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Automated Detection of Specific Zones Using CNN: A Deep Learning Approach

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Abstract: *In our day today life, time is very important thing so everyone trying to complete the task in less time is the human tendency. Therefore to complete the desired task as early as possible we should increase the speed, for example speed of vehicle. If we see the scenarios of vehicle density, it is continuously going on increasing form. As well as the drivers are not following the rules and regulation given by traffic control department at specific areas. But most of the drivers drive the vehicle very fast in that restricted areas with and without reasons. It is happened because of vehicle speed control is on drivers hand and over speed driving are there. The over speed of vehicle is the major problem due to number of accidents are increased much more. To overcome these problems we proposed automatic speed control of vehicle using video processing with small modification in existing system. It reduces the speed of vehicle gradually when the restricted areas are detected. For that video recording is done through small camera of road scene and detection and identification of Road Traffic sign/ speed limit/ school zone/hospital zone is done using CNN algorithm and alert through mail. In future, Arduino and vehicle speed is reduced and alert the driver with a help of DC motor and LCD display.*

Keywords: speed of vehicle

I. INTRODUCTION

Vehicle is an integral part of our daily life and its growth incremented day by days. The scenario of increased vehicle density in India from 2001 to 2015 is shown in Fig.1. Due to increased vehicle density and over speed driving causes more accidents. The statistical reports of occurred accidents are shown in Fig.2 [1].There are lot of reasons behind it. These are increased rate of vehicle density, the Indian roads are not changed upto the expecting level excluding the national highway, multiple functioning at the time of driving the vehicle that is like use of mobile, drink while driving, disobey of traffic rules and regulation, crossing speed limits which is dangerous for your own safety and that of others and many more. Out of them speed limit at specific areas are very important and it is displayed by traffic control system in sign form. For example in residential areas and market places ideal speed should be maximum upto20 km/hrto 30 km/hr. Secondly in the regions of school and hospital speed limits are kept upto 30 km/hr to 40 km/hr and so on. However, unfortunately most of the drivers are not following the rule of speed limit at specific areas and causes the accidents. These accidents are going on increasing because the whole control of the speed of the vehicle is in driver hand. They do not reduce and control the speed in restricted areas as per rules.

The purpose of the proposed work is to identify the factors contributing to fatal accidents. This is achieved by analysing road accidents using Convolutional Neural Networks by considering appropriate features and effectively clustering the records. Several combinations of attributes of large datasets are analysed to discover hidden patterns that are the root cause for accidents. The chances of accident occurrence could be identified by considering various criteria like speed limit and injury severity, time of accidents and drunk driver, month and weather during the accident, lightness and speed limit, human factors, surface and light conditions. The experimental results on road accident data set FARS (Fatality Analysis Reporting System) generated risk factors that cause fatal accidents which will be helpful in generating safer driving principles.

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Roadway traffic is the major issue these days. Increase in number of vehicles moving on roads accelerated the risk of accidents. Of them, fatal accidents is the major issue where people lose their lives. Also, these accidents are unpredictable that they may occur anywhere, anytime. As a human being we should save the lives of people and avoid these accidents. A secure roadway movement is a major concern for both transportation administering organizations and common nationals. Keeping these facts in mind, the aim of this work is to provide safe driving instructions to people moving on the roads and emergency services to people effected in the accident zone. So, factors like weather conditions, collision manner, surface condition, light condition, speed, drunk driver and so on were considered and examined. Analysed data can be used to give safer driving suggestions and reduce the accident rate. Also, emergency services can be provided to people affected at accident prone area. Data mining is one of the important mechanisms used in Information Technology from previous times. Data mining techniques best works in processing data and identifying the relationship among data. Association rule mining is a method used for finding interesting patterns among variables from huge databases. To find association among data, support and confidence are calculated by placing a threshold value. Finding related data using association rules helps in frequent item set mining.

Classification is performed on data using some classification model suitable to the given set of data. The purpose is to find out the frequent item sets. During classification a model is constructed in which different records of data set with unspecified class labels are separated easily. Naive Bayesian classification is one of the probabilistic methods used to predicate the independence among variable pairs. It strongly assumes and auto correlates the information. Sometimes these assumptions may go wrong. Thus, a better classification technique proposed to efficiently classify the data is Convolution Neural Network. It assumes data based on the locality. The classification technique proposed can be applied on the data to get effective results. The association rule mining algorithm ever used is Apriori. The algorithm efficiently works based on relevant association rules for frequent item set mining. It uses a bottom up approach. The property followed by this algorithm says any subset of frequent item set must be frequent. It uses larger item sets and can be implemented easily. This algorithm is applied on roadway traffic fatal accident dataset to test the data.

II. ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI), sometimes called machine intelligence, is demonstrated by , in contrast to the natural intelligence displayed by humans. Leading AI textbooks define the field as the study of "": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the , such as "learning" and "problem solving".

Artificial intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans. Some of the activities computers with artificial intelligence are designed for include:

- Speech recognition
- Learning
- Planning
- Problem solving

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DEFINITIONS

Computer science defines AI research as the study of "": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. A more elaborate definition characterizes AI as "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation

Artificial intelligence is a branch of computer science that aims to create intelligent machines. It has become an essential part of the technology industry.

Research associated with artificial intelligence is highly technical and specialized. The core problems of artificial intelligence include programming computers for certain traits such as:

- Knowledge
- Reasoning
- Problem solving
- Perception
- Learning
- Planning

ABILITY TO MANIPULATE AND MOVE OBJECTS

Knowledge engineering is a core part of AI research. Machines can often act and react like humans only if they have abundant information relating to the world. Artificial intelligence must have access to objects, categories, properties and relations between all of them to implement knowledge engineering. Initiating common sense, reasoning and problem-solving power in machines is a difficult and tedious task.

Machine learning is also a core part of AI. Learning without any kind of supervision requires an ability to identify patterns in streams of inputs, whereas learning with adequate supervision involves classification and numerical regressions.

Classification determines the category an object belongs to and regression deals with obtaining a set of numerical input or output examples, thereby discovering functions enabling the generation of suitable outputs from respective inputs. Mathematical analysis of machine learning algorithms and their performance is a well-defined branch of theoretical computer science often referred to as computational learning theory.

Machine perception deals with the capability to use sensory inputs to deduce the different aspects of the world, while computer vision is the power to analyze visual inputs with a few sub-problems such as facial, object and gesture recognition.

Robotics is also a major field related to AI. Robots require intelligence to handle tasks such as object manipulation and navigation, along with sub-problems of localization, motion planning and mapping.

CHALLENGES OF AI

The overall research goal of artificial intelligence is to create technology that allows computers and machines to function in an intelligent manner. The general problem of simulating (or creating) intelligence has been broken down into sub-problems. These consist of particular traits or capabilities that researchers expect an intelligent system to display. The traits described below have received the most attention.

REASONING, PROBLEM SOLVING

Early researchers developed algorithms that imitated step-by-step reasoning that humans use when they solve puzzles or make logical deductions. By the late 1980s and 1990s, AI research had developed methods for dealing with or incomplete information, employing concepts from and .

These algorithms proved to be insufficient for solving large reasoning problems, because they experienced a "combinatorial explosion": they became exponentially slower as the problems grew larger. In fact, even humans rarely

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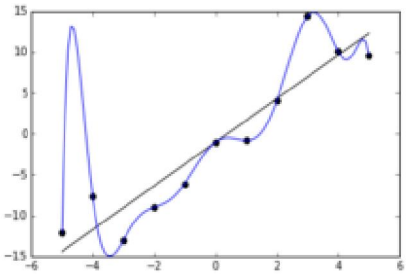
use the step-by-step deduction that early AI research was able to model. They solve most of their problems using fast, intuitive judgements.

LEARNING

Machine learning (ML), a fundamental concept of AI research since the field's inception is the study of computer algorithms that improve automatically through experience.

is the ability to find patterns in a stream of input, without requiring a human to label the inputs first. includes both and numerical , which requires a human to label the input data first. Classification is used to determine what category something belongs in, and occurs after a program sees a number of examples of things from several categories. Regression is the attempt to produce a function that describes the relationship between inputs and outputs and predicts how the outputs should change as the inputs change. Both classifiers and regression learners can be viewed as "function approximators" trying to learn an unknown (possibly implicit) function; for example, a spam classifier can be viewed as learning a function that maps from the text of an email to one of two categories, "spam" or "not spam". can assess learners by , by (how much data is required), or by other notions of . In the agent is rewarded for good responses and punished for bad ones. The agent uses this sequence of rewards and punishments to form a strategy for operating in its problem space.

III. NATURAL LANGUAGE PROCESSING



A represents the structure of a sentence according to some .

(NLP) gives machines the ability to read and human language. A sufficiently powerful natural language processing system would enable and the acquisition of knowledge directly from human-written sources, such as newswire texts. Some straightforward applications of natural language processing include , , and . Many current approaches use word co-occurrence frequencies to construct syntactic representations of text. "Keyword spotting" strategies for search are popular and scalable but dumb; a search query for "dog" might only match documents with the literal word "dog" and miss a document with the word "poodle". "Lexical affinity" strategies use the occurrence of words such as "accident" to of a document. Modern statistical NLP approaches can combine all these strategies as well as others, and often achieve acceptable accuracy at the page or paragraph level, but continue to lack the semantic understanding required to classify isolated sentences well. Besides the usual difficulties with encoding semantic commonsense knowledge, existing semantic NLP sometimes scales too poorly to be viable in business applications. Beyond semantic NLP, the ultimate goal of "narrative" NLP is to embody a full understanding of commonsense

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PERCEPTION;

AI compose informative abstract structures out of raw data.

is the ability to use input from sensors (such as cameras (visible spectrum or infrared), microphones, wireless signals, and active lidar, sonar, radar, and) to deduce aspects of the world. Applications include ,[118] , and . is the ability to analyze visual input. Such input is usually ambiguous; a giant, fifty-meter-tall pedestrian far away may produce exactly the same pixels as a nearby normal-sized pedestrian, requiring the AI to judge the relative likelihood and reasonableness of different interpretations, for example by using its "object model" to assess that fifty-meter pedestrians do not exist.

MOTION AND MANIPULATION

AI is heavily used in Advanced and other , widely used in modern factories, can learn from experience how to move efficiently despite the presence of friction and gear slippage. A modern mobile robot, when given a small, static, and visible environment, can easily determine its location and its environment; however, dynamic environments, such as (in) the interior of a patient's breathing body, pose a greater challenge. is the process of breaking down a movement task into "primitives" such as individual joint movements. Such movement often involves compliant motion, a process where movement requires maintaining physical contact with an object. Moravec's paradox generalizes that low-level sensorimotor skills that humans take for granted are, counterintuitively, difficult to program into a robot; the paradox is named after , who stated in 1988 that "it is comparatively easy to make computers exhibit adult level performance on intelligence tests or playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility". This is attributed to the fact that, unlike checkers, physical dexterity has been a direct target of for millions of years.

SOCIAL INTELLIGENCE

Moravec's paradox can be extended to many forms of social intelligence. Distributed multi-agent coordination of autonomous vehicles remains a difficult problem. is an interdisciplinary umbrella that comprises systems which recognize, interpret, process, or simulate human . Moderate successes related to affective computing include textual and, more recently, multimodal affect analysis (see), wherein AI classifies the affects displayed by a videotaped subject.

ARTIFICIAL INTELLIGENCE CLASSIFICATION OF LEARNING MODEL:

Supervised learning. This learning algorithm uses samples of input vectors as their target vectors. The target vectors are typically referred to as labels. Supervised learning algorithm's goal is to estimate the output vector for a specific input vector using learning algorithms. User-cases that have target identifiers are contained in a finite distinct group. This is typically referred to as classification assignment. When these targeted identifiers consists of one or more constant variables, they are called regression assignment.

Unsupervised learning. This learning algorithm does not require labeling of the training set. The objective of this type of learning is to identify hidden patterns of the analogous samples in the input data. This is commonly called clustering. This learning algorithm provides suitable internal understanding of the input-source information, by preprocessing the baseline input-source, making it possible to reposition it into a different variable space of the algorithm. The preprocessing phase enhances the outcome of a successive ML algorithm. This is typically referred to as a feature extraction [].

Reinforcement learning. This learning algorithm involves deploying similar actions or series of actions when confronted with same problem with the aim of maximizing payoff. Any outcome that does not lead to favorable expectation is dropped and conversely. Expectedly, this type of algorithm consumes lots of memory space and is predisposed in applications that are executed continuously.

Supervised ML Algorithm

Most practical ML deploys supervised learning. In supervised learning, the available datasets are called "true" datasets or "correct" datasets. The algorithm is "trained" by using these input datasets. This is referred to as: training data.

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During this procedure, the algorithm roles reduces to making estimations on the given input experimental data and expanding or contracting its evaluations based on the "ground truth" as baseline, repeating the process until the algorithm achieves some degree of accuracy universally acceptable. An ML algorithm will, typically, adjust and satisfies a cost function. A cost function quantifies the error between the "ground truth" and algorithm calculations. Minimizing the cost function, allows for training the model to yield results that align to more precise values (ground truth). Minimizing cost function can be achieved with the utilization of a gradient descent technique. Different gradient descent techniques such as stochastic gradient descent, momentum-based gradient descent, and Nesterov accelerated gradient descent have been applied to ML training paradigms. In an example where 'm' represents the number of trainings, each training can be denoted in a pair, as follows: (x, y). In this example the x can signify the input experimental data and y signifies the class identifier label. The input experimental data x represents an n dimensional, while individual dimension links to an explicit feature or a specific variable. In this example, the ML algorithm is aligned with a specific sensor system embedded in the program to accommodate the IoT application. Supervised learning problems can be further grouped into classification and regression problems. In the following subsections, a detailed discussion is presented.

CLASSIFICATION TASKS

Classification is a technique to categorize the data into a desired and distinct number of classes where a label is assigned to each class. There are many methods to classify the data, a detailed discussion about the types of classification algorithms is given in the following subsections.

GENERAL INTELLIGENCE

Historically, projects such as the Cyc knowledge base (1984–) and the massive Japanese initiative (1982–1992) attempted to cover the breadth of human cognition. These early projects failed to escape the limitations of non-quantitative symbolic logic models and, in retrospect, greatly underestimated the difficulty of cross-domain AI. Nowadays, the vast majority of current AI researchers work instead on tractable "narrow AI" applications (such as medical diagnosis or automobile navigation). Many researchers predict that such "narrow AI" work in different individual domains will eventually be incorporated into a machine with (AGI), combining most of the narrow skills mentioned in this article and at some point even exceeding human ability in most or all these areas. Many advances have general, cross-domain significance. One high-profile example is that in the 2010s developed a "generalized artificial intelligence" that could learn many diverse games on its own, and later developed a variant of the system which succeeds at . Besides , hypothetical AGI breakthroughs could include the development of reflective architectures that can engage in decision-theoretic metareasoning, and figuring out how to "slurp up" a comprehensive knowledge base from the entire unstructured . Some argue that some kind of (currently-undiscovered) conceptually straightforward, but mathematically difficult, "Master Algorithm" could lead to AGI. Finally, a few "emergent" approaches look to simulating human intelligence extremely closely, and believe that features like an or simulated may someday reach a critical point where general intelligence emerges.

Many of the problems in this article may also require general intelligence, if machines are to solve the problems as well as people do. For example, even specific straightforward tasks, like , require that a machine read and write in both languages (), follow the author's argument (), know what is being talked about (), and faithfully reproduce the author's original intent (). A problem like machine translation is considered "", because all of these problems need to be solved simultaneously in order to reach human-level machine performance.

IV. LITERATURE SURVEY

1) Ancy John, Asst.Prof.Nishanth P.R et al "Real Time Embedded System For Accident prevention" IEEE, JOURNAL – 2017

They have used RF communication based zone detection. vehicle is in the transmitter zone, the vehicle speed is controlled by receiving the signal from the RF transmitter. For this, RF transmitter can be kept at a few meters before the zone.

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2) R.D.Thombare, P. M.Sawant et al "AUTOMATIC SPEED CONTROL OF VEHICLE USING VIDEO PROCESSING" - IEEE, JOURNAL – 2018. Road Traffic sign is done using Speeded up Robust Features (SURF) algorithm in MATLAB Simulink software. To reduce the vehicle speed gradually PID controller is used.

3) Huiyuan Xiong, Zhirong Tan et al "A New Dual Axle Drive Optimization Control Strategy for Electric Vehicles Using Vehicle-to-Infrastructure Communications" - IEEE, CONFERENCE, 2019. V2I communication is used to obtain road surface adhesion coefficient, road roughness and other information. A dual motor optimal torque distribution control method for adaptive road surface

4) OKRAH. S.K WILLIAMS. E.A KUMASSAH.F et al "Design and implementation of automatic headlight dimmer for vehicles using light dependent resistor (ldr) sensor" – IEEE, 2016. (LDR) sensor has been designed to dim the headlight of on-coming vehicles to avoid human eye effects and avoiding accident in highways

V. SYSTEM DESIGN

EXISTING SYSTEM

Agent-based approaches have gained popularity in engineering applications, but its potential for advanced traffic controls has not been sufficiently explored.

This existing paper presented a multi-agent framework that models traffic control instruments and their interactions with road traffic.

A constrained Markov decision process (CMDP) model is used to represent agent decision making in the context of multi-objective policy goals, where the policy goal with the highest priority becomes the single optimization objective and the other goals are transformed as constraints.

A reinforcement learning-based computational framework is developed for control applications.

To implement the multi-objective decision model, a threshold lexicographicordering method is introduced and integrated with the learning-based algorithm.

EXISTING SYSTEM - DISADVANTAGES

- Performance of the intelligent control approach was evaluated by simulation, and compared with several other signal control methods
- Not avoiding vehicle accident in restricted zone

PROPOSED SYSTEM

In this paper we proposed a system which will control the speed of vehicle automatically when the road sign of restricted areas are detected using video processing. For that a small camera is mounted on vehicle and it records the video of road with traffic sign. The recorded videos are transferred for video processing after every 1sec interval. Then these videos are converted into frames and compare it with the reference image available into the system database. When appropriate match is found the control signal is send to speed control mechanism of vehicle. But drastic speed reduction is dangerous to drivers therefore by using raspberry pi controller gradual speed reduction is achieved. The different algorithms are available for detection and matching of image, out of them CNN algorithm is used for this proposed system. It gives the high accuracy and more efficient than the existing system.

Mainly the proposed system consists of four blocks and these are as follows.

- Video to frame conversion unit
- Image detection and identification
- Reference speed subsystem
- Speed control unit

VIDEO TO FRAME CONVERSION UNIT:-

The small camera mounted on the vehicle records the video signal and givesa primary input to this system. The recorded video has to convert into frames to identify and detect the desired traffic sign. While convertingvideo signal

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into frames approximately 30 frames are produced in 1second.But30 frames per second contain the redundant datathat is data wise similar frames which take more time for identify and detect of the desired traffic sign. Due to this system becomes sluggish and will not provide the fast response for control action. Therefore redundant data are reduced and only single frame per second is taken for the comparison purposes. So the time required for data processing is very less which will increases overall system performance.

IMAGE DETECTION AND IDENTIFICATION (IDI)

The frame coming from video to frame conversion unit is compared with the reference image stored into the database. By using the CNN algorithm the reference image compared with the Scene image on the basis of the feature points matched. As per the matching result control signal will generate and corresponding signalsend to action subsystem block.

IMPLEMENTATION OF CONVOLUTIONAL NEURAL NETWORKS

A Convolutional Neural Network is a class of deep learning, feed-forward artificial neural networks, and most commonly useful for several analyses. They visualize metaphors and Numerical data. It can use a difference of multilayer perceptron designed to need minimal pre-processing. It is very similar to normal Neural Networks. They are made up of neurons that have learned weights and biases. Each neuron receives several inputs, performs a dot product and optionally follows it with a non-linearity. The complete network at rest articulates to achieve the function from the raw input data on one end to achieve the class at the other end. It can make a clear hypothesis that the inputs allow us to encode certain possessions into the CNN process and then, make the forward function more efficient to implement. They very much reduce the number of parameters in the network. Neural Networks consider an input and transform it through a series of hidden layers. Each hidden layer is made up of a set of neurons, where
each neuron is fully connected to all neurons in the previous layer. Neurons in a single layer function in a completely separate manner and do not share any relations. The very last fully-connected layer is called the output layer and it represents the class achieved.

There are three main Layers that build Convolutional Neural Networks. They are Convolution Layer, Pooling Layer, and Fully-Connected Layer

True positive (TP): If the given combination matches with at least one record in base dataset
along with result, that particular result corresponds to TP value.

True Negative (TN): If the given combination matches with at least one record in base dataset
but the rate doesn't match, it defines TN.

False positive (FP): If the given combination doesn't match with any record in base dataset but the fatality rate is High, it comes under FP.

False negative (FN): If neither the record matches nor the rate is High, its FN.

The above values TP, TN, FP and FN are compared and incremented on matching basis. Final counts of every case are jotted and following formulae calculates the values respectively.

Accuracy = (TP+FP)/(TP+TN+FP+FN)

Precision = TP/ (TP + FP)

Recall = TP/ (TP + FN)

F-Measure = (2*Precision*Recall)/(Precision+Recall)

Efficiency based Result for the classification techniques Naïve Bayes And Convolutional Neural Networks can be given in the below tabular for based on above calculations.

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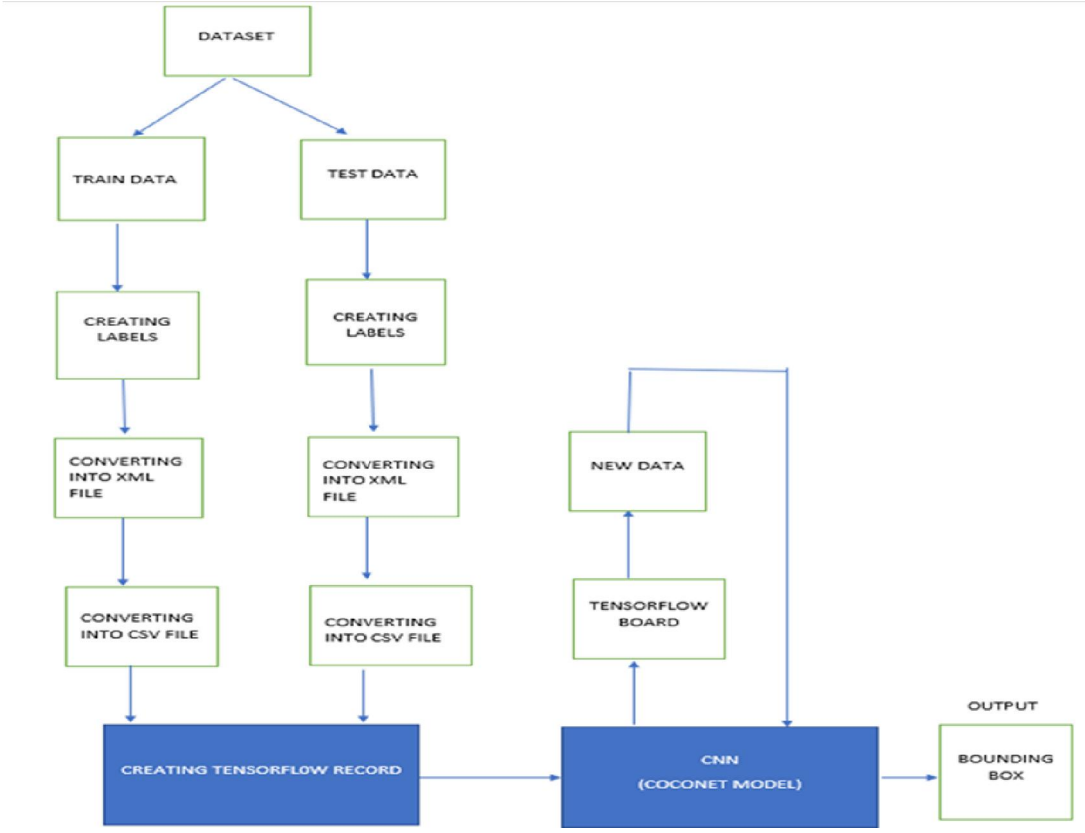
VI. SOFTWARE IMPLEMENTATION

FLOWCHART



ALGORITHM

CONVOLUTION NEURAL NETWORK:

A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates.

In this sense, neural networks refer to systems of neurons, either organic or artificial in nature. Neural networks can adapt to changing input; so the network generates the best possible result without needing to redesign the output criteria.

The concept of neural networks, which has its roots in artificial intelligence, is swiftly gaining popularity in the development of trading systems.

Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics

Pooling Layer

There are two types of pooling:

1) Max Pooling

2) Average Pooling

Fully Connected Layer

Fig 4. Fully Connected Network

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Fully Connected Layer is simply, feed forward neural networks. Fully Connected Layers form the last few layers in the network.

The input to the fully connected layer is the output from the final Pooling or Convolutional Layer, which is flattened and then fed into the fully connected layer.

PROPOSED METHODOLOGY

Computer vision is evolving rapidly day-by-day. Its one of the reason is deep learning. When we talk about computer vision, a term convolutional neural network(abbreviated as CNN) comes in our mind because CNN is heavily used here. Examples of CNN in computer vision are face recognition, image classification etc. It is similar to the basic neural network. CNN also have learnable parameter like neural network i.e, weights, biases etc.

Why should we use CNN?

Problem with Feed forward Neural Network

Suppose you are working with MNIST dataset, you know each image in MNIST is 28 x 28 x 1(black & white image contains only 1 channel). Total number of neurons in input layer will 28 x 28 = 784, this can be manageable. What if the size of image is 1000 x 1000 which means you need 10^6 neurons in input layer. Oh! This seems a huge number of neurons are required for operation. It is computationally ineffective right. So here comes Convolutional Neural Network or CNN. In simple word what CNN does is, it extract the feature of image and convert it into lower dimension without loosing its characteristics. In the following example you can see that initial the size of the image is 224 x 224 x 3. If you proceed without convolution then you need 224 x 224 x 3 = 100, 352 numbers of neurons in input layer but after applying convolution you input tensor dimension is reduced to 1 x 1 x 1000. It means you only need 1000 neurons in first layer of feedforward neural network.

Layers in CNN

There are five different layers in CNN

Input layer

Convo layer (Convo + ReLU)

Pooling layer

Fully connected(FC) layer

Softmax/logistic layer

Output layer

Different layers of CNN

Input Layer

Input layer in CNN should contain image data. Image data is represented by three dimensional matrix as we saw earlier. You need to reshape it into a single column. Suppose you have image of dimension 28 x 28 =784, you need to convert it into 784 x 1 before feeding into input. If you have “m” training examples then dimension of input will be (784, m).

Convo Layer

Convo layer is sometimes called feature extractor layer because features of the image are get extracted within this layer. First of all, a part of image is connected to Convo layer to perform convolution operation as we saw earlier and calculating the dot product between receptive field (it is a local region of the input image that has the same size as that of filter) and the filter. Result of the operation is single integer of the output volume. Then we slide the filter over the next receptive field of the same input image by a Stride and do the same operation again. We will repeat the same process again and again until we go through the whole image. The output will be the input for the next layer.

Convo layer also contains ReLU activation to make all negative value to zero.

Pooling Layer

Pooling layer is used to reduce the spatial volume of input image after convolution. It is used between two convolution layer. If we apply FC after Convo layer without applying pooling or max pooling, then it will be computationally expensive and we don’t want it. So, the max pooling is only way to reduce the spatial volume of input image. In the above example, we have applied max pooling in single depth slice with Stride of 2. You can observe the 4 x 4 dimension input is reduce to 2 x 2 dimension.

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There is no parameter in pooling layer but it has two hyperparameters — Filter(F) and Stride(S).
In general, if we have input dimension W1 x H1 x D1, then
W2 = (W1−F)/S+1
H2 = (H1−F)/S+1
D2 = D1
Where W2, H2 and D2 are the width, height and depth of output.
Fully Connected Layer (FC)
Fully connected layer involves weights, biases, and neurons. It connects neurons in one layer to neurons in another layer. It is used to classify images between different categories by training.
Softmax / Logistic Layer
Softmax or Logistic layer is the last layer of CNN. It resides at the end of FC layer. Logistic is used for binary classification and softmax is for multi-classification.
Output Layer
Output layer contains the label which is in the form of one-hot encoded.
The steps needed for zone identification system implementing CNN are:
Gathering data
Labeling data
Generating TFRecords for training
Configuring training
Training model
Exporting inference graph
Testing object detector
GATHERING DATA
Before we can get started creating the object detector we need data, which we can use for training.
To train a robust classifier, we need a lot of pictures which should differ a lot from each other. So they should have different backgrounds, random object, and varying lighting conditions.
LABELING DATA
Now that we have our images we need to move about 80 percent of the images into the object_detection/images/train directory and the other 20 percent in the object_detection/images/test directory.
In order to label our data, we need some kind of image labeling software. LabelImg is a great tool for labeling image.
To create the bounding box the “Create RectBox” button can be used. After creating the bounding box and annotating the image you need to click save. This process needs to be repeated for all images in the training and testing directory.

GENERATING TFRECORDS FOR TRAINING
With the images labeled, we need to create TFRecords that can be served as input data for training of the object detector. In order to create the TFRecords we will use two scripts from Data Tran’s raccoon detector. Namely the xml_to_csv.py and generate_tfrecord.py files.
After downloading both scripts we can first of change the main method in the xml_to_csv file so we can transform the created xml files to csv correctly.
CONFIGURING TRAINING
The last thing we need to do before training is to create a label map and a training configuration file.
Creating a label map
The label map maps an id to a name. We will put it in a folder called training, which is located in the object_detection directory
The id number of each item should match the id of specified in the generate_tfrecord.py file.
TRAINING MODEL
To train the model we will use the train.py file, which is located in the object_detection/legacy folder. We will copy it into the object_detection folder and then we will open a command line and type default code.

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EXPECTED OUTCOME

VII. RESULTS AND DISCUSSION

In this work, a classification technique named Convolution Neural Networks has been used that effectively identified the conditions contributing to fatal accidents. Using these conditions, the public could identify dangerous zones and take measures to avoid accidents. Experimental results have shown that CNN is more efficient than Naïve Bayes classifier in identifying the risk factor and also vehicle speed will be reduced without any invention. In the future it could be planned to make analysis on road accident dataset by considering more features and more clusters and to use deep learning techniques.

REFERENCES

[1] K.Jayasudha and C.Chandrasekar, "An overview of data mining in road traffic and accident analysis", Journal of Computer Applications, Vol.2, Issue.4, pp:32–37, 2009.
[2] Eric M Ossiander and Peter Cummings, "Freeway speed limits and traffic fatalities in Washington state", Accident Analysis & Prevention, Vol.34, Issue.1, pp:13–18, 2002.
[3] William M Evanco, "The potential impact of rural mayday systems on vehicular crash fatalities", Accident Analysis & Prevention, Vol.31, Issue.5, pp:455–462, 1999.
[4] KMA Solaiman, Md Mustafizur Rahman and Nashid Shahriar, "AVRA Bangladesh collection, analysis & visualization of road accident data in Bangladesh", In Proceedings of International Conference on Informatics, Electronics & Vision, pp.1–6, IEEE, 2013.
[5] Sachin Kumar and Durga Toshniwal, "Analysing road accident data using association rule mining", In Proceedings of International Conference on Computing, Communication and Security, pp.1–6, 2015.
[6] S.Krishnaveni and M.Hemalatha, "A perspective analysis of traffic accident using data mining techniques", International Journal of Computer Applications, Vol.23, Issue.7, pp:40–48, 2011.
[7] Amira A El Tayeb, Vikas Pareek, and Abdelaziz Araar, "Applying association rules mining algorithms for traffic accidents in Dubai", International Journal of Soft Computing and Engineering, 2015.
[8] L.Li, S.Shrestha and G.Hu, "Analysis of road traffic fatal accidents using data mining techniques", IEEE 15th International Conference on Software Engineering Research Management and Applications (SERA), pp.363-370, 2017.
[9] Sami Ayramo, Pasi Pirtala, Janne Kauttonen, Kashif Naveed and Tommi Karkkainen, "Mining road traffic accidents", Reports of the Department of Mathematical Information Technology Series C. Software and Computational Engineering, University of Jyvaskyla,
pp.1-53, 2009.
[10] S. Shanthi and R. Geetha Ramani, "Classification of Vehicle Collision Patterns in Road Accidents using Data Mining Algorithms", International Journal of Computer Applications (0975–8887), Vol.35, Issue.12, pp:30-37, 2011.
[11] S. Shanthi, R. Geetha Ramani, "Feature Relevance Analysis and Classification of Road Traffic Accident Data through Data Mining Techniques", Proceedings of the World Congress on Engineering and Computer Science, Vol 1, 2012.

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Impact Factor: 7.67

[12] Dharmendra Sharma and Suresh Jain, "Evaluation of Stemming and Stop Word Techniques on Text Classification Problem", International Journal of Scientific Research in computer Science and Engineering, Vol.3, Issue.2, 2015.
[13] Mohnish Patel, Aasif Hasan, Sushil Kumar, "Preventing Discovering Association Rules For Large Data Base", International Journal of Scientific Research in computer Science and Engineering Vol.1, Issue.3, 2013.
[14] Neeraj Chhabra, "Comparative Analysis of Different Wireless Technologies", International Journal of Scientific Research in Network Security and Communication, Vol.1, Issue.5, 2013.
[15] V. Kapoor, "A New Cryptography Algorithm with an Integrated Scheme to Improve Data Security", International Journal of Scientific Research in Network Security and Communication Vol.1, Issue.2, 2013.