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SMART CITIES MANAGEMENT USING DEEP LEARNING AND IoT WITH CLOUD COMPUTING

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ABSTRACT

Machine learning is most prominent tech in the recent times and we tried to do some wonders with it in different domains, especially in medical domains. We are implementing in this article in implementing smart cities and smart house. For this we need to implement image classification and deep learning models which can understand the insights of the IOT and deep learning methodologies for smart cities like vehicle automation, parking with the smart technology, digital security, digital currency, identifying the person with the face recognition technology and so on. For all these kind of things we need to implement machine learning and deep learning methodologies with cloud computing. Cloud computing is used to store information we retrieve and transfer to appropriate locations or to the recipients. Machine learning and deep learning methodologies are used to predict something and identify the insights of the data gathered. We utilized CNN for deep learning methodology and clustering models for the machine learning approaches. In this article we present you the multi-functional model for smart city management.

KEYWORDS: Machine Learning, Deep Learning, Smart City, Management, CNN, Clustering.

INTRODUCTION

Smart city management and all the issues we can solve with machine learning and deep learning are complex with the aim which we are planning to do. The same concept was researched by different organizations and we are planning to maintain all the systems on one platform as a union and without diverting from the track of security and service providing. There are lot more things to be understandable by the different organizations and we require a large set of information regarding this.[1,2] The things which we need to consider while creating anything related to the smart device implementations are how we are gathering the information and what are the libraries which we need to consider for algorithms identification of the smart things in our environment. The list is as follows:

- Smart parking
- Smart driving
- Vehicle automation
- Traffic signalling

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- Hospital and healthcare management.
- Smart house.
- Face recognition
- Vehicle detection

There are some of the wide range of libraries we can use for our target work. First we start with the things we require.[3,4,5]

In this article the following things to be noted down for better research of this concept further. They are as follows:[6,7,8]

DATA COLLECTION

We need to collect information from wide range of sources and all the sources we opt should provide the right choices of image data as the raw information. The images and the videos which we are considering has to be forwarded to the pre-processing mechanisms and all the processing's must be done for identifying the insights of the images and all the blur and unwanted things in image has to be eliminated. [9,10,11]

MEDICAL APPLICATION

Smart medical applications are used to convey the medical records to the doctors using smart apps and also we have some advanced sensors with the mobile phones which can calculate the basic health information with holding them in the specific positions. The applications like mentioned in figure 1 is the basic example. [12,13,14]

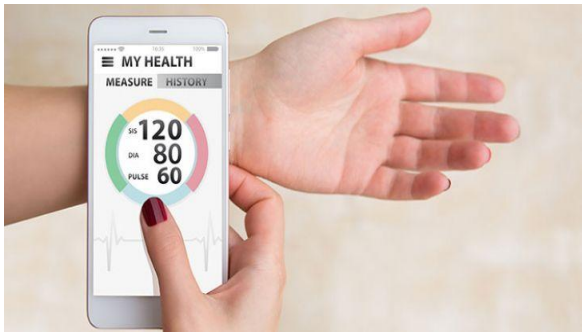

Figure 1.Smart health applications

SMART PARKING

By considering few of the things like parking in a smart way considering the surroundings of the vehicle. We need to check the mirror for the back side position of the vehicles. But with the smart vehicles we are considering the automation of the parking with the smart sensors and also with the deep learning methodologies. Here we are considering deep learning to identify the objects behind the vehicle and also all the surroundings of the vehicle. Figure 2 implements the vehicle automation and the smart parking.[18,19]

Figure 2.Smart parking

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SMART HOME

Smart homes are connecting devices with different networks to perform a certain task and the figure 3 explains the concept of smart homes which will work on connecting the devices at home with a mobile app and will track every action performed by the application.]15,16,17]

Figure 3.Smart house application using IoT

VEHICLE AUTOMATION

Vehicle automation is driverless cars which will connect car to network and work on driving the car without any drivers. Arduino and Raspberry pie are the hardware components which can connect with Wi-Fi of Bluetooth to the server and works according to the sensors. Those hardware devices are as follows.[20,21]

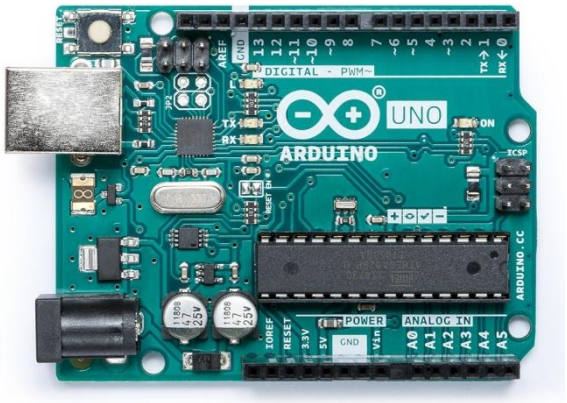

Figure 4.Arduino Device

Figure 5 explains the structure of Raspberry pie which is another device to connect with car.

Figure 5.Raspberry Pie 3

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The following things can be gathered and required to implement vehicle automation: [22,23]

- Voice connector
- Sensors
- Raspberry Pie 3
- Arduino
- Wi-Fi
- Bluetooth
- Power backup
- Sensors
- Remaining hardware devices.

Figure 6 explains the vehicle automation scenario in a deep level.

Figure 6.Vehicle Automation scenario

LITERATURE REVIEW AND EXISTING SYSTEM

Smart implementations in the traffic signals are the most prominent things which we have in the recent days. The concept of smart signalling was invented to monitor the ambulance and the emergency vehicles and help them in the main time. Here some of the things which are needed consider for the structure of the smart cities and smart security. The smart way of converting the data is to use the advanced mapping technologies like CNN and Hierarchical learning and other methods of data mining to extract the data and convert those to the useful information. The following image figure 7 explains the smart trafficking. [24,25,26]

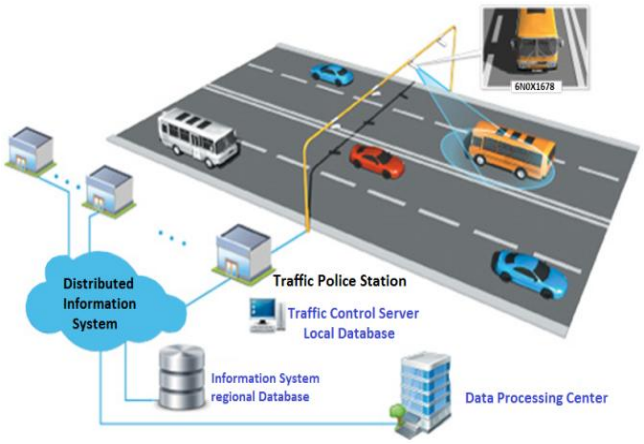

Figure 7.Smart Trafficking

This smart trafficking is used to help the people to identify the cars which are not following the rules and can catch them when they found next time. Then we need to process the information using the cloud server and all the things using the cloud computing.[27]

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PROPOSED SYSTEM

In the proposed system we are maintaining a model with machine learning and deep learning methodologies. Using which we proces the face recognition of a person and identify the same person at any time they identified in the different places while doing any crime or if they are met with an accident and any other kind of issues.

CNN is an deep leaning methodology which is used for image processing and other king of machine learning research issues which can be used for identifying the special things with the unstructured data, that is images and videos. Then we need to convert the image into different segments and all the images we have will be used for identifying the insignts of the images as below mentioned in figure 8

CNN

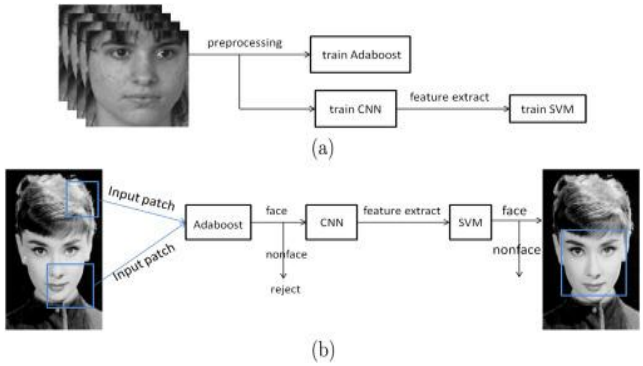

Figure 8.Face recognition using CNN

MACHINE LEARNING

Using machine learning models we need to identify the text data individuals and need to predict something we require from the data we have. For suppose we have information regarding different hospitals of the vehicles which are moving in a street and some of the suspicious things are recognized then we need to identify them using some of the prediction models like random forest like mentioned in figure 10. Figure 9 will help us to identify the single decision tee based on the rules we generate from the knowledge base.[28]

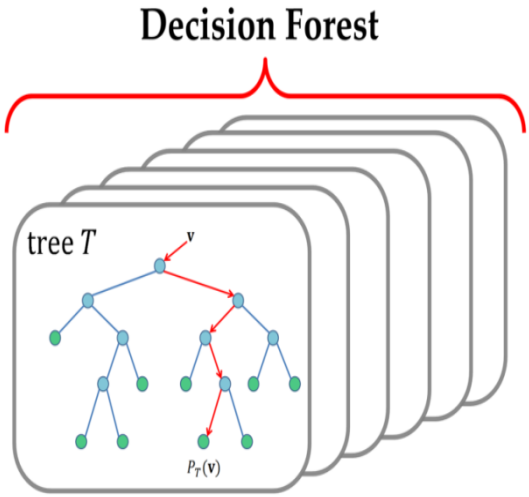

Figure 9.Random Forest implementation

Figure 10 will also state the importance of random forest algorithm as it is a combination of multiple decision trees.

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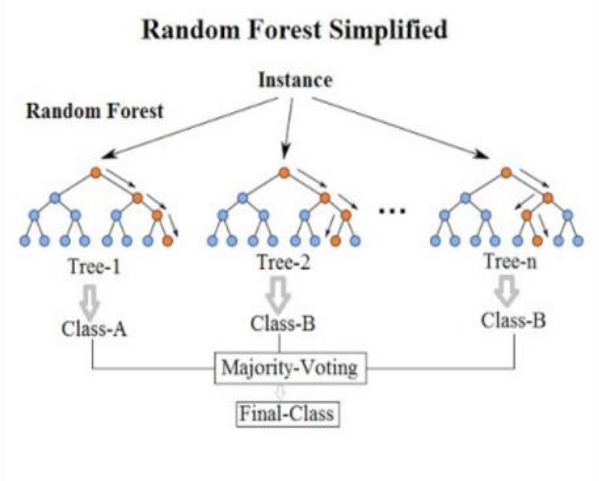

Figure 10.Group of trees will form Random Forest

PROPOSED ARCHITECTURE

The proposed architecture consists of the things which are the combination of the decision trees and random forest with other deep learning methodologies and also the cloud computing. The following things can be observer from the cloud computing architecture and also we need to identify what are the services we are getting from AWS to get on demand service access.[29]

Figure 11 will explain the AWS IoT architecture with lambda fucntion and dynamo DB for data base access and other machine learning and IoT services from AWS.[30]

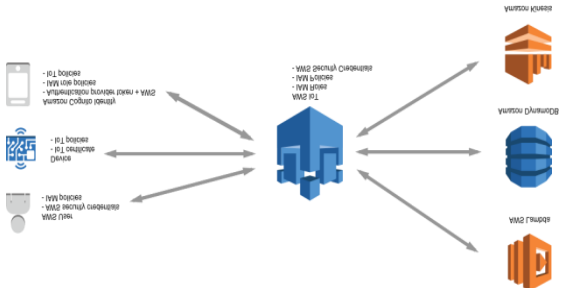

Figure 11.AWS IoT architecture

Figure 12 is another kind of cloud compuring architecture we follow for the smart city implementation

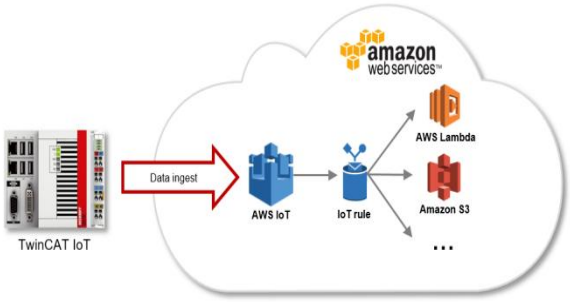

Figure 12.AWS data ingestion model

In figure 13 we try to explain the different architectures we follow for the cloud implementation. The CNN and the data usin Cloud and prediction models with Machine learning will be combined and formed a superior architecture to connect every aspect of the smart operations.

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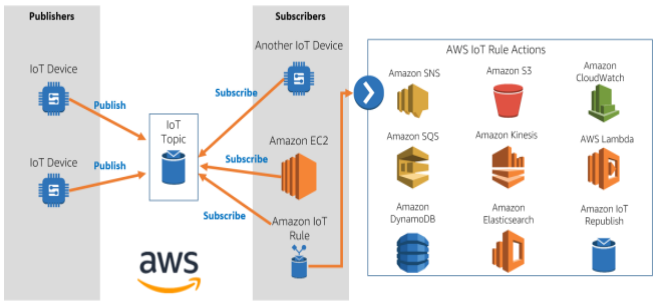

Figure 13.AWS rule actions for different IoT operations

IMPLEMENTATION

The implementation of this architecture have a detailed approach of machine learning, cloud computing and deep learning methodologies. The cloud computing will be used when a device is connected to the server and uploading the operations and also we need to store the information related to the past experiences using which we need to design the machine learning and deep learning models which can be used for the implementation of prediction models. These kind of data server operations used to store and retrive information related to the operations whether it may be healthcare, trafficking or anyother system. The deep learning models will connect to the cloud server and activate the Open CV library to identify the humans, vehicle numbers and other related operations. Using which we can provide security to the people or to the devices which are in motion or lost. For suppose if a person phone was lost and we need to identify that using insights of the phone and also we need to track it using IMEI number in a smart way. If a person approached for crime then we need to identify the person when he is doing that deep learning methodologies and all the systems are certainly work with cloud services for better understanding of server operations.

RESULTS

In this section we discussing the results we acquired with the smart vehicle operations and the smart parking operations. We used OpenCV as the machine learning library which can be used for the identification of the objects in a certain distance. Here the figure 14 and figure 15 will explain the results of the smart vehicle automation and the driving samples.

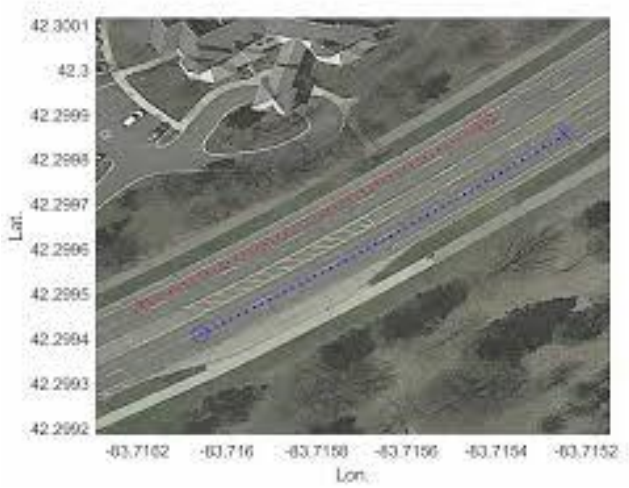

Figure 14.Arial view of the self driving

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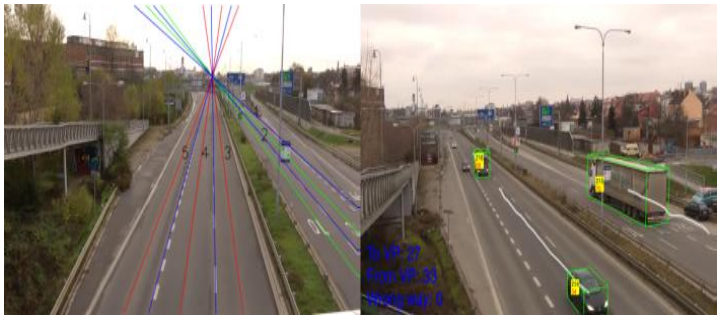

Figure 15.OpenCV report of identifying the signals and the vehicles around us

CONCLUSION

In this paper we discussed about the objectives of identifying the smart ways to connect the different devices and connecting them to make a smart and secrured work. Related to this we implemented multiple dicipline of technologies. One is machine learning which is used for implementing predicting models and other is deep learning models which are used as the hidden models which can be created with smart knowledge and rules by the domain experts. After implemeting this kind of advnaced methodologies we are implementing the models for smart vehicle parking, vehicle automation, driverless cars, smart health and other smart related things which can be used for maintaing the smart city in a smart way.

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