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E-HUB

Platform of services for college students to improve their overall campus experience

¹Aditya Chavan, ²Saurabh Borate, ³Aniket Bhosale, ⁴Krutika Bhandari, ⁵Prof.Dattatraya Jadhav, ⁶Prof.VrushaliWankhede

¹BE.Computer, ²BE.Computer, ³BE.Computer, ⁴BE.Computer, ⁵Assistant Professor, ⁶Assistant Professor
Keystone School of Engineering, Pune, India

Abstract: Students often encounter significant challenges in accessing affordable and convenient mess facilities, accommodations, and transportation services, which adversely impact their overall campus experience. This study aims to analyze the common issues faced by students in these areas and propose practical solutions to enhance accessibility, affordability, and quality. Through surveys and feedback collection, the research identifies key concerns and provides recommendations for campus administrators and service providers. The ultimate objective is to develop a more supportive and efficient infrastructure that improves student life, reduces stress, and fosters a conducive academic environment. This abstract outlines the challenges, methodology, and overarching goal of enhancing student well-being and the campus experience.

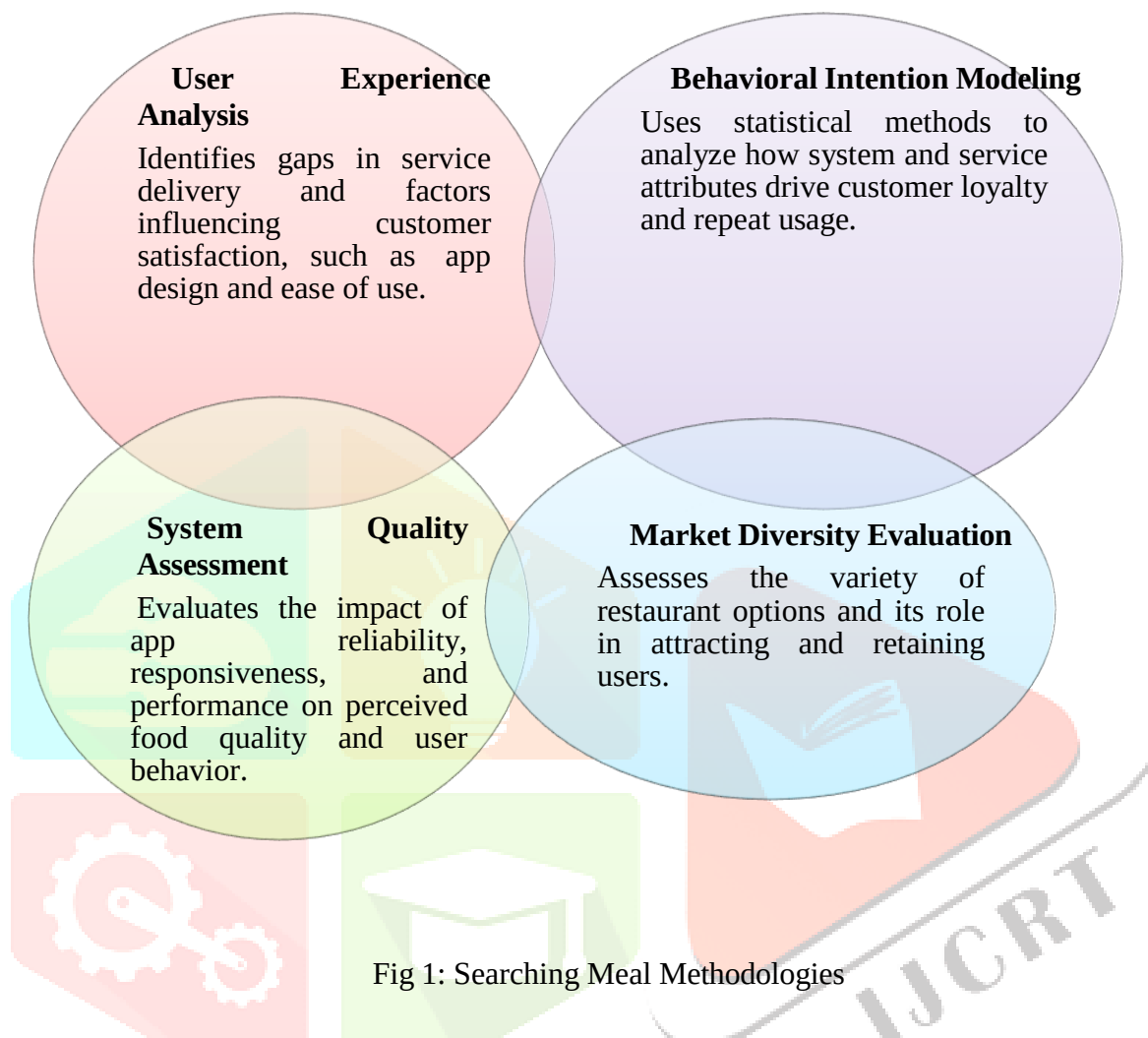
I. INTRODUCTION

The challenges of securing affordable and convenient mess facilities, accommodations, and transportation services significantly affect the campus experience for college students. Rising food costs and limited access to budget-friendly, nutritious meal options near campuses create difficulties, particularly in the absence of centralized meal plans or systems. Similarly, high rental costs and the scarcity of affordable housing near academic institutions impose financial strain on students and their families, often forcing them into substandard living conditions far from campus, leading to stressful and time-consuming commutes. Transportation issues, including overcrowded, unreliable, or infrequent public transit, further compound these challenges negatively impacting students' punctuality, academic performance, and well-being. Addressing these interconnected problems requires a holistic approach that leverages technology to provide centralized access to affordable meal plans, quality housing options, and reliable transportation services. Such a solution would streamline essential services, reduce stress, and enhance students' academic focus and overall quality of life.

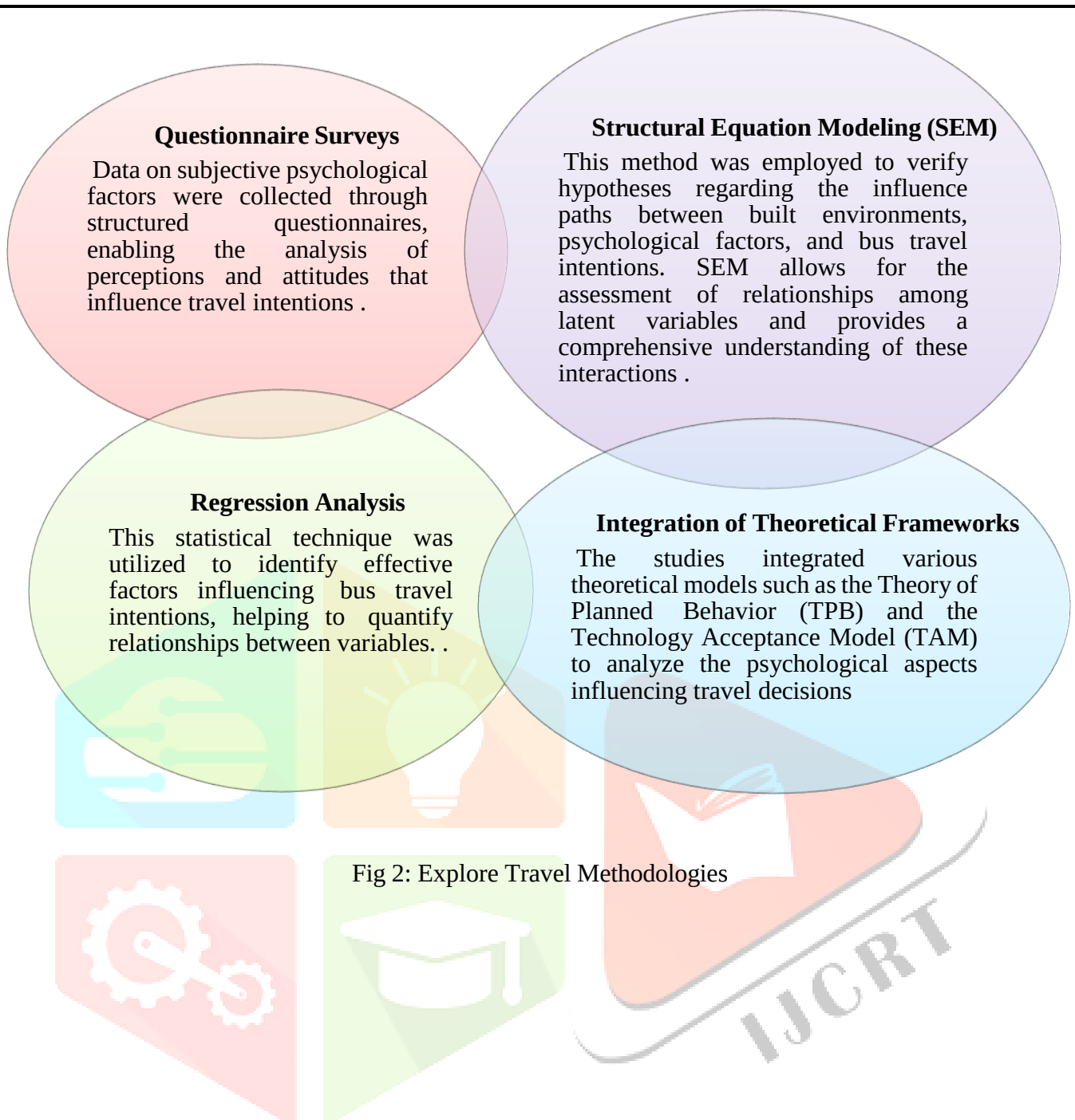
II. RESEARCH METHODOLOGIES

The existing literature delineates critical factors that influence customer satisfaction within food delivery applications. Empirical studies demonstrate that system quality exerts a significant influence on perceived food quality, which subsequently affects consumer behavioral intentions. Research focused on Indian food delivery platforms underscores the importance of offering a diverse array of restaurant options and maintaining a user-centric design as pivotal elements for enhancing customer satisfaction

and fostering user loyalty. In contrast, the quality of packaging has been found to exert a negligible impact on overall customer satisfaction. Furthermore, the implementation of intuitive user interfaces and a broad range of offerings is essential for optimizing the user experience in food delivery applications.



The studies examine methodologies for optimizing bus travel efficiency and planning processes. Chen et al. (2022) establish a correlation between psychological determinants and environmental design factors with travel behavior intentions, highlighting their influence on commuter decision-making. Kieu et al. (2012) advocate for the integration of alternative data sources to improve the accuracy of bus travel time forecasting, thereby enhancing predictive capabilities. Mohd Azmi et al. (2024) emphasize the implementation of advanced algorithms for the optimization of school bus routing and the selection of optimal stops, contributing to operational efficiency. Collectively, these research efforts underscore strategic approaches for enhancing public transportation systems and improving routing effectiveness.



Phantomization has significantly transformed global housing markets, notably illustrated by Uniplaces in Lisbon, which has optimized student housing through secure booking systems and streamlined searches. While this model enhances access to local housing for a global audience, it has also led to the rise of midterm rentals (MTRs), potentially undermining tenant rights and exacerbating transnational gentrification. Similarly, Airbnb's operations in Yogyakarta exemplify circular economy principles by repurposing unused housing for tourism, allowing homeowners to rent their properties without new construction. Although occupancy rates could improve, the abundance of rental units meets the accommodation needs of both tourists and locals. Additionally, the "Hostels" mobile application simplifies the search for paying guest (PG) accommodations, offering a user-friendly interface with tailored meal services and flexible housing solutions, thereby facilitating relocation and settlement processes for users.

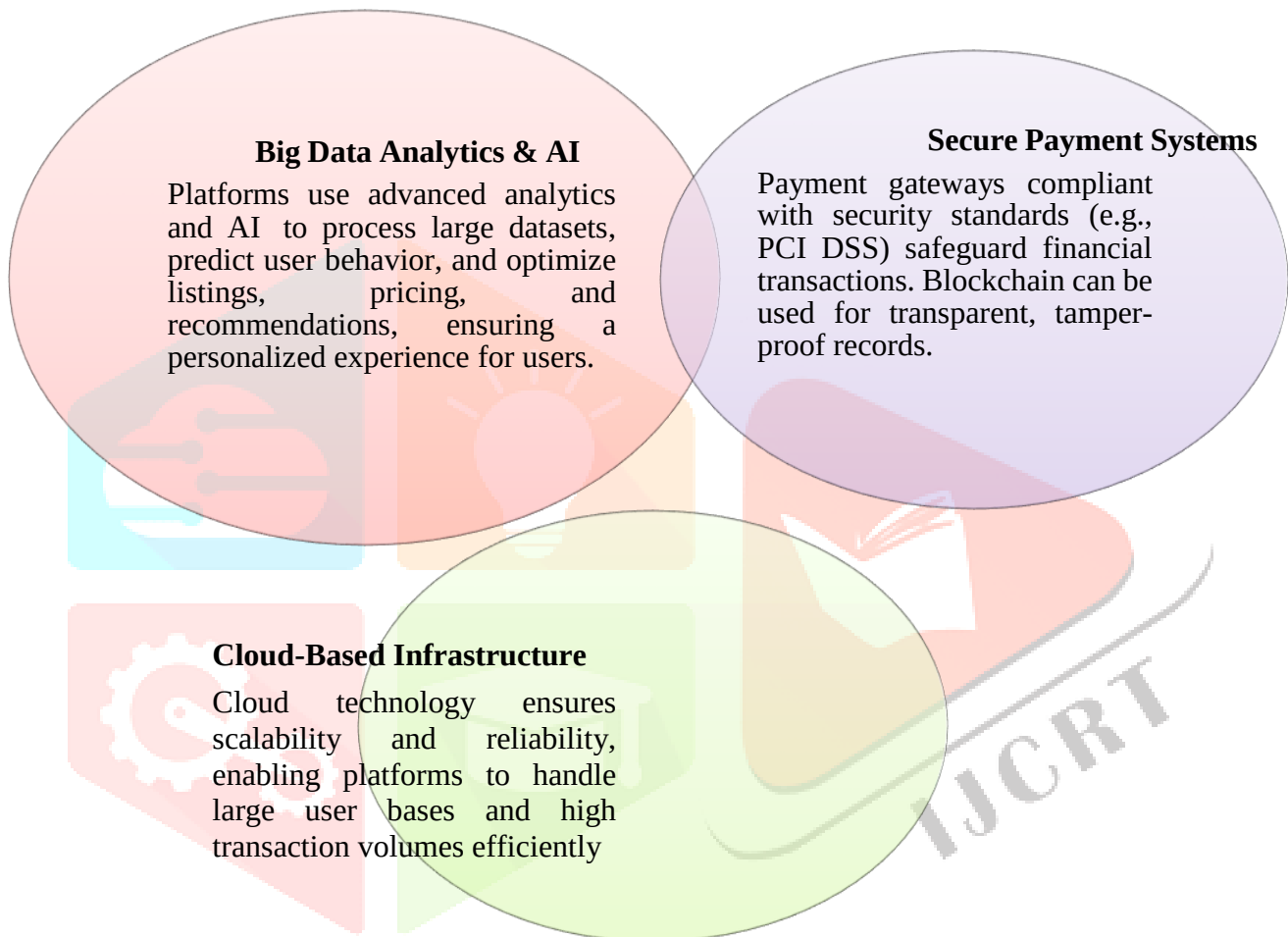


Fig 3: Living Accommodation Methodologies

Integrating Machine Learning and Cloud Computing into an Android-based Java application enables the development of a scalable and intelligent solution for managing mess facilities, accommodations, and transportation services for students. Machine Learning facilitates predictive analytics, personalization, and anomaly detection, while Cloud Computing ensures efficient real-time processing and secure data storage. Additionally, the use of GPS for location-based services and RFID for access control and automation enhances efficiency, security, and user convenience. Together, these technologies provide a comprehensive and future-ready platform designed to improve the overall campus experience for students.

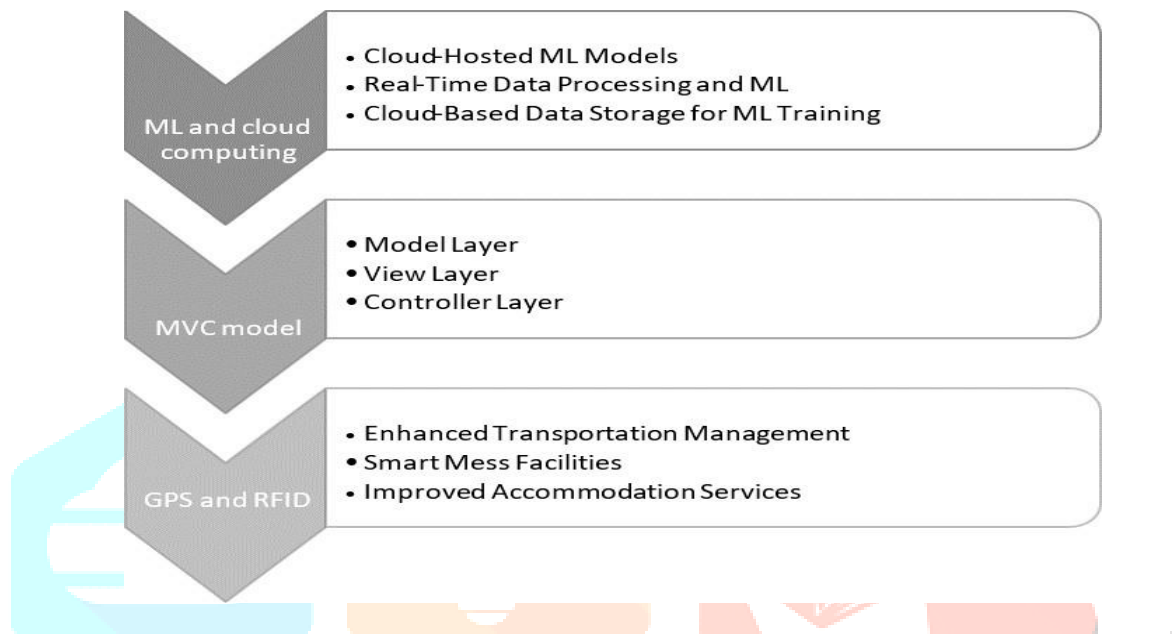


Fig 4: Sequence of Methodologies

III. EQUATIONS

To implement live tracking, location mapping, and food and accommodation management in Android applications, a combination of mathematical models, algorithms, and Android services is utilized. Live tracking relies on GPS coordinates and location services provided by Android, while location mapping is powered by Google Maps APIs for real-time visualization. Route optimization employs algorithms such as Dijkstra's or A* to calculate the most efficient paths. For resource allocation, methods like linear programming or greedy algorithms are applied to optimize the distribution of food and accommodation resources. These equations and algorithms are integrated with Android's backend services, data storage systems (e.g., Firebase or SQLite), and user interface elements, enabling seamless functionality and an efficient user experience:

1. Live Location Tracking (GPS and Location Services)

In Android, you would typically use the Location Manager or Fused Location Provider Client to get the current GPS coordinates of the user in real-time. The GPS coordinates are defined in terms of latitude (ϕ) and longitude(λ).

Key Equation: Haversine Formula

For calculating the distance between two locations based on GPS coordinates (latitude and longitude), you can use the Haversine Formula

$$a = \sin^2\left(\frac{\Delta\phi}{2}\right) + \cos(\phi_1) \cdot \cos(\phi_2) \cdot \sin^2\left(\frac{\Delta\lambda}{2}\right) \quad \text{EQ 1}$$

$$c = 2 \cdot \arctan 2(\sqrt{9}, \sqrt{1-a}) \quad \text{EQ.....2}$$

$$d = R \cdot C \quad \text{EQ.....3}$$

Where:

- d is the distance between two points (in meters),
- R is the radius of the Earth,
- Φ_1, Φ_2 are the latitude of the points in radians,
- $\Delta\Phi$ and $\Delta\lambda$ are the difference in latitude and longitude in radians.

2. Route Optimization and Mapping

For route planning, you would use Google Maps API or any third-party service to get real-time directions. You can optimize the travel path using algorithms such as Dijkstra's Algorithm or A (A-star) * Algorithm for finding the shortest or fastest route.

Key Equations:

Dijkstra's Algorithm: This is used to calculate the shortest path between points (nodes) on a graph where distances between them are known (obtained via GPS or Google Maps API).

For each edge (between two nodes):

$$\text{ShortestPath} = \min_{\text{all_paths}} (\sum_{i=1}^n d_i)$$

EQ.....4

Where:

- d_i is the distance of edge i and n is the number of the nodes between start and end
- A Algorithm*: Adds a heuristic estimate of the remaining distance.

$$f(n) = g(n) + h(n)$$

Where:

- $f(n)$ is the total estimated cost of the path through node n ,
- $g(n)$ is the exact cost from start node to n ,
- $h(n)$ is the heuristic estimated cost from n to the destination.

EQ..... 5

3. Food and Accommodation Management (Resource Optimization)

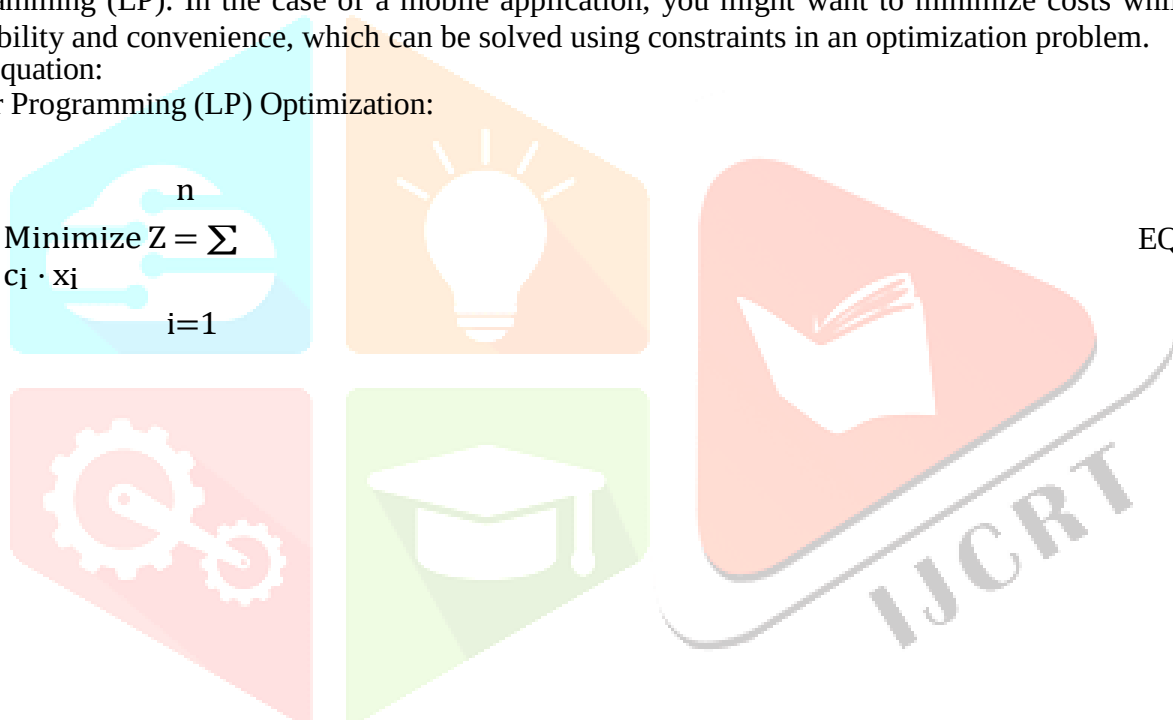
For managing food and accommodation options during travel, you can use optimization techniques like Linear Programming (LP). In the case of a mobile application, you might want to minimize costs while ensuring availability and convenience, which can be solved using constraints in an optimization problem.

Key Equation:

Linear Programming (LP) Optimization:

$$\text{Minimize } Z = \sum_{i=1}^n c_i \cdot x_i$$

EQ..... 6



Subject to

- Time constraint: $\sum_{i=1}^n t_i \leq T_{max}$
- Budget Constraint: $\sum_{i=1}^n C_i \cdot x_i \leq B_{max}$

Where:

- C_i is the cost of staying or eating at location i
- x_i is the number of resources (days/amount spent) at location
- t_i is the travel time,
- B_{max} is the maximum allowable budget.

IV. ALGORITHMIC FLOWCHART



Fig 5: Flowchart of Android Function

V. RESULT AND DISCUSSION

The integration of Native Android development using Java, the MVC architecture, a Firebase backend, real-time data handling, and advanced Android functionalities such as GPS and push notifications provides a comprehensive and efficient framework for addressing students' daily challenges related to mess facilities, accommodations, and transportation. By utilizing these technologies and methodologies, the application ensures scalability, reliability, and user-friendliness. This solution enhances the accessibility and management of essential services, ultimately improving the overall campus experience for students.

VI. ACKNOWLEDGMENT

To tackle the challenges of affordable and convenient mess facilities, accommodations, and transportation services for students, a viable technical solution is the development of a comprehensive Android application. This app would streamline access to essential campus services and improve the overall student experience by offering a centralized platform that caters to their daily needs. By integrating these into a user-friendly mobile application, the solution addresses key issues. This will significantly improve the quality of life for students, allowing them to focus more on their academic and personal development without being burdened by logistical challenges. The Android app serves as a modern, scalable, and easily implementable tool to enhance the campus experience holistically.

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