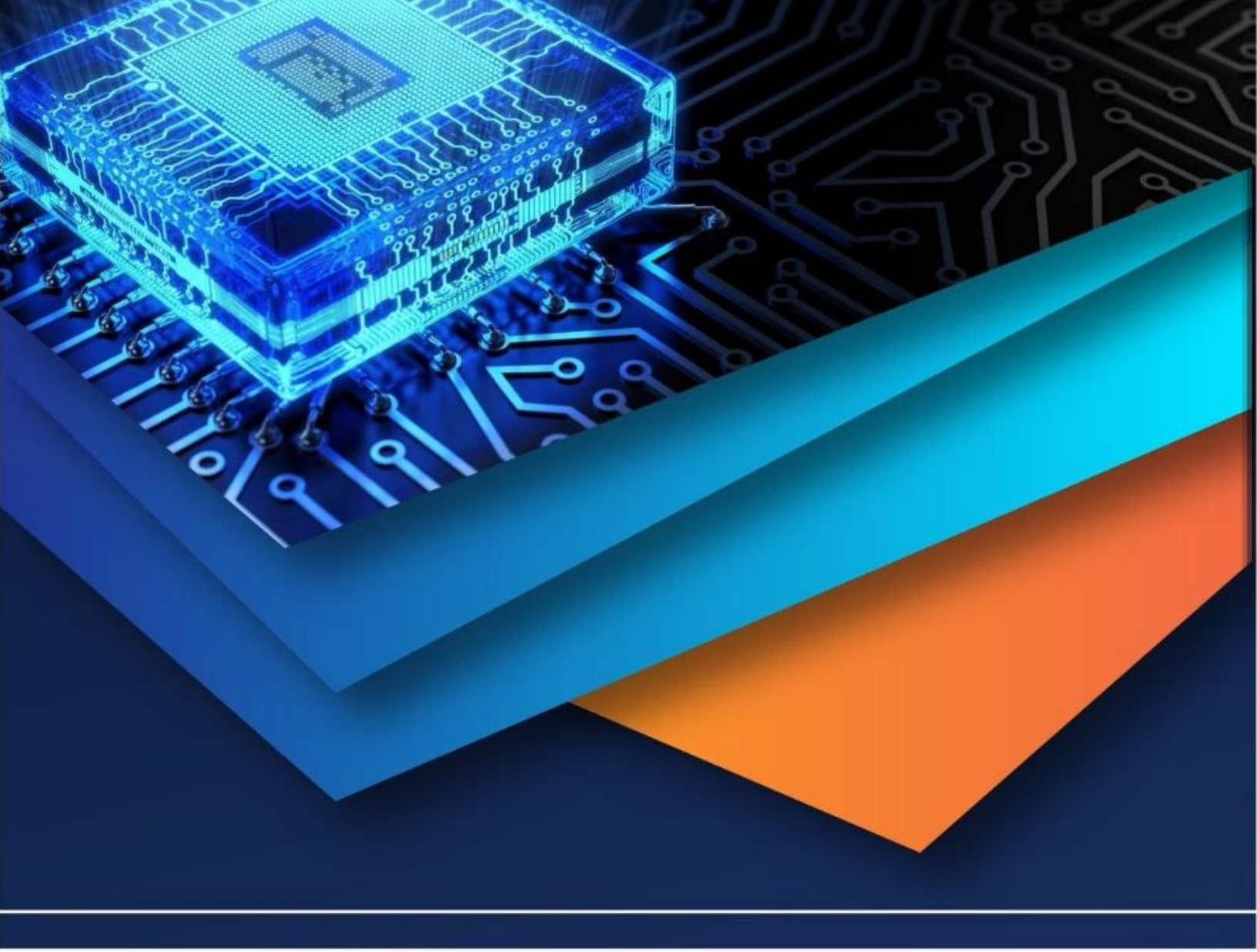

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