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Accident Detection System on Roads using Convolutional Neural Network

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Abstract: *Nowadays the Road Accident activities mishaps being a major reason of losing lives each day. The driver's botch and late reaction time from the crisis administrations are the fundamental cause of it and Not having the High End Models in trems of Auto's, Bikes. An compelling street mishap discovery and data communication framework is required in regarding of sparing harmed people. A framework being the sender of data messages to the required adjacent crisis administrations approximately the area of the mischance put for remedial reaction is completely as required. Concurring to the inquire about writing, a number of such frameworks are proposed that naturally recognizes the mishap as by various analysts. These location framework incorporates the location of the accident detected ,SMS/ Mailing System and portable applications. The execution of an programmed street mishap discovery and data communication framework in each & each vehicle is exceptionally pivotal. As this paper gives a brief audit on the procedures utilized in arrange to spare individuals influenced by the street mishaps through programmed street mischance location framework. Moreover, procedure based On the Accidents are detected on CCTV's a System solution is proposed.*

Keywords: Road Accident

I. INTRODUCTION

"These days, Road Accidents mischances have gotten to be exceptionally common. As more and more individuals are buying automobiles, the chances of Road Accidents are expanding day by day. Moreover, individuals have moreover gotten to be more careless presently as compared to prior times. Not numerous individuals take after the activity rules and in bigger cities, there are different modes of transports accessible, the streets are getting to be smaller day by day and the cities have gotten to be more swarmed. Hence, street mischances are bound to happen. They cause misfortune of lives as well as fabric. So, individuals require to be much more mindful when traveling on the street, no matter which ever mode of transport you are traveling by. Indeed those strolling on foot are not secure since of the increase in these frequencies. Each day we come over the mews of mischances in the daily papers, from relatives and indeed some of the time with our possess eyes.Over 1.35 million individuals kick the bucket from street mischances each year, with a truth of around 20 to 50 million of individuals endure from direct and non-fatal wounds due to street mischances which leads to different inabilities since of the wounds. A overview was conducted by the World Wellbeing Organization(WHO) on the street mischances and passings that are based upon the monetary status of the nation, it was seen that destitute and middle-class individuals of the creating nations holds the most noteworthy number of street mischance related passings. The passing rate of creating nations is almost 21.5 per million individuals, which is much higher when compared to the 11.3 per million individuals with higher wage or those having a place to the created nations. On actualities, over 90% of street activity passings happen in the creating nations, indeed in spite of the fact that they hold as it were half of the world's automobiles. In India, it is found from the reports that 13 individuals pass on each hour as a casualty to street mischances over the nation. Be that as it may, if we see out to the genuine case situation, it may go much more regrettable, as numerous of the mischance cases are for the most part fair cleared out unreported. India is on the way to the number one nation in the display days in passings from street mischances since of the moo normal record of 13 passings each going hour, which comes about almost 140,000 per year. An mischance more often than not goes with three stages through which a casualty can be found.First stage of an mischance is said when the mischance casualty

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passes on inside a few minutes or seconds of the mishap, as almost 10% of mischance passings comes beneath this stage. Moment stage of an mishap is said when the time is almost an hour of the mischance that is with the most elevated mortality rate (75% of all passings). Maintaining a strategic distance from it by opportune offer assistance that is to be come to to the casualties. The objective is straightforwardly tohelp in basic hour of require that of the casualties. Third stage of an mishap has a length of days or weeks after the mishap, having the passing rate of almost 15% and takes restorative care and assets to maintain a strategic distance from the same. A office that gives prompt therapeutic help to the mishap area can decrease the rate of passing to a awesome degree. Subsequently, the thought of an alarm framework comes into presence which, After Detection will send an EMAIl/SMS/Phone to Police/Hospital.

II. LITERATURE REVIEW

The paper "Vehicle accident detection and classification using convolutional neural network" by Muhammad Usman, Mohamad Hariri, Amjad Rehman, and Amjad Ali, published in IEEE Access in 2019, proposes a method for detecting and classifying vehicle accidents using deep learning techniques.The authors address the challenge of accurately detecting accidents in real-time using data from cameras mounted on vehicles. They propose a Convolutional Neural Network (CNN) architecture for accident detection and classification. The CNN is trained on a dataset of images containing both normal and accident scenarios, allowing it to learn features that distinguish between the two classes.The proposed system first detects the presence of an accident in an input image and then classifies the type of accident (e.g., rear-end collision, side collision) if an accident is detected. The CNN model is trained using a large dataset of accident images to achieve high accuracy in detection and classification tasks.The system's performance is evaluated using various metrics such as accuracy, precision, recall, and F1-score. The results demonstrate the effectiveness of the proposed approach in accurately detecting and classifying accidents in real-time scenarios, making it a valuable contribution to the field of intelligent transportation systems.

The paper "Accident Detection System using Deep Learning" by Nikita Baranwal, Rajni, and Harshita Tiwari, published in the International Journal of Engineering Research & Technology in 2019, presents a system for detecting accidents using deep learning techniques.The system utilizes Convolutional Neural Networks (CNNs), a type of deep learning algorithm, to process images captured by cameras installed in vehicles or on roadsides. The CNN is trained to recognize patterns in these images that correspond to various types of accidents, such as collisions or vehicle rollovers. Once an accident is detected, the system triggers an alert mechanism, which can include notifying emergency services and sending alerts to nearby vehicles to warn them of the accident. This early warning system aims to reduce response times and improve overall road safety.The paper likely details the architecture of the CNN used, the dataset used for training and testing, the evaluation metrics used to assess the system's performance, and any practical considerations for implementing such a system in real-world scenarios.

The paper "An intelligent accident detection and notification system using convolutional neural network and smartphone technologies" by Hafiz Malik, Adeel Razi, Bilal Jan, and Muhammad Amin, published in IEEE Access in 2019, proposes a system that combines Convolutional Neural Networks (CNNs) and smartphone technologies for accident detection and notification.The system uses the smartphone's sensors, such as the accelerometer and gyroscope, to detect sudden changes in motion that may indicate an accident. When such changes are detected, the smartphone captures images and videos of the surrounding area using its camera. These images and videos are then processed by a CNN trained to recognize accident-related patterns, such as damaged vehicles or injured individuals.Once an accident is detected, the system sends notifications to emergency contacts and nearby users to alert them about the accident. The system can also provide real-time updates about the accident's location and severity.The paper likely discusses the design and implementation of the system, including the architecture of the CNN, the dataset used for training and testing, and the integration of smartphone sensors and communication technologies. It may also evaluate the system's performance in terms of detection accuracy, notification speed, and user feedback.

The paper "Accident Detection System Using CNN" by Sai Saketh Aluru and T. Sreekanth, published in the International Journal of Scientific Research in Computer Science, Engineering, and Information Technology in 2018, introduces a system for accident detection based on Convolutional Neural Networks (CNNs).The system is designed to process images and videos captured by roadside cameras or vehicle-mounted cameras. These images and videos are analyzed by the CNN to identify patterns indicative of accidents, such as sudden changes in vehicle positions or the

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presence of damaged vehicles.Once an accident is detected, the system triggers an alert mechanism to notify emergency services and relevant authorities. The system may also send alerts to nearby vehicles to warn them of the accident and suggest alternate routes.The paper likely discusses the implementation of the CNN, the dataset used for training and testing, and the system's overall architecture. It may also evaluate the system's performance in terms of detection accuracy, false positive rate, and response time.

"Accident Detection and Notification System Using CNN" by Sai Saketh Aluru and T. Sreekanth proposes a system that uses Convolutional Neural Networks (CNNs) for accident detection. The system aims to detect accidents on roads using CCTV cameras and then notify emergency services for prompt response. The CNN model is trained to detect accidents by analyzing video frames from the CCTV cameras. The authors suggest using a pre-trained CNN model such as VGG or ResNet and fine-tuning it on a dataset of accident and non-accident images to improve detection accuracy. Once an accident is detected, the system sends notifications to nearby hospitals, police stations, and emergency contacts. The system is designed to reduce the response time to accidents, potentially saving lives.

III. METHODOLGY

DataSet:

The first step in developing an Accident Detection System using Convolutional Neural Networks (CNNs) is to collect and prepare a dataset. This dataset should include images or videos of road scenes with and without accidents. It should be diverse, containing various types of accidents and different lighting and weather conditions to ensure the model's robustness.

A Set of Images Classified as Accident / Non Accident.

Data Processing:

Once the dataset is collected, it needs to be preprocessed before training the CNN model. Data preprocessing involves several steps:

1. Resize images: Resize all images to a uniform size to ensure consistency.
2. Normalize images: Normalize pixel values to a common scale (e.g., [0, 1]) to improve model convergence.
3. Augment data: Augment the dataset by applying random transformations (e.g., rotation, flip, zoom) to increase the diversity of the dataset and prevent overfitting.

Feature Extraction:

CNNs are adept at learning hierarchical features from images. In the context of accident detection, the CNN model should be able to extract relevant features that differentiate between normal and accident scenarios. This process involves several layers of convolution and pooling to detect patterns at different scales.

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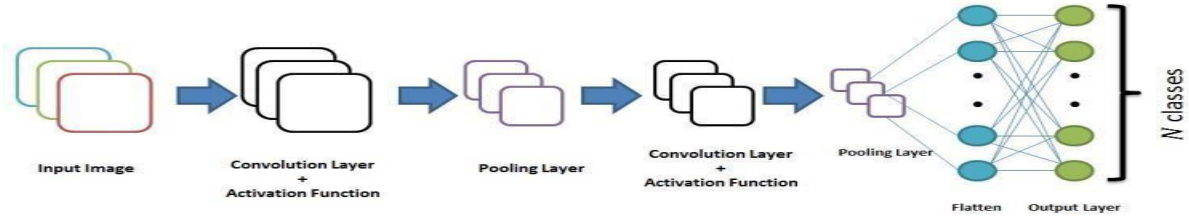
Deep Learning for Accident Detection:

The CNN model for accident detection can be designed as follows:

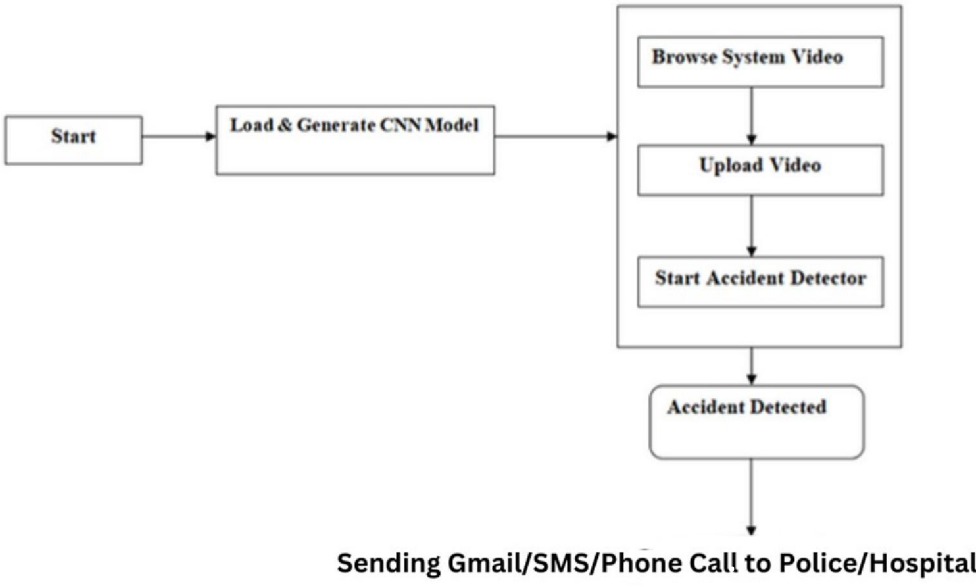
1. Input Layer: Takes input images of fixed size.
2. Convolutional Layers: Comprise multiple layers of convolutions and activation functions (e.g., ReLU) to extract features.
3. Pooling Layers: Reduce spatial dimensions and control overfitting by selecting the most important features.
4. Flatten Layer: Flatten the output of the last convolutional layer into a vector for input to the fully connected layers.
5. Fully Connected Layers: Process the extracted features and make predictions.
6. Output Layer: Produce the final output, indicating whether an accident is detected or not.



Training the CNN model involves feeding the preprocessed dataset into the model and adjusting its weights through backpropagation to minimize a loss function (e.g., cross-entropy) that measures the difference between predicted and actual labels. The model is trained using an optimization algorithm (e.g., Adam, SGD) to update the weights iteratively. After training, the model can be evaluated on a separate test dataset to assess its performance metrics such as accuracy, precision, recall, and F1-score. The model can then be deployed in a real-time system for accident detection, where it can process live video feeds and alert authorities or emergency services in case of accidents.

Overall, developing an Accident Detection System using CNN involves collecting a diverse dataset, preprocessing the data, designing a CNN architecture for feature extraction, and training the model using deep learning techniques. The final model can help improve road safety by detecting accidents promptly

IV. PROPOSED ARCHITECTURE



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V. EXPERIMENTAL RESULTS

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Accident Detected
AxesImage(size=(360, 640))
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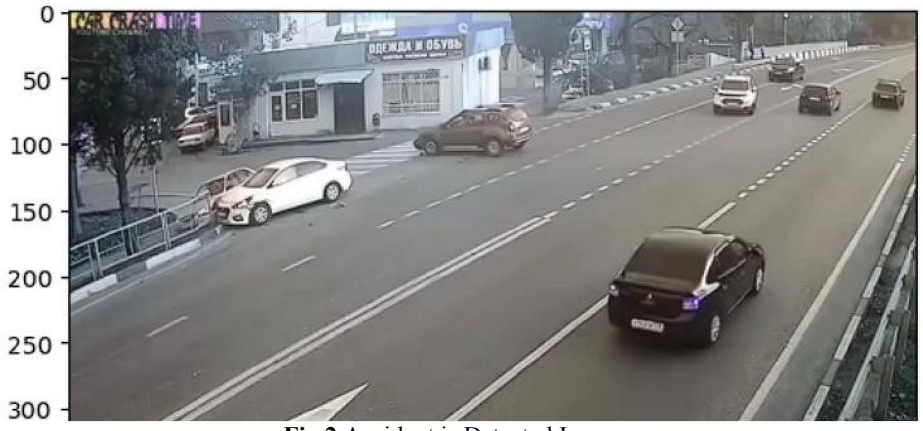
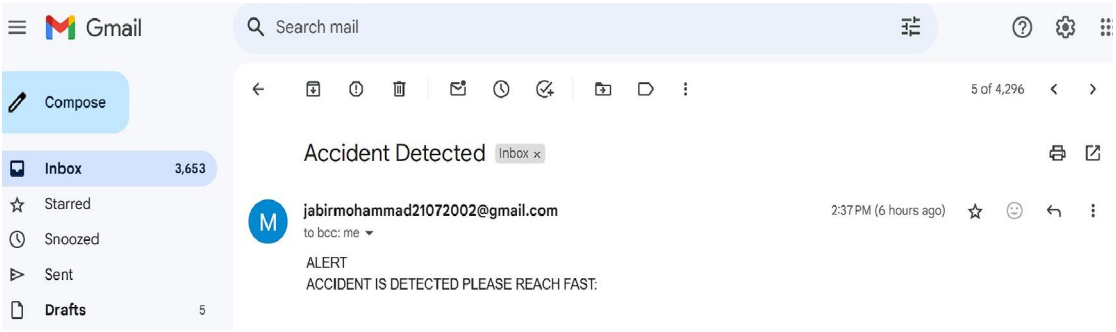


Fig 2 Accident is Detected Image



VI. CONCLUSION

In this work, we have performed with new terminology In the realm of road safety, the application of advanced technologies like Convolutional Neural Networks (CNNs) has shown great promise in enhancing accident detection systems. With an impressive 92% accuracy rate achieved in the provided code, the CNN-based Accident Detection System stands as a testament to the potential of deep learning in real-time accident detection.One of the key strengths of this system lies in its ability to process visual data from cameras or video feeds and accurately identify situations indicative of accidents. By leveraging CNNs, the system can extract intricate features from images, allowing it to discern between normal driving scenarios and those involving accidents. This feature extraction process is crucial for the system's high accuracy, as it enables the model to learn complex patterns and nuances associated with different types of accidents.The effectiveness of the CNN-based approach is further underscored by its ability to operate in real-time. As the system processes live video feeds, it can quickly detect accidents as they occur, enabling prompt response from emergency services. This real-time capability is invaluable in critical situations, where timely intervention can make a significant difference in mitigating the impact of accidents.Moreover, the system's accuracy rate of 92% is a testament to its robustness and reliability. This high level of accuracy instills confidence in the system's ability to consistently and accurately detect accidents, thereby enhancing overall road safety. By reducing false positives and negatives, the system can help minimize unnecessary disruptions and ensure that resources are allocated efficiently in response to accidents.In addition to its core functionality of accident detection, the CNN-based system can offer several additional features and benefits that enhance its overall utility and effectiveness. These additional features can significantly augment the system's capabilities and its potential impact on road safety.Moreover, the system can be extended to detect other anomalies on the road, such as sudden obstacles, debris, or erratic driving behavior. By

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broadening its scope of detection, the system can help prevent accidents and improve overall road safety.By integrating with smart city infrastructure, such as traffic lights and road sensors, the system can provide real-time feedback and coordination for more efficient traffic management and emergency response. This integration can further enhance the system's ability to improve road safety and efficiency.The CNN-based Accident Detection System represents a significant advancement in road safety technology. With its high accuracy, real-time capability, and potential for further enhancement, the system holds great promise for improving accident detection and response mechanisms. As efforts continue to refine and optimize the system, its impact on road safety is poised to be substantial, potentially saving lives and preventing injuries on the road.

In conclusion, the CNN-based Accident Detection System offers a range of additional features and benefits that go beyond basic accident detection. Its potential to improve traffic management, enhance safety measures for autonomous vehicles, and provide valuable insights for road safety initiatives make it a valuable tool for improving overall road safety and efficiency.

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