

VISVESVARAYA TECHNOLOGICAL UNIVERSITY



BELAGAVI–590018, Karnataka

INTERNSHIP REPORT

ON

“Automated Parking System using ML ”

Submitted in partial fulfilment for the award of degree(2022-2026)

BACHELOR OF ENGINEERING IN DATA SCIENCE

Submitted by:

SANDHYA PATEL K



Conducted at
COMPSOFT TECHNOLOGIES



AMC ENGINEERING COLLEGE

Department of Data Science

Accredited by NBA , New Delhi

**AMC Campus, Bannerghatta Rd, Bengaluru,
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CERTIFICATE

This is to certify that the Internship titled "**Automated Parking System using ML**" carried out by **Miss Sandhya Patel K**, a bonafide student of AMC Engineering College, in partial fulfillment for the award of **Bachelor of Engineering**, in **Data Science** under Visvesvaraya Technological University, Belagavi, during the year 2022-2023. It is certified that all corrections/suggestions indicated have been incorporated in the report.

The project report has been approved as it satisfies the academic requirements in respect of Internship prescribed for the course Internship / Professional Practice (21CSI85)

Signature of Guide

Signature of HOD

Signature of Principal

External Viva:

Name of the Examiner

Signature with Date

1) _____

2) _____

D E C L A R A T I O N

I, **Sandhya Patel k**, second year student of Data Science , AMC Engineering College –560083 , declare that the Internship has been successfully completed, in **COMPSOFT TECHNOLOGIES**. This report is submitted in partial fulfillment of the requirements for award of Bachelor's degree in Data Science, during the academic year 2022-2023.

Date :03-12-2023 : :

Place : Bangalore

USN :1AM22CD087

NAME : Sandhya Patel K

OFFER LETTER



Date: 6th November, 2023

Name: **Sandhya Patel k**
USN: **1AM22CD087**
Placement ID: **0611MLWPbFOUR**

Dear Student,

We would like to congratulate you on being selected for the **Machine Learning with Python (Research Based)** Internship position with **Compsoft Technologies**, effective Start Date **6th November, 2023**. All of us are excited about this opportunity provided to you!

This internship is viewed as being an educational opportunity for you, rather than a part-time job. As such, your internship will include training/orientation and focus primarily on learning and developing new skills and gaining a deeper understanding of concepts of **Machine Learning with Python (Research Based)** through hands-on application of the knowledge you learn while you train with the senior developers. You will be bound to follow the rules and regulations of the company during your internship duration.

Again, congratulations and we look forward to working with you!

Sincerely,

Nithin K. S
Project Manager
COMPSOFT TECHNOLOGIES
No. 363, 19th main road,
1st Block Rajajinagar
Bangalore - 560010

A C K N O W L E D G E M E N T

This Internship is a result of accumulated guidance, direction and support of several important persons. We take this opportunity to express our gratitude to all who have helped us to complete the Internship.

We express our sincere thanks to our Principal, for providing us adequate facilities to undertake this Internship.

We would like to thank our Head of Dept, for providing us an opportunity to carry out Internship and for his valuable guidance and support.

We express our deep and profound gratitude to our guide, for her keen interest and encouragement at every step in completing the Internship.

We would like to thank all the faculty members of our department for the support extended during the course of Internship.

We would like to thank the non-teaching members of our dept, for helping us during the Internship.

Last but not the least, we would like to thank our parents and friends without whose constant help, the completion of Internship would have not been possible.

SANDHYA PATEL K

1AM22CD087

ABSTRACT

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CHAPTER 1
COMPANY PROFILE

1. COMPANY PROFILE

A Brief History of Compsoft Technologies

Compsoft Technologies, was incorporated with a goal "To provide high quality and optimal Technological Solutions to business requirements of our clients". Every business is a different and has a unique business model and so are the technological requirements. They understand this and hence the solutions provided to these requirements are different as well. They focus on clients requirements and provide them with tailor made technological solutions. They also understand that Reach of their Product to its targeted market or the automation of the existing process into e-client and simple process are the key features that our clients desire from Technological Solution they are looking for and these are the features that we focus on while designing the solutions for their clients.

Sarvamoola Software Services. is a Technology Organization providing solutions for all web design and development, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever increasing automation requirements, Sarvamoola Software Services. specialize in ERP, Connectivity, SEO Services, Conference Management, effective web promotion and tailor-made software products, designing solutions best suiting clients requirements.

Compsoft Technologies, strive to be the front runner in creativity and innovation in software development through their well-researched expertise and establish it as an out of the box software development company in Bangalore, India. As a software development company, they translate this software development expertise into value for their customers through their professional solutions.

They understand that the best desired output can be achieved only by understanding the clients demand better. Compsoft Technologies work with their clients and help them to define their exact solution requirement. Sometimes even they wonder that they have completely redefined their solution or new application requirement during the brainstorming session, and here they position themselves as an IT solutions consulting group comprising of high caliber consultants.

They believe that Technology when used properly can help any business to scale and achieve new heights of success. It helps Improve its efficiency, profitability, reliability; to put it in one sentence "Technology helps you to Delight your Customers" and that is what we want to achieve.

CHAPTER 2

ABOUT THE COMPANY

2. ABOUT THE COMPANY



Compsoft Technologies is a Technology Organization providing solutions for all web design and development, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever increasing automation requirements, Compsoft Technologies specialize in ERP, Connectivity, SEO Services, Conference Management, effective webpromotion and tailor-made software products, designing solutions best suiting clients requirements. The organization where they have a right mix of professionals as a stakeholders to help us serve our clients with best of our capability and with at par industry standards. They have young, enthusiastic, passionate and creative Professionals to develop technological innovations in the field of Mobile technologies, Web applications as well as Business and Enterprise solution. Motto of our organization is to “Collaborate with our clients to provide them with best Technological solution hence creating Good Present and Better Future for our client which will bring a cascading a positive effect in their business shape as well”. Providing a Complete suite of technical solutions is not just our tag line, it is Our Vision for Our Clients and for Us, We strive hard to achieve it.

Products of Compsoft Technologies.

Android Apps

It is the process by which new applications are created for devices running the Android operating system. Applications are usually developed in Java (and/or Kotlin; or other such option) programming language using the Android software development kit (SDK), but other development environments are also available, some such as Kotlin support the exact same Android APIs (and bytecode), while others such as Go have restricted API access.

The Android software development kit includes a comprehensive set of development tools. These include a debugger, libraries, a handset emulator based on QEMU, documentation, sample code, and zutorials. Currently supported development platforms include computers running Linux (any modern desktop Linux distribution), Mac OS X 10.5.8 or later, and Windows 7 or later. As of March 2015, the SDK is not available on Android itself, but software development is possible by using specialized Android applications.

Web Application

It is a client–server computer program in which the client (including the user interface and client- side logic) runs in a web browser. Common web applications include web mail, online

retail sales, online auctions, wikis, instant messaging services and many other functions. web applications use web documents written in a standard format such as HTML and JavaScript, which are supported by a variety of web browsers. Web applications can be considered as a specific variant of client–server software where the client software is downloaded to the client machine when visiting the relevant web page, using standard procedures such as HTTP. The Client web software updates may happen each time the web page is visited. During the session, the web browser interprets and displays the pages, and acts as the universal client for any web application. The use of web application frameworks can often reduce the number of errors in a program, both by making the code simpler, and by allowing one team to concentrate on the framework while another focuses on a specified use case. In applications which are exposed to constant hacking attempts on the Internet, security-related problems can be caused by errors in the program.

Frameworks can also promote the use of best practices such as GET after POST. There are some who view a web application as a two-tier architecture. This can be a “smart” client that performs all the work and queries a “dumb” server, or a “dumb” client that relies on a “smart” server. The client would handle the presentation tier, the server would have the database (storage tier), and the business logic (application tier) would be on one of them or on both. While this increases the scalability of the applications and separates the display and the database, it still doesn’t allow for true specialization of layers, so most applications will outgrow this model. An emerging strategy for application software companies is to provide web access to software previously distributed as local applications. Depending on the type of application, it may require the development of an entirely different browser-based interface, or merely adapting an existing application to use different presentation technology. These programs allow the user to pay a monthly or yearly fee for use of a software application without having to install it on a local hard drive. A company which follows this strategy is known as an application service provider (ASP), and ASPs are currently receiving much attention in the software industry.

Security breaches on these kinds of applications are a major concern because it can involve both enterprise information and private customer data. Protecting these assets is an important part of any web application and there are some key operational areas that must be included in the development process. This includes processes for authentication, authorization, asset handling, input, and logging and auditing. Building security into the applications from the beginning can be more effective and less disruptive in the long run.

Web design

It is encompasses many different skills and disciplines in the production and maintenance of websites. The different areas of web design include web graphic design; interface design; authoring, including standardized code and proprietary software; user experience design; and

search engine optimization. The term web design is normally used to describe the design process relating to the front-end (client side) design of a website including writing mark up. Web design partially overlaps web engineering in the broader scope of web development. Web designers are expected to have an awareness of usability and if their role involves creating mark up then they are also expected to be up to date with web accessibility guidelines. Web design partially overlaps web engineering in the broader scope of web development.

Departments and services offered

Compsoft Technologies plays an essential role as an institute, the level of education, development of student's skills are based on their trainers. If you do not have a good mentor then you may lag in many things from others and that is why we at Compsoft Technologies gives you the facility of skilled employees so that you do not feel unsecured about the academics. Personality development and academic status are some of those things which lie on mentor's hands. If you are trained well then you can do well in your future and knowing its importance of Compsoft Technologies always tries to give you the best.

They have a great team of skilled mentors who are always ready to direct their trainees in the best possible way they can and to ensure the skills of mentors we held many skill development programs as well so that each and every mentor can develop their own skills with the demands of the companies so that they can prepare a complete packaged trainee.

Services provided by Compsoft Technologies.

- Core Java and Advanced Java
- Web services and development
- Dot Net Framework
- Python
- Selenium Testing
- Conference / Event Management Service
- Academic Project Guidance
- On The Job Training
- Software Training

CHAPTER 3
INTRODUCTION

3. INTRODUCTION

Introduction to ML

Machine learning (ML) is a field of artificial intelligence (AI) that allows computers to learn without explicit programming. Instead, ML algorithms are trained on massive amounts of data, enabling them to identify patterns and make predictions. Think of it like teaching a child to recognize a cat: you show them pictures of cats and tell them what they are, and eventually, they can identify cats on their own. There are three main types of ML: supervised learning, unsupervised learning, and reinforcement learning. Supervised learning is where the algorithm is trained on labeled data, meaning each data point has a known outcome. Unsupervised learning is where the algorithm is given unlabeled data and must find patterns and relationships on its own. Reinforcement learning is where the algorithm learns through trial and error, taking actions and receiving rewards or punishments based on the outcome.

Problem Statement

This project aims to develop an intelligent parking management system using machine learning (ML) and computer vision. The system will utilize images to detect car numbers and automatically allocate available parking spots.

Benefits:

- Increased efficiency: Automating the parking allocation process reduces wait times and improves traffic flow.
- Improved security: Tracking car numbers helps deter theft and unauthorized parking.
- Enhanced user experience: Drivers can easily find available parking spots and receive guidance to their assigned locations.
- Data collection: The system can collect valuable data about parking usage patterns, which can be used to optimize parking management strategies.

Developing an intelligent parking management system using ML and computer vision offers significant advantages for both drivers and parking authorities. This project showcases a promising application of these technologies in addressing real-world challenges and improving the parking experience

CHAPTER 4
SYSTEM ANALYSIS

4. SYSTEM ANALYSIS

1. Existing System

There are several existing automated parking systems that utilize machine learning and other technologies. Here are a few examples:

- **Stanley Robotics**: Stanley Robotics offers an automated valet parking system that uses machine learning algorithms and robotics. The system relies on cameras and sensors to navigate and park vehicles efficiently. Machine learning techniques enable the system to improve over time by learning from parking patterns and optimizing parking space allocation.
- **CityLift** is an automated parking system provider that offers a variety of automated parking solutions, including valet parking, guidance systems, and autonomous parking. The company's systems utilize machine learning and other technologies to improve efficiency, reduce congestion, and enhance the overall parking experience. One of CityLift's key strengths is its use of machine learning to optimize parking space allocation.
- **Unitronics and Serva Transport Systems** are two companies that are using machine learning (ML) to improve their products and services.

Unitronics is a manufacturer of programmable logic controllers (PLCs). PLCs are used to control a wide variety of industrial machines and processes. Unitronics is using ML to develop new PLC features that will make them more efficient and easier to use. For example, Unitronics is developing ML algorithms that can automatically detect and diagnose PLC faults. This will help to reduce downtime and improve the overall reliability of PLC systems.

- **Serva Transport Systems** is a manufacturer of automated guided vehicles (AGVs). AGVs are used to transport materials in a variety of industries, including manufacturing, warehousing, and logistics. Serva Transport Systems is using ML to develop new AGV features that will make them more intelligent and autonomous. For example, Serva Transport Systems is developing ML algorithms that can enable AGVs to learn and adapt to their environment. This will help to improve the efficiency and flexibility of AGV systems.

Here are some specific examples of how Unitronics and Serva Transport Systems are using ML in their products:

- Unitronics
 - **Predictive maintenance**: Unitronics is using ML to develop algorithms that can predict when PLC components are likely to fail. This will help to prevent downtime and improve the overall reliability of PLC systems.
 - **Root cause analysis**: Unitronics is using ML to develop algorithms that can automatically identify the root cause of PLC faults. This will help to reduce downtime and improve the overall efficiency of PLC systems.

- **Adaptive control:** Unitronics is using ML to develop algorithms that can automatically adjust PLC control parameters based on real-time data. This will help to improve the performance and efficiency of PLC systems. Serva Transport Systems.
 - **Obstacle avoidance:** Serva Transport Systems is using ML to develop algorithms that can enable AGVs to avoid obstacles in their path. This will help to prevent collisions and improve the safety of AGV systems.
 - **Traffic management:** Serva Transport Systems is using ML to develop algorithms that can optimize the flow of AGV traffic in a warehouse. This will help to improve the efficiency of AGV systems.
 - **Route optimization:** Serva Transport Systems is using ML to develop algorithms that can optimize the routes that AGVs take to transport materials. This will help to reduce travel time and improve the efficiency of AGV systems.
- The use of ML in the products of Unitronics and Serva Transport Systems is a good example of how ML is being used to improve industrial products and processes. ML has the potential to revolutionize a wide variety of industries, and it is likely that we will see even more innovative applications of ML in the years to come

2. Proposed System

→ When a vehicle enters the parking facility, a network of sensors, such as cameras captures the number plate of the vehicle. Using machine learning algorithms, the system analyzes the sensor data to identify available parking spaces within the facility. Once an available parking space is identified, the system allots a parking lot to the vehicle and guides the driver to the designated spot. The Upayi ID of the person is used to deduct the charges of the parking upon leaving the parking space. The available space is used for further processes.

1. Vehicle Entry and Number Plate Recognition:

As a vehicle enters the parking facility, a network of high-resolution cameras captures the vehicle's number plate. These cameras can operate in various lighting conditions and can capture clear images even during challenging weather situations. Advanced image processing algorithms are employed to extract the number plate information from the captured images.

2. Parking Space Identification and Allocation:

The extracted number plate information is then fed into the system's machine learning algorithms. These algorithms have been trained on vast amounts of data, including images of parking spaces, occupancy status, and vehicle dimensions. Using this knowledge, the system can accurately identify available parking spaces within the facility.

Once an available parking space is identified, the system allocates it to the incoming vehicle. This allocation is based on factors such as the vehicle's size, the distance from the entrance, and the occupant's preferences.

3. Driver Guidance to Designated Parking Spot:

To guide the driver to the designated parking spot, the system utilizes a combination of visual and auditory cues. These may include illuminated parking space indicators, directional arrows on display screens, and voice prompts. The system can also provide real-time navigation instructions to assist the driver in maneuvering through the parking facility.

4. Payment Processing and Upayi ID Integration:

Upon entering the parking facility, the driver associates their Upayi ID with their vehicle's number plate. This ensures that upon leaving the parking space, the parking charges are automatically deducted from the linked Upayi account. This eliminates the need for manual transactions and provides a seamless payment experience.

5. Space Availability Management and Continuous Optimization:

As vehicles enter and exit the parking facility, the system continuously updates its database of available parking spaces. This real-time information is then used to guide incoming vehicles to open slots, optimizing the overall parking utilization.

In addition to these core functionalities, the automated parking system can incorporate various advanced features, such as:

- Dynamic Parking Allocation: The system can dynamically adjust parking space allocation based on real-time demand and occupancy patterns. This ensures that parking spaces are utilized efficiently and reduces congestion.
- Data-driven Parking Optimization: The system can collect and analyze parking usage data to identify patterns, trends, and potential areas for improvement. This data can then be used to optimize parking facility design, operational strategies, and resource allocation.

Overall, the automated parking system represents a significant advancement in parking technology, offering a range of benefits to both drivers and parking facility operators. By utilizing machine learning, sensor technology, and advanced algorithms, the system provides a seamless, efficient, and secure parking experience.

3. Objective of the System

1. Convenient and Efficient Parking Experience:

The automated parking system eliminates the time-consuming and often frustrating task of searching for a parking spot. Upon entering the parking facility, the system automatically identifies and allocates an available parking space, guiding the driver to the designated spot using visual and auditory cues. This significantly reduces the time spent searching for parking, improving the overall parking experience for drivers.

2. Improved Safety and Security:

The automated parking system enhances safety and security within the parking facility. The system's network of sensors and cameras continuously monitors the parking area, providing

real-time surveillance and ensuring the safety of vehicles and pedestrians. Additionally, the system can integrate with access control systems to restrict unauthorized access to designated parking areas, further enhancing security.

3. Optimal Space Utilization:

The system's machine learning algorithms optimize parking space allocation, ensuring that available spaces are utilized efficiently. The system can dynamically adjust parking allocation based on real-time demand and occupancy patterns, preventing overallocation and underutilization of parking spaces. This optimization maximizes the parking capacity of the facility and reduces congestion.

4. Data Collection and Insights:

The automated parking system collects valuable data on parking usage patterns, occupancy trends, and driver behavior. This data can be analyzed to gain insights into parking utilization patterns, identify areas for improvement, and inform future facility design and operational strategies. Data-driven decision-making can lead to more efficient parking management, improved resource allocation, and enhanced customer satisfaction.

CHAPTER 5

REQUIREMENT ANALYSIS

5. REQUIREMENT ANALYSIS

❖ Hardware Requirement Specification

1. Entry/Exit Gates:

- Barrier gates: These are motorized gates installed at the entrance and exit points of the parking facility to control vehicle access.
- Access control systems: These include card readers, RFID scanners, or ticket dispensers to authenticate and manage entry and exit permissions.

Parking Guidance System:

- Sensors: Ultrasonic or infrared sensors are used to detect the presence of vehicles and monitor parking space occupancy.
LED indicators: These are placed above each parking space to guide drivers by indicating whether a particular space is available (green) or occupied (red).
- Central server: It processes data from the sensors and communicates with the parking management software.

2. Parking Management System:

- Central server: It acts as the core of the parking system, managing various subsystems and processing data.
- Database server: Stores information about parking space availability, user profiles, payment transactions, etc.
- Communication infrastructure: It enables real-time communication between the various components, including the central server, entry/exit gates, and payment systems.
- User interface devices: Kiosks, touch screen panels, or mobile applications for users to interact with the parking system, check availability, make reservations, or make payments.

3. Surveillance and Security:

- CCTV cameras: Strategically placed cameras to monitor the parking facility for security purposes and to ensure compliance with parking regulations.
- Network video recorder (NVR): Records and stores video footage from the CCTV cameras for later review and analysis.
- Security alarms: Intrusion detection systems that can alert security personnel in case of unauthorized access or suspicious activities.

4. Payment Systems:

- Ticketing machines: Dispense tickets with unique identifiers for tracking purposes.
Payment terminals: Allow users to pay for parking fees using cash, credit cards, or mobile payment methods.
- Integration with payment gateways: To process online payments and provide seamless payment options to users.

5. Power and Connectivity:

- Electrical infrastructure: Power supply and distribution systems to provide electricity to various components.
- Network infrastructure: Ethernet or Wi-Fi connectivity to facilitate communication between different devices and subsystems.

Software Requirement Specification

System Overview:

- System architecture: Provide an overview of the software architecture, including the different modules and their interactions.
- User roles and permissions: Identify the various user roles within the system and their respective permissions.
- **Functional Requirements:**
 - Use case scenarios: Describe the typical interactions between the users and the system, including actions such as vehicle entry, parking space allocation, payment processing, and vehicle exit.
 - Use case diagrams: Visual representations of the interactions between users and the system.
 - Functional requirements: Specify the specific features and functionalities required, such as vehicle detection, parking space availability tracking, ticket generation, payment processing, and user management.
- **Non-functional Requirements:**
 - Performance: Specify the expected performance metrics, such as response time, system throughput, and maximum concurrent users.
 - Reliability: Define the system's expected reliability, including availability, fault tolerance, and error handling.
 - Security: Outline the security requirements, including user authentication, data encryption, and access control mechanisms.
 - Scalability: Identify the system's scalability requirements to accommodate future growth and increased usage.
 - Usability: Describe the user interface design principles, accessibility requirements, and any usability guidelines.

System Constraints:

- Hardware and software constraints: Specify any specific hardware or software requirements for the system to function properly.
- Regulatory and legal constraints: Identify any legal or regulatory requirements that the system must comply with, such as data privacy regulations or parking regulations.
- External interfaces: Describe the interactions between the automated parking system and external systems, such as payment gateways, access control devices, or parking

guidance systems.

- User interfaces: Specify the requirements for the user interface, including design guidelines, navigation, and input/output specifications.

System Maintenance and Support:

- Documentation requirements: Specify the documentation that needs to be provided, such as user manuals, installation guides, and system administration guides.
- Maintenance and support requirements: Define the support and maintenance expectations, including bug fixes, updates, and technical support.

CHAPTER 6
DESIGN ANALYSIS

6. DESIGN & ANALYSIS

Processor type	Pentium IV or above for optimum performance.
System type	1.00GB and above
Input device	Basic Keyboard and Touch Pad
Output device	Standard color monitor
Operating system	WINDOWS Versions (7,8.1,8,10,11)
Front End	VISUAL STUDIO 2015
Back End	SQL SERVER 2008

1. Convenient and Efficient Parking Experience:

The automated parking system eliminates the time-consuming and often frustrating task of searching for a parking spot. Upon entering the parking facility, the system automatically identifies and allocates an available parking space, guiding the driver to the designated spot using visual and auditory cues. This significantly reduces the time spent searching for parking, improving the overall parking experience for drivers.

2. Improved Safety and Security:

The automated parking system enhances safety and security within the parking facility. The system's network of sensors and cameras continuously monitors the parking area, providing real-time surveillance and ensuring the safety of vehicles and pedestrians. Additionally, the system can integrate with access control systems to restrict unauthorized access to designated parking areas, further enhancing security.

3. Optimal Space Utilization:

The system's machine learning algorithms optimize parking space allocation, ensuring that available spaces are utilized efficiently. The system can dynamically adjust parking allocation based on real-time demand and occupancy patterns, preventing overallocation and underutilization of parking spaces. This optimization maximizes the parking capacity of the facility and reduces congestion.

4. Data Collection and Insights:

The automated parking system collects valuable data on parking usage patterns, occupancy trends, and driver behavior. This data can be analyzed to gain insights into parking utilization patterns, identify areas for improvement, and inform future facility design and operational strategies. Data-driven decision-making can lead to more efficient parking management, improved resource

allocation, and enhanced customer satisfaction.

In summary, the proposed automated parking system offers a range of benefits that enhance the parking experience for drivers, improve safety and security, optimize space utilization, and provide valuable data insights for informed decision-making.

CHAPTER 7

IMPLEMENTATION

7. IMPLEMENTATION

Implementation is the stage where the theoretical design is turned into a working system. The most crucial stage in achieving a new successful system and in giving confidence on the new system for the users that it will work efficiently and effectively.

The system can be implemented only after thorough testing is done and if it is found to work according to the specification. It involves careful planning, investigation of the current system and its constraints on implementation, design of methods to achieve the change over and an evaluation of change over methods as part from planning.

Two major tasks of preparing the implementation are education and training of the users and testing of the system. The more complex the system being implemented, the more involved will be the system analysis and design effort required just for implementation.

The implementation phase comprises of several activities. The required hardware and software acquisition is carried out. The system may require some software to be developed. For this, programs are written and tested. The user then changes over to his new fully tested system and the old system is discontinued.

TESTING

The testing phase is an important part of software development. It is the Information zed system will help in automate process of finding errors and missing operations and also a complete verification to determine whether the objectives are met and the user requirements are satisfied. Software testing is carried out in three steps:

1. The first includes unit testing, where each module is tested to provide its correctness, validity and also determine any missing operations and to verify whether the objectives have been met. Errors are noted down and corrected immediately.
2. Unit testing is the important and major part of the project. So errors are rectified easily in particular module and program clarity is increased. In this project entire system is divided into several modules and is developed individually. So unit testing is conducted to individual modules.
3. The second step includes Integration testing. It need not be the case, the software whose modules when run individually and showing perfect results, will also show perfect results when run as a whole.

Implementing an automated parking system using machine learning involves several key steps:

Sensor Setup and Data Acquisition:

- Install a network of cameras and other sensors, such as lidar or ultrasonic sensors, throughout the parking facility.
- Collect and store sensor data, including images, distance measurements, and occupancy status of parking spaces.

Data Preprocessing and Labeling:

- Preprocess the sensor data to clean, normalize, and prepare it for machine learning algorithms.
- Label the preprocessed data with accurate information about parking space occupancy and vehicle characteristics.
- Split the labeled data into training, validation, and testing sets for model development and evaluation.

Machine Learning Model Training:

- Choose appropriate machine learning algorithms, such as convolutional neural networks (CNNs) for image recognition and recurrent neural networks (RNNs) for temporal sequence analysis.
- Train the selected machine learning models on the training data using supervised learning techniques.
- Evaluate the trained models on the validation data to assess their performance and accuracy.

System Integration and Deployment:

- Integrate the trained machine learning models into the automated parking system software.
- Implement real-time data processing pipelines to handle incoming sensor data and generate parking guidance instructions.
- Deploy the automated parking system software onto hardware platforms, such as edge devices or cloud servers.

Continuous Monitoring and Optimization:

- Continuously monitor the performance of the automated parking system and machine learning models.
- Collect feedback from users and analyze system performance data to identify areas for improvement.

- Refine and retrain machine learning models using updated data and feedback to maintain optimal performance.

In addition to these core steps, consider incorporating additional features and enhancements:

- **User Interface and Mobile Integration:** Develop user-friendly interfaces for drivers to interact with the system, such as mobile apps or parking lot displays.
- **Dynamic Parking Allocation:** Implement dynamic parking allocation algorithms to optimize space utilization based on real-time demand and occupancy patterns.
- **Navigation and Guidance:** Provide personalized navigation instructions to drivers based on their vehicle dimensions, driving style, and parking preferences.
- **Security and Access Control:** Integrate with access control systems to restrict unauthorized access to designated parking areas.
- **Data Analytics and Insights:** Analyze parking usage data to gain insights into user behavior, identify trends, and inform future facility design and operational strategies.
- The implementation of an automated parking system using machine learning offers a range of benefits, including:
 - **Improved Parking Efficiency:** Significantly reduce the time spent searching for parking spaces, enhancing the overall parking experience for drivers.
 - **Enhanced Safety and Security:** Monitor the parking area, provide real-time surveillance, and integrate with access control systems to improve safety and security.
 - **Optimized Space Utilization:** Maximize parking capacity and reduce congestion through dynamic parking allocation and efficient space utilization algorithms.
 - **Data-driven Insights:** Gain valuable insights into parking usage patterns, driver behavior, and facility utilization to inform future decisions.

CHAPTER 8
SNAPSHOTS

8. SNAPSHOTS

ACCURACY

imf/1.jpg MH 20 EE 7598 91.35%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/2.jpg HR 13 H 0025 80.97%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/3.jpg DL7C N 5617 93.79%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/4.jpg IND 82.29%

imf/5.jpg NCU 8918 99.71%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/6.jpg IND 99.90%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/7.jpg KL 99.94%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/8.jpg MP 99.24%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/9.jpg KL 99.94%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/10.jpg KL 99.71%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/11.jpg MGZSEV 99.53%

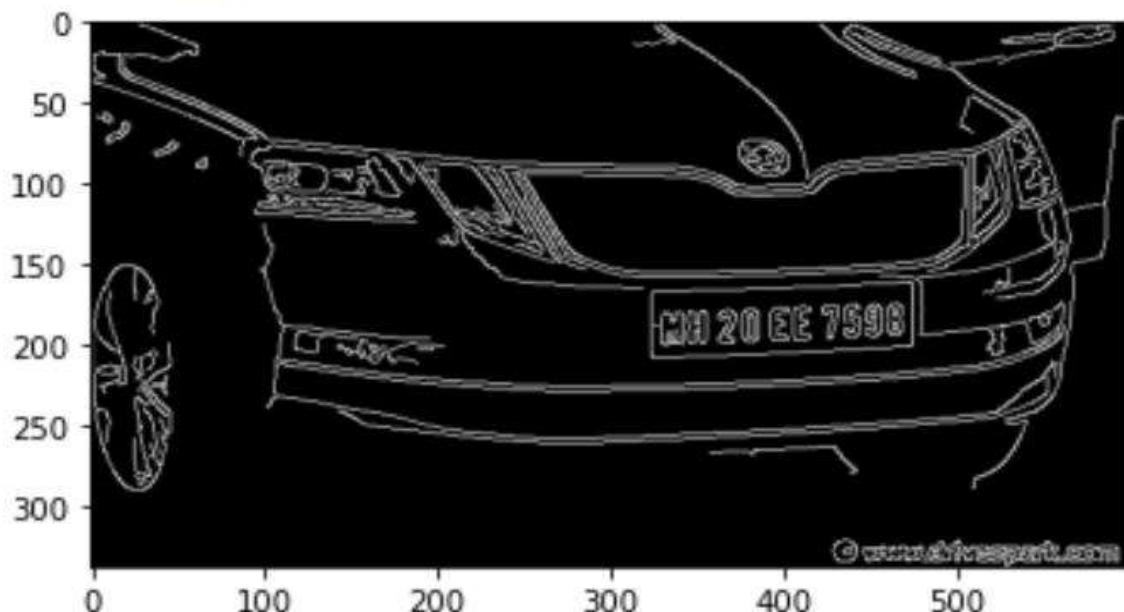
Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/12.jpg KL 18 N 6999 77.97%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.
imf/13.jpg HR 69 6969 89.59%

Neither CUDA nor MPS are available - defaulting to CPU. Note: This module is much faster with a GPU.

imf/14.jpg MP 99.86%

imf/15.jpg PY 95.34%



CAR PARKING MANAGEMENT

Vehicle Number:

Entry Exit

Cost: Rs.150

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

```

Automated-Parking-System-using-ML-main > mainCar.py ...
1 Click here to ask Blackbox to help you code faster!
2 import mysql.connector
3 import datetime
4 import sys
5 import re
6 import time
7
8 from PyQt5 import QtCore, QtWidgets, uic
9 mydb = mysql.connector.connect(host = "localhost", user = "root", passwd = "", database = "car")
10
11 cursor = mydb.cursor()
12
13 cursor.execute("CREATE TABLE IF NOT EXISTS slots(slots_id INT AUTO_INCREMENT PRIMARY KEY, slot_no INT, status CHAR(1), timestamp DATETIME);")
14
15 cursor.execute("CREATE TABLE IF NOT EXISTS exits(carNumber VARCHAR(20) PRIMARY KEY, exitTime DATETIME);")
16
17 cursor.execute("CREATE TABLE IF NOT EXISTS cost(carNumber VARCHAR(20), cost INT);")
18
19
20
21
22
23
24
25
26
27
28
29
30
31 self.ENTRYBUTTON.released.connect(lambda: xd())
32 self.EXITBUTTON.released.connect(lambda: exit())
33 self.Active.setStyleSheet("background-color: #FF0000")#red
34 self.Active.setStyleSheet("background-color: #00FF00")#green
35 def xd():
36     carNumber = self.lineEdit.text()
37     mycursor.execute("SELECT carNumber FROM slot")
38     f = list(mycursor.fetchall())
39     if carNumber in s for s in f:
40         print("x")
41         self.label_2.setText("Duplicate")
42
43         print(f)
44
45     else:
46         bla()
47     def bla():
48         carNumber = self.lineEdit.text()

```

checkbox, Edit, Copy and Delete features are not available.

Showing rows 0 - 3 (4 total, Query took 0.0002 seconds.)

SELECT * FROM `cost`

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25

Extra options

carNumber	cost
HR 13 H 0025	NULL
MH1Z DE4433	NULL
KA 03 MW 0400	150
AP05 BL 6339	NULL

Show all | Number of rows: 25

CAR PARKING MANAGEMENT

Vehicle Number:

Entry Exit

Cost: Rs.150

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

CHAPTER 9
CONCLUSION

9. CONCLUSION

The package was designed in such a way that future modifications can be done easily. The following conclusions can be deduced from the development of the project:

- ❖ Automation of the entire system improves the efficiency
- ❖ It provides a friendly graphical user interface which proves to be better when compared to the existing system.
- ❖ It gives appropriate access to the authorized users depending on their permissions.
- ❖ It effectively overcomes the delay in communications.
- ❖ Updating of information becomes so easier
- ❖ System security, data security and reliability are the striking features.
- ❖ The System has adequate scope for modification in future if it is necessary.

10. REFERENCE

★

- ★ <https://www.oracle.com/in/>
- ★ <https://www.geeksforgeeks.org/>
- ★ <https://www.w3schools.com/>
- ★ <https://www.tutorialspoint.com/>

