A Mini Project-II report Titled

“ROAD ACCIDENT AND NON-ACCIDENT DETECTION”

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Under The Guidance of

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CERTIFICATE

This is to certify that the Mini Project-2 report entitled **“ROAD ACCIDENT AND NON-ACCIDENT DETECTION”,** submitted **Ruchita Nikam** and **Anil Riswal** is the Bonafede work completed under my supervision and guidance in partial fulfillment of TY subject ‘**Mini Project-2**’, of Bachelor of Technology (**Artificial Intelligence and Data Science**)of Dr. Babasaheb Ambedkar Technological University, Lonere (M.S.).

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CONTENTS

List of Figures

ABSTRACT

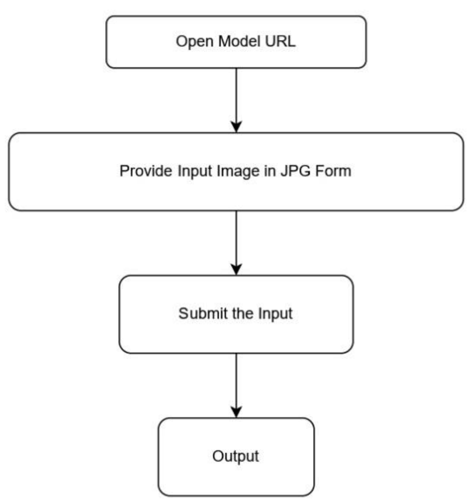
The dramatic increase in road traffic accidents in the world is causing serious problems in every aspect of human lives. the traffic accident data is only used to conduct a rudimentary statistical analysis and data mining efforts which results only in patterns and statistics. The main targets of this road accident data classification are to identify the major and key factors that cause the road traffic accident and form policies and preventive actions that would reduce the accident severity level. Machine learning algorithms are used to analyze the data, extract hidden patterns, predict the severity level of the accidents and summarize the information in a useful format. In this work, we have applied different machine learning classification algorithms and discussed here the six algorithms with high accuracy and best classification performances such as Fuzzy-FARCHD, Random Forest, Hierarchal LVQ, RBF Network (Radial Basis Function Network), Multilayer Perceptron, and Naïve Bayes on road traffic accident data set obtained from UK road traffic accident of the year 2016. The data set contains information on all road accident casualties across Calderdale. The results from our analysis show that Fuzzy-FARCHD algorithm is effective to classify the dataset and achieves an accuracy of 85.94%. In this work, we have revealed that Lighting Conditions, 1st Road Class & No., Number of vehicles are the key features in selecting the attributes.

1.INTRODUCTION

1.1. Introduction:

There is a huge impact on society due to road accidents where there are great costs of fatalities and injuries. In recent years, there is an increase in research attention to determine the significant effect of the severity of driver’s injuries which is caused due to road accidents. Accurate and comprehensive accident records are the basis of accident analysis. The effective use of accident records depends on some factors, like the accuracy of the data, record retention, and data analysis. There are many approaches applied to this scenario to study this problem.

A recent study illustrated that the residential and shopping sites are more hazardous than village areas. as might have been predicted, the frequencies of the casualties were higher near the zones of residence possibly because of the higher exposure. A study revealed that the casualty rates among the residential areas are classified as relatively deprived and significantly higher than those from relatively affluent areas.



1.1. Fig: Block diagram of Model

In Figure 1.1, the first step is to establish a connection with our project's URL, which we have developed. Once we have accessed the URL, we proceed to upload an image in JPEG format. After uploading the image, In the backend of the project, the pre-trained VGG16 model is loaded using TensorFlow or Keras. This model has been trained on a dataset to classify images into two classes: "Accident" and "Non-Accident.". With the help of a model. Save () Method We save the train model, and then whenever we need that, we import it and use it for the prediction, as it gives us the freedom to save the whole training procedure, which can reduce our time to train a model every time.

After this, we are submitting the image to the model, which will predict whether an accident will happen or not. It will give a result in two classes ("accident" and "non-accident"), and it will also generate confidence, which is the probability of an accident.

1.2Necessity

The classification of road accident images into accidental and non-accidental categories enables accurate accident analysis. Understanding the causes, contributing factors, and patterns of accidents is crucial for implementing effective preventive measures, improving road infrastructure, and enhancing driver training programs.

Quick and accurate classification of road accident images helps emergency response teams prioritize their actions and allocate appropriate resources. By identifying the nature of the incident, emergency services can respond more efficiently, potentially saving lives and reducing the severity of injuries.

So, the Road Accidental and Non-Accidental Image Classification project is necessary to enhance accident analysis, emergency response, preventive measures, fraud detection, road safety, and informed decision-making. By leveraging machine learning and computer vision techniques, this project has the potential to significantly impact road safety efforts, reduce the frequency and severity of accidents, and save lives.

1.3 Objective

- The objective of the Road Accident and Non-Accident Image Classification project is to develop a robust and accurate classification system capable of automatically distinguishing between accidental and non-accidental road accident images.
- The project aims to achieve specific objectives, including accurate image classification, high reliability, and generalization to unseen images. It also focuses on real-time processing, robustness to varied data sources, interpretability of the classification decisions, and seamless integration into relevant applications and systems.

By attaining these objectives, the project aims to provide a valuable tool for accident analysis, emergency response, preventive measures, and data-driven decision-making, ultimately contributing to enhanced road safety and improved outcomes in accident-related scenarios.

2.LITERATURE SURVEY

2.1 LITERATURE SURVEY

"Adaptive video-based algorithm for accident detection on highways", by B. Maaloul, A. Taleb-Ahmed, S. Niar, N. Harb and C. Valderrama, et al. (2021)

In this paper a novel vision-based road accident detection algorithm on highways and expressways is proposed. This algorithm is based on an adaptive traffic motion flow modeling technique, using Farneback Optical Flow for motions detection and a statistic heuristic method for accident detection. The algorithm was applied on a set of collected videos of traffic and accidents on highways. The results prove the efficiency and practicability of the proposed algorithm using only 240 frames for traffic motion modeling. This method avoids to utilization of a large database while adequate and common accidents videos benchmarks do not exist.[3]

"Accident Detection through CCTV Surveillance", by R. Babu and B. Rajitha et al. (2022)

This paper proposes an automated accident detection from traffic videos. Here the frames are extracted from the video shots. Key-frames are identified using the histogram difference, later features are extracted from it using the VGGNET and finally classified as accident or non-accident. The proposed methodology has been compared with the literature methods and found out to be the best.[1]

"Road Accident Detection and Severity Determination from CCTV Surveillance" ,by Veni, S. & Raju, Anand & Santosh et al. (2021)

Wide variety of road types like intersections, highways pose a real challenge to the computer vision algorithms. Hence, there is a need of efficient algorithm to detect the accident on road and also evaluate the severity

of the incident. This can be used to improve the emergency services response time. The work demonstrated in this paper aims to develop such an algorithm by modifying existing CCTV surveillance system. In this work, the accident is detected by the dispersion in the motion field of the vehicles during collision. Motion field of the road is obtained from the optical flow of the video frames. The moving objects in the frames are segmented and tracked. The dispersion in the angle vector of the optical flow is derived for each of the moving object. The dispersion of angle vector for each object is monitored, and deviation of the same from the threshold is determined as an accident. The harshness of the accident can be found by the range of dispersion of the motion field. The algorithm developed here is capable of detecting accidents between any types of moving objects. [2]

the papers propose different methods for accident detection. where the first pepar uses an adaptive traffic motion flow modeling technique combined with a statistical method, demonstrates the efficiency and practicability of the proposed algorithm using a relatively small number of frames (240 frames) for traffic motion modeling. And the second paper extracts key freames, applies feature extreaction, and employs clasification to determonie accidents, compares its proposed methodology with existing literature methods and claims superiority. And the third paper utilizes dispersion in the motion field of vehicles during collision to detect accidents,discusses the importance of accident detection in improving emergency services response time. It also mentions that the severity of accidents can be determined based on the dispersion of the motion field.

3. SYSTEM MODELLING

3.1 VGG16 Architecture: -

VGG16 is a 16-layer convolutional neural network (CNN) architecture that was first introduced in the paper "Very Deep Convolutional Networks for Large-Scale Image Recognition" by Karen Simonyan and Andrew Zisserman in 2014.

The VGG16 architecture is characterized by its simplicity: it uses only 3x3 convolutional filters and 2x2 max pooling layers. This simplicity makes it relatively easy to train and understand, while still achieving state-of-the-art performance on image classification tasks.

VGG16 was one of the top-performing models in the 2014 ImageNet Large Scale Visual Recognition Challenge (ILSVRC), and it remains a popular choice for image classification tasks today.

The VGG16 architecture is made up of the following layers:

2D convolutional layer with 64 filters of size 3x3 and stride 1

Max pooling layer with size 2x2 and stride 2

2D convolutional layer with 128 filters of size 3x3 and stride 1

Max pooling layer with size 2x2 and stride 2

2D convolutional layer with 256 filters of size 3x3 and stride 1

Max pooling layer with size 2x2 and stride 2

2D convolutional layer with 512 filters of size 3x3 and stride 1

Max pooling layer with size 2x2 and stride 2

2D convolutional layer with 512 filters of size 3x3 and stride 1

Max pooling layer with size 2x2 and stride 2

3 fully connected layers with 4096, 4096, and 1000 neurons, respectively

The VGG16 architecture can be used for a variety of image classification tasks, including object detection, image segmentation, and scene classification.

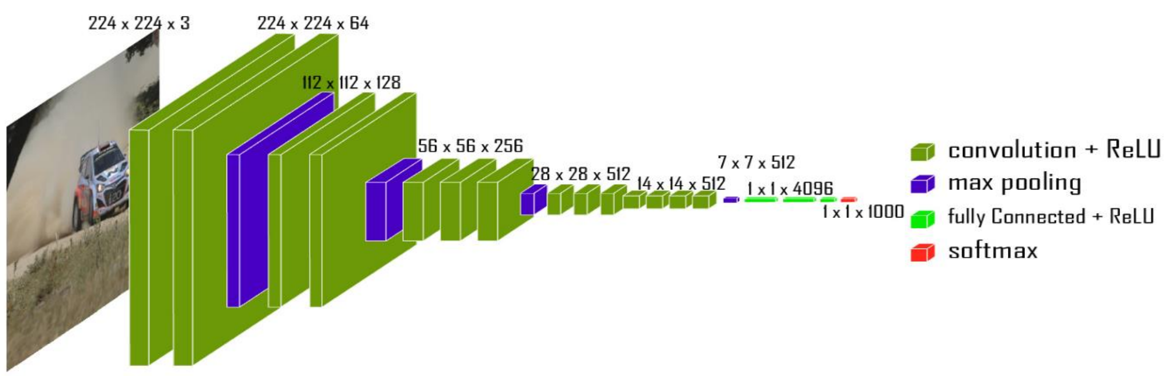


Fig No: - 3.3 Architecture of VGG16

3.1 Working of project

For this we have downloaded dataset which contain images with two classes . Where the whole dataset contains 989 number of images. That images we given to the algorithm like (VGG16)

Where for traing we have given 791 this number of image and for testing 100 this number of images and for validation we have given 98 this number of images given to train the model.

Basically, we are using a CNN (Convolutional Neural Network) Which work on an image it extracts the feature from it and base on that it predicts the new given input images here is about the CNN.

- The 16 in VGG16 refers to 16 layers that have weights. In VGG16 there are thirteen convolutional layers, five Max Pooling layers, and three Dense layers which sum up to 21 layers but it has only sixteen weight layers i.e., learnable parameters layer.

- VGG16 takes input tensor size as 224, 244 with 3 RGB channel

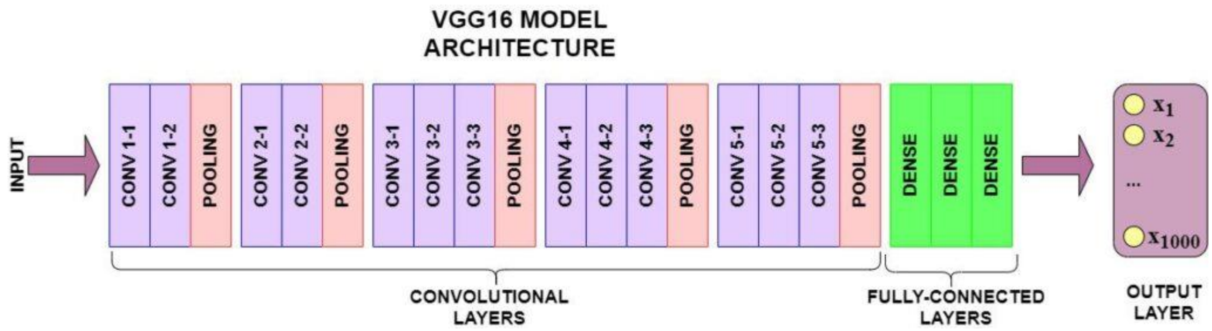
- Most unique thing about VGG16 is that instead of having a large number of hyper-parameters they focused on having convolution layers of 3x3 filter with stride 1 and always used the same padding and maxpool layer of 2x2 filter of stride 2.

- The convolution and max pool layers are consistently arranged throughout the whole architecture

- Conv-1 Layer has 64 number of filters, Conv-2 has 128 filters, Conv-3 has 256 filters, Conv 4 and Conv 5 has 512 filters.

- Three Fully-Connected (FC) layers follow a stack of convolutional layers: the first two have 4096 channels each, the third performs 1000-way ILSVRC classification and thus contains 1000 channels (one for each class). The final layer is the soft-max layer.

4.BLOCK DIAGRAM



4.1. Block diagram

Input Data: The project starts with a dataset of road accident images, which serves as the input to the classification system.

Data Preprocessing: The input data undergoes preprocessing steps, which may include resizing, normalization, noise removal, and data augmentation techniques to enhance the quality and diversity of the dataset.

VGG16 Model: The preprocessed images are fed into the VGG16 model, a deep convolutional neural network architecture known for its excellent performance in image classification tasks. The VGG16 model consists of multiple convolutional and pooling layers that learn hierarchical features from the images.

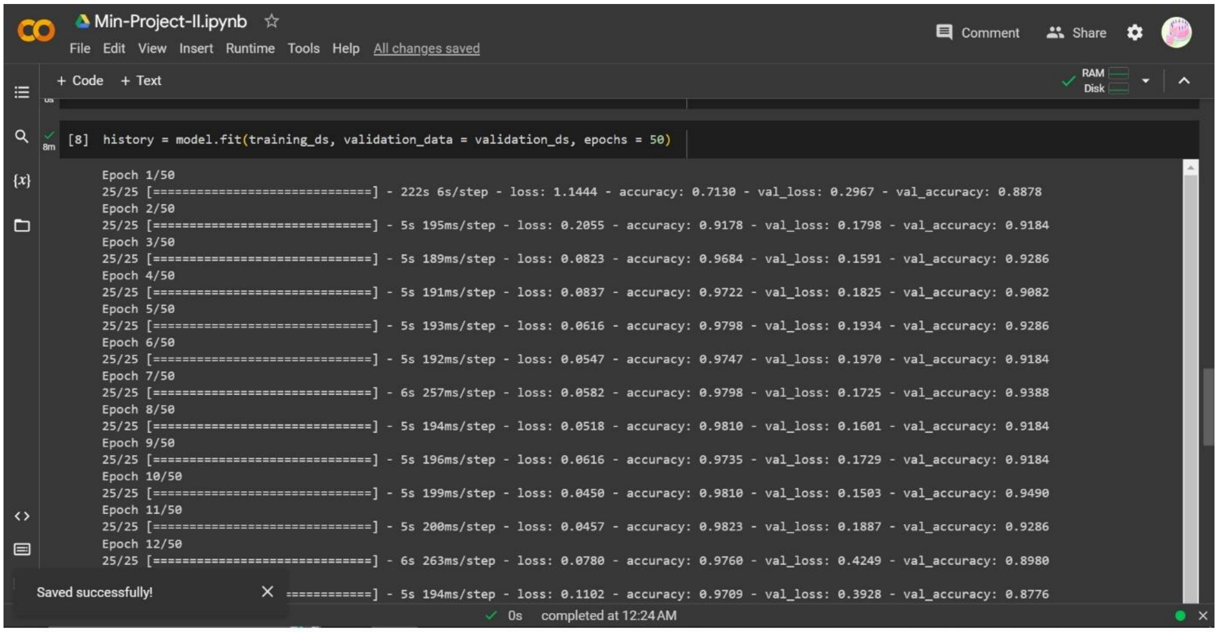
Fully Connected Layers: The output of the convolutional layers is flattened and passed through one or more fully connected layers. These layers perform feature extraction and mapping from the learned features to the target classes (accidental and non-accidental).

Output Predictions: The final layer of the model produces the output predictions, indicating whether each input image is classified as accidental or non-accidental

5.RESULTS

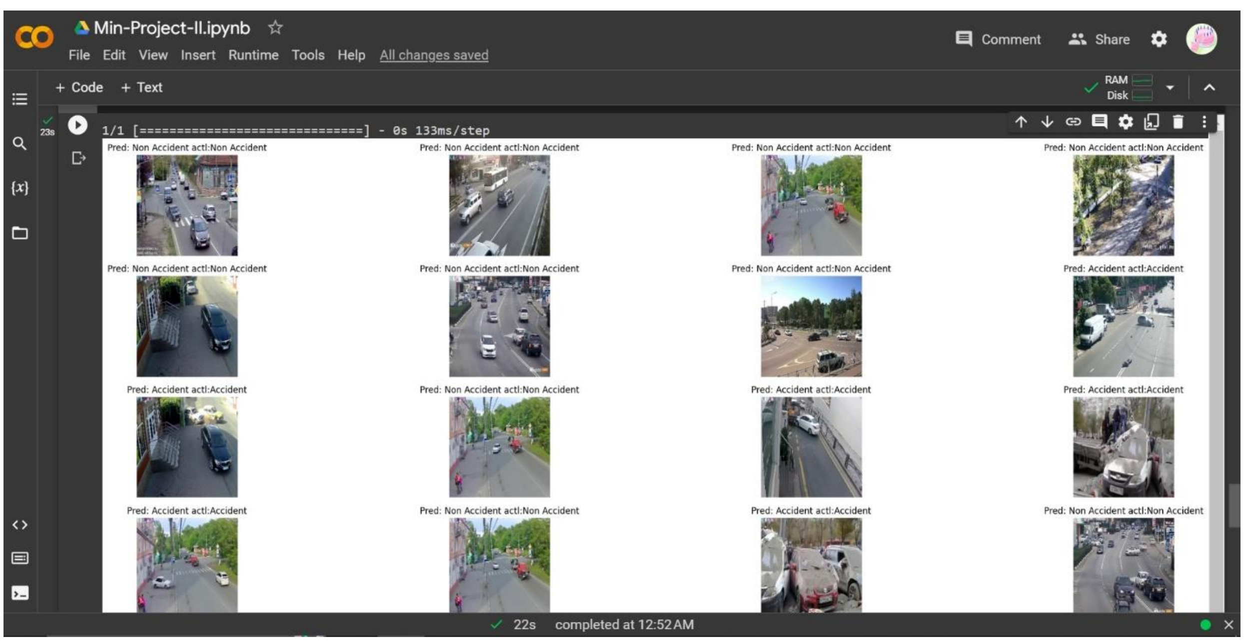
5.1. Accuarcy

As we have taken VGG 16 pretrain model we got a accuracy 0.9423 after traing 50 Epoch.



5.2: output image

Here the group of images is given to the model and base on that result is ploted.



5.3: Result

Here is a final result of the model with the single image with predicting the percentage of accident Confidence 0.54, model has detected an accident with the probability of 0.54.

6.ADVANTAGES, DISADVANTAGES, AND APPLICATION

6.1 ADVANTAGES:

- Automation and Efficiency: The project automates the classification process, eliminating the need for manual inspection and analysis of numerous accident images. This increases efficiency, reduces human error, and allows for real-time processing, enabling faster decision-making and response.

- Objective Evidence: The classification system provides objective visual evidence of accidents, which can be used in legal proceedings, insurance investigations, and accident reconstructions. The accurate classification of images adds credibility to the evidence and contributes to fair and just outcomes in legal and insurance claim processes.

- Public Awareness and Education: The availability of an accurate image classification system can be leveraged to raise public awareness about road safety. Sharing insights and statistics derived from the system's analysis can educate the public about accident causes and encourage safer driving behaviors, promoting a culture of road safety.

6.2 DISADVANTAGES:

- Complex Image Variability: Road accident images can vary significantly in terms of lighting conditions, weather situations, camera angles, and image quality. Dealing with such variability can pose challenges in accurately classifying images and may require robust algorithms and large, diverse training datasets.

- Ethical Considerations: There may be ethical concerns regarding the use of accident images, especially if they contain sensitive or personal information. Strict privacy policies and data protection measures must be in place to ensure compliance with legal and ethical guidelines.

- Interpretability Challenges: Although machine learning algorithms can classify images accurately, they often lack interpretability. Understanding the exact features or regions of an image that contribute to the classification decision can be challenging, limiting the ability to explain the system's predictions.

6.3 APPLICATION:

- Accident Analysis Platforms: The classification system can be integrated into accident analysis platforms to automatically categorize road accident images, enabling comprehensive analysis of accident data and facilitating evidence-based decision-making for road safety improvements.

- Emergency Response Systems: The classification system can be utilized in emergency response systems to automatically classify incoming accident images and assist emergency services in prioritizing their actions and resource allocation.

- Traffic Management Systems: Real-time classification of road accident images can contribute to traffic management systems by identifying incidents, congestion, or abnormal events, allowing authorities to take immediate action, reroute traffic, and ensure smooth traffic flow.

- Insurance Claim Processing: Insurance companies can utilize the classification system to assess the authenticity and severity of accident claims, improving the accuracy and efficiency of claims processing and fraud detection.

- Research and Policy Development: The project's outcomes and insights can support research efforts in the field of road safety, contributing to evidence-based policy development, the formulation of targeted interventions, and the evaluation of road safety initiatives

7. CONCLUSION

The Road Accidental and Non-Accidental Image Classification project has great potential to improve road safety. By developing a powerful system that can analyze images of road accidents, we can gain valuable insights and make better decisions to prevent accidents and improve safety.The system can be integrated into platforms used to analyze accidents, allowing us to understand the causes and patterns of accidents more deeply. With this knowledge, we create targeted interventions and policies to make our roads safer for everyone.

In emergency situations, the system can help emergency responders by quickly classifying accident images and prioritizing their actions. This can save precious time and potentially save lives.For traffic management, the system can identify accidents and abnormal events in real-time, helping authorities take immediate action to prevent further accidents and keep traffic flowing smoothly.Insurance companies can also benefit from the system. It can help them assess the authenticity and severity of accident claims more accurately, leading to faster and fairer processing of claims. It can also help detect fraudulent claims, saving resources for legitimate cases.

The project's outcomes and insights can support research and policy development in road safety. Policymakers can use the data and analysis to make informed decisions and evaluate the effectiveness of road safety initiatives. At last, It can also contribute to international comparisons and help in planning better road infrastructure.

7.1 Future Scope:

The Road Accidental and Non-Accidental Image Classification project has a lot of exciting possibilities for the future

- **Advancements in Technology:** As technology progresses, the project can explore more advanced algorithms and techniques to improve the accuracy and performance of the image classification system. This means using smarter and more powerful methods to analyze accident images.

- **Integration of Different Data:** The project can expand its scope by including other types of data, such as audio, video, or sensor data, in addition to images. By combining multiple sources of information, a better understanding of road accidents can be achieved, leading to more accurate classifications and a deeper analysis of how accidents happen.

- **Real-time Accident Detection and Prediction:** Building on the ability to classify images in real-time, the project can develop a system that detects and predicts accidents as they happen. By continuously analyzing CCTV footage or other streaming data, the system can identify potential accidents or dangerous situations in real-time. This allows for proactive measures to be taken, such as alerting drivers, activating safety mechanisms, or notifying emergency services to prevent accidents or reduce their impact.

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