

**A**

**Mini Project Report**

**on**

**ParkWatch: Parking Space Monitoring System**

Submitted in partial fulfillment of the requirements for the degree

**Second Year Engineering – Computer Science Engineering (Data Science)**

**by**

**Ronit Amberkar                    23107086**

**Ajit Gophane                    23107080**

**Tanay Bandekar                    23107079**

**Shantaram Gawas                    23107108**

**Under the guidance of**

**Prof. Dipali Gat**



**DEPARTMENT OF COMPUTER SCIENCE ENGINEERING (DATA SCIENCE)**

**A.P. SHAH INSTITUTE OF TECHNOLOGY**

**G.B. Road, Kasarvadavali, Thane (W)-400615**

**UNIVERSITY OF MUMBAI**

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## CERTIFICATE

This to certify that the Mini Project report on **ParkWatch: Parking Space Monitoring System** has been submitted by Ronit Amberkar (23107086), Ajit Gophane (23107080), Tanay Bandekar (23107079) and Shantaram Gawas (23107108) who are bonafide students of A. P. Shah Institute of Technology, Thane as a partial fulfillment of the requirement for the degree in **Computer Science Engineering (Data Science)**, during the academic year **2024-2025** in the satisfactory manner as per the curriculum laid down by University of Mumbai.

**Prof. Dipali Gat**  
**Guide**

**Ms. Anagha Aher**  
**HOD, CSE(Data Science)**

**Dr. Uttam D. Kolekar**  
**Principal**

**External Examiner:**  
**1.**

**Internal Examiner:**  
**1.**

**Place:** A. P. Shah Institute of Technology, Thane  
**Date:**

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# **Chapter 1**

## **Introduction:**

Finding a parking space is a common challenge that leads to traffic congestion, increased fuel consumption, and driver frustration. ParkWatch seeks to solve this problem by using advanced technologies to effectively monitor and manage parking spaces, ensuring a smoother and more efficient parking experience. ParkWatch is a cutting-edge parking space monitoring system designed to tackle the growing challenges of urban parking.

Parkwatch is an innovative parking space monitoring system designed to address the growing challenges of urban parking. As cities become more crowded and parking spaces become increasingly limited, Park watch aims to streamline the parking process for both drivers and parking facility managers. Parkwatch enables efficient monitoring and management of parking spaces. Additionally, it helps parking operators optimize space utilization, improve revenue generation, and offer smoother parking experience for all users. This report will explore the key features of Parkwatch, its benefits, and how it contributes to smarter, more efficient urban parking solutions. ParkWatch leverages advanced technology to offer a seamless and intelligent parking management solution, benefiting both drivers and parking facility operators. For parking operators, ParkWatch offers a centralized dashboard that allows them to monitor occupancy levels, manage reservations, and optimize space utilization. The system provides detailed analytics and reports on parking trends, peak usage hours, and revenue generation

### **1.1 Purpose:**

The goal of this project is to create a Parking Space Detection System that makes parking management more efficient by using video feeds and sensor data. The system helps to accurately determine whether parking spaces are occupied or available in real-time. This approach reduces the time drivers spend searching for a parking spot, which in turn helps reduce traffic congestion and saves fuel. By ensuring that parking spaces are used effectively, the system also stores data in the cloud, analyzes trends, and provides an easy-to-use interface

for drivers to quickly access parking information. As cities face growing parking challenges, this project aims to improve urban mobility, making it easier for people to park, and support environmental sustainability by reducing unnecessary driving and emissions.

The system leverages real-time video feeds and sensor-based data collection to analyze parking occupancy and availability accurately. This technology-driven approach minimizes the time spent searching for parking spaces, leading to reduced traffic congestion and fuel consumption. Additionally, the system ensures optimal space utilization by integrating cloud-based storage, predictive analytics, and an intuitive user interface for seamless access to parking information. By addressing the increasing demand for smart parking solutions, this project aims to contribute to improved urban mobility and environmental sustainability.

### **1.1.Problem Statement:**

Parking congestion in urban areas has become a critical issue, leading to increased fuel consumption, traffic congestion, and frustration among drivers. The inefficiencies of conventional parking management systems contribute significantly to these problems, as they often lack real-time data and efficient space allocation mechanisms. This project aims to address this problem by implementing a smart parking detection system that leverages advanced technologies by integrating cloud-based data storage and a friendly interface, this system will ensure seamless access to parking information, ultimately improving overall traffic management and urban mobility.

### **1.3 Objectives:**

- **Parking Availability:** To provide information about available or occupied parking spaces in a parking lot, helping drivers find free spots quickly.
- **Reduce Fuel Consumption:** To reduce fuel consumption by accurately identifying free parking spots and minimizing search time.

- **Enhanced User Experience:** To Provide drivers with seamless and user-friendly experience, using a display board showing live parking space status.
- **Efficient Parking Management:** To improve parking lot management by tracking and displaying occupancy status and waiting time for drivers.

## **1.4 Scope:**

The system will be designed to monitor parking lots using a network of symbolism to accurately detect vacant and occupied spaces. It ensures high precision in identifying vehicles and available parking spots. The collected data will be processed in real-time and stored in a secure Mysql based infrastructure, allowing seamless integration

A user-friendly interface will provide navigation assistance to available spots, and predictive analytics for demand forecasting. Additionally, the system will support automated alerts for parking violations and unauthorized vehicle detection, enhancing overall parking management efficiency. ParkWatch is designed to simplify and optimize parking management by integrating smart monitoring, automated alerts, and user-friendly interfaces. By reducing congestion, improving space utilization, and enhancing security, the system will contribute to a smoother and more convenient parking experience for both drivers and parking facility operators. Through continuous development and structured monitoring capabilities, ParkWatch will set a new benchmark for modern parking solutions, making urban parking more accessible, efficient, and well-regulated.

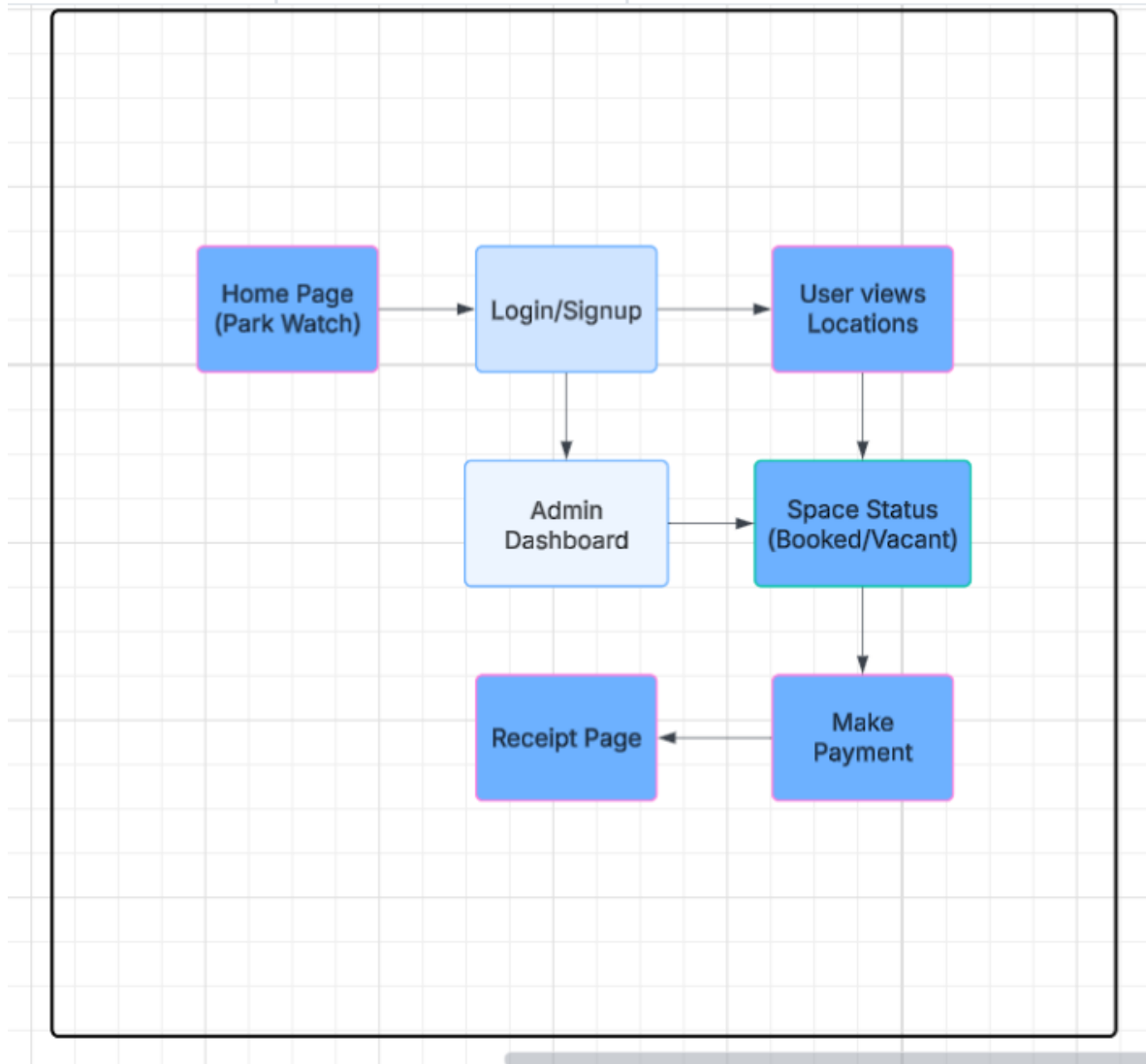
## **Chapter 2**

### **Proposed System:**

The proposed ParkWatch parking space monitoring system is designed to optimize urban parking by providing real-time information and enhancing the overall parking experience for both drivers and parking facility operators. As cities become more congested, the demand for efficient parking solutions has increased, making it essential to implement smart technology that simplifies parking management and reduces the stress of finding available spaces. To enhance the user experience, the platform will support seamless integration with multiple parking locations, allowing users to access parking information across various sites.

The system will track the availability of each parking spot, generate reports on space usage, and additionally, it will allow operators to optimize space utilization, improving revenue generation and reducing the chances of overcrowding. The platform will support integration with multiple parking locations, allowing users to access parking information across various sites, and making it suitable for both public and private parking facilities. To enhance customer experience. For parking facility operators, ParkWatch offers a comprehensive management dashboard that provides insights into space usage, peak hours, and occupancy trends. The system generates detailed reports, enabling operators to optimize space utilization and implement dynamic pricing strategies that adjust parking fees based on demand. This not only maximizes revenue generation but also helps regulate parking availability, ensuring that spaces are used efficiently and reducing the risk of overcrowding. By offering an interconnected and user-friendly platform, ParkWatch aims to redefine modern parking management. As urbanization continues, the implementation of smart parking solutions like ParkWatch will become increasingly essential in ensuring efficient space management, reducing congestion, and creating a seamless parking experience for all users.





## 2.1 Block Diagram

In figure 2.1 block diagram illustrates the workflow of the ParkWatch parking system. Users begin at the Home Page and proceed to the Login/Signup module. Upon successful login, they can either view available parking locations or access the Admin Dashboard. Users can then check space status (booked or vacant), proceed to make payments, and are redirected to the Receipt Page for confirmation. Admins can also monitor bookings and manage the system through the dashboard.

## **2.1. Features and Functionality:**

- The system monitors parking areas in real-time, accurately detecting available and occupied spaces through manual or automated data inputs.
- Payment Options: Supports credit/debit cards.
- Show Parking Prices: Display parking fees clearly for each location or spot, especially if dynamic pricing is used.
- Time-Based Fee Calculation: Add a feature to calculate parking fees based on the duration of the vehicle's stay.

This parking management system offers real-time monitoring of parking spaces, accurately identifying available and occupied spots using either manual input or automated sensors. It ensures efficient space utilization and helps users quickly find open parking. The system supports secure payment options through credit and debit cards, making transactions easy and convenient. Parking fees are clearly displayed for each location or individual spot, helping users understand the charges before parking. If dynamic pricing is applied, the system updates the rates accordingly. A key feature is time-based fee calculation, which automatically calculates the total cost based on how long a vehicle stays parked. This promotes transparency and accurate billing. The system is designed to reduce congestion, save time for users, and improve the overall parking experience. It is user-friendly, reliable, and scalable for different types of parking areas.

# Chapter 3

## Project Outcomes

The implementation of the ParkWatch parking space monitoring system is expected to significantly improve parking efficiency, reduce traffic congestion, and enhance the overall parking experience for both drivers and facility operators. Drivers will benefit from real-time information on available parking spots, making it easier to find parking and reduce time spent searching. Features like space reservation, digital payment options, and notifications for parking time expiry will provide added convenience.

For parking facility operators, the system will automate space monitoring, track occupancy rates, and provide valuable data insights into space utilization. This will help optimize parking operations, reduce overcrowding, and improve revenue generation.

### **The expected key outcomes of the ParkWatch application include:**

- **Improved Parking Space Utilization:**

Efficient allocation of available parking spots minimization of vacant or underused spaces.

- **Reduced Traffic Congestion:**

Less time spent searching for parking Improved traffic flow in and around parking areas.

- **Enhanced User Experience:**

Faster and hassle-free parking process Clear guidance for parking availability.

- **Time and Cost Savings:**

Reduction in fuel consumption due to quicker parking Lower operational costs for parking management.

- Improved Monitoring & Control:

Real-time tracking of available parking spots Ability to enforce parking rules effectively.

- Better Revenue Management:

Accurate tracking of parked vehicles for fair charging Prevention of unauthorized parking.

Overall, this project will modernize urban parking by integrating advanced digital solutions to address the growing challenges of parking management. It will bridge the gap between traditional parking systems and modern, tech-driven solutions, ensuring that parking facilities are more efficient and accessible.

# Chapter 4

## Software Requirements:

- **Programming Language:** Python is a high-level, interpreted programming language that was created by Guido van Rossum and first released in 1991. It is designed with an emphasis on readability and simplicity, which makes it an excellent choice for both beginners and experienced programmers. Python's syntax is clean and easy to understand, which allows developers to express their ideas in fewer lines of code compared to many other programming languages.
- **Database:** MySQL is an open-source, relational database management system (RDBMS) that uses Structured Query Language (SQL) to manage and manipulate data. MySQL is designed to store, retrieve, and manage data in tables that are related to each other. These tables are structured in a way that allows users to store data in rows and columns, much like a spreadsheet. Each row represents a record, and each column represents a field of data within that record.
- **Framework:** Tkinter is a standard Python library used for creating graphical user interfaces (GUIs). It is a thin object-oriented layer over the Tk GUI toolkit, which is one of the oldest and most widely used GUI toolkits for developing desktop applications. The Tkinter library enables Python developers to create desktop applications with windows, buttons, text fields, labels, and other common interface components.

# Chapter 5

## Project Design:

Project design is the process of defining the structure, components, and execution plan of a project. It involves outlining the project's objectives, scope, timeline, deliverables, resources, and risks. In this phase, detailed plans for how to achieve the project goals are created, including tasks, workflows, and responsibilities. Effective project design ensures that all stakeholders have a clear understanding of the project's direction and how the final outcomes will be achieved, setting the foundation for successful implementation and delivery.

**Park Watch:** Park Watch is likely an application or system designed to manage parking spaces and provide real-time information about parking availability. The goal of ParkWatch would be to help users easily find and reserve parking spots in locations like shopping malls, public spaces, or private lots

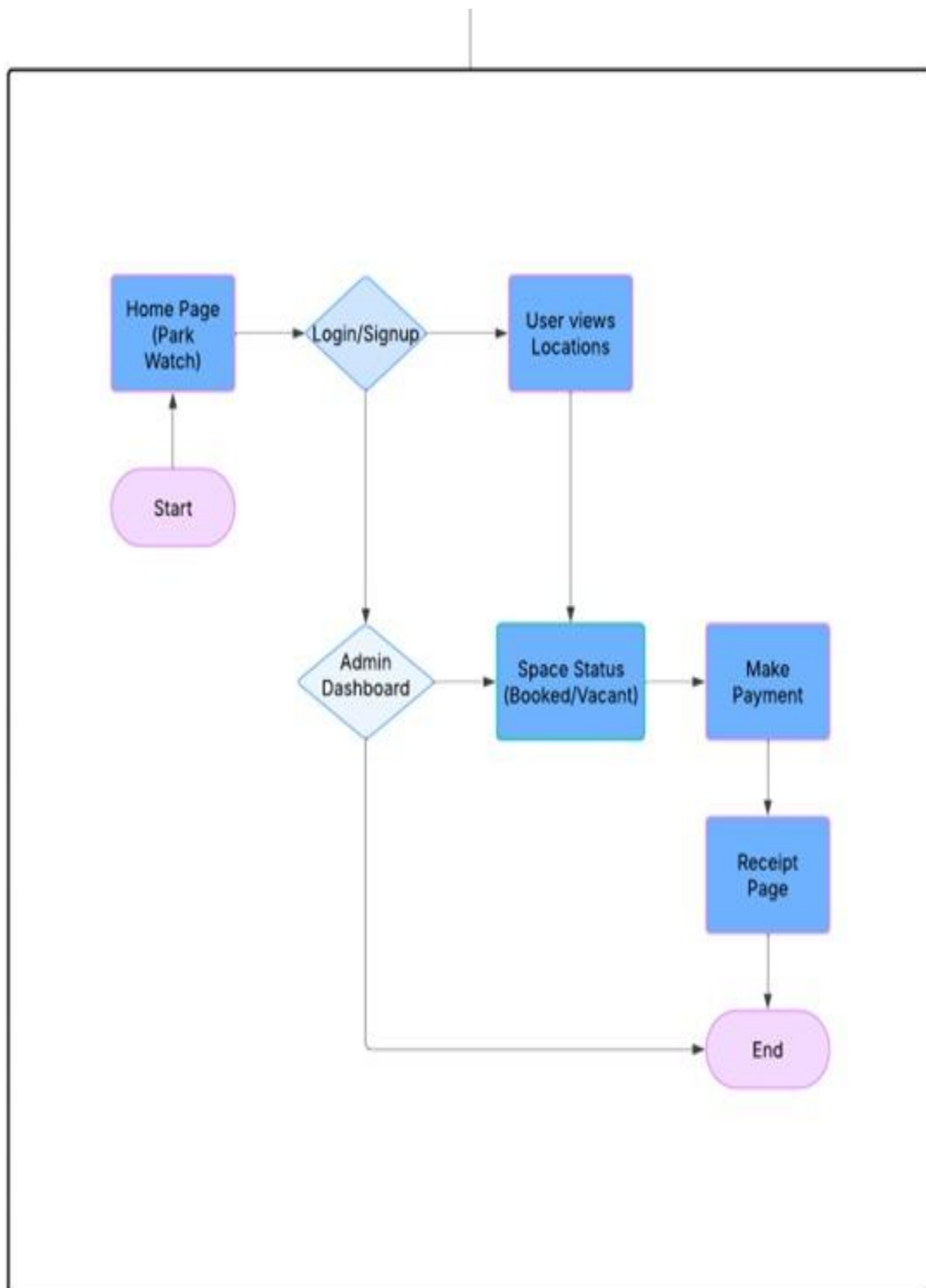
**Login/Signup:** Existing users can log into the system. For new users to register into the system. After signing up, the user can proceed to log in.

**Location Access:** In a system like ParkWatch allows the application to retrieve the user's geographical position, which can be used to improve the parking experience.

**Vacant Spaces:** Vacant space refers to parking spots that are available for use and not currently occupied.

**Time & Cost:** The time and cost feature in a parking management system like ParkWatch helps users understand the time duration and associated charges for parking in a particular space. When a user selects a parking space, the system allows user for the time to be parked, calculating the total parking duration.

**Bill Payment:** Bill payment in a parking management system like ParkWatch allows users to pay for their parking charges easily and securely. The user is presented with the payment options, which may include credit/debit cards, digital wallets, or other online payment methods.



**Figure 5.1 Flowchart**

## **Chapter 6**

### **Project Scheduling:**

The image is a Gantt chart, a visual representation of a project's timeline and task progression. It is organized by weeks on the vertical axis and is divided into two main project phases: Project Conception and Initiation and Project Design and Implementation. Each phase includes a series of tasks, which are color-coded for easy distinction, with each task spanning a specific period (weeks).

Task descriptions, deadlines, and assigned responsibilities are clearly listed, providing a structured project schedule. The chart uses bars of various colors to indicate progress and dependencies, visually showing how tasks are linked and when they are scheduled. This design allows project managers to track milestones and deliverables over time, helping in the effective management and monitoring of the project.

The Following Image is This Gantt chart which represents the timeline and progress of the Parkwatch project, guided by Prof. Deepali Gat.



A Gantt chart's visual timeline allows you to see **Smartsheet Tip** details about each task as well as project dependencies.

INSTITUTE & DEPARTMENT NAME AP SHAH INSTITUTE OF TECHNOLOGY (IASE-Data Science)

DATE: 4-2-25

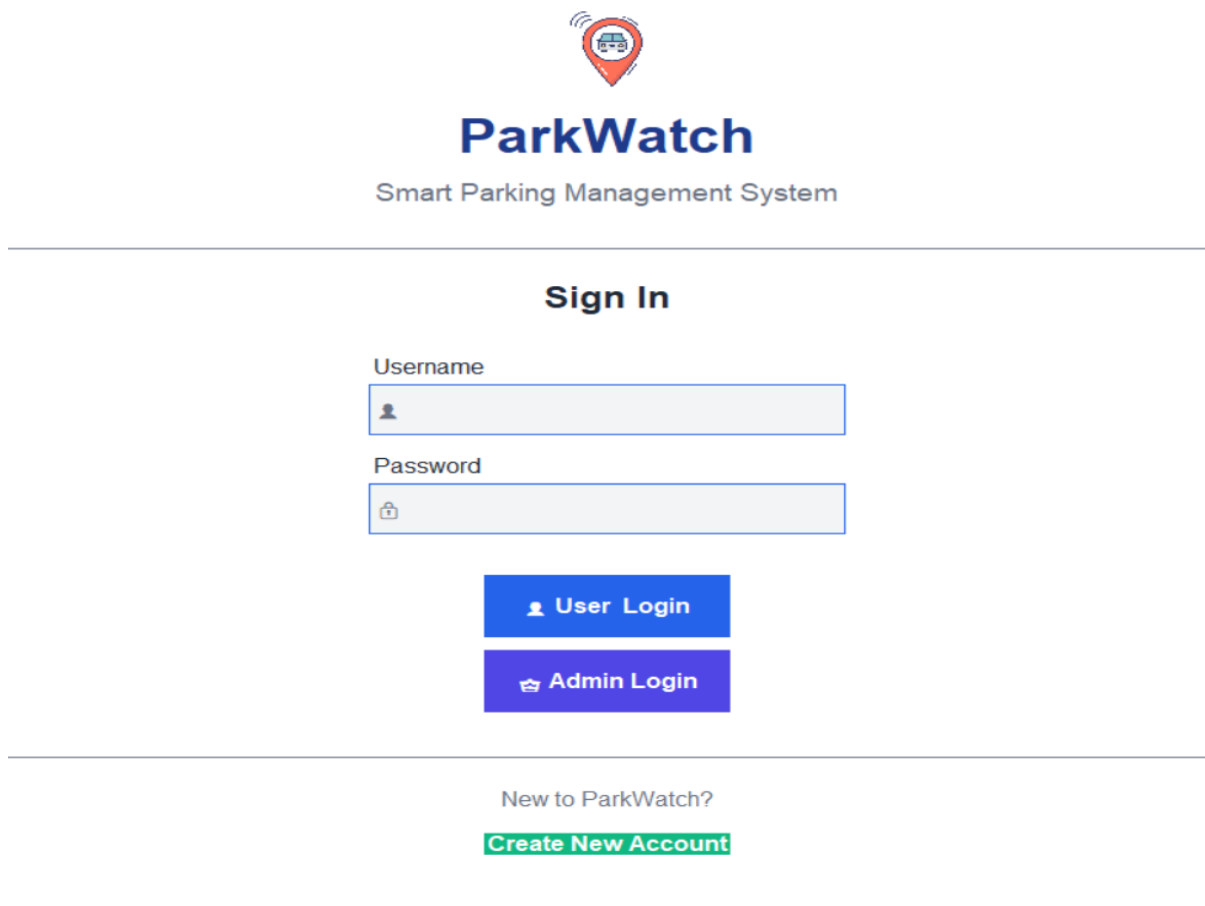
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DATE: 4-2-25



## Chapter 7

### Result:



The image shows the home page of the ParkWatch Smart Parking Management System. At the top, there is a logo featuring a red location pin with a car icon inside, and the text "ParkWatch" in blue, followed by "Smart Parking Management System" in a smaller font. Below this, a horizontal line separates the header from the main content area. The main content area has a "Sign In" heading. Underneath, there are two input fields: "Username" with a person icon and "Password" with a lock icon. Below these fields are two buttons: "User Login" (blue) and "Admin Login" (purple). At the bottom, there is a link "New to ParkWatch?" followed by a green button labeled "Create New Account".

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### Sign In

Username

Password

User Login

Admin Login

---

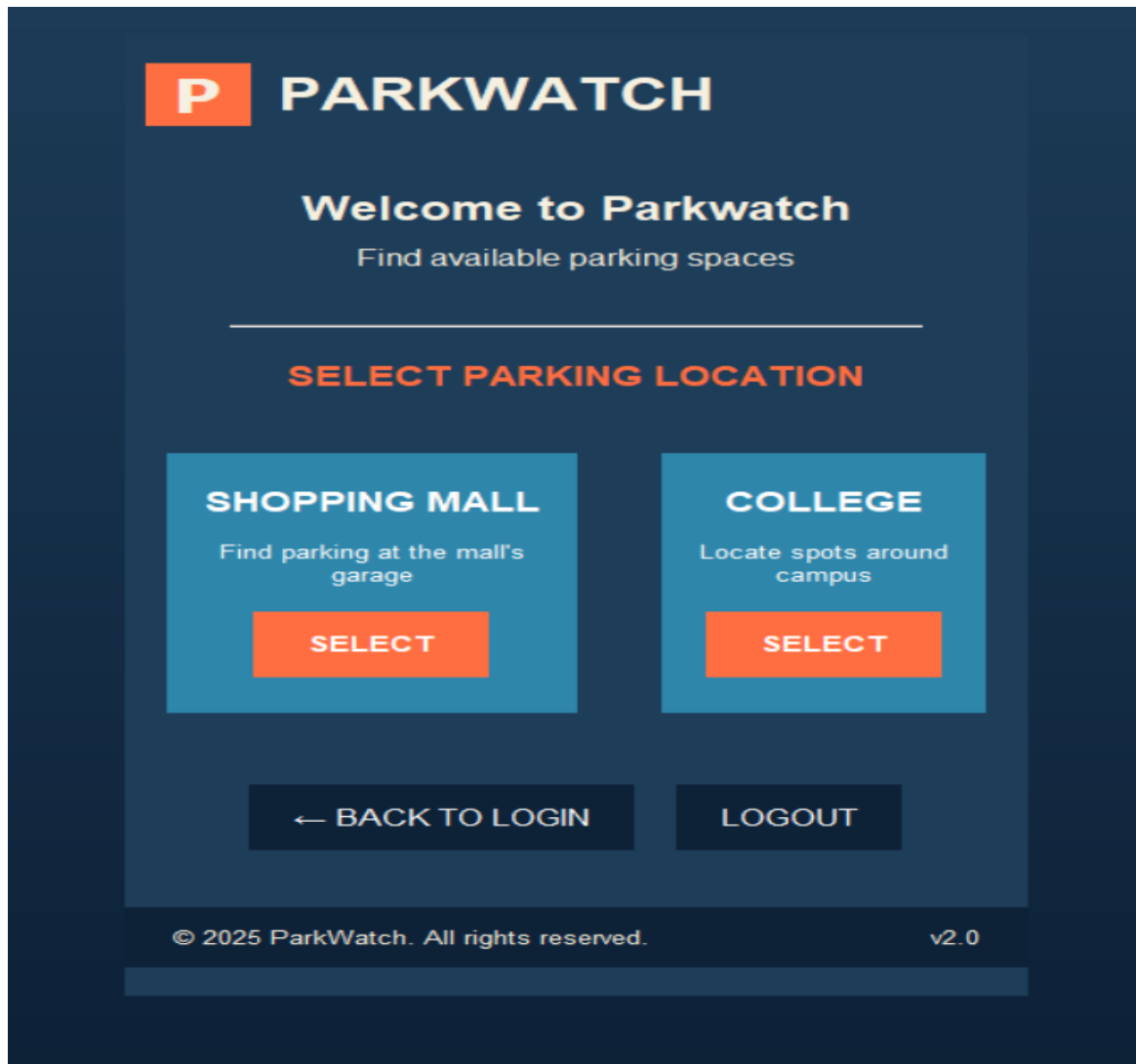
New to ParkWatch?

Create New Account

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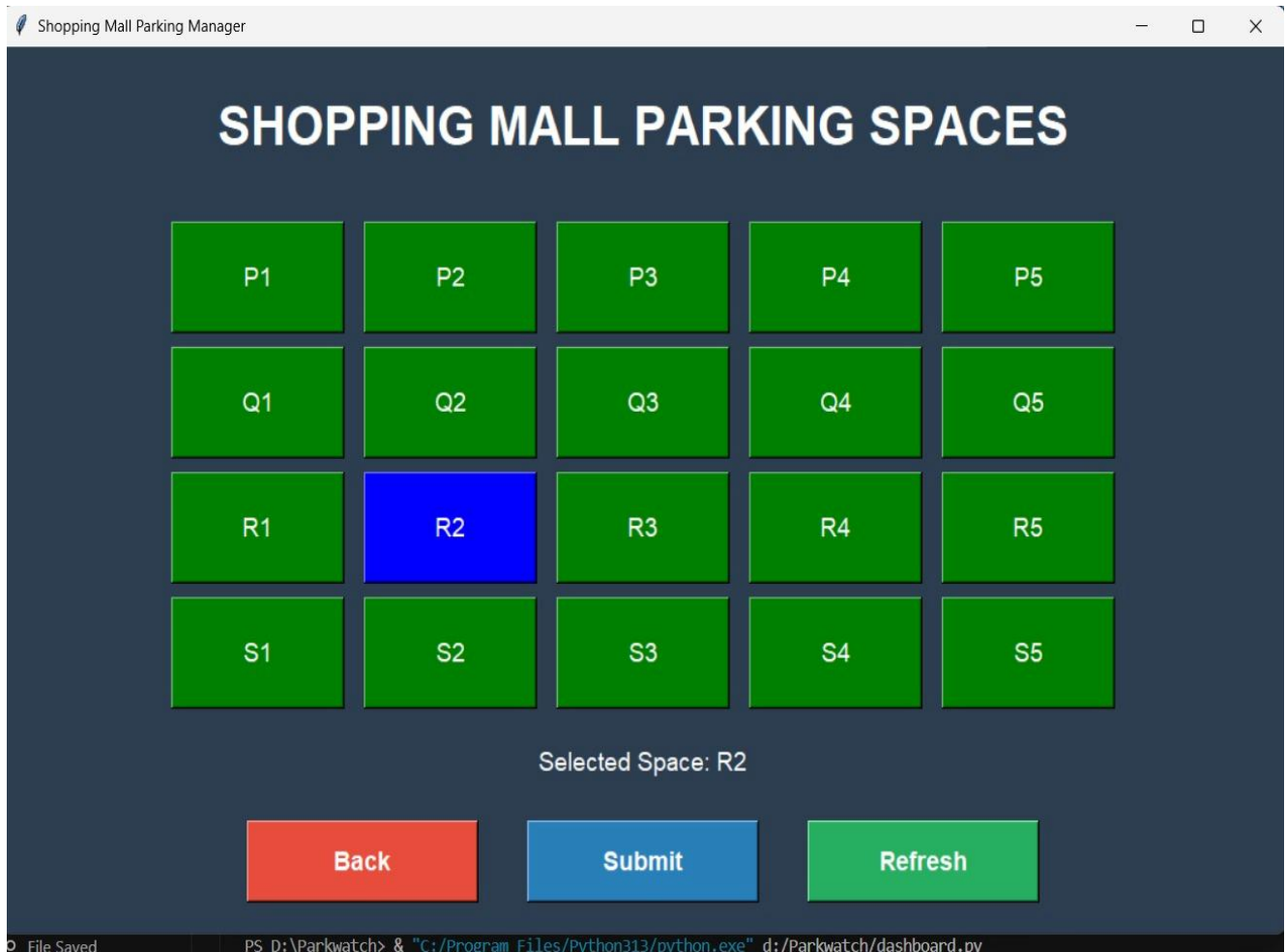
**Figure 7.1 Home Page**

Figure 7.1 shows Park Watch, a smart parking management system that simplifies finding, reserving, and managing parking spaces. With a login system in place, ParkWatch ensures secure access for users and administrators, allowing them to manage their respective tasks. The presence of a signup option suggests that new users can create accounts to access the platform, possibly benefiting from features such as parking reservations, payment processing, or tracking past parking history.



**Figure 7.2 Parking Location**

Figure 7.2 shows parking location is a designated area where vehicles can be parked temporarily or for an extended period. Parking locations can be privately owned, such as those in shopping malls and office buildings, or publicly managed by local authorities. Parking locations require payment, depending on regulations and demand. In a system like ParkWatch allows the application to retrieve the user's geographical position, which can be used to improve the parking experience.



**Figure 7.3 Parking Space**

Figure 7.3 shows image displays a graphical user interface for managing parking spaces in a shopping mall. The screen shows a grid of labeled parking spots, each represented by a green button, except for one blue button indicating the selected space. Below the parking grid, there are three buttons: a red "Back" button for returning to the previous screen, a blue "Submit" button for confirming the selected parking space, and a green "Refresh" button, possibly to update the parking availability.

ParkWatch - Receipt

— ⓘ ✕

PARKWATCH

PARKING RECEIPT

Location: Shopping Mall

Transaction ID: 14A8E83C

Date: 31-03-2025

Time: 04:02 PM

Space Number: R1

Vehicle Number: MH 04 RE 7456

Entry Time: 31-03-2025 04:01 PM


Exit Time: 31-03-2025 04:31 PM

Duration: 0.5 hours

Payment Details

Payment Method: Card

Amount Paid: ₹50.00

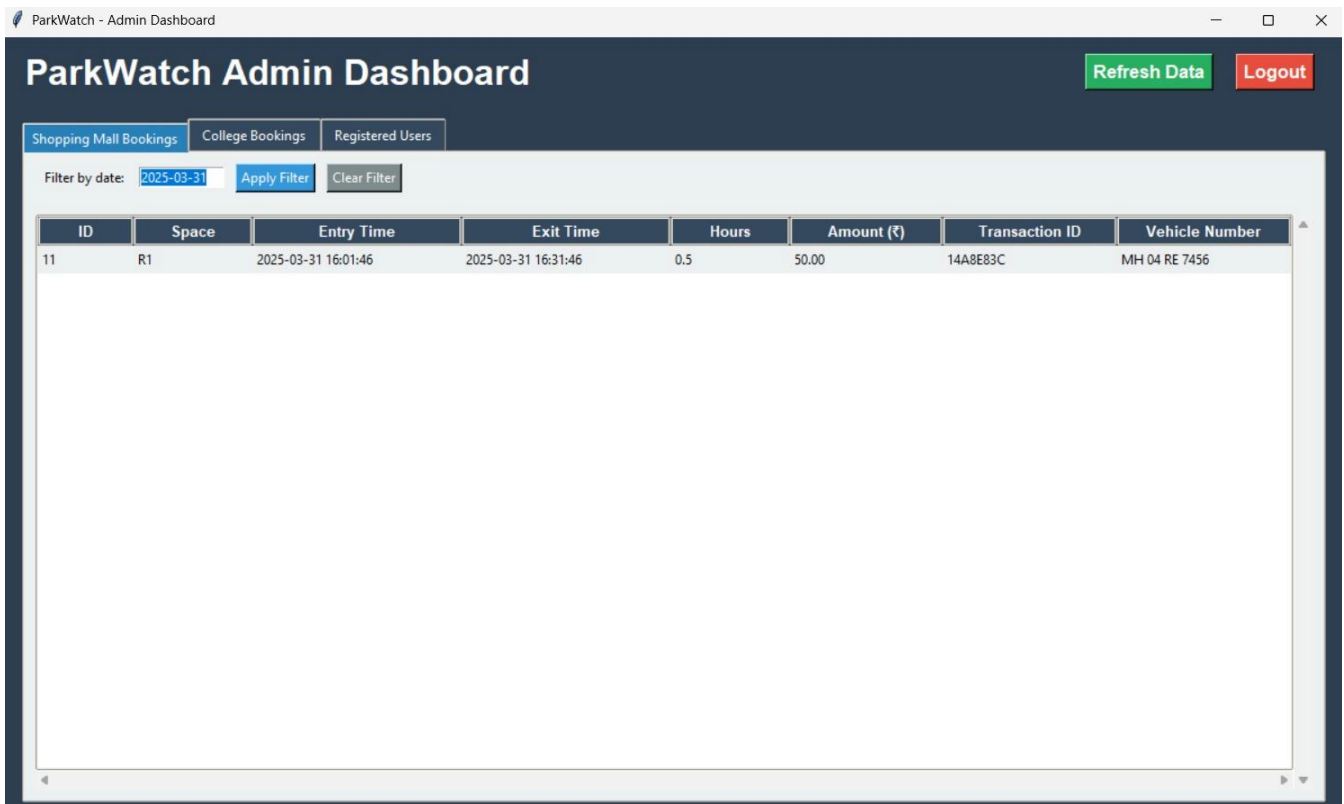


Scan for digital verification

Thank you for using ParkWatch

### Figure 7.4 Receipt

Figure 7.4 indicates the receipt serves as proof of a financial transaction, confirming that payment has been made for a product or service. It typically includes essential details such as the date and time of the transaction. For a parking system, the receipt usually specifies the parking location, the space number, and the duration for which the parking has been reserved or used. The payment method, whether cash, card, or digital transaction, is also recorded on the receipt.



**Figure 7.5 Dashboard**

Figure 7.5 shows a dashboard, a visual interface that displays key data and functions of a system. It serves as a central hub which can monitor and manage different aspects of an application efficiently. For administrators, the dashboard may include analytics on parking usage, revenue reports, and system settings. In addition to parking space monitoring, the dashboard may provide details such as vehicle entry and exit times, pricing information, and reservation history.

# Chapter 8

## Conclusion

The ParkWatch Parking Space Monitoring System is a comprehensive solution developed to significantly enhance the efficiency, convenience, and intelligence of urban parking management. Tailored for both public and private parking facilities, the system offers a structured and highly responsive approach to managing parking spaces in increasingly congested urban environments.

One of the standout features of ParkWatch is its availability of spots. For drivers, this translates into a seamless parking experience: they can quickly locate available spaces through integrated navigation tools, and complete secure digital payments through a variety of supported methods, including cards.

On the operational side, parking facility managers benefit from space detection, and structured reporting tools that streamline decision-making, improve revenue tracking, and enable predictive maintenance scheduling. These capabilities reduce manual oversight and ensure smoother day-to-day management.

Moreover, ParkWatch is built with scalability and future-readiness in mind. Its modular architecture allows easy integration with existing digital infrastructure, such as smart city platforms, license plate recognition systems, and automated billing services. This ensures that the system can grow alongside technological advancements and urban expansion needs.

Through its commitment to continuous innovation, user-centric design, and adaptable infrastructure, ParkWatch sets a new benchmark in smart, structured, and accessible parking management, shaping the future of urban mobility.

## References

- [1] Abror Abduvaliyev, Al-Sakib Khan Pathan, Jianying Zhou, Rodrigo Roman and WaiChoong Wong ,“On the vital Areas of Intrusion Detection Systems in Wireless Sensor networks”,IEEE Communications Surveys & Tutorials, Accepted For Publications, 2013-in press.
- [2] H.H. Soliman, et al,“A comparative performance evaluation of intrusion detection techniques for hierarchical wireless sensor networks”, Egyptian Informatics Journal (2012) 13, 225238.
- [3] Giannetsos Athanasios, “Intrusion Detection in Wireless Sensor Networks”, Master THESIS, Carnegie Mellon University, April 8, 2008.
- [4] K.Fall and K.Varadhan,“The NS Manual”, [http://www.isi.edu/nsnam/ns/doc/ns\\_doc.pdf](http://www.isi.edu/nsnam/ns/doc/ns_doc.pdf)., 1 Feb 2014.
- [5] Jae Chung and Mark Claypool,“NS by Example-Tutorial”, <http://nile.wpi.edu/NS/overview.html> , 1 Feb 2014.
- [6] Network Simulator blog, <http://Mohittahilani.blogspot.com> , 1 Feb 2014.
- [7] AWK Script for NS2, <http://mohit.ueuo.com/AWK-Scripts.html> , 1 Feb 2014.