INTELLIGENT TECHNOLOGIES FOR AUTOMATED ELECTRONIC SYSTEMS

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Intelligent Technologies for Automated Electronic Systems

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PREFACE

The major objective of Smart Electronic Systems is to provide a platform where researchers from the fields of hardware and software may work together under one roof to speed up the development of smart electronic systems. Effective and secure data sensing, storage, and processing are essential in today's information age. Modern smart electronic systems meet the criteria of effective sensing, storage, and processing. Effective techniques and software that allow for a quicker analysis and retrieval of necessary data are simultaneously becoming more important. The internet world now includes big data, which comprises large, complex data collections. It is becoming harder to store and analyse the vast amount of structured and unstructured data that has to be collected. With concurrent hardware and software development, the Internet of Things (IoT) and cyber-physical systems (CPS) have been growing to include everyday consumer electronics. The effectiveness and performance of current and next generations of computing and information processing systems depend on advancements in both hardware and software. Some of the focused areas in this field include memristor and memristive systems, advanced 3D IC technologies, design methodologies, and 3D pacing. Others include molecular electronics, biosensors, bio-molecular and biologically inspired computing, nanoelectronics for energy harvesting, spintronics, domain-wall and phase-change memories, and nanoelectronics for energy harvesting. Quantum computing, communication, information processing, circuit, system, and sensor design based on nanoelectronics for critical applications, chip-to-system design, and techniques for electronic design automation (EDA) or computer-aided design (CAD) are the topics addressed in this book. At the same time, programming and efficient calculations for quicker examination and retrieval of crucial data are slowly getting out of style.

Massive amounts of both organised and unstructured data are challenging to store and manage. Post-CMOS technologies, the Internet of Things (IoT), and the cyber-physical system (CPS) have all been advancing simultaneously with synchronous hardware and software developments and have surpassed standard client devices. Future ages of figuring and data processing frameworks, as well as the present generation, will be largely influenced by advancements in both design and programming. In order to exchange information and research discoveries on all facets of electronic systems and digital electronics, it aims to bring together eminent academic scientists, researchers, and research scholars. It also acts as a premier interdisciplinary platform where researchers, practitioners, and educators may discuss and present the most recent findings, challenges, and trends in the fields of analogue and digital electronic systems, as well as their applications and solutions. The most recent developments in the study of solidification as well as the processing and analytical issues the society is facing in the twenty-first century are discussed. We would like to thank everyone who participated on behalf of the editors. First and foremost, we would like to congratulate wish success to the writers, whose wonderful work forms the basis of the book. We would like to use this opportunity to express our gratitude to our family and friends for their support and inspiration while we wrote this book. First and foremost, we give all praise and adoration to our omnipotent Lord for his abundant grace, which made it possible for me to successfully complete this book. For their contributions to this edited book, the authors deserve our sincere thanks. We also want to thank Bentham Science Publishers and its whole staff for making the work possible and giving us the chance to participate in it.

The content of this book is summarized as follows:

1. Chapter 1 presents that motorcycle accidents are a major societal concern in many countries. Due to improper riding behaviours including not wearing a helmet, driving

recklessly, driving while intoxicated, riding while fatigued, etc., the issue persists despite public awareness initiatives. The risk of fatalities and impairments is relatively high as a result of delayed assistance to accident victims. Significant economic and societal repercussions are seen for those involved. As a consequence, several research institutions and significant motorcycle manufacturers have created safety devices to protect riders. A good motorbike safety system is also difficult to implement and expensive. Modern communication technologies are being incorporated into the automobile sector to improve the aid provided to those injured in traffic accidents, speed up the response time of emergency services, and provide them with more information about the incident. If the resources required for each catastrophe could be estimated with more accuracy, the number of deaths may be significantly decreased. According to the proposed plan, every vehicle must have an onboard device that can identify accident situations and report them to an outside control unit, which determines the severity of the issue and gives the necessary resources to address it. The development of a prototype using commercially available equipment shows that this technology may significantly save the amount of time it takes to deploy emergency services after an accident.

2. In Chapter 2, it is discussed that Malaria is a sickness that is brought on by the Plasmodium parasite and spread by the bite of female Anopheles mosquitoes. There are four different types of plasmodium that cause malaria. 1. *Plasmodium Falciparum*, 2. *Vivax Plasmodium*, 3. *Plasmodium Ovale* and 4. *Plasmodium Malariae*. Although there are a number of clinical and laboratory procedures for detecting the presence of malaria, the speed and precision needed to do so are insufficient. In order to assess if malaria is present in human RBCs, we have developed a method in this study that makes use of image processing techniques. The technique also establishes the malarial parasite's stage and intensity.

3. Defocus blur is a very frequent occurrence in photographs taken by optical imaging devices, as discussed in Chapter 3. It could be unwanted, but it might also be a deliberate aesthetic impact, which means it might help or hurt how we see the scenario in the photograph. A partly blurred picture could be segmented into blurred and non-blurred parts for tasks like object detection and image restoration. In this research, we present a robust segmentation technique to distinguish in- and out-of-focus picture areas and a sharpness measure based on the local Gabor maximum edge position octal pattern (LGMEPOP). The suggested sharpness measure makes use of the finding that the majority of local picture patches in fuzzy parts contain a disproportionately lower number of specific local binary patterns than those in crisp regions. In conjunction with picture matting and multiscale fuzzy inference, this measure was used to produce high-quality sharpness maps in this study. Our blur segmentation algorithm and six competing techniques were put to the test using tests on hundreds of partly blurred photos. The findings demonstrate that our method produces segmentation results comparable to those of the state-of-the-art and has a significant speed advantage over the competition.

4. In Chapter 4, analytics is discussed as one of the leading technologies today since data is amassing in all shapes, sizes, and volumes, as well as in a dynamic way. In the age of social media and social networks, predictive analytics is particularly popular as data sources expand from data banks to data rivers. This chapter provides an overview of the fundamentals of analytics as well as some of the current predictive analytical models used in the analytical community, such as multiple regression, logistic regression, and the k closest neighbor model. Having a predictive analytical tool in our toolbox is even more important now that we live in the age of machine learning and artificial intelligence.

5. In Chapter 5, it is discussed how simulation, a particularly versatile and adaptable area of computer science, is used to model and analyse systems for which an analytical solution is either unavailable or challenging to achieve. Because it is simpler than conventional approaches, which are often challenging, simulation is also chosen as a method of system analysis. Because of this, simulation is an area with extensive application and demand, making it fascinating and helpful to include a chapter for studying simulation with a case study of modelling a Queuing system.

6. Chapter 6 claims that virtualization is a cloud computing solution that only requires one CPU to operate. Through virtualization, many computers seem to be operating together. Because it saves time, virtualization focuses mostly on efficiency and performance-related activities. Virtualization of operating systems is the main topic of this essay. It is a customised version of a typical operating system that enables users to run numerous programmes that create a virtual environment to carry out different jobs on the same computer by running other platforms. Based on the amount of work they accomplish and the amount of memory they use, this virtual machine aids in comparing the performance of Type 1 and Type 2 hypervisors.

7. In Chapter 7 it is discussed that cloud computing offers a dynamic paradigm that enables consumers and organisations to acquire a variety of additional services in accordance with their needs. The cloud provides services including data storage, a platform for developing and testing applications, a way to access online services, and more. Maintaining application performance in a cloud environment is a common challenge due to Quality of Service (QoS) and Service Level Agreements (SLA) supplied by service providers to the organisation. Distributing the workload across many servers is the main duty carried out by service providers. By effectively allocating resources inside Virtual Machines, a load-balancing strategy should meet user needs. This study discusses the review of several LB strategies that affect overall performance and the research gap.

8. The existing electronic voting system may be readily hacked, according to Chapter 8. There are several strategies used to prevent malpractice. This study, allows for safe voting and forgoes human interference, resulting in a seamless and secure election process. The voter's face and biometric fingerprints are used in this study's authentication process. With the voter fingerprint information already in this database, the first step in the verification process for an electronic voting system may be simply accomplished. Voter facial recognition using data previously stored in the database is the second phase of verification. The voter may cast his or her ballot and deliver it if two-phase verification is completed. The ballot will then be encrypted. This stops false votes and guarantees accurate voting free of any corruption. We have developed a fingerprint-based voting system that eliminates the need for the voter to provide an ID with all of the required information. A person is permitted to vote if the facts match the registered fingerprints' previously recorded information. If not, a warning notice is sent and the individual is disqualified from casting a vote. The administrator will decode and count the votes during the counting phase of an election.

9. Chapter 9 presents a research that outlines a method for resolving the problem of real-time decision-making in farming that arises from rapid changes in circumstances, such as atmospheric changes, monsoons, insect assaults, etc. The future of agricultural technology is big data collection and analysis in agriculture to maximise operational performance and reduce labour expenses. The Internet of Things will, however, have an impact on a far wider range of industries than just agriculture since there are more IoT-related concepts to understand. The adaptation of IoT's capacity for data collecting on crop attributes and for automated decision-making using data analytics algorithms is the main goal of this project.

10. In Chapter 10, it is discussed that biometrics innovation is still one of the major predictions that combined biosciences and innovation, serving as a tool for criminology and security analysts to develop more accurate, robust, and certain frameworks. Biometrics, when combined with various combination techniques like feature-level, score-level, and choice-level combination procedures, remained one of the most researched technologies. Uni-modular biometrics, such as unique marks, faces, and iris, are followed by multimodal biometrics dependent on. By presenting a similar investigation of frequently used and referred to uni- and multimodal biometrics, such as face, iris, finger vein, face and iris multimodal, face, unique mark, and finger vein multimodal, this paper will attempt to lay the groundwork for analysts interested in biometric frameworks moving forward. This comparative research includes the development of a comparison model based on DWT and IDWT. The method towards combining the modalities also entails applying a single-level, two-dimensional wavelet (DWT) that has been solidified using a Haar wavelet to accomplish the good pre-taking care of to eliminate disruption. Each pixel in the picture is subjected to a different filtering operation in order to determine the Peak-Signal-to-Noise Ratio (PSNR). This PSNR analyzes the mean square error (MSE) to quantify the disruption to hail before the division of the largest data set to the chosen MSE. In the most recent advancement, each pixel's concept is fixed up using the opposing two-dimensional Haar wavelet (IDWT), creating a longer image that is better able to recognise approbation, affirmation, and confirmation of parts. The MATLAB GUI is used to implement the diversions for this enhanced blend investigation, and the obtained outcomes are satisfactory.

11. Chapter 11 presents that performance prediction is the estimate of future performance circumstances based on information from the past and the present. Companies, divisions, systems, procedures, and personnel may all get forecasts. This research focuses on evaluating employee performance in terms of behavior, output, and potential for development. When workers perform effectively for their employers, everyone wins. As a result, forecasting staff performance is crucial for a developing company. To this purpose, we suggest the support vector machine, the decision tree (j48), and the naive Bayes classifier as three machine learning methods. These help forecast an employee's behaviour at work. Based on parameters like accuracy, error loss, and timeliness, the Naive Bayes algorithm outperforms the other two algorithms in terms of their findings.

12. Chapter 12 discusses the idea that the discipline of artificial intelligence (AI), which trains computers to comprehend and analyse pictures using computer vision, remains in its infancy. This is particularly true in the medical industry. Coronary computed tomography angiography, or CCTA, is a well-known non-invasive technique for diagnosing cardiovascular diseases (CD). Pre-processing CT Angiography images is a crucial step in a computer vision-based medical diagnosis. Implementing image enhancement preprocess to reduce noise or blur pixels and weak edges in a picture marks the beginning of the research stages. Using Python and PyCharm(IDE) editor, we can build Edge detection routines, smoothing/filtering functions, and edge sharpening functions as the first step in the pre-processing of CCTA pictures.

13. In Chapter 13, a patient-monitoring smart wheelchair system is developed as an ambulatory assistance for persons with disabilities and for continuous monitoring of the user's vital bodily parameters. Four interfaces—eyeball control, gesture control, joystick control, and voice control—have been created for wheelchair control in order to cater to various limitations. The picture of the eyeball is captured using a camera. In order to make the appropriate decisions based on the location of the eyeball, LabVIEW is employed. The wheelchair movement may also be controlled by the other three modes. Anti-collision mechanisms are implemented using ultrasonic sensors. There is a feature in the wheelchair for

measuring body temperature and heart rate. If any parameter is outside of a safe range, this system will notify the appropriate medical authorities and the wheelchair user's chosen persons. The finished product is an innovative kind of assistive technology that would simplify and reduce stress in the life of its user.

14. Chapter 14 presents that the power grid assaults serve as a reminder that although the smart Internet of Things (IoT) might help us regulate our lightbulbs, it also poses the risk of putting us in the dark if it comes under attack. Many works of literature have recently attempted to address the issues surrounding IoT security, but few of them tackle the serious dangers that the development of quantum computing poses to IoT. Lattice-based encryption, a likely contender for the next post-quantum cryptography standard, benefits from strong security and good efficiency, making it well-suited for IoT applications. In this article, we list the benefits of lattice-based cryptography and the most recent developments in IoT device implementations.

15. Due to newly developed technologies in cars, traffic signal prediction devices are made and discussed in Chapter 15. It teaches users how to maneuver a car safely and effectively. Because of the many ways that drivers are distracted nowadays, the number of accidents is rising alarmingly. This technology lowers the danger of distracted driving, which causes accidents, by helping to recognise and deliver information based on data. The concepts of supervised learning, unsupervised learning, and reinforcement learning are addressed under the classification heading and serve as a major directive as the topic of machine learning is introduced. Machine learning may produce many different types of models, including neural networks, naive Bayes, random forests, support vector machines, clustering, etc. The primary concept of machine learning model training is to divide the data into training, testing, and validation sets. In order to deliver the best machine learning project, this chapter's conclusion accesses machine learning methodologies. The suggested method describes how to recognise traffic signs using a model that combines a classic support vector machine (SVM) with a newer convolutional neural network (CNN). In essence, a CNN model was trained to create this model. Several CNN model topologies, including LeNet, AlexNet, and ResNet-50, may be used in this situation. Later CNN layers' output may be utilised to generate features. The SVM was then used to classify using these characteristics.

16. In Chapter 16, machine learning is used to alter the systems that carry out artificial intelligence-related tasks. (AI). It displays the many ML kinds and applications. It also explains the fundamental ideas behind feature selection techniques, which can be applied to a variety of machine learning (ML) methods, including artificial neural networks (ANN), Naive Bayes classifiers (probabilistic classifiers), support vector machines (SVM), K Nearest Neighbor (KNN), and the greedy algorithm-related decision trees algorithm.

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CHAPTER 1

Innovative Device for Automatically Notifying and Analyzing the Impact of Automobile Accidents

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Abstract: In many nations, motorcycle accidents are a big public issue. Despite public awareness campaigns, the problem continues to grow as a result of poor riding habits such as riding without a helmet, dangerous driving, drunk driving, riding without enough sleep, and so on. Because of late help to those who have been in accidents, the rate of deaths and disabilities is quite high. People who are implicated suffer significant economic and social consequences as a result of them. As a result, various research organizations and large motorcycle companies have developed safety systems to safeguard riders from harm. Furthermore, a dElectronics and Communication Engineeringnt motorcycle safety system is hard to execute and costly. The integration of modern communication technologies into the automotive industry allows for greater assistance to people wounded in traffic accidents, a reduction in the time it takes emergency services to respond, and an increase in the amount of knowledge they have about the occurrence. The number of fatalities might be greatly reduced if the resources necessary for each disaster could be determined more precisely. The developed scheme calls for every vehicle to be equipped with an on-board unit that detects and reports accident scenarios to an exterior control unit that assesses the depth of the problem and provides the needed resources to aid it. The creation of a prototype based on off-th--shelf equipment indicates that this technology can considerably reduce the time it takes to send emergency services following an accident.

Keywords: Buzzer, GSM, GPS, LCD, Tilt Sensor, Zigbee.

INTRODUCTION

An embedded server is a computer that is designed to do one or a few specific functions, frequently under time limitations. It is frequently incorporated as part system, including a PC, on the other hand, is built to be adaptable and suit a huge

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of a larger device that includes hardware and mechanical components. An overall spectrum of end-user requirements. Many modern devices are controlled by embedded systems.

One or more primary processing cores, usually a microcontroller or a digital signal processor, control embedded systems. The most important attribute, however, is that it is dedicated to completing a certain task, which may necessitate the use of extremely powerful processors. Because the embedded system is dedicated to a single purpose, design engineers may optimise it to decrease the product's size and cost while improving its dependability and performance. Certain embedded systems are high-density to take advantage of economies of scale. The overall number of cars on the road has increased dramatically in recent decades, increasing traffic congestion and the incidence of traffic accidents. In the event of a traffic collision, finishing the aid of badly wounded passengers within an hour following the occurrence is critical to limiting the detrimental consequences to the occupants' health [1-5].

In terms of the second goal, the efficacy of assistance to passengers engaged in a traffic accident may be increased if rescue services had access to information about the circumstances in which the accident occurred before arriving at the accident scene. This additional data, collected by sensors within the car, would be used to determine the extent of the occupants' injuries. People who are implicated suffer enormous social and economic consequences as a result of them. As a result, various research organizations and major vehicle manufacturers have developed safety systems to safeguard riders from harm. However, decent vehicle safety technology is difficult to deploy and costly.

GPS, crash sensor, tilt sensor, GSM, Zigbee, buzzer, battery, and LCD are all needed for our project. The accident was discovered using a crash sensor. The accident severity is estimated using the tilt sensor. If an accident is discovered, it uses GPS to coordinate and communicate information to the care center as well as the family through GSM and Zigbee. If an accident happens, the vehicle's motor will come to a complete stop. The battery stores the energy generated [6-10]. The received values can be seen on the LCD, and a bell will alert the people around you.

Using an ad-hoc manner, accident information will be communicated to the other car through a Zigbee device. As a result, avoiding a collision is relatively simple. It is simple to determine the overall intensity of the accident. As a result, various research organizations and major vehicle manufacturers have developed safety systems to safeguard riders from harm [11-14].

LITERATURE SURVEY

Prototyping an Automatic Notification Scheme for Traffic Accidents in Vehicular Networks

The proposed system calls for each vehicle to be provided with an on-board unit that detects and reports accident scenarios to an exterior control unit that assesses the severity of the problem and allocates the required resources to aid it. The creation of a prototype using off-the-shelf components and the integration of modern communication technologies into the automotive industry allows for greater assistance to people wounded in traffic accidents, as well as a reduction in the time it takes emergency services to respond and an increase in the amount of evidence they have about the occurrence. The majority of casualties might be reduced if the available resources necessary for each disaster could be determined more precisely. The proposed system calls for every vehicle to be equipped with an on-board unit that detects and reports accident scenarios to an exterior control unit that assesses the severity of the problem and allocates the required resources to aid it.

Emergency Services in Future Intelligent Transportation Systems Based on Vehicular Communication Networks

We've used a technology to increase the pace of operations and boost productivity throughout the years. We've also seen the convergence of computing and telecommunications. This wonderful combination of two critical disciplines has boosted our capabilities, even more, enabling us to communicate at any time and from any location, greatly boosting our workflow flow and raising our quality of life. The confluence of telecommunications, computers, wireless technologies, and advances in transportation is the next wave of development we expect to witness. It may also make this country less enticing to foreign investors since motorists spend more time waiting on clogged highways, causing more pollution.

National Highway Traffic Safety Administration

The Department of Transportation, the NHTSA, and the people we serve all prioritizes safety. We can't believe that highway-related deaths are inevitable. To that aim, the Department is currently working on a significant cross-modal project to produce a national roadway safety plan that will help to address this critical public health concern. Despite changes in road user demands and expectations, the NHTSA is dedicated to its tradition of safeguarding vulnerable road users. The National Highway Traffic Safety Administration will also continue to execute the Department of Transportation's Motorized Coach Safety Action Plan, which

CHAPTER 2

Detection of Malarial Using Systematized Image Processing

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Abstract: The disease, Malaria, is caused by Plasmodium Parasite, and is transmitted *via* female Anopheles mosquito bite. There are 4 variants of plasmodium which cause malaria, they are, 1) *Plasmodium falciparum*, 2) *Plasmodium vivax*, 3) *Plasmodium ovale*, and 4) *Plasmodium malariae*. Though there are several clinical and laboratory techniques for finding the presence of malaria, the accuracy and the time required to determine the presence of the parasite are inadequate. Therefore, in this work, we have come up with a system that uses image-processing techniques to determine the presence of malaria in Human RBCs. In addition, the system determines the severity and stage of the malarial parasite.

Malaria is brought on by the Plasmodium parasite and spread *via* female Anopheles mosquito bites. *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale*, and *Plasmodium malariae* are the four plasmodium species that cause malaria. Although there are a number of clinical and laboratory methods for detecting the presence of malaria, the speed and precision needed to do so are insufficient. As a result, in this study, we have developed a system that employs image-processing methods to ascertain if there is malaria present in human RBCs. The technique also establishes the malarial parasite's stage and intensity.

Keywords: Greyscale, Image processing, Malaria, Thresholding.

INTRODUCTION

The bite of an infected female anopheles mosquito transmits the terrible sickness known as malaria. Over 1 million people die and an estimated 300–400 million people are afflicted each year. Besides, 40% of the population lives in malaria-risk areas. Bashir *et al.* [1] introduced a model for diagnosing malaria using images of stained thin blood smears. The technique makes use of the intensity characteristics of erythrocytes and Plasmodium parasites. Photos of both infected

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and uninfected erythrocytes were obtained, pre-processed, and significant features were extracted from them; ultimately, a diagnosis was performed using the features derived from the images. An artificial neural network (ANN) classifier was used to test the performance of a set of intensity-based characteristics on samples of red blood cells from the newly constructed database. These traits could be successfully applied for malaria detection, according to the results.

Mehrjou *et al.* [2] created a motorised, sophisticated microscope with an autonomous system that can snap high-speed images of blood smears. The main task of our work in this study is image processing, which is started once there are enough samples for microscopy. Saputra *et al.* [3] provide a thorough analysis of the conventional expert and computer-aided identification methods used to diagnose malaria in thin blood smears. As a pre-processing technique for segmentation, Reni *et al.* [4] introduced a new approach for morphological filtering of blood pictures. In blood pictures, conventional morphological closure removes the undesirable elements but also results in the loss of important information. The suggested morphological filtering keeps the important foreground component information while eliminating noise and artefacts. The pre-processing of additional pathological images using this technique, such as tissue analysis and cell differential analysis, could be adjusted. Das *et al.* [5] presented morphological and textural data-based computer-assisted malaria infection prediction, specifically for *Plasmodium vivax*. Here, erythrocytes have been separated from peripheral blood smear light microscopic images employing marker controlled watershed and pre-processing. In order to diagnose malaria using vision alone, Vink *et al.* [6] suggested a simple, quantitative cartridge-scanner system that focuses on low parasite densities. To generate a thin blood film, we employed specialised finger-prick cartridges filled with acridine orange, and a specialised scanner to picture the cartridge. We have created a *Plasmodium falciparum* detector using supervised learning. Dallet *et al.* [7] present a platform for an Android mobile application that enables quick and accurate diagnosis of malaria from thin blood film pictures stained with Giemsa. The innovative Annular Ring Ratio Method, which has previously been implemented, tested, and validated in MATLAB, serves as the foundation for the application. The technique finds the parasites in the infected RBCs as well as other blood components including White Blood Cells (WBCs) and Red Blood Cells (RBCs). The programme also recognises the various stages of parasite life cycles and computes parasitemia, a measurement of the degree of infection. By putting up a brand-new technique for identifying blood components termed the Annular Ring Ratio transform, he made a contribution to the field of mathematical morphology. Additionally, it has suggested an automated algorithm for separating white blood cells from red blood cells that, when combined with the ARR transform approach, has numerous uses for blood-related analyses including microscopic examination

in addition to helping to diagnose malaria [8]. Makkapati *et al.* [9] provided a method for detecting parasites in microscope images of blood smears based on image processing, as well as a method for classifying the stage of the parasite based on ontology to determine the species of infection. This method is modelled after the pathologist's method of diagnosis for visual examination, hence it is anticipated that it would produce outcomes that are comparable.The Autoscope, a low-cost automated digital microscope with a set of computer vision and classification algorithms, aims to provide use cases in the developing world with accurate diagnosis of a range of infectious diseases [10]. Mohammed *et al.* [11] developed a system for processing images to recognise malaria parasites in thin blood smears and categorise them into one of the four kinds of the disease. Several methods were used during the preprocessing stage to improve the photos. The five different types of leukocytes are categorised using the genetic algorithm-based k-means clustering approach in the reduced dimensions. Microscopy is the gold standard for diagnosing malaria. When instances are found in remote rural locations, this process gets difficult because there may not be any experts available to make a diagnosis there. This issue might be resolved by automating the diagnosis procedure and using an intelligent system that can identify malaria parasites. Peñas *et al.* [12] suggested a technique that may recognise malaria parasites in thin blood smear images and detect them. Huang *et al.* [13] offered a technique for automatically identifying and detecting leukocytes. Leukocytes can generally be divided into five groups: lymphocytes, monocytes, eosinophils, basophils, and neutrophils. Different roles are played by each group in the human immune system. The primary components of a leukocyte are found in the nucleus, and this is a crucial characteristic for illness classification. Five different types of leukocytes are distinguished in this study using their nuclei. The experimental findings demonstrate that our method achieves a high and guaranteed accurate recognition rate even when only leukocyte nucleus traits are used for categorization [14]. Counting white blood cells (WBCs) gives crucial information for the diagnosis of many diseases. The use of automated counting may improve the haematological approach. The initial step of automation, segmentation, is crucial for the next stages, feature extraction and classification [15]. Despite being relatively cheap and giving the examiner the chance to count the parasites and distinguish between the various types of malaria, laboratory and clinical diagnosis have certain drawbacks.

Clinical Malaria Diagnosis

Earlier symptoms of malaria are nearly equal to symptoms of any other disease which in turn lead to overtreatment, misdiagnosis, and wrong treatment.

CHAPTER 3

LMEPOP and Fuzzy Logic Based Intelligent Technique for Segmentation of Defocus Blur

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Abstract: Defocus blur is extremely common in images captured using optical imaging systems. It may be undesirable, but may also be an intentional artistic effect, thus it can either enhance or inhibit our visual perception of the image scene. For tasks, such as image restoration and object recognition, one might want to segment a partially blurred image into blurred and non-blurred regions. In this project, we propose a sharpness metric based on the the Local maximum edge position octal pattern and a robust segmentation algorithm to separate in- and out-of-focus image regions. The proposed sharpness metric exploits the observation that most local image patches in blurry regions have significantly fewer certain local binary patterns compared with those in sharp regions. Using this metric together with image matting and multiscale fuzzy inference, this work obtained high-quality sharpness maps. Tests on hundreds of partially blurred images were used to evaluate our blur segmentation algorithm and six comparator methods. The results show that our algorithm achieves comparative segmentation results with the state of the art and has high speed advantage over others.

Keywords: Edge position, Fuzzy systems, Maximum, Octal patterns.

INTRODUCTION

Signal processing is an electrical engineering and mathematics field that focuses on the analysis and treatment of analog and digital signals, as well as signal storage, filtering, and other processes. These signals include transmit signals, audio or voice signals, image signals, and other signals. Image processing seems to be the field that deals with the forms of signals in which an image is formed

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and the output is also an image. As the name suggests, it is concerned with image processing. Digital and analog image processing are two types of image processing.

If we can accurately recognize all of the items and their forms in a picture, it will appear crisper or more detailed. A picture of a face, for example, seems clear when we can recognize the facial components. The margins of a thing give it its form. So, when we blur the image, we just minimize the edge content and smooth out the transition from one hue to the next.

The phenomenon of defocus occurs when a picture is out of focus, reducing the sharpness as well as the contrast of the image [1 - 5]. Signal processing is a branch of electrical engineering and mathematics concerned with the examination and processing of analogue and digital signals, as well as actions such as signal storage and filtering. These signals include sound or speech communication, as well as visual messages. Image processing is the process of analysing and acting on pictures by humans.

Local sharpness assessment is the most commonly used method for defocus segmentation in the literature. In the last two decades, there have been several efforts in this area, the majority of which can be found in the field of picture quality evaluation, where images are graded by a single sharpness value that should comply with human visual perception. As a result, a blurred, high-contrast edge section could have a better sharpness rating than one that is in focus but low-contrast. These metrics work well for relative sharpness measurements, such as in focal stacking, but not for local sharpness measurements across different picture contents.

Object segmentation, dynamic compression, and object identification all benefit from the detection of visually prominent picture areas. In this research, we provide a technique for detecting salient regions that produce full-resolution representations with well-defined salient object borders. The original image's borders are retained by maintaining far more frequency of content than previous approaches [6 - 10]. This approach takes advantage of colour and brightness attributes while being easy to implement and computationally efficient. By obtaining higher precision and recall, our technique beats the five algorithms in both the ground-truth assessment and the segmentation job.

The method noise is a new metric for evaluating and comparing the overall performance of digital picture denoising algorithms. We calculate and assess the technique’s noise for a broad class of denouncing methods, notably local smoothing filters, first. Second, a novel technique called the nonlocal mean (NL-means), which is based on a nonlocal average of all pixels in the picture, is used.

Finally, we compare the NL-means method with local smoothing filters in certain trials.

The local blur kernels of picture blocks are first approximated, and then the local blur levels of both the local blur kernels are measured using a blurring approach. The result of reblurring is a statistic that may be used to distinguish between blurred and nonblurred picture blocks. For the fine identification of blurry and non-blurred sections, block-based and pixel-based approaches are also used. For out now and motion-blurred photos, our method has been tested. The novel method detects and segments blurred and non-blurred areas in selective blurred images with 88 percent accuracy for normal out-of-focus blur, 86 percent accuracy for artificial out-of-focus blur, and 83 percent accuracy for artificial motion blur, outperforming state-of-the-art approaches [11 - 15].

LITERATURE SURVEY

Image Sharpness Assessment Based on Local Phase Coherence

Sharpness is a significant factor in visual picture quality evaluation. The visual processing system is capable of detecting blur and evaluating the sharpness of visual pictures with ease, but the underlying process is unknown. The majority of existing blur/sharpness evaluation techniques rely on edge energy reduction of global or local high-frequency content. Sharpness is defined as a good community of unique picture features assessed in the difficult wavelet transform domain, which is a new way of looking at the issue. In the scale space, previous LPC computations were limited to complex coefficients distributed across three successive dyadic scales. A versatile architecture is proposed that enables LPC computing in various fractional sizes. Then, without referring to the original image, make a new brightness assessment algorithm. The suggested technique was tested using four subject-rated publically available picture datasets, which showed equivalent performance when compared to state-of-the-art algorithms.

Gray-scale and Rotation Invariant Texture Classification with Local Binary Patterns

The technique is founded on the recognition that uniform local binary patterns are essential aspects of local image texture and that their occurrence histogram is a highly significant texture feature. Because the operator is stable against any monotonic change in the grey scale, the suggested technique is particularly resilient in respect of gray-scale fluctuations. Another benefit is the operator's computational simplicity. These operators define the spatial configuration for local image texture, and their performance can be enhanced by integrating them with scale-invariant variance metrics that define local image texture contrast.

CHAPTER 4

Predictive Analytics - An Introduction

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Abstract: Analytics is one of the front runners nowadays as we have data piling in various sizes and quantities and in a dynamic fashion too. Data Analytics and in particular, predictive analytics is a hot cake in the days of social media and social networks as we grow from data banks to data rivers. This chapter is a glimpse of the basics of analytics and a few predictive analytic models currently employed in the analytical circle like Multiple regression, logistic regression and K nearest neighbor model. As we are in the era of machine learning and artificial intelligence, having a predictive analytical tool in our toolkit is all the more necessary.

Keywords: Analytics, KNN, Logistics, Regression.

INTRODUCTION

This chapter discusses predictive analytics, tools and some prevalently used models. Basically, predictive analytics forms a stage or a level in broader data analytics. Data Analytics is in general the area where we employ machine learning, statistical, mathematical models and analysis tools on data to derive valid inferences that can help us in better decision-making. It has four levels of analytics.

Descriptive Analytics

This is about what has happened in the past or about the historical data. It describes with measures like average, Dispersion, Skewness, Kurtosis or moments what exactly has happened in the system because of which we have the collected data. In other words, it describes the system through the data.

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Diagnostic Analytics

This is the level that will tell us why, whatever we have garnered using the first level of descriptive analytics, has happened.

Predictive Analytics

This stage is used for predicting the values of one variable using one or more variables which we found out using the second level of diagnostic analytics that are related. Regression, in various forms, is the most prevalently employed predictive analytic tool as it relates quite nicely with the query we have and provides simple and clear answers.

Prescriptive Analytics

This is the most advanced kind of analytics, and it will inform us what adjustments or actions we need to make to the variables or system entities in question to get the desired results. For instance, what precise activities should a student do to acquire a 90% grade, such as reading a given text for a specified amount of hours in a specified manner [1]? It is regarded as one of the top introductions to the discipline [2 - 5]. Predictive analytics are used in [3 - 9] articles to solve a real-world issue involving consumer connections. Reference [4] is a good read on the subject of data mining, which is now a hot issue. Reference [6] will provide us with a solid foundation for comprehending knowledge domains, one of the key ideas in the use of predictive analytics. Another interesting issue, analytic language processing is well implemented in a study [7]. [8] This study is comparable to [6] but addresses a different issue: the social network, which has generated a lot of research [10]. Another research examines document clustering in the publishing domain and is an excellent study to comprehend the idea. While reference [12 - 15] are papers researching customers or customer analytics in the sector, which is a fruitful one, reference [11] is also an application paper on supply chain.

MAIN TEXT: PREDICTIVE ANALYTICS

We are going to make predictions about what could happen in the future based on what has already happened in the past—the data—as the term plainly implies. For instance, by looking at historical data from a shopping centre, we can learn more about how, what, and when customers buy. Using pattern recognition, we can then predict what, when, and how much a particular group of customers will buy. With this information, we can then make a variety of managerial decisions, such as how much to order, how much inventory we should have, how much to invest, *etc.* We use data mining, analytics, and machine learning methods for this.

Benefits and Drawbacks

Advantages

1. It is quite effective.

2. It gives us a consumer viewpoint, enabling us to serve customers more effectively.

3. We can identify dishonest consumers, brokers, or channels and stop them in order to save our resources.

4. The business's risk may be significantly decreased.

Disadvantages

1. Depends heavily on data.

2. Some techniques, such as machine learning models, may not take into consideration elements outside the data that are sometimes essential.

MODEL 1 OF PA: REGRESSION

Regression is the method used to determine the sort of relationship that exists between the variables being examined.

Depending on the situation, several definitions of “linear model” are employed. The phrase is most often used in relation to regression models, and it is commonly used interchangeably with a linear regression model. The term “linear” denotes a subclass of models that allows for a significant decrease in the complexity of the corresponding statistical theory. Let's think about the two variables X and Y. Since we are hypothetically examining their relationship, we will develop an equation that is shown in Table **1** while treating each as an independent variable.

Regression Line of X on Y [X Depending on Y]

$$X-\bar{X}=b_{xy}\,[Y-\bar{Y}]$$

Where,

$\bar{X}$ - mean of X

$\bar{Y}$ - mean of Y

CHAPTER 5

Discrete Event System Simulation

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Abstract: Simulated systems are used for modelling and analysis of systems for which an analytical solution is either not accessible or difficult to achieve. Simulation is a highly flexible and adaptable discipline within computer science. Because it is simpler than conventional approaches, which are often challenging, simulation is also chosen as a method of system analysis. Because of this, simulation is an area with extensive application and demand, making it interesting and beneficial to have a chapter dedicated to researching simulation with a case study of modelling a Queuing system.

Keywords: Multi-server, Queuing Model, Simulation.

INTRODUCTION

This chapter provides a basic discussion on simulation, the areas of application and one case study. Simulation is a step that a modeler or a researcher turns to when he cannot find any solution for a problem analytically. This is considered a multi-disciplinary heuristic line as many researchers from various fields have contributed to the models and tools in simulation. This is applied to a wide area of fields like production, scheduling, logistics, *etc*.

Simulation is applicable in almost all imaginable fields, of course with the restriction for a proper requirement and a decent approach in applying it. Throughout history, it is applied in manufacturing systems, public systems of many disciplines, transportation systems, construction systems, *etc*.

In manufacturing systems, it is applied in material handling areas, inventory areas, assembly sections, scheduling areas, product-mix decisions, *etc*.

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In the public systems, we can use it in health care, military, waste management, power plant areas, and oilspilling modeling.

In the construction area, we apply it for applications in earthmoving, strip-mining, cable-stayed bridges, strengthening the design, advanced project planning paradigm, *etc*.

In transportation areas, we apply it for cargo transfer, personnel launch systems, container operations, tollplaza operations, *etc*.

We can also use it in restaurants, entertainment, food processing, computer system performances. References [1 - 3] are excellent resources for learning about discrete event simulation or simulation in general. References [4] and [5, 6] are books of a similar kind that may be used to study queuing theory. It is a discrete event simulation application paper for queueing systems. References [7 - 10] are comparable articles that may provide us with a thorough understanding of how the toic is used in practise. A great work on the use of simulation in the economic realm can be found in [11], while another article on the use of simulation in healthcare can be found in [12].

MAIN TEXT: SIMULATION

Simulating a system's activities allows us to better understand its behaviour and implement the findings in the system. In order to make conclusions about the system, we are thereby creating a fake history of the system. The model is the imitation. Simulation may be used to investigate systems that are still in the design phase and are not yet operational. Therefore, either we are modelling a hypothetical system to determine how to implement it or we are examining an actual system to see how modifications to it would affect it.

A complicated system's internal interactions may be studied *via* simulation. Separate studies may be done to examine how changes affect different subsystems. We can learn more about crucial system parts by undertaking sensitivity analysis. Simulated data may be used to validate solutions as well.

Advantages and Disadvantages

The benefits of simulation are many. Since it replicates the system, it mostly appeals to clients intuitively. It is possible to investigate new guidelines. Both organisational and informational fluxes may be recognised. You may build new layouts and designs. It is possible to identify theories about certain phenomena. It is possible to learn how a system operates exactly.

Simulating situations have several drawbacks. Building models is a difficult procedure that requires professionals. As most of the outputs are random variables, their interpretation may be challenging. The whole procedure may be costly and time-consuming. We often employ it even though there are analytical answers because of its popularity.

System in a Simulation

A system is a collection of connected items that cooperate to achieve a single objective. In order to simulate anything, we must first identify the system. Its environment refers to the things outside the system that could have an impact on operations within the system. So, a system's border is the line separating it from its surroundings.

Any item of interest in a system is considered an entity. The traits of the entities are referred to as their personalities. A time period of a certain duration is referred to as an activity. A system state is a group of things that at any one moment characterise the system. An activity is any instantaneous event that modifies the state of the system. Exogenous events and activities are those that take place outside the system. Endogenous events and activities are those that take place within the system.

These system types may be generally categorised:

• Systems classified as discrete only experience discrete state changes.

• Continuous systems are those whose state is always changing.

Model of a System

A model is a representation of a system used to learn more about it. We include the characteristics of a system that interests us in a model. We model a system in part because it is difficult to examine the system directly, we are unable to make modifications to an active system, or the system doesn't exist in real life. We extensively examine the models to learn about the system and then apply those facts to the system to increase its effectiveness.

Models may roughly be divided into mathematical and physical categories. Symbolic notations and mathematical equations are used in mathematical models to depict systems. Physical models attempt to capture a system's underlying physics.

(i) Static: Models which represent systems only in discrete points of time.

CHAPTER 6

Performance Analysis of Different Hypervisors Using Memory and Workloads in OS Virtualization

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Abstract: Virtualization is a cloud-computing technology that only needs one CPU to work. Virtualization makes it look like many machines are working together. Virtualization focuses mainly on efficiency and performance-related tasks because it saves time. This paper primarily focuses on operating system virtualization. It is the modified form of a standard operating system that allows users to operate different applications that produce a virtual environment to perform various tasks on the same machine by running other platforms. This virtual machine helps compare the performance of Type1 and Type2 hypervisors based on how much work they do and how much memory they use.

Keywords: Bare metal hypervisor, Cloud computing, Deadline, Deployment model, Energy consumption, Hosted hypervisor, Hyper-V, KVM, Optimization, OS virtualization, Service model, Task scheduling, Virtualized cloud, Vm placement, VMware, Xen.

INTRODUCTION

Cloud computing is a way to run applications and let people pay for their use. It allows people to use server networks and pays for what they use. Cloud computing has a lot of significant advantages, like flexible and scalable infrastructures, lower operational and maintenance costs, and more high-performance applications available [1]. Virtualization means that it is possible to run one or more virtual machines on the same computer simultaneously. Each virtual machine has its own (guest) operating system (OS) [2]. In Virtualization, there are many different ways to make things work. Everything you need to run your computer and get your data is here.

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A hypervisor is a process or a thing that does something. Administrators can keep operating systems and applications separate from the hardware that makes them work when administrators can do this. People who use cloud computing the most use virtual machines, or VMs, because they let multiple guest operating systems (also called virtual machines or VMs) run simultaneously on the same host computer, which is called a host computer. People who run computers can use many resources more efficiently if they split up computing resources (RAM, CPU, and so on) between multiple virtual machines (VM). (Fig. **1**).

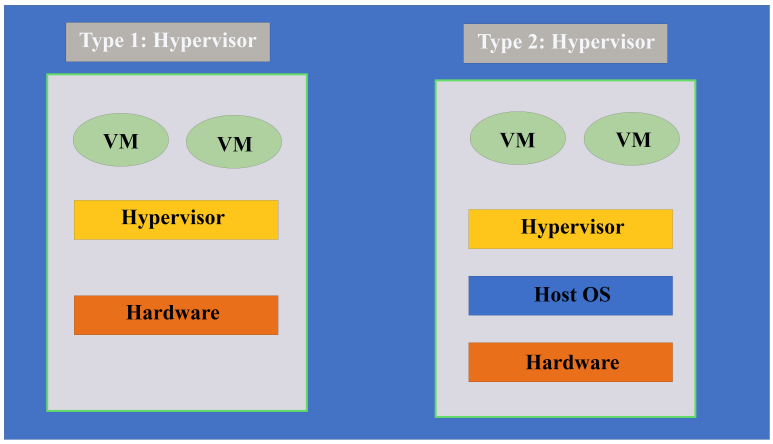

Fig. (1). Types of Hypervisors.

In virtualization, a computer system's virtual instance is created in an isolated layer from its authentic hardware. Virtualization enables a computer system to run multiple operating systems simultaneously. It is also possible for applications running on top of a virtual machine to appear on a separate device. In addition to the host operating system beneath it, this device has its operating system, libraries, and other programs.

It is used in computers for a variety of reasons. The maximum common application for desktop users is accessing software designed for a different operating system without having to switch machines. Server administrators can run various operating systems through virtualization. More importantly, virtualization allows an extensive plan to be segmented into smaller pieces, making it easier to use the server by multiple users or applications with varying requirements. It also will enable programmes inside a virtual machine to be isolated from those running in another virtual machine on the same host.

Server virtualization (OS virtualization) involves customizing a conventional operating system to enable multiple applications simultaneously on a single

computer through operating system virtualization (OS virtualization). They don't conflict even if they're on the same machine [3 - 7].

The operating system behaves like numerous separate systems in a virtualized environment. Other users running other applications on the same workstation can send commands to the virtualized environment. Virtualized operating systems handle each user's requests independently.

At the operating system level, this is also known as virtualization.With operating system virtualization, applications are separated from the operating system, enabling users to enjoy application-transparent virtualization. In addition to providing granular control at the application level, OS virtualization technology allows for more flexibility and lower overhead with its improved granularity migration.

Critical applications can also be moved to another operating system instance using OS virtualization. Patches and changes to the underlying operating system are applied promptly and have minimal or no impact on application service availability. The OS virtualized environment's processes are segregated, and their interactions with the underlying OS instance are tracked.

Since hypervisors serve as a software layer, they allow one host device to support multiple virtual machines simultaneously, one of the critical components of cloud computing technology. By making cloud-based applications accessible in a virtual environment, hypervisors allow IT to maintain control over the infrastructure, processes, and sensitive data within a cloud environment.

Creative applications are becoming increasingly important in response to digital transformation and increasing consumer expectations. As a consequence, many businesses are switching to cloud computing [9]. As a result, rewriting any existing application for the cloud will take valuable IT resources and create infrastructure silos.

As part of a virtualization platform, a hypervisor also helps companies move applications quickly to the cloud. A quicker return on investment is possible by taking advantage of the cloud's many benefits, such as lower hardware costs, greater accessibility, and increased scalability [8 - 12].

Hypervisors have many Benefits

Some of the perks are as follows for hosting several virtual machines on a hypervisor:

CHAPTER 7

A Study on Load Balancing in Cloud Computing

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Abstract: Cloud computing provides a dynamic model that provides many more services to users, as well as organizations, that can purchase based on their requirements. Cloud offers services such as storage for data, a platform for application development and testing, providing an environment to access web services, and so on. Common issues in a cloud environment are maintaining the application performance with Quality of Service (QoS) and Service Level Agreement (SLA) provided by the service providers to the organization. The major task done by the service providers is to distribute the workload among multiple servers. An effective load-balancing technique should satisfy the user requirements through efficient resource allocation in Virtual Machines. A review of various LB techniques that result in overall performance and research gaps is discussed in this paper.

Keywords: Architecture, Cloud computing, Issues, Load balancing, Metrics.

INTRODUCTION

Cloud computing provides the processing environment over the internet to clients or organizations based on client requirements at any time. Clients can utilize resources whenever they need an on-demand service. Cloud provides extendable services of distributed as well as parallel computing. Various features of the cloud are flexibility, scalability, on-demand services, *etc.*, Virtualization is the main concept implemented in the cloud concept [1]. Cloud Service Providers (CSP) provide a variety of computing environments such as SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service) to cloud clients. Clients can access all kinds of services on pay per use basis.

CSP offers Service Level Agreement (SLA) documents to clients for satisfactory services level [2].

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Four deployment models are present in clouds such as public, private, community, and hybrid clouds [3]. The public model is available for all public provided by service providers. The private cloud is exclusively utilized only by a single organization. The community cloud is used by a group of enterprises that have the same requirements and work nature. A hybrid cloud is a combination of private and public clouds that uses some strategies for application and data availability between those environments.

Major issues in Cloud Computing include efficient resource allocation, security, effective load balancing, and support level of scaling. In the cloud, the workload can be balanced properly is an important concern [4]. The main function of a task scheduler is to monitor every virtual machine and assign the task to the virtual machine with the required resources. Load balancing algorithms can be used to handle the load for the virtual machine without underload or overload. The main purpose of using load balancing algorithms is to utilize the resources effectively and complete the tasks with minimal makespan and increase throughput [5]. Tasks assigned to the virtual machines in the computing environment use either static or dynamic scheduling.

CLOUD COMPUTING ARCHITECTURE

CC architecture slightly differs from the traditional distributed and parallel system architecture. CC architecture supports high-level scalability, provides a variety of distinct services to the client, and enables the dynamic required services through virtualization. The single host system architecture is represented in Fig. (**1**). Architecture has 3 layers: a Hardware layer, a Virtualization layer, and an Application layer. The hardware layer is designed with virtualized hardware resources such as memory, network, and processing unit [6]. In the virtualization layer, the Hypervisor or virtual machine monitor acts as a mediator between the multiple virtual machines and guest OS. A hypervisor is a software that supports multiple platforms in a single hardware. In the application layer, the customers can use or create the application and test it under multiple platforms [7]. Each VM processes a single task at a time. Among multiple VMs, one acts as a load balancer, it allocates the task to VM if the requested resources are available to complete the task within the allocated deadline.

Multiple users can submit their tasks with different resource requirements. To handle the environment cloud service provider maintains the scheduling model that is shown in Fig. (**2**). All tasks are entered into the task queue. VM Manager receives the task from the task queue and checks the required resource availability for all tasks [8]. If the VMs are available, the task is assigned to the task schedu-

duler. Mapping among the tasks is done by the task scheduler based on resource availability. A finite number of VMs only present in every host.

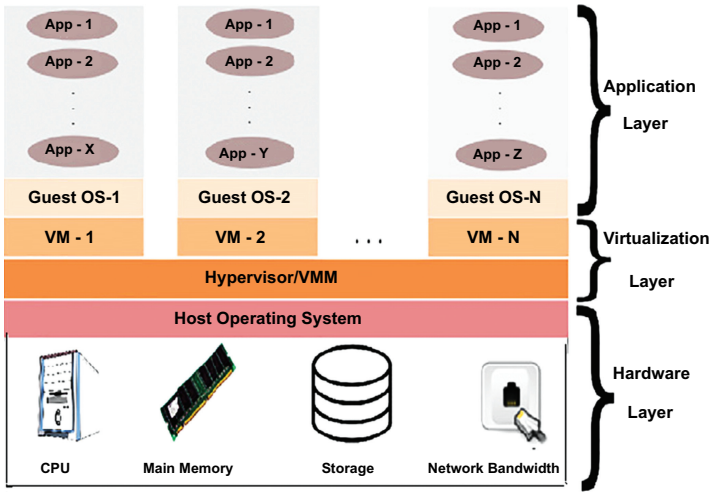

Fig. (1). Single Host Architecture in CC.

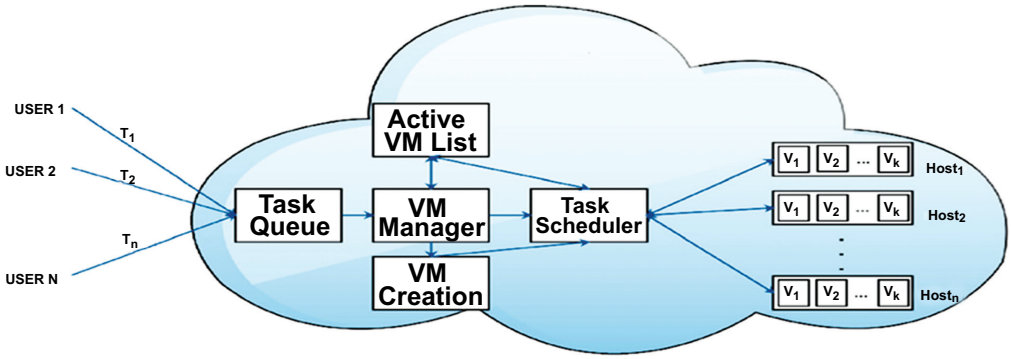

Fig. (2). Scheduling Model.

LOAD BALANCING

In a cloud environment, a method used to optimize the resources is load balancing. It handles the dynamic distribution of workload and utilization of resources effectively. We can reduce the underloaded and overloaded situation of nodes by implementing the load balancing technique. The load balancing model can be described in Fig. (**3**) [9]. Multiple client requests can be received by the Datacenter Controller (DCC), which acts as the job manager. Tasks are forwarded to the load balancer which has the load balancing algorithms to allocate the task to VMs. Virtual Machine Manager maintains a list of underloaded VMs. VM is a software installed on top of the host then we can execute the OS and application.

CHAPTER 8

A Survey on Facial and Fingerprint Based Voting System Using Deep Learning Techniques

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Abstract: The current electronic voting system can be hacked easily. There are a lot of methods adopted to avoid malpractice. This research provides secured voting and avoids human intervention that results in smooth and secure conduction of elections. This research adopts biometric fingerprint recognition and face recognition of the voter for authentication. In an electronic voting system, the first step in the verification process can be easily achieved with the voter fingerprint data available in this database. The second step of verification involves the face recognition of the voter by the data already present in the database. If two-phase verification is done, the voter can proceed with the voting process and present his/her vote. Then the vote will be encrypted. This prevents fake votes and ensures perfect polling without any corruption. We have created a fingerprint-based voting system where the user does not have to take hisher ID with his/her necessary information. If the details match the previously stored information of registered fingerprints, a person is allowed to cast his or her vote. If not, a warning message will be displayed and the person is excluded from voting. In an election counting stage, the admin will decrypt and count the votes.

Keywords: Deep learning algorithm, E-Voting, Encryption and decryption, Fingerprint recognition, Facial recognition.

INTRODUCTION

Biometrics is the science and technology of measuring and analyzing the natural data. The biometric field was developed and has since expanded into a variety of physical diagnoses. These diagnostic ideas have led to the creation of fingerprints that serve to rapidly recognize people and give them access rights. The essential point of these machines is to scan the data of individual fingerprints and facial recognition and compare them with the data of other fingerprints and facial recog-

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nition. In this research, we have used fingerprints and facial recognition to identify voters or to prove authenticity. Since the impression of each person's thumb is different and each person's facial pattern is different, it helps to minimize errors. A database containing fingerprints and facial recognition of all voters is required. Fake votes and repeated votes are checked in this system for an accurate coding system. In addition, elections will no longer be tedious and expensive [1].

A number of problems are associated with this approach. If sick voters are unable to reach the polling station, and without a station, they cannot approach the polling station, and bad weather cannot allow a visit to the polling station, transport pool, and much more.

LITERATURE REVIEW

Smart Voting

The Aadhar website allows us to get information about individuals above the age of 18, or we may register using the voter registration form. Voters in the primary round will get an ID, a password, and a registration email address before casting their ballots. After the voter has been verified using fingerprint data in the next step, they will be given the go-ahead to cast their ballot. The voting ID will be erased after submission and there will be no additional opportunity to vote. The voter's Aadhar information will be locked in order to trace them for future access. Accordingly, the number will be rearranged [2].

Paper-based Voting

An unfilled ballot is given to each voter, who then uses a pen or marker to indicate whether they wish to support a certain candidate. Manual voting takes a lot of time, but it is simple to cast a ballot by hand, and ballot papers may be preserved for confirmation; this is still a common method of voting [3].

Handle Voting Machine

Each racquet on this unique machine is paired with a partner. Voters press a button to support the candidate. These voting devices could compute automated voting. Voters must be educated in order to avoid the border becoming useless due to its poor usability.

Direct Electronic Voting System

DRE interacts with the touchscreen; touch screen, or buttons of the voting machine to cast a ballot. On the voting records, some of them are dozing off, and

the vote-counting process is swift. However, the accuracy of another DRE that does not maintain voting records is in dispute.

Punched Cards

The voter pokes a hole in an empty balloon with a metallic gap hit. It can automatically count the votes, but if there is a low voter turnout, the result can be unreliable.

Visible Voting System

This system selects the darkest mark in each vote and totals the results after each voter completes a round with their choice on an empty ballot. Vote counting on this kind of device happens quite swiftly. If the voter completes the round, it will lead to a visual check error [4].

Voting Machine Uses Fingerprint Identification

This recognition makes use of a sensor and records the information in a file. A tiny microcontroller port will be used to transmit the data to the network app once these biometric photos have been read. The input picture will be compared to an image that has already been entered into the database, or the server will provide a message, which will be shown on an LCD and serve to verify the voter's identity. If not, it exhibits LCD-like characteristics and its drawbacks [5].

Wyndham, Chen, & Das, 2016

The authors describe yet another electronic voting system that relies on cryptographic techniques and Blockchain development to provide clear results while maintaining voter protection. According to the authors, in a rare instance, the vote is recorded and notification of the vote is conveyed to the public.

Blockchain forms a test station for electronics in their frame. The co-candidate then cancels every vote, delivers the number closer to evidence that the outcomes are as expected, and allows the voter to display their vote. The idea enhances the safety and authority of mandatory voting, voter registration, and access to preliminary results, unfettered votes, and dropping vote totals. To document that a vote was cast, we utilise the square anchor. Additionally, we use native cryptographic systems to guarantee the accurate and secret counting of votes. To demonstrate to voters that their vote has been cast, the blockchain's Merkle Tree is in operation. We eliminate the possibility of voting under pressure by employing virtual polling booths and keeping receipts secret. We cannot register when the time results are received and the time the choice is made since Hawk has the

CHAPTER 9

IoT-Based Automated Decision Making with Data Analytics in Agriculture to Maximize Production

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Abstract: This study presents a technique for solving the real-time decision-making difficulty in farming due to sudden changes in situations like atmospheric changes, monsoons, pest attacks, *etc.* The future of farming technologies is collecting and analyzing big information in agriculture to maximize effectiveness that is operational and minimize work costs. But there tend to be more styles to comprehend with all the IoT, therefore the Internet of Things will touch many more companies than simply farming. This study is focused on adapting the capability of IoT for data collection of features of crops and for automated decision-making with data analytics algorithms.

Keywords: Agriculture, Cost management, Decision making model, Data analytics, IoT, Pest classification, Pest detection.

INTRODUCTION

The farming industry will become more important than ever before in the next years. The UN projects that by 2050, there will be 9.7 billion people on earth, which may result in a 69% rise in agricultural manufacturing on a global scale. Ranchers and rural businesses are adopting the Internet of Things (IoT) for research and enhanced creative capabilities to meet the growing need [1 - 5].

The UN predicts that by 2050, there will be 9.7 billion people on earth, with agriculture activity increasing by 69% of total production between 2010 and 2050 [6]. Ranchers and rural businesses are embracing the Internet of Things for research and enhanced creative capabilities in order to meet this requirement. The UN predicts that by 2050, there will be 9.7 billion people on earth, with agriculture activity increasing by 69% of total production between 2010 and 2050

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[6]. Ranchers and rural businesses are embracing the Internet of Things for research and enhanced creative capabilities in order to meet this requirement.

Actually, acquiring skills is nothing new. Before the Industrial Revolution, handheld tools had been the standard for more than 100 years [7 - 10]. Grain lifters, material composts, and the first farm tractor with internal combustion were all introduced in the 1800s. Fast-forward to the late 1900s, when ranchers began using satellites to organise their labour.

The IoT is expected to advance farming to the next level. Thanks to agricultural drones and sensors, smart farming is already becoming increasingly widespread among farmers. High-tech equipment is also swiftly becoming the norm.

This chapter's IoT applications in agriculture are described below, along with how “Internet of Things farming” might assist farmers in supplying the world's food needs in the years to come [11 - 15].

EXISTING TECHNOLOGICAL INTERVENTION IN AGRICULTURE

To improve the efficiency of their daily labour, planters have begun using high-tech advancements and technology in agriculture. For instance, sensors installed in fields enable ranchers to get precise maps of the topography and resources in a given area, despite factors like the causticity and heat of the soil. In order to predict environment designs for the days ahead, they may also access weather statistics.

Planters may use their smartphones to see their equipment, crops, and animals from a distance, as well as learn more about what their domesticated animals eat and produce. With the help of this invention, they can conduct accurate yield and animal projections.

Additionally, ranchers now use drones as a tool that is important for studying their holdings, doing field research, and producing ongoing data. As a significant example, John Deere, one of the most well-known brands in farming equipment, has started connecting its work vehicles to the Internet and has developed a method for handling information on the harvest yields of ranchers. Similar to self-driving cars, the organisation is leading the development of autonomous work vehicles that will free up ranchers to carry out other tasks and enhance their level of skill.

A few of these techniques go into precision farming, which is the most popular way to use satellite symbolism and other technology (especially sensors) to notice

and record data with the aim of increasing production yield while minimising cost and protecting assets.

Brilliant nurseries use the IoT and related products to automatically offer a microclimate to trim assembly. These managed environmental conditions let ranchers have enough time for optimal adequacy while preventing conflicts with hunters and bad weather.

Crop splashing, water system, lighting, temperature, and dampness, which are only the tip of the iceberg, are just a few of the things that ranchers who utilise nursery that is reasonable monitoring frameworks may manage with the use of these bits of information from big data and research.

It is projected that the future of farming will include the use of IoT, agricultural sensors, and farming drones. Although cunning precision and cultivation are eradicating, they may just be the precursors to the supported use of innovation in the cultivation scene.

The rise of blockchain technology is moving towards the IoT and might have an impact on the farming sector because of its ability to provide organisations with important information about crops. Ranchers may use sensors to capture agricultural data that will be assembled into a blockchain and include attributes that are well-known, such as pH level, salt and sugar content, *etc.*

By 2023, agro sensors are expected to number around 12 million globally, according to insider knowledge. Additionally, innovation juggernaut IBM estimates that the typical ranch produces 50% of 1,000,000 informational leads each time, assisting ranchers in increasing advantages while improving returns.

Manure can be sprayed 40 to 100 times more quickly by robots than by humans. Given a significant share of the potential advantages of these IoT applications in the agribusiness, it makes sense that farmers are increasingly considering drones that are horticultural satellites for long-term farming. Ranchers may use drones to remotely monitor how far along their crops are in different stages of development. Ranchers may also use ingredients to revive plants that are sick or injured robots by spraying them with water. According to DroneFly, a robot can shower dung 40 to 50 times faster than doing it manually.

FARMING DATA COLLECTION WITH IOT

The Internet of Things (IoT) is increasingly prevalent in many aspects of our lives. We can see that the Internet of Things has a lot of potential for assisting us in our daily lives. IoT devices may gather different data from our everyday files,

CHAPTER 10

An Indagation of Biometric Recognition Through Modality Fusion

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Abstract: One of the key predictions that had combined bio-sciences with innovation was bio-metrics, which represents a tool for security and criminology analysts to develop more accurate, robust, and certain frameworks. Biometrics, when combined with different combination techniques like feature-level, score-level, and choice-level combination procedures, remained one of the most researched technologies. Starting from uni-modular biometrics as unique marks, faces, and iris, they progress to multimodal bio-metrics. By presenting a similar investigation of frequently used and referred to uni- and multimodal biometrics, such as face, iris, finger vein, face and iris multimodal, face, unique mark, and finger vein multimodal, this paper will attempt to lay the groundwork for analysts interested in enhanced biometric frameworks. This comparative research includes the development of a comparison model based on DWT and IDWT. The method towards combining the modalities also entails applying a single-level, two-dimensional wavelet (DWT) that has been cemented using a Haar wavelet to accomplish the best pre-taking care of to eliminate disturbance. Each pixel in the picture is subjected to a different filtering operation in order to determine the peak signal to noise extent (PSNR). This PSNR analyses the mean square error (MSE) to quantify the disruption to hail before playing out the division of the largest dataset to the chosen MSE. In the most recent advancement, each pixel's concept is fixed up using the opposing two-dimensional Haar wavelet (IDWT), creating a longer image that is better able to recognise approbation, affirmation, and confirmation of parts. The MATLAB GUI is used to implement the diversions for this enhanced blend investigation, and the obtained outcomes are satisfactory.

Keywords: Authentication, Biometric, DWT, Fingerprint, Fusion, Iris.

INTRODUCTION

Fraud, information loss or exposure, and associated protected innovation are difficulties in today's PC-driven world. Security is essential to everything, including the concept of client verification. The verification measure provides

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security for monitoring, tracking, and accessing client individuality. There are many ways to authenticate a client, including information-based methods (such as a secret phrase or a unique proof number), token-based methods (like a security token, ATM card, or shrewdcard), and biometric methods. Despite the fact that passwords are straightforward, most implementations only provide the bare minimum of security. It is a pain dealing with several passwords for various frameworks. The use of security tokens or savvy cards is more expensive and calls for more specialised equipment and base support. The most secure form of validation has always been considered biometric. Biometric can only be stolen, lost, compromised, duplicated, or shared with much effort. They are also resistant to attacks on social structures. For their products, the organisations are participating in biometric verification. For businesses managing online business applications needing high levels of security, improving security for Web banking, ATMs, airports, legal requirement apps, and so forth, biometrics are essential. The foundation of ID, confirmation, and non-disavowal in data security is biometric verification [1].

Thus, a sensor module, an element extraction module, a coordinating module, and a selection module are included in the fundamental biometric structure shown in Fig. (**1**).

Fig. (1). A biometric system.

1. The sensor stage protects a person's biometric data, such as their fingerprints, by using a scanner to record a picture of their fingerprint.

2. The concentrations in which the supplied information is generated contain the values from the feature extraction step. For instance, the component extraction module of an iris framework would extract the mathematical forms (lines, spots, and so on) from an iris picture.

3. The component vectors are compared at stage 3.2's matching stage when the database's format creates the coordinating score. For instance, closeness estimates of the highlight vectors between the input face image and the information base face image will be logged and taken into account as a coordinating score.

4. Based on the coordinating score generated in the coordinating stage, the decision-making stages determine how the client's personality is regarded and is either recognised or rejected.

5. According to a few studies, the biometric validation framework based on the perception of the unimodal biometric format suffers from inadequate exactness caused by overly loud information, limited opportunities, non-distinctive and non-universal biometric characteristics, and execution restrictions [2].

6. In literature, the phrase "multi-biometric" is often used to denote biometric combinations. Therefore, in order to construct a multi-biometric framework, one must consider the three questions that have been covered in this article: (I) what to entangle, (II) when to circuit, and (III) how to combine. Choosing the many data sources to be combined, such as several computations or different modes, is part of what has to be intertwined. By analysing the various degrees of combination, or the many points in the biometric recognition pipeline at which data might be entangled, the question of when to combine is answered is shown in Table **1**. The phrase "step by step instructions to meld" refers to the combining approach used to combine the various data sources [3].

Table 1. Overview of major biometric traits.

S. No.	Traits	Advantages	Complications
1	DNA	Accuracy, discriminating power	Computational time, cost.
2	Finger Print	Accurate, unique, Consonant, smalldeposit Space.	Easily Hack able/Intrusive, dirt, dryness, finger Malposition, matchingis Calculation intensive.
3	Face	The process of Integrationiseasy, Touch-lesscapturing.	Lighting, camera angle, Twin'sproblem, storage Space and quality.
4	Iris	Stable ornament, high Degree of irregularity.	Hidden by eyelashes, lenses, Reflections, luminous illumination.
5	Palm	PrintDistinctiveness due to large area.	Expensive.
6	Ear	Less memory space, Consistent.	Obstruction by hair, ear Rings.
7	Signature	Templatescannotbe Stoleneasily, noninvasive.	High error rate, inconsistency.
8	Hand Geometry	Simple, easy to use, non-influence of Situation factors, less intrusive.	Not highly unique, not perfect for children, larger size of data.
9	Voice	Easy to use, less expensive	Alteration in voice due to sickness, can bemimicked, and can beoverheard if talkedaloud.

CHAPTER 11

A New Perspective to Evaluate Machine Learning Algorithms for Predicting Employee Performance

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Abstract: Performance prediction is the forecast of future performance conditions based on past and present information. Forecasts can be made about companies, departments, systems, processes, and employees. This study focuses on assessing employee performance in terms of employee behavior, work, and growth potential. Organizations benefit when their employees perform well. Therefore, predicting employee performance plays an important role in a growing organization. To this end, we propose three machine learning algorithms: a support vector machine, a decision tree (j48), and a naive Bayes classifier. These can predict employee behavior in the workplace. Comparing the results, the Naive Bayes algorithm shows better results than the other two algorithms on the basis of metrics such as timeliness, error loss, and accuracy.

Keywords: Classification, Employee performance, Decision tree (j48), Naive bayes, Prediction, Support vector machine.

INTRODUCTION

Most businesses conduct quarterly or semi-annual performance reviews of their employees. It includes monitoring certain locations in need of development. And the yearly performance report shows the outcome. To increase attention and accomplish objectives, constant performance monitoring has been carried out recently on a weekly or monthly basis. For evaluating employee performance, there are several factors to consider. To anticipate employee performance, it takes into account important factors including the job satisfaction index, age, performance, number of employers, current years of employment, gender, job title, department, and total years of service. In this study, pilot tests are conducted

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to choose an appropriate model for predictive comparison. According to experimental findings, Naive Bayes, Decision Trees, and SMO are the most accurate prediction models when compared to other models and will be employed in further studies.

LITERATURE SURVEY

The literature review that follows is highly useful in predicting customer behaviour and performance rating.

Muhammad TurkiAlshurideh *et al.* discussed raising customer turnover rates, dispersing categories, and client retention. He suggested, from a variety of angles, that appropriate categorisation be utilised to address problems with customer retention and customer-supplier relationships [1].

With the use of three-variable algorithms and complaints data, John Hadden *et al.* developed a novel method for forecasting customer attrition. They conducted a classification analysis on 202 records. Classification techniques include decision trees, regression, and neural networks, with neural networks achieving the greatest accuracy of 90% [2].

Ahmed Qureshi *et al.* used three methods based on their literature review since various authors used different algorithms depending on relevance and importance. P-values of certain characteristics were employed for data balancing, and the data set was resampled as well. The accuracy level was about 70%. The accuracy was enhanced to 75% using the decision tree when five more derived characteristics were used to improve it [3].

Manpreet *et al.* presented their results using graphs and other visual aids while using the J48 decision tree approach. The same Kaggle dataset that he had previously acquired was utilised. 'SGI' and 'data mining consultancy' both have copies of the dataset accessible on their websites [4].

By using KM in the HR system, LipsaSadath *et al.* described a data mining approach to forecast employee performance. The C4.5 approach exhibits greater accuracy in identifying various decision-making strategies on huge datasets in an automated and intelligent manner [5].

To estimate a student's final course grade, AI-Radaideh *et al.* employed a classification algorithm based on decision trees. They created a CRISP data-mining system for this purpose, which was utilised to mine academic student data [6].

A decision tree classifier was used by Surjeet *et al.* to conduct KDD in an educational setting and predict student performance. Additionally, it aided in the identification of dropouts, kids in need of particular attention, and students who need counselling and advice [7].

The classification methods Navie Naive Bayes, Decision Tree, and NBTree were compared by Alfisahrin *et al.* For this research, the 10 most relevant factors that contribute to liver illnesses were chosen. Higher accuracy is obtained using the NBTree method, while the quickest calculation time is obtained using Navie Naive Bayes [8].

A talent management challenge utilising C4.5 Data Mining methods was given by Hamidah Jantan *et al.* Based on prior information, they make predictions about the performance [9].

Tsai *et al.* used decision trees and neural networks as data mining techniques in mobile communications. They decided employing association rules to choose the most important variables to include during the preprocessing step. We can choose several metrics to assess model performance [10].

To forecast the performance of the new employee, Qasem *et al.* employed the ID3, J48 algorithms and Naive Bayes Classification approach. Data are gathered from many organisations to identify the most important performance-related criteria. According to the findings, an employee's job title has the greatest impact on their performance [11].

In order to categorise HR data, Yasodha *et al.* suggested a hybrid technique called CACC-SVM, which performs more accurately than conventional supervised algorithms. To identify a solution with greater accuracy, the different classification techniques such as Decision Trees, SVM, Neural Networks (NN), and closest neighbor algorithms were also contrasted [12].

On predicting employee turnover, Saradhi *et al.* compared several Machine Learning algorithms using employee attrition data and came to a conclusion that the work was highly beneficial for creating the best employee prediction model [13].

Decision trees were utilised by Kirimi JM *et al.* to determine the accuracy of employee performance using data from Kenya. The Institute for Public Management Development in Kenya paid close attention to the potential for creating new approaches for predicting employee performance and chose a superior one [14].

CHAPTER 12

Pre-process Methods for Cardio Vascular Diseases Diagnosis Using CT (Computed Tomography) Angiography Images

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Abstract: The discipline of artificial intelligence (AI), which trains computers to comprehend and analyse pictures using computer vision, is flourishing, particularly in the medical industry. The well-known non-invasive diagnostic procedure known as CCTA (Coronary Computerized Tomography Angiography) is used to diagnose cardiovascular disease (CD). Pre-processing CT Angiography pictures is a crucial step in computer vision-based medical diagnosis. Implementing image enhancement preprocess to reduce noise or blur pixels and weak edges in a picture marks the beginning of the research stages. Using Python and PyCharm(IDE) editor, we can build Edge detection routines, smoothing/filtering functions, and edge sharpening functions as a first step in the pre-processing of CCTA pictures.

Keywords: Artificial intelligence (AI), Cardiovascular diseases (CVD), Coronary computed tomography angiography (CCTA), Coronary artery diseases (CAD), Stenosis.

INTRODUCTION

An essential prerequisite for originating that does extensive internal and external validation is data preparation. Computer vision is a field that deals with giving robots the ability to comprehend pictures from coronary computed tomography and angiography.

Segmentation is a difficulty in scientific image processing to express the severity of coronary artery plaque and is essential to study the contraction of heart arteries to prevent heart attacks. Typically, noise, poor resolution, and inadequate reproducibility have an influence on photographs. This study employs a variety of edge detection techniques, including canny, cvtColor, GaussianBlur, Dialate, and

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Erode, as well as soothing and sharpening techniques, including filter2D, GaussianBlur, medianBlur, filter2D, and bilateral Filter.

BLOCK DIAGRAM FOR PREPROCESSING IN CCTA IMAGE

Edge Detection

The primary phase in the image processing is deciphering the contents of the picture. The method of edge detection on a picture is crucial for interpretation. Fig. (**1**) illustrates an edge detection approach for locating the edges of an item or area inside an image.

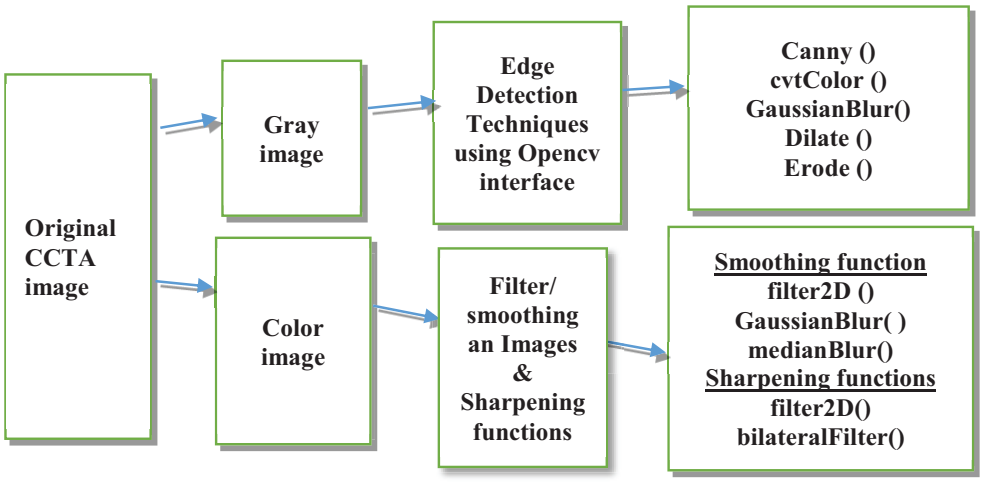

Fig. (1). Block diagram for preprocessing in CCTA image.

An edge is created by a fixed collection of connected pixels that span two endpoints. There are three different kinds of edges: a. horizontal; b. vertical; and c. diagonal.

A technique for dividing a CT picture into areas of discontinuity is called edge detection. It is used for picture morphology [1]. The viewer may see the image's structural elements in grayscale. It reserves the structural components of a CT picture while reducing the image data.

Edge Detection Operators:

There are two kinds of edge detection operators:

1. Gradient: It computes first-order derivations for digital cardiac pictures using algorithms like Sobel, Prewitt, and Robert.

2. Gaussian: In a CT picture, it computes second-order derivatives such as the Cannyedge detector and the Gaussian Laplacian.

To produce clear and precise edges, many edge-detecting algorithms have been created. The efficiency of image processing operations like picture segmentation and its retrieval will rise with accurate edge detection.

Steps to Perform Edge Detection in Python

1. Introduce Python Libraries

2. Select an image

3. Implement edge detection function

4. Execute the program

5. Save the image

Introduce Python Libraries

A process starting with a library needs to import three main libraries: Numpy, Matplotlib, and OpenCV.

Numpy, Matplotlib, and OpenCV are the three essential libraries that must be imported by a process beginning with a library.

Numpy is a Python package that supports expansive multidimensional arrays and a sizable number of high-level mathematical operations. We'll utilise the Matplotlib package to create static, animated, and interactive image visualisations in Python, and the OpenCV library for computer vision.

Select an Image

The imread ()function is used to read the image. The path of **the** image is passed as an argument. img = **cv2.imread ("d: /FFRCT_heartflow1_0.jpg")**

Implement Edge Detection Function

The canny edge detection model is another name for this OpenCV detection algorithm. Edge detection, visualisation, and result storage make up our function's three components [2]. Calling Canny is a way to conduct detection using OpenCV. The function's image is a parameter. That is, when we call the function, we provide the picture. The location array is necessary for the plot. After that, see both the original and edge-detection images [3 - 10]. The colour of the picture is

CHAPTER 13

Implementation of Smart Wheelchair using Ultrasonic Sensors and Labview

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Abstract: The patient-monitoring smart wheelchair system is a mobility aid for people with disabilities and continuously tracks the user's vital body metrics. Four interfaces—eyeball control, gesture control, joystick control, and voice control—have been created for wheelchair control in order to cater to various limitations. The image of the eyeball is captured using a camera. In order to make the necessary decisions based on the position of the eyeball, LabVIEW is used. The wheelchair movement can also be controlled by the other three modes. Anti-collision mechanisms are implemented using ultrasonic sensors. In the wheelchair, body temperature and heart rate monitoring provision is made. If any parameter is outside of a safe range, this system will notify the appropriate medical authorities and the wheelchair user's chosen individuals. The finished product is an innovative assistive technology that would simplify and lessen the stress in its user's life.

Keywords: MSP430, Patient monitoring, Python, Smart wheelchair.

INTRODUCTION

In India, there are persons with special needs. This demographic has a significant portion of physically challenged people. Independent movement is essential for people of all ages. Children who are unable to walk safely and independently are missing out on a crucial learning opportunity, which puts them at a developmental disadvantage in comparison to their peers who can walk safely and independently [1 - 5]. Although there are intelligent wheelchairs on the market, their price is rather expensive. The wheelchair in use is an attempt to make such cutting-edge assistive equipment affordable. Disabilities come in many forms, including paralysis, paraplegia, and muscular dystrophy.

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There are four options available, including joystick mode, gesture control, ocular control, and voice control, depending on the kind of handicap. It has been made possible to monitor the heart rate and body temperature. The installation of ultrasonic sensors will offer obstacle detection and assure the wheelchair user's safety. When a person's bodily parameters rise over a certain level or the user hits the panic button, a GSM module has been installed that will send an alarm message to specific people so they may take the appropriate action.

As mobility assistance for those with disabilities, the patient-monitoring smart wheelchair device also continuously monitors the user's vital physiological data. Four wheelchair control interfaces—eyeball control, gesture control, joystick control, and voice control—have been created to cater to various limitations. The picture of the eyeball is taken with a camera. Depending on the location of the eyeball, LabVIEW is utilised to make appropriate decisions. The wheelchair may also be moved under control in three modes. For the implementation of the anti-collision system, ultrasonic sensors are used. The wheelchair has a feature for measuring body temperature and heart rate. If any parameter is outside of a safe range, the system will notify the appropriate medical authorities and the wheelchair user's chosen people. The finished product is a unique kind of assistive technology that would simplify and lessen the stress in its user's life.

The comfort of physically disabled people's lives is greatly aided by automation. In India, 41.32% of the population has a handicap of some type or another. The primary goal of this effort is to improve the lives of persons with physical disabilities and enable them to move about independently, free from the assistance of others or carers. It may be very helpful for those with muscular dystrophy, who are unable to move any portion of their bodies below the neck. They grow dependent on others due to muscular dystrophy, which causes them to feel bad and lose motivation. Such patients need the system to be self-sufficient in order to maintain their self-esteem. The existing systems for assisting the handicapped are expensive and out of the grasp of the average person. A middle-class family may also afford the system due to its high cost-effectiveness.

According to the goals of creating this mobility system, physically disabled persons would be able to move as they need to without depending on others. Patients with muscular dystrophy may be able to move independently by merely moving their faces. It may enable individuals who are completely paralysed live better lives.

The system is built using LabVIEW and the IMAQ vision package to run several digital image processing algorithms. This toolbox offers a full range of digital

image processing and acquisition capabilities that boost system performance and require less human programming while producing better results faster [6-9].

SYSTEM OVERVIEW

The block diagram of the implemented system is shown in Fig. (**1**).

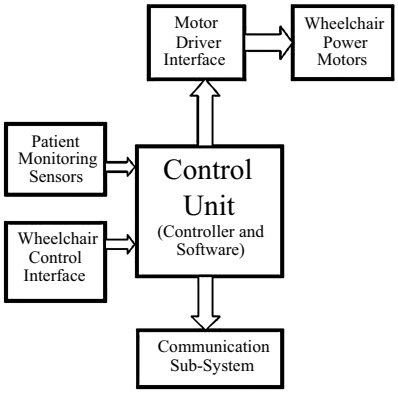

Fig. (1). Block diagram.

The system consists of the following sub-blocks.

Control Unit

MSP430 microcontroller, Python, and LabVIEW software make up the control unit. The control unit makes all of the choices and manipulates all of the data.

Wheelchair Power Motors

In order to move wheelchairs, DC motors are employed. High torque motors that can support the weight of a person sitting in a wheelchair are necessary because the real user will be seated in the wheelchair.

Motor Driver Interface

Those powerful motors cannot be driven by the controller. These motors need to be driven, hence a driver that can give the requisite current is needed.

Patient Monitoring Sensors

The wheelchair user's body temperature and heart rate are tracked using the temperature sensor LM35 and TCRT1000 module.

CHAPTER 14

Cryptography using the Internet of Things

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Abstract: Cyberattacks on the power grid serve as a reminder that while the smart Internet of Things (IoT) can help us control our lightbulbs, it also runs the risk of putting us in the dark if attacked. Many works of literature have recently attempted to address the issues surrounding IoT security, but few of them tackle the serious dangers that the development of quantum computing poses to IoT. Lattice-based encryption, a likely contender for the next post-quantum cryptography standard, benefits from strong security guarantees and great efficiency, making it well-suited for IoT applications. In this article, we list the benefits of lattice-based cryptography and the most recent developments in IoT device implementations.

The Internet of Things (IOT) is a new technology that is anticipated to improve human lives. According to Cisco research, by 2020, there will be a vast array of IOT devices that will span every industry, including transportation, healthcare, and smart gadgets for every aspect of daily life. IOTs are improving user experience by making smart devices smarter and their services of high quality. The devices' unfettered access to the whole network makes the IOT's security issues more susceptible. The research paper will contribute to the presentation of a compiled report on the security issues with IOTs and the cryptographic techniques utilised to address them.

Keywords: Constrained devices, Digital signatures, Encryption, Lattice-based cryptography, Post-quantum cryptography.

INTRODUCTION

We now live in a global community thanks to the Internet, where emails from the US can be sent to China in less than a second, and real-time teleconferences link individuals from all over the globe. Even further, the Internet of Things (IoT) has an impact the physical environment in addition to how we transmit data (Fig. **1**). Smart home appliances, wearable technology that we use every day, driverless cars, and industrial control systems are just a few examples of how the Internet of

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things has revolutionised how we live. It would be nearly impossible to purchase new technology in the near future that is not IoT-connected.

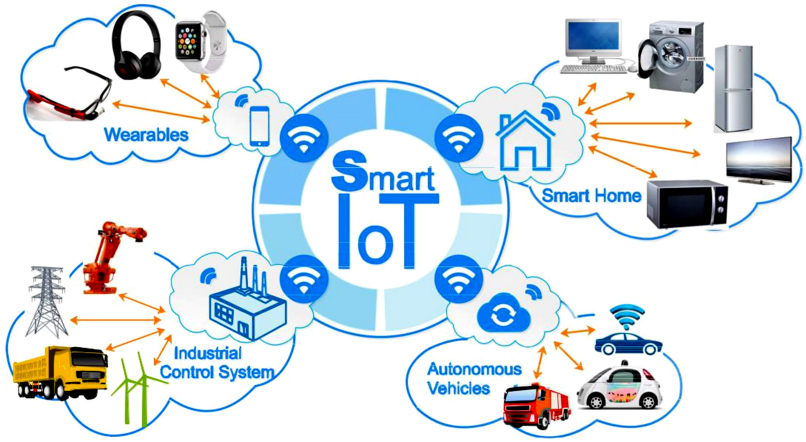

Fig. (1). Illustration of smart IoT applications.

By 2020, it is predicted that IoT technologies will have a several trillion dollar impact on the world's economy [1].

IoT privacy and security problems, however, loom over us constantly. Bruce Schneier [2], a security expert at Harvard University and the CTO of IBM Resilient, made the observation that IoT businesses are racing to make their devices cheaper and smarter but aren't paying much attention to security. The assaults on the Indian electrical system serve as a reminder that although smart IoT may help us regulate our lightbulbs if attacked, it might also leave us in the dark. Many works of literature have recently attempted to address the issues surrounding IoT security [3], but few of them examine the serious danger that improvements in quantum computing pose to IoT.

Despite the fact that there are still significant disagreements among scientists about quantum computers, many researchers are becoming more and more optimistic about the potential of large-scale quantum computers. The IBM Q system is a commercially accessible universal quantum computing system that IBM introduced in March 2017 as part of an industry-first project. It is intended for use in business and scientific applications. The commercially accessible 17-qubit processor is said to be at least twice as powerful as the 15-qubit universal quantum processor that is currently available to the general public.

Since they entail difficult-to-update platforms and systems, smart devices often utilised in smart IoT services are subject to the same, if not larger, quantum risks to cryptography. For instance, it's challenging to update embedded electronics in

wearables and furniture, and the scaling issue with IoT devices makes the situation much worse. Therefore, while developing safe architectures and systems for the smart IoT, we need now take post-quantum security into account.

Post-quantum cryptography (PQC) has received attention recently thanks to Cheng *et al.* [4]. Lattice-based cryptography, a likely contender for the next PQC standard, benefits from strong security guarantees and great efficiency, making it well-suited for IoT applications. The benefits of lattice-based encryption and the most recent state-of-the-art IoT device implementations are the main topics of this article.

We first provide a quick overview of cryptography and the implications of quantum computers in the text that follows. Next, we discuss the benefits of lattice-based cryptography for smart IoT. After providing a high-level overview of lattice-based cryptography, we go into greater detail about the most recent lattice-based cryptography implementations on constrained devices. Finally, we discuss our thoughts on current issues and potential directions for further research into the use of lattice-based cryptography in IoT systems.

History suggests that innovation is driven by necessity, and as a result, contemporary science and technology have advanced in step with the desire to make people's lives simpler. As a result of the Internet of Things, the world is becoming increasingly interconnected every day. By 2020, roughly 31 billion linked gadgets will exist, according to Statista 2018. The increase in these gadgets' availability has made security the top priority.

For a very long time, both the makers and the customers have often ignored the security component of this vast network. It's imperative that we take a step back and consider security implications of this since our technology-dependent way of life is advancing us towards an Internet of Insecure Things.

The major topic of interest for researchers in this discipline has been security.

Multiple networked devices that are part of the Internet of Things (IoT) are constantly exchanging data and information with one another. We must understand the fundamental properties of security for IoT devices in order to secure that data:

• Confidentiality – We need to make sure that only authorised people have access to the information.

CHAPTER 15

Machine Learning For Traffic Sign Recognition

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Abstract: The recently developed technology in autos makes traffic signal prediction devices obligatory. It teaches users how to drive safely and manoeuvre their vehicles effectively. Due to drivers' various forms of attention, the number of accidents is rising alarmingly nowadays. The danger of distracted driving, which causes accidents, is decreased thanks to this technology, which also assists in identifying and providing information based on data. The notion of machine learning is presented, and the concepts of supervised learning, unsupervised learning, and reinforcement learning are covered under the heading of categorization and serve as the main principle. Linear regression, neural networks, naive Bayes, random forests, support vector machines, clustering, *etc.* are some types of models that machine learning may give. This study describes how to train a model using machine learning, with the basic principle being to divide the data into training, testing, and validation. The last section of this chapter discusses how to access machine learning methods to improve the quality of a machine learning project. The suggested approach provides an explanation of the combined model of the modern convolutional neural network (CNN) and the classic support vector machine (SVM) for traffic sign identification. Essentially, a CNN model was trained to produce this model. Several CNN model designs, including LeNet, AlexNet, and ResNet-50, may be used here. The subsequent layers of CNN's output may be utilised as features. These characteristics were added to SVM for categorization purposes.

Keywords: Convolutional neural network, Classification of signal image, Machine learning, Support vector machines.

INTRODUCTION

The electronic system of the car can distinguish a range of traffic symbols and signs on the road thanks to the classification and identification method used for

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traffic signals. It upholds traffic laws, ensures safety, and reduces the frequency of traffic collisions. The recommended method is advantageous for many real-world applications, such as driverless vehicles, driver assistance systems, and navigation systems.

Machine learning, a component of artificial intelligence, allows us to automatically examine data and build analytical models. It is based on the idea that computers can analyse data, spot trends, and reach conclusions either automatically or with little human intervention. The machine-analyzed data may be used as the main basis for making decisions.

Machine learning is used to optimise various methods for creating mathematical models and making decisions using knowledge or data from the past. It is presently used for a variety of tasks, such as speech recognition, recommender systems, Facebook auto-tagging, face recognition and image identification, email searching and filtering, and more [1 - 5].

How successfully a machine learning algorithm predicts a model depends on the quantity of data provided by the system and a large amount of data allows the machine to understand more information and improve its prediction accuracy. Fig. (**1**) depicts the data flow in the machine learning model.

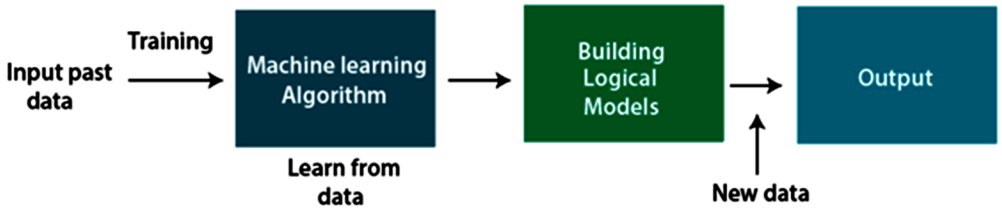

Fig. (1). Flow of data in machine learning model.

Loan Cristian Schuszter, ”A Comparative Study of Machine Learning Methods for Traffic Sign Recognition, 2017.

WHY MACHINE LEARNING IS NEEDED?

The need for machine learning is increasing quickly as technology advances in line with user demands since this technology can automatically learn data without human intervention and can interpret complicated programmes that are challenging for humans to comprehend. We needed a computer to quickly correct the programmes using the data at hand since humans are incapable of manually optimising complicated data [6 - 10].

We may easily train the model using the machine learning algorithm by giving it a large amount of data, letting it handle the data, analysing the programme to use it to construct a particular model, and lastly automatically predicting the desired output.

Currently, it is utilised for a variety of purposes, including identifying online fraud, recommending Facebook friends, self-driving automobiles, virtual personal assistants, automatic language translation, email spam filtering, stock market exchange, *etc.*

CLASSIFICATION OF MACHINE LEARNING

Three major categories may be used to classify machine learning: supervised learning, unsupervised learning, and hybrid learning.

Supervised Instruction

It is a machine learning technique in which the system is trained using a collection of sample, labelled data to produce the desired outcome. The objective is to teach the computer by providing sample data, and then process the model to anticipate the outcome. It is always processed in a controlled environment. Spam filtering is one example of supervised learning.

Unsupervised Learning

Unsupervised learning is a technique that involves little to no human intervention while the computer learns.

The highlighted algorithm will automatically sort and take action on the data without any human intervention. The objective is to give new characteristics and identify patterns in the complicated data structure.

Some of the techniques used in unsupervised learning include principal component analysis, hierarchical clustering, and K means clustering.

Reinforcement Learning

A learning programme based on input from the environment is known as reinforcement learning. The agent will analyse the surroundings in this case and adjust the programme as necessary. With more favourable comments, the reward points will grow, and the performance will be enhanced as a result.

CHAPTER 16

Analysis of Machine Learning Algorithms in Healthcare

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Abstract: Machine learning entails making changes to the systems that carry out artificial intelligence (AI)-related tasks. It displays the many ML kinds and applications. It also explains the fundamental ideas behind feature selection methods and how they can be applied to a variety of machine learning (ML) techniques, including artificial neural networks (ANN), Naive Bayes classifiers (probabilistic classifiers), support vector machines (SVM), K Nearest Neighbour (KNN), and decision trees, also known as the greedy algorithm.

Keywords: Algorithms, Artifical intelligence, Classification, Learning methods, Machine learning, Svm.

INTRODUCTION

Machine learning is the study of algorithms by computers that can only become better with time or with the use of data. Machine learning heavily includes AI [1 - 5]. Machine learning algorithms learn knowledge directly from the provided data rather than using a model that has been preset. The algorithm categorization is shown in Fig. (**1**).

CLASSIFICATION OF MACHINE LEARNING

Unsupervised Learning

It's a kind of algorithm that discovers patterns from data that hasn't been labelled, or that hasn't been tagged. As a result, the machine is used to develop its own internal representation of its environment and to produce the crucial material from

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it. This is a crucial process that is copied from learning with humans. In unsupervised machine learning, clustering the data into patterns does not provide any outputs that can be predicted. Its performance is assessed after completing supervised machine learning exercises. Fig. (**2**) displays the flow diagram for machine learning in the cardiovascular field. Unsupervised machine learning leads to a state called heterogeneous, which is analogous to an abrupt myocardial infarction arrest. Once again, we may begin with a big collection of numbers that are representative of every person with unexplained heart failure [6 - 10]. In order to characterise the composition of cells' complex biomolecules in each sample, one may conduct Myo-Cardic biopsies and use several immunological staining techniques. In contrast to supervised learning, there is no expected result. Thus, we may demonstrate the data's interest in identifying patterns. In reality, this presents an SL difficulty since, when a model is developed and patients are categorised according to risk, there is a potential that the identification of the illness may be lost.

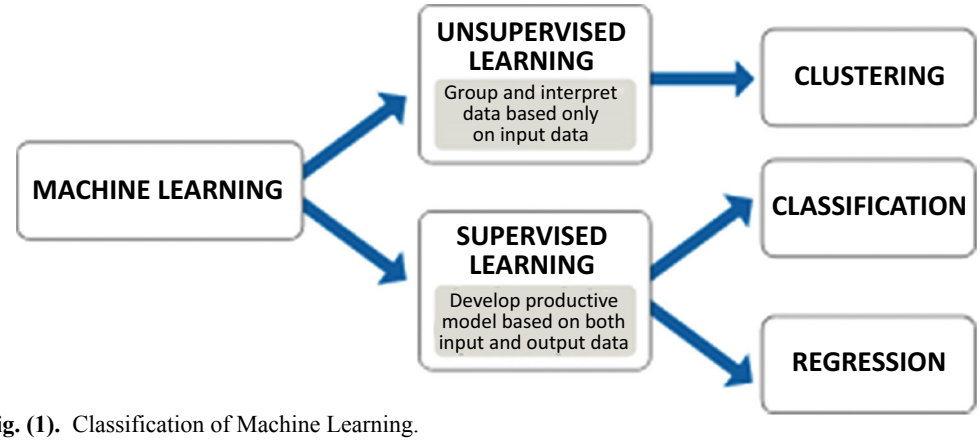

Fig. (1). Classification of Machine Learning.

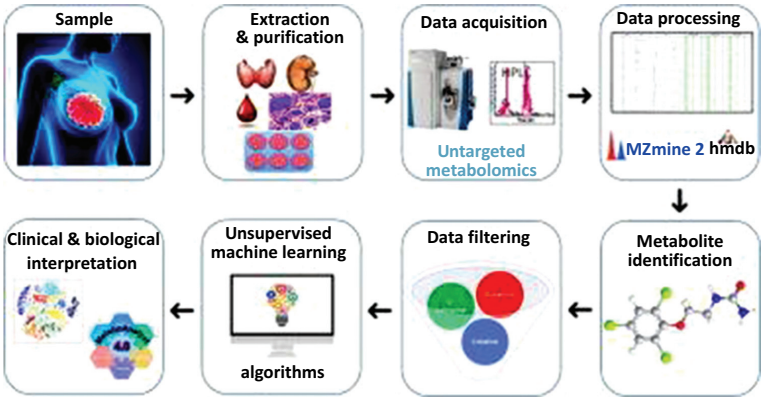

Fig. (2). Machine Learning in Cardiovascular.

Supervised Learning

A subset of both machine learning and artificial intelligence is supervised learning. It is used to train algorithms or to properly anticipate its data by categorising the labelled data sets. Its first objective is to forecast the algorithm's known aim and output [11 - 15]. There are many higher competitions in machine learning, so each participant is evaluated on their own merits using data sets from repeated supervised learning tasks that include handwriting recognition, object classification using images, and document classification. Fig. (**3**) depicts the labelled and unlabeled training algorithm. SL concentrates on its own categorization, which requires it to choose a subset for itself and to select the best new instance of data, which it uses to forecast. It also requires to estimate an unidentified parameter. In order for a trained individual to function successfully, it is often tried to establish a steady performance on humans. An ECG (Electrocardiogram) signal is used to gauge the heart's activity. The use of ML-libs is being made to put the suggested strategy into practise. The scalable machine learning library for Apache Spark is called ML-lib. Its characteristics serve as the ML algorithm's inputs. The automatic pattern recognition that may be chosen to execute a restricted selection of diagnoses is how the ECG is interpreted. In supervised machine learning, automated detection is used to identify a nodule from a chest x-ray that would also serve as a radiography [16 - 20].

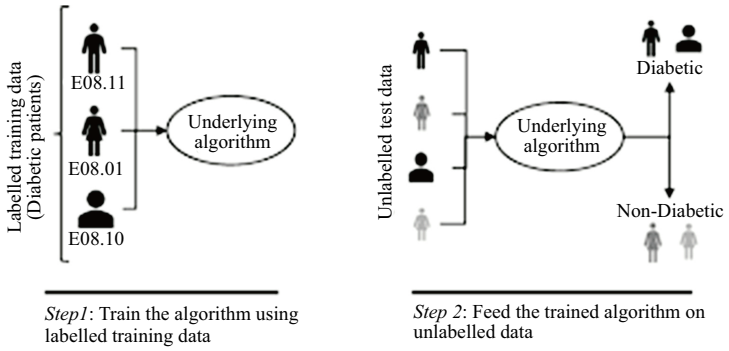

Fig. (3). ECG in machine learning.

Machine Learning in Health Care

It often includes an ML and SL technique that is used to train the data with labels for the training models in order to forecast an illness that is a danger. The test is administered in sets of high and low-risk patients. These models, however, are exclusively employed for research and clinical applications [21 - 25]. Fig. (**4**) illustrates how machine learning algorithms are employed in the healthcare industry.

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