"Pay As You Park" - Smart Parking Solution

2021-198

Student Information

Student ID	Student Name	Presentation Slides
IT18012552	M.D.S.M. Antany	Validate and suggest the best solution for parking yards
IT18154672	Priyankara A.D.D	Introduction and Find the availability of free spaces inside parking yard
IT18013092	Aadil M.R.M	Suggest and direct to most suitable parking yard for user
IT18013924	Ferreira L.V	Internal navigation in parking yards

Introduction

WHAT IS SMART PARKING ?

DOES CURRENT SOCIETY NEED A SMART PARKING SOLUTION?

Research Problem

- Existing payment process in parking systems
- Hardness to find a parking yard to park
- Difficulty of navigation inside parking yards
- Wastage of spaces in parking yards

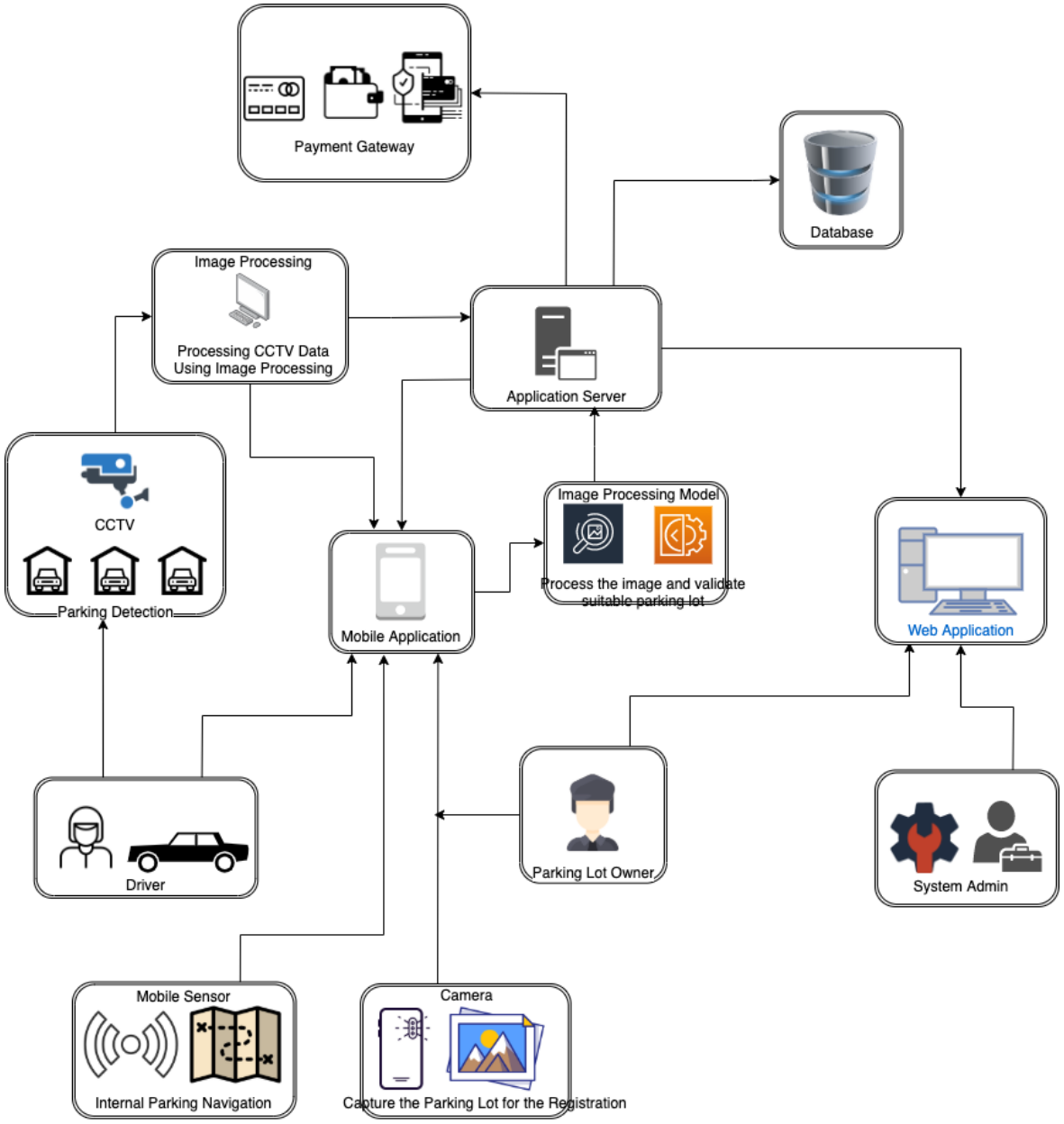
Objectives

- Introduce "pay as you park" concept to the parking system.
- Support users to find the most suitable parking yard
- Provide the best experience in parking using smart technology

Research Components

- Find the availability of free spaces inside parking yard
- Suggest and direct to most suitable parking yard for user
- Internal navigation in parking yards
- Validate and suggest the best solution for parking yards

System Diagram



IT18154672 | PRIYANKARA A. D. D.

Software Engineering

INTRODUCTION

- Background
- Research Problem
- Research Gap
- Objectives

BACKGROUND

- What is a vacant space in a parking slot?
- What is identifying vacant space?
- What are the currently available options?
- What are the benefits of identifying vacant space in a parking slot?

RESEARCH PROBLEM

- What are the drawbacks of current systems?
- How can image processing-based system can improve the situation?
- Problems faced by drivers while finding a vacant parking space.
- Problems faced by parking lot owners.

RESEARCH GAP

Sensor Type	Accuracy	Suitable for bad weather conditions	Investment and maintenance cost	Suitable for indoor parking	Suitable for outdoor parking
Passive Infrared	Poor	✗	High	✓	✗
Active Infrared	Poor	✗	High	✓	✗
Ultrasonic	Moderate	✗	High	✓	✗
LDR	Poor	✗	Low	✓	✗
Magnetometer	Moderate	✓	High	✓	✓
Pay as You Go: Image Processing	High	✓	Low	✓	✓

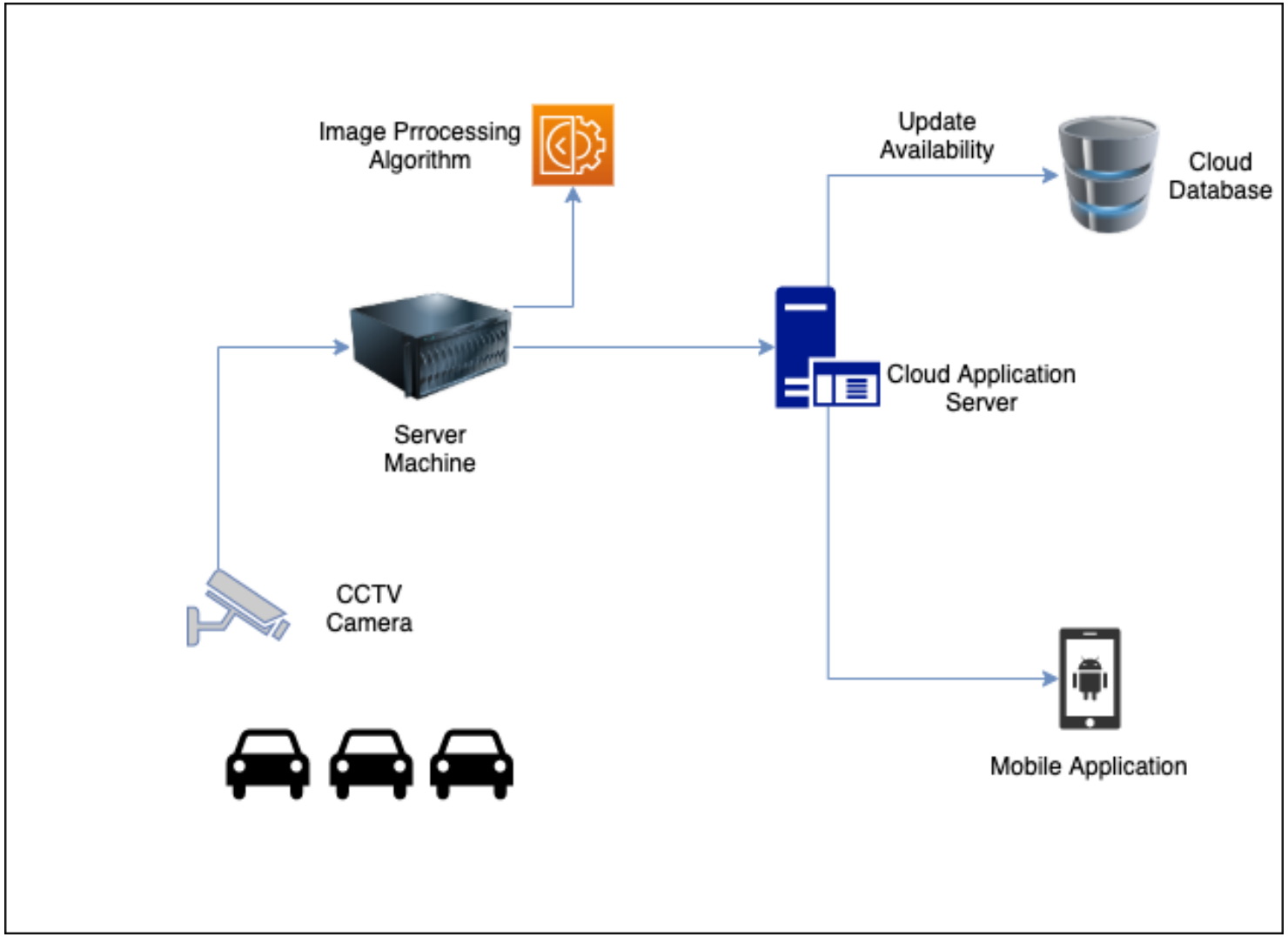
OBJECTIVES

- Identifying vacant parking slots in a parking lot.
- Save time of the user by pre-identifying vacant spaces.
- Send the processed data for the further process.

RESEARCH METHODOLOGY

- System Diagram
- Technologies to be used

SYSTEM DIAGRAM



TECHNOLOGIES TO BE USED

- Identifying vacant/available parking spaces
  - Image Processing Algorithm
- Smoothening the shadow/ Noise Filtering
  - Gaussian Blurring, Median Filtering
- Number of vehicles detection

SUPPORTIVE INFORMATION

- Commercialization

COMMERCIALIZATION

- Find vacant space inside a parking slot
- Use existing CCTV/ Surveillance Cameras
- Saves the process of finding a space to park vehicle
- Enhances user experience and save money

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IT18013092 | AADIL M.R.M

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INTRODUCTION

- Background/Research Gap
- Research Question
- Specific and Sub Objectives

BACKGROUND / RESEARCH GAP

- Difficulty to find the most suitable nearest parking yard.
- What are the facts to be consider when suggesting a parking yard ?
- Does existing parking solution meet this requirements ?

BACKGROUND / RESEARCH GAP

Product	Distance	Availability	Physical Characters	Relate to Parking
Research A [3]	✓	✗	✗	✓
Research B [1]	✓	✓	✗	✗
Research C [6]	✗	✓	✗	✓
Pay as You Park	✓	✓	✓	✓

RESEARCH PROBLEM

- Problems faced by the drivers when finding a parking yard.
- How does it affect the society ?
- How does it affect the environment ?

Objectives

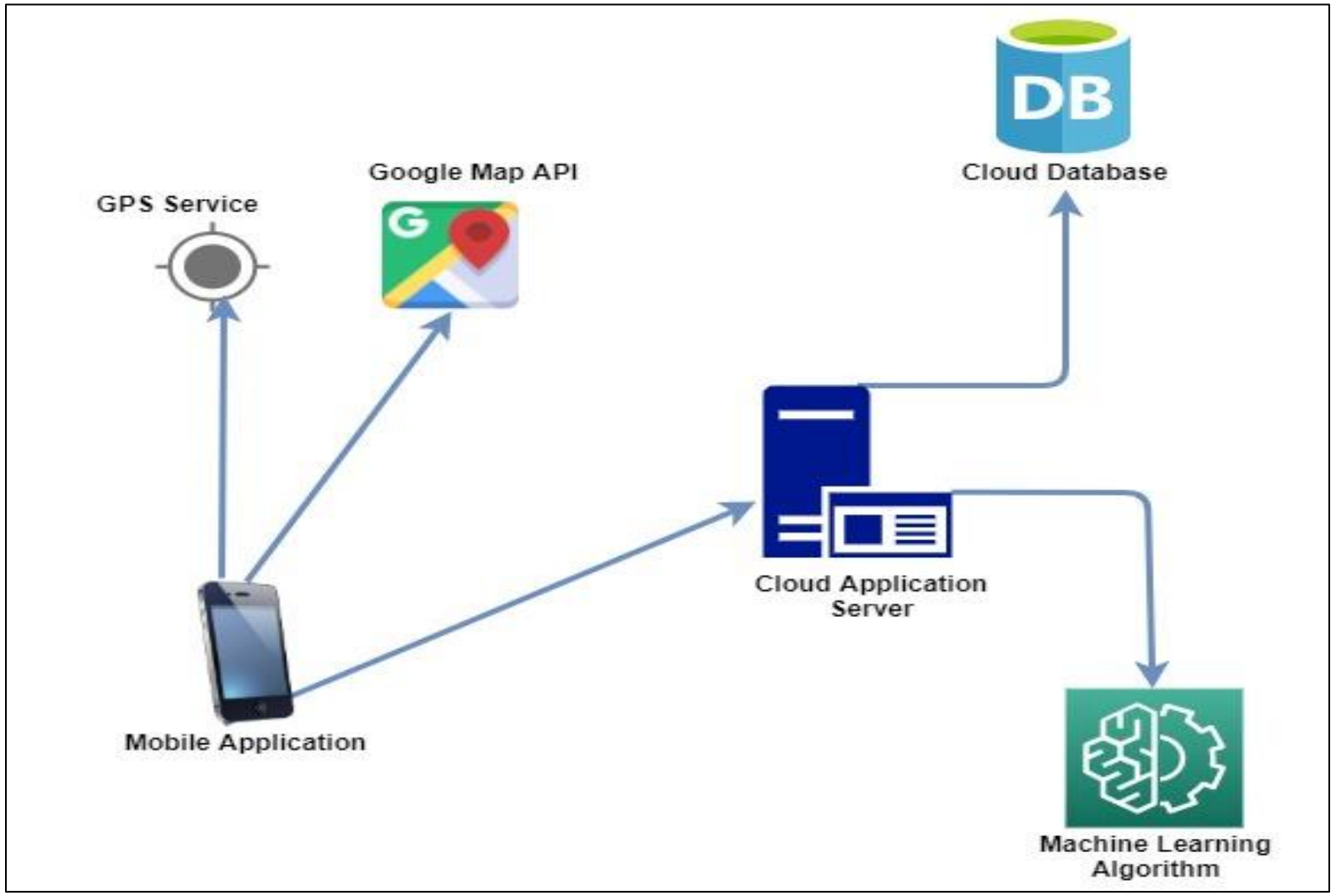
- Identify the nearest parking yard around user/user destination.
- Suggest optimal parking yard to park the vehicle based on key factors.
- Provide a cross platform mobile app to perform the task

RESEARCH METHODOLOGY

SYSTEM DAIGARM

TECHNOLOGY AND TECHNIQUES TO BE USED

SYSTEM DIAGRAM



TECHNOLOGY AND TECHNIQUES TO BE USED

- Retrieving the current location of user
  - GPS related technology
  - Google Map API – visualize the location
- Suggest optimal parking yard to park the vehicle based on key factors
  - Machine learning algorithms
  - Google Map API – visualize the locations and directions

WBS

- UI Design and implementations
- Fetch current location and visualize
- Retrieve parking yard closer to user destination
- Validate the availability of free spaces
- Process and suggest the most optimal parking yards based on key factors

GANTT CHART


January
February
March
April
May
June
July
August
September
October
Novemver
December
Feasibility Study
Identify the opportunity
Evaluate Feasibility and Background
Environment Setup
Requiremnt Gathering
Background Survey
Litreture Review
Requiremnt Analysis
Proposal
Project Proposal
Project Presentation
Software Requirement Specification
Identifying Functions
Design And Implementation
Databse Designing
Design Prototypes
Implementation
Testing
Unit Testing
Integrated Testing
Final Documentation And Presentation
Final Documentation
Final Presentation

SUPPORTIVE INFORMATION

COMMERCIALIZATION

COMMERCIALIZATION

- Optimal suggestion is the key component of parking system
- Saves user's time and cost.
- Effective to the society in a positive way.

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IT18013924 | FERREIRA L.V.

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INTRODUCTION

BACKGROUND

RESEARCH PROBLEM

OBJECTIVES

Background

- What is an Internal Navigation inside a parking area?
  - Indoor/outdoor parking areas.
- Technologies can be used.
  - Wi-fi based, RFID, UWB,LED etc.
- Beacon technology and its advantages.
- Methods can use to improve the accuracy of position.
- Novelty of the research Component
  - ➢ Internal navigation system inside the parking area in Sri Lanka.

Research Problem/Research Gap

- Issues faced by the drivers to find the parking slot.

- Why GPS cannot be used inside the indoor parking area.

- Research Gap

Indoor Posisitioning Services	Technology Used	High Accuracy	Low Cost	Uncomplicated System
Radar	Wi-fi	✗	✓	✗
Ubisense	UWB	✓	✗	✗
LANDMARC	RFID	✗	✓	✓
Proposed System	Beacon	✓	✓	✓

Objectives

- Identify the beacons in each parking slot.
- Register and Unregister a beacon.
- Guide user to the parking slot inside the parking area.

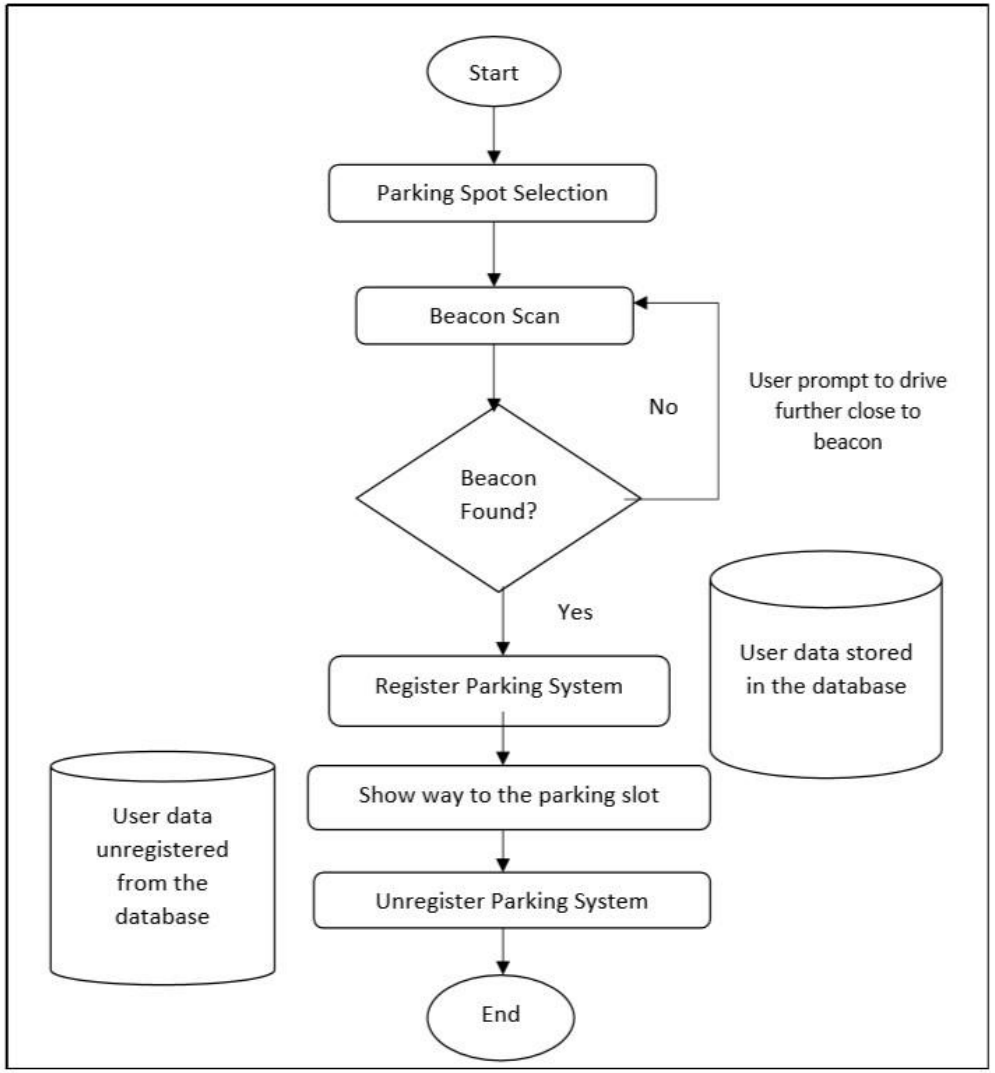
RESEARCH METHODOLOGY

FLOW GRAPH

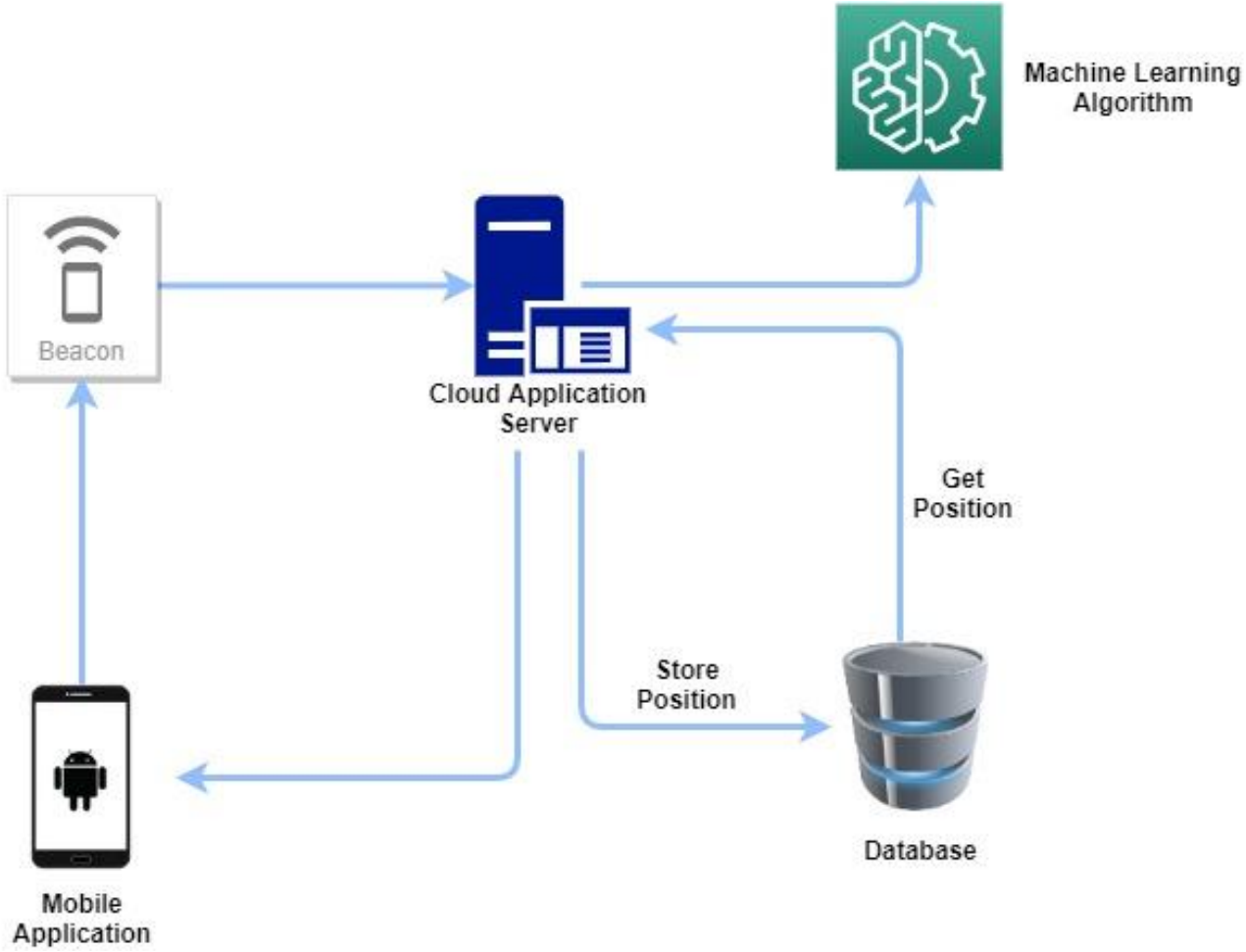
SYSTEM DIAGRAM

TECHNOLOGIES TO BE USED

System Flow Graph



System Diagram



Technologies, Techniques to be Used

- Identify the parking slot
  - ➢ Beacon technology
    - Beacon per each parking slot
- Improve the accuracy of the position
  - ➢ Distance Model
    - Calculate the distance
  - ➢ Improve accuracy of position using filters.

Work Beak-Down

1. Feasibility Study	**1.1 Identify the opportunities**	**From January 10th to January 20th**
	1.2 Evaluate the Background	From January 21st to January 31st
2. Environment Setup	2.1 Requirement gathering	From February 1st to February 15th
	2.2 Background Survey	
	2.3 Literature review	From February 15th to February 25th
	2.4 Requirement analysis	
3. Proposal	3.1 Project proposal	
	3.2 Project presentation	From February 26th to March 9th
4. Software Requirement Specification	4.1 Identify Functions	From March 11th to April 11th
5. Designing and Implementation	5.1 Database designing	From April 11th to April 20th
	5.2 Design prototype	From April 21st to April 30th
	5.3 Implementation	From May 1st to September 30th
6. Testing	6.1 Unit testing	From October 1st to October 10th
	6.2 Integrated testing	From October 11th to October 15th
7. Final Report and Presentation	7.1 Final report	From October 15th to November Till the end
	7.2 Final presentation	

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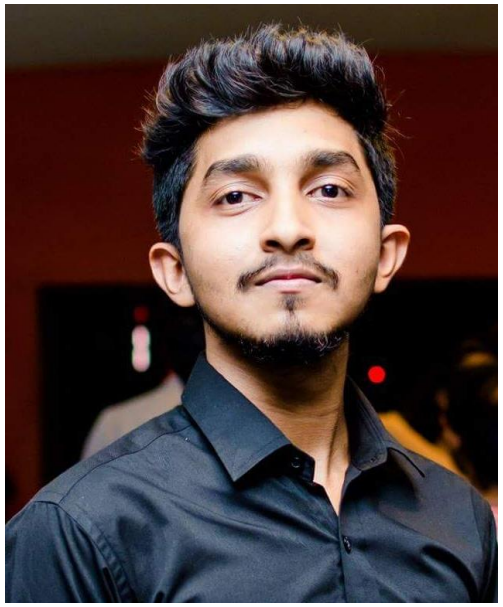

IT18012552 | M.D.S.M. ANTANY

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INTRODUCTION

- "Pay as you park" provide a solution for the lack of parking places in urban areas.
- The new functionality to users allowing rent their private lands/ garages spot as a parking spot in the system.
- The novelty of the function
    I. Automated registration process
    II. Providing fast component verification for the parking lot registration
    III. Less human interaction to the verification process

WHY WE NEED A VERIFICATION?

- To provide long term protection for both parking lot owners and the drivers.
- To standardize every parking lot before releasing it for public use.
- Identify the surface of the parking lot
  - Asphalt or concrete parking surface
  - permeable pavers
  - gravel or stone surface
- Prevent the misusing of the application.
- Keep the customer satisfaction on us.

BACKGROUND / RESEARCH GAP

- Identifying soil type of the land before registration (ex: Clay soil, Loam soil, Sand soil and etc).
- Parking lot entrance pothole detection
- Giving the necessary recommendation for long term vehicle parking in the land considering the soil type.
    - **Installing a gravel or stone on the lands (ex: 57 Granite, Pea graval)**
    - **Repair the parking lot entrance with Concrete, asphalt or paver driveway**

57 GRANITE

PEA GRAVEL

ALABAMA PATH

Clay Soil

BACKGROUND / RESEARCH GAP

Methods	Examples	Problems
Conventional Techniques To Classify Soil	• Standard Penetration Test • Cone Penetration Test • Pressure Meter Test	Not smart solution for this application Need equipment and more staff
Image Processing Techniques To Classify Soil	• Basics of Image Processing • Application of SVM to classify Soil • Application of ANN to classify Soil	Low accuracy
Proposed solution for **"Pay as you park"** smart parking solution	Combination of Image processing and machine learning technics	High accuracy

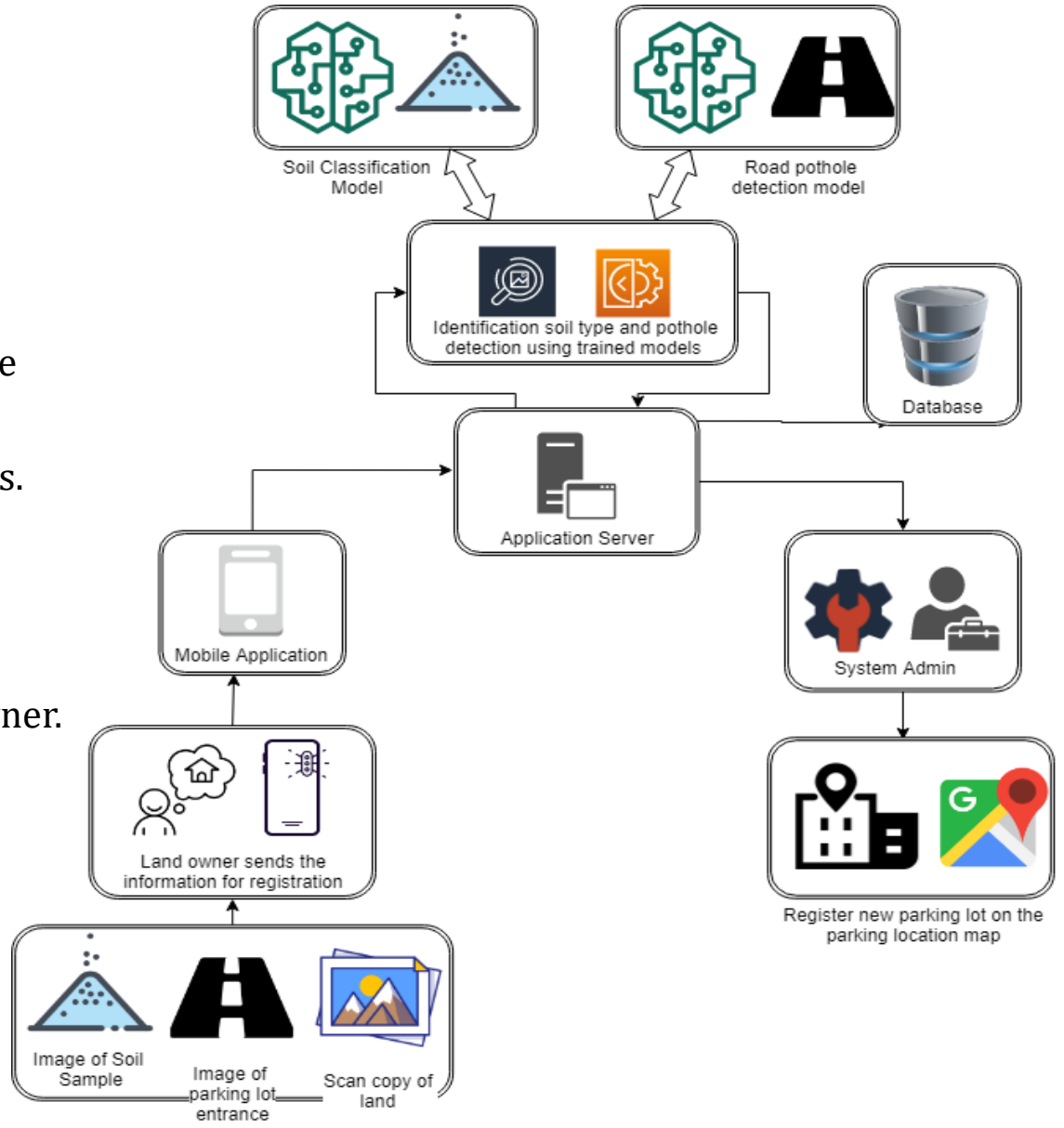
RESEARCH METHODOLOGY

SYSTEM DIAGRAM

- Upload the required images for the land registration (land/ garage owner).
- Process with the pre trained models and get the verification status.
- If the status is "Passed", the details will be sent to the system admin to add the location

to the map

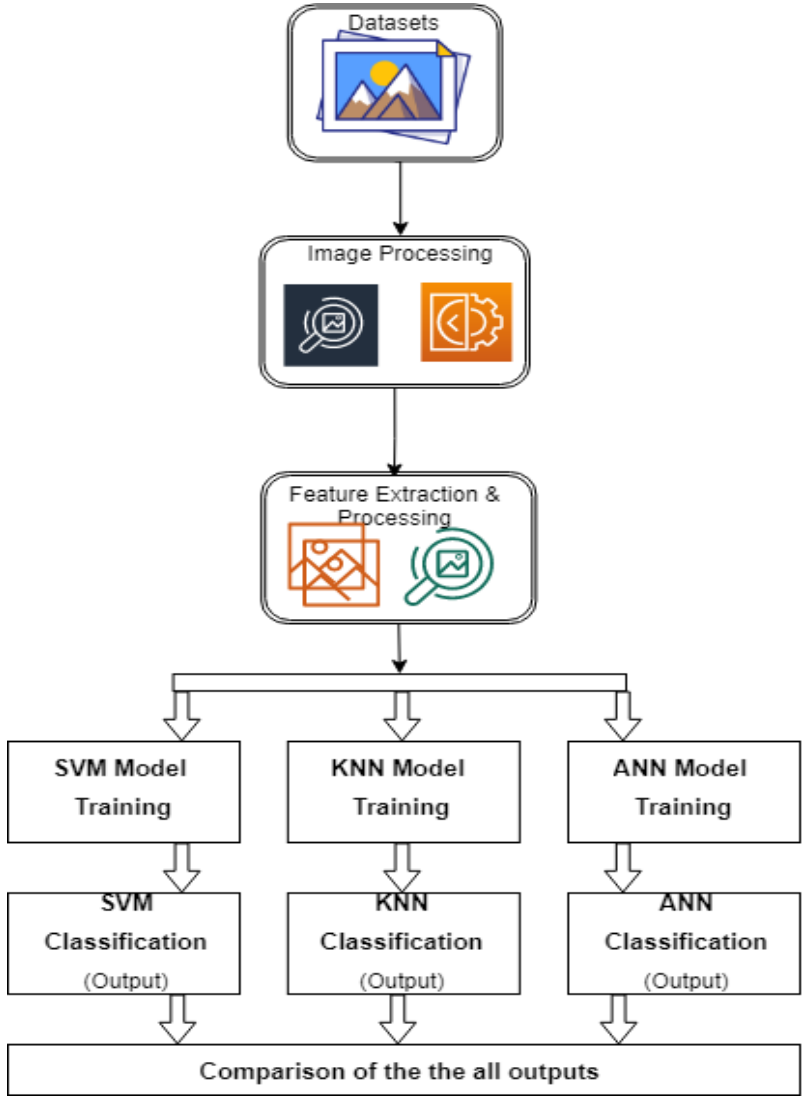
- If the status "Failed", necessary suggestions will be sent to the owner.



TECHNOLOGIES, TECHNIQUES, ALGORITHMS TO BE USED

Soil Classification

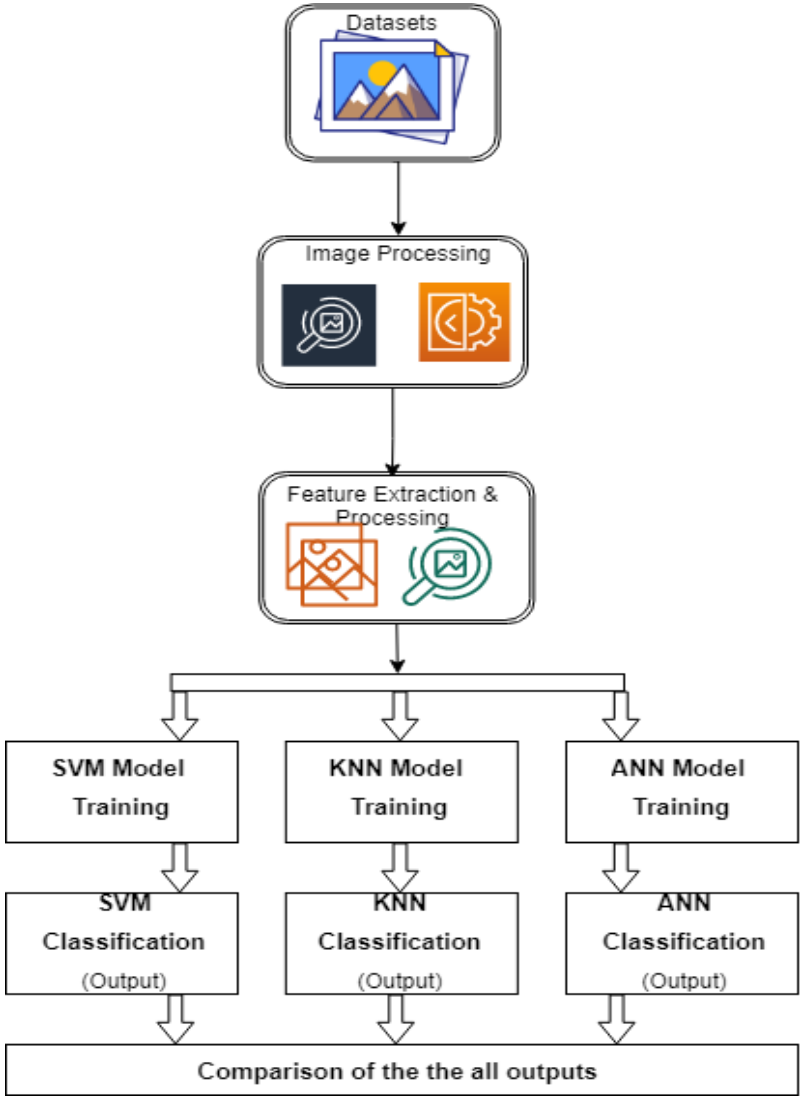
- Image Preprocessing
  1. improving its contrast
  2. removing errors (ex: scratches, lapping tracks, etc)
- Feature Extraction and Feature Selection
  1. Features are extracted for detection of soil type (Ex: texture, color, intensity, saturation, hue, etc)
  2. good representative dataset for each class can be obtained



- Classification technic (Support Vector Machine)
  1. Design a decision boundaries that classifies the training vector in to two class
  2. Reduce misclassification in new data

- Artificial Neural Network
  1. problem critical thinking gives new way by extracting relevant features from the provided data
  2. performs a pattern recognition

- K- Nearest Neighbors' Algorithm (k-NN)
  1. object is classified based on the labels of its k nearest neighbors by majority vote



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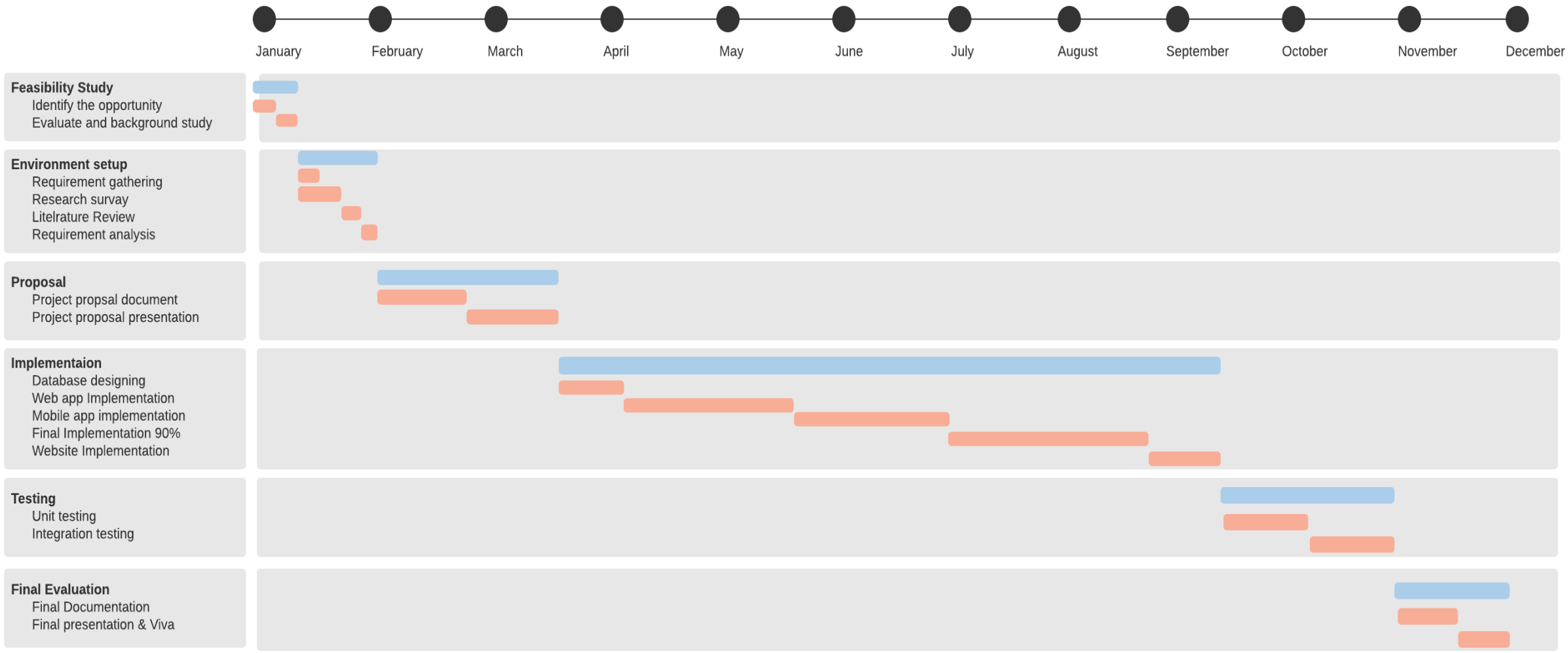
January
February
March
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September
October
November
December
Feasibility Study
Identify the opportunity
Evaluate and background study
Environment setup
Requirement gathering
Research survay
Litelrature Review
Requirement analysis
Proposal
Project propsal document
Project proposal presentation
Implementaion
Database designing
Web app Implementation
Mobile app implementation
Final Implementation 90%
Website Implementation
Testing
Unit testing
Integration testing
Final Evaluation
Final Documentation
Final presentation & Viva

COMMERCIALIZATION

- "Pay as you park" has a huge business opportunity for the people who have lands and garages.
- An automated fast land verification process reduces the time-wasting of our new users.
- Verified standardized parking places always keep our customer satisfied and safe.
- Owning more parking spots in the system is a good sign of having a more customer base.

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BUDGET

$1.00 = Rs. 185.00

Component	Amount(USD/Year)	Amount(LKR/Year)
Azure Machine Learning **(Free Credits : $100)** B1S: 1 vCPU(s), 1GB RAM	$100 - $53.00 ~ $0	Rs. 0
Domain Name Registration	$8.00	Rs. 1,480.00
Hosting	$60.00	Rs. 11,100,00
Per Beacon	$10.00	Rs. 1,850.00
Map API **(Free Credits : $200)**	$ 0	Rs. 0
Total	$78.00	Rs. 14,430.00

Thank You !

Q & A