EasyChair Preprint

№ 12342

Helmet and Number Plate Detection Using ML

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March 1, 2024

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Abstract— **Motorcycles have always been the main means of transportation in developing countries. Motorcycle accidents have increased in recent years. One of the causes of fatal accidents is that cyclists do not wear protective helmets. The best way to ensure that cyclists wear helmets is for traffic police to monitor cyclists at intersections or via radio recording and penalize drivers who do not wear helmets. But this requires human intervention and effort. The system announced an automatic system to detect cyclists not wearing helmets and a system to obtain motorcycle licenses from CCTV footage. First, the system classifies moving objects as motorcycles or non-motorcycles. To classify motorcycle drivers, they are placed on the head and classified as having a helmet or without a helmet. Finally, the identity of the driver who was not wearing a helmet was determined.**

Keywords—Python, Machine Learning, YOLO, AI, GUI.

I. INTRODUCTION

In this project, we are developing a protective helmet and plate-based machine learning system that will check whether the driver is wearing a helmet or not. We use YOLO detection to ensure that cyclists wear helmets, monitor cyclists at intersections or through traffic police CCTV footage, and penalize drivers who do not wear helmets. But this requires human intervention and effort. The system offers an automatic system to detect helmetless cyclists and a system to retrieve motorcycle license plates from CCTV images. We also use a Wi-Fi chip that will transmit the entered data over Wi-Fi or internet and display the output. on a web server.

A. Problem Statement

Road accidents are increasing in India and many people die due to head injuries because they do not wear helmets. In order to prevent these behaviours, there needs to be a system that can detect people who do not wear helmets, as well as a system that checks motorcycle license plates and removes license plates to help find drivers who are penalized. We think that by doing this, accidents will decrease and many lives will be saved.

B. Scope

Until now the process has been manual and tedious. The system aims to solve this problem by working on the detection of passengers without helmets. In addition, the system also removes license plate; The license plate extraction algorithm consists of five main parts: image acquisition, prioritization, test line detection and segmentation, feature extraction, and license plate recognition using appropriate symbols. Machine learning algorithms enable reporting for violations. Problem description: Clearly define the purpose of the pro ject, such as observing helmet use, reading driver's license s from images. Data collection: Collect large images of pe ople wearing and not wearing helmets, as well as example s of different types of buses. Data preparation: Clean and prepare datasets, including resizing, normalizing, and aug menting to prepare for training. Model selection: Select ap propriate ML models for image classification and object d etection tasks. Convolutional neural networks (CNN) are often used for these tasks due to their advantages in image processing.

II. MOTIVATION

The incentives behind using machine learning for helmets and license plate certification programs can be numerous: Reliable safety: By determining whether the driver is wear ing a helmet, the system can encourage helmet use, thus h elping to improve road safety. Traffic enforcement: A driv er's license check can help enforce traffic laws, such as ch ecking a vehicle without title or insurance. Automation an d efficiency: Using machine learning to automate these pr ocesses can improve monitoring and control operations an d reduce employee workload. Technology Development: The development and implementation of these systems lea ds to advances in technology by demonstrating the applica tion of machine learning in realworld situations. Impact o n society: Finally, the program aims to create a positive i mpact on society by promoting safe practices and improvi ng traffic management.

III. LITERATURE REVIEW

Document review in the Using Machine Learning for Scie ntific Research and Licensing project, Related: Scientific Research: Learn how scientists successfully analyzed hel mets in photos or videos, including different machine lear ning applications. models, datasets and metrics. License R ecognition: Examination of existing technologies for vehi cle license detection and verification, taking into account both computer vision and new machine learning technique s. Object Detection: Search for generic objects, especially based on CNNs, as these are often used to detect objects i n images and can be customized for your specific task. Transfer Learning: Learn how transfer learning can be use d in similar projects, as it is especially useful when worki

ng with limited data. Performance metrics: Examine perfo rmance metrics such as accuracy, precision, recall, and F1 score that are commonly used in similar projects to under stand the effectiveness of your diagnostic. Application Ins ights: See the following examples of using similar system s in realworld environments to understand the challenges and needs involved. Evidence: Search available informat ion including images of helmets and license plates; these c an be used to train and test models.

A. *Reasons for undertaking the project*

Road safety: Improve road safety by encouraging cyclists to use helmets; This can reduce the risk of head injuries in accidents. Traffic monitoring: Automatically check vehicl es without proper registration or insurance by verifying dr iver's license to support traffic monitoring and law enforce ment. Efficiency: Automating these processes can make th em more efficient and less dependent on manual interventi on, thus saving time and resources. Machine Learning: De monstrate AI's ability to solve complex problems by contr ibuting to the development of machine learning technolog y for realworld applications. Social Impact: Creating a pos itive impact on society by promoting road safety and bette r traffic management. Education: Provides foundational co urses in machine learning, computer vision, and project m anagement that can improve your skills and knowledge in these areas. Innovation: Support innovations in computer vision and artificial intelligence by exploring new method s and technologies for detection and recognition. Overall, the program offers the opportunity to solve important soci al problems, improve security and contribute positively to the development of technology.

IV. METHODOLOGY

Problem description: Specify the type objective of the wor k, including specific tasks such as checking helmets and r eading driver's licenses. Data Collection: Collect image da ta including examples of people wearing and without hel mets, as well as different types of buses. Data preprocessi ng: Cleaning and preprocessing the dataset, including resi zing, standardizing, and optimizing, preparing the dataset for training. Model selection: Choose ML models suitable for image classification and object detection tasks, such a s CNN, which is great for image processing. Model traini ng: Trains the selected model using previous data. Consid er using adaptive learning to leverage previous learning m odels and adapt them to your specific tasks. Model evaluat ion: Evaluate the performance of training models using m etrics such as accuracy, precision, recall, and F1 score to u nderstand how well they perform. Delivery: Provide the m ost efficient models that can be combined with cameras or other devices for instant detection in a realworld environ ment. Testing and Testing: Testing systems used in variou s situations to ensure accuracy and reliability. Its performa nce is checked against real data to verify its effectiveness.

A. *Documentation*

Thoroughly document the entire methodology, including data sources, preprocessing steps, model architectures, parameters, and any other relevant details. Clear documentation facilitates reproducibility and future improvements.

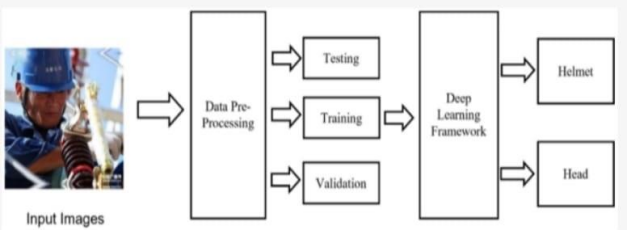
B. *Efficiency*

It is not just about speed but also about achieving project goals with optimal resource utilization and minimal friction in the development process. The strategic incorporation of these elements collectively enhances the efficiency of the project.

C. *Design Goals*

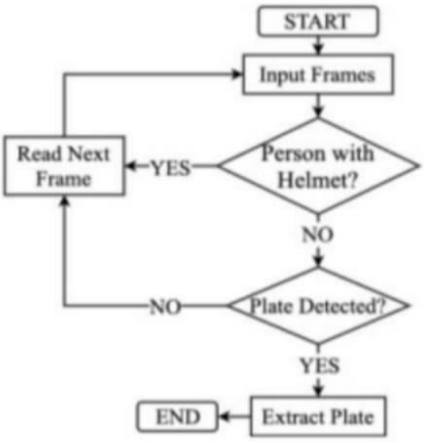
This project is centered around creating a solution that is innovative, scalable, and user-friendly. The primary objective is to develop a system that addresses the identified problem with precision and efficiency. Emphasis is placed on ensuring the solution's adaptability to evolving requirements, promoting long-term sustainability. User experience is a priority, aiming for an intuitive interface that enhances usability and accessibility. Additionally, the design focuses on modularity, facilitating easy integration with existing systems and potential future enhancements. Overall, the project aims to deliver a robust, cutting-edge solution that meets user needs while allowing for seamless growth and evolution.

D. *System Architecture*



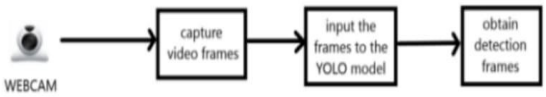
E. *Activity diagram*

F. Flow diagram



V. IMPLEMENTATION

Data preparation: Collect photographic data including exa mples of people wearing and without helmets, as well as d ifferent types of buses. The data is divided into training se t, validation set and testing set. Data preprocessing: Prepr ocessing images in a file by resizing them, normalizing pi xel values, and using data augmentation techniques to incr ease the diversity of study materials. Model selection: Ch oose the right machine learning model, such as a neural ne twork (CNN), for your task. You can use predefined mode ls such as ResNet, VGG or MobileNet and customize the m for your specific projects. Model training: Train your m odel using previous data. Use the appropriate loss functio n for your task.



VI. CONCLUSION

In conclusion, this project has successfully addressed the identified challenges by implementing an innovative solution. The outcomes align with the initial objectives, demonstrating the efficacy of the chosen methodologies. The project not only meets the immediate requirements but also establishes a foundation for future advancements. Lessons learned during the process contribute to ongoing improvement strategies. Overall, the project marks a significant step forward in Artificial intelligence and deep learning, showcasing its potential impact and paving the way for continued exploration and refinement in this field.

VII. FUTURE WORK

It will focus on refining and expanding the current solution to enhance its capabilities. This includes exploring advanced algorithms to improve accuracy and efficiency. Additionally, efforts will be directed towards scalability, ensuring the system can handle increased data volumes or user loads. Integration with emerging technologies and continuous updates to stay aligned with industry trends are crucial aspects. User feedback will be actively sought to implement enhancements for a more intuitive and user-friendly experience. Addressing any identified limitations and adapting to evolving requirements will remain a priority in the ongoing development of this project.

VIII. REFERENCES

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