



# ParkMate an Android Based Smart Parking

Prof.Chaudhari.V.S<sup>1</sup>, Dangat Gayatri<sup>2</sup>, Rayakr Shital<sup>3</sup>, Gondhane Sakshi<sup>4</sup>

Associate Professor, Department of Computer Engineering, VACOE Engineering College, Ahilyanagar, India

U.G. Student, Department of Computer Engineering, VACOE Engineering College, Ahilyanagar, India

U.G. Student, Department of Computer Engineering, VACOE Engineering College, Ahilyanagar, India

U.G. Student, Department of Computer Engineering, VACOE Engineering College, Ahilyanagar, India

**ABSTRACT:** As urban areas grow and vehicle usage increases, finding available parking spaces in large lots has become increasingly difficult, leading to delays, frustration, and inefficient space utilization. Traditional parking systems often rely on manual processes or basic digital solutions, which lack essential features like offline navigation, structured (sequential) parking, and flexible slot reservations—key elements for a smooth user experience. ParkMate, an Android-based application, addresses these challenges by improving the efficiency and user-friendliness of parking management in high traffic areas. ParkMate utilizes a QR-based system for advance slot reservations, streamlining access and reducing congestion. Upon arrival, users receive a digital receipt confirming their reservation and parking location. The app's offline navigation feature enables users to find their vehicle without needing internet access, especially useful in areas with limited connectivity. Additionally, ParkMate supports sequential parking, guiding users to specific slots in a structured manner to optimize space usage. By offering a hybrid of offline functionality and digital conveniences, ParkMate improves traditional parking systems, enhancing operational efficiency and user satisfaction in large urban parking facilities.

**KEYWORDS:** ParkMate, Parking management, QR based reservation, Offline navigation, Sequential parking, Urban mobility, Android application, Parking optimization, User experience, Smart parking systems

## I. INTRODUCTION

The rapid growth of urbanization and the increasing number of vehicles have created significant challenges in parking management across cities worldwide. Finding a suitable parking space has become a time-consuming and frustrating task for drivers, especially in crowded areas such as shopping malls, hospitals, educational institutions, airports, railway stations, and business complexes. Traditional parking systems often rely on manual processes, paper tickets, and unorganized parking arrangements, which lead to traffic congestion, fuel wastage, environmental pollution, and inefficient utilization of parking spaces. In recent years, smart city initiatives have encouraged the adoption of intelligent transportation systems to improve urban mobility and infrastructure management. Smart parking systems have emerged as an effective solution for addressing parking-related issues by utilizing mobile applications, cloud computing, GPS technology, QR codes, and real-time monitoring techniques. These technologies help users locate available parking spaces, reserve slots in advance, and complete payment transactions digitally. Despite the availability of various smart parking solutions, several limitations still exist. Many existing systems require continuous internet connectivity, lack user-friendly navigation features, and do not provide an efficient mechanism for parking space allocation. In large parking facilities, users often spend considerable time searching for their vehicles after parking, resulting in inconvenience and reduced user satisfaction. Additionally, unstructured parking allocation can lead to underutilization of available spaces and increased vehicle movement within parking areas. To overcome these challenges, this paper presents **ParkMate**, an Android-based Smart Parking Management System designed to enhance parking efficiency and improve user experience. The proposed system integrates multiple features including user registration, parking slot reservation, QR-based payment, navigation assistance, booking management, and chatbot support. The system enables users to reserve parking spaces in advance, reducing waiting time and eliminating uncertainty regarding parking availability. A key feature of ParkMate is its sequential parking allocation mechanism, which assigns parking spaces in an organized manner to maximize space utilization and reduce congestion. The system also incorporates Google Maps-based navigation, allowing users to easily locate parking facilities and navigate to their reserved slots. Furthermore, QR-based payment functionality provides a secure and contactless transaction process, improving convenience for users. The application includes a booking management module that allows users to view active bookings, booking history, payment details, and parking information. In addition, a chatbot module assists users

by providing instant responses to common parking-related queries, thereby enhancing customer support and overall usability. The proposed system aims to reduce parking search time, improve operational efficiency, minimize traffic congestion, and provide a seamless parking experience. By combining mobile technology, digital payment solutions, navigation services, and intelligent parking allocation strategies, ParkMate contributes to the development of modern smart parking infrastructure. The system is scalable and can be implemented in various parking environments, including commercial complexes, educational institutions, hospitals, and public parking facilities. Overall, ParkMate represents a practical and cost-effective approach to smart parking management and demonstrates how digital technologies can be leveraged to solve real-world urban transportation challenges while improving convenience, efficiency, and user satisfaction.

## II. LITERATURE SURVEY

A literature survey is an important part of research that helps identify existing technologies, methodologies, and challenges related to the proposed system. Several researchers have developed smart parking solutions using technologies such as RFID, IoT sensors, QR codes, cloud computing, mobile applications, and machine learning algorithms. These systems aim to improve parking efficiency, reduce traffic congestion, and enhance user convenience.

RFID-based parking systems automate vehicle entry and exit operations, minimizing manual intervention and improving security. IoT-based parking solutions provide real-time monitoring of parking slot availability through sensors and wireless communication technologies. QR code-based systems simplify reservation, payment, and authentication processes, offering a contactless parking experience.

Researchers have also proposed various parking allocation algorithms to optimize parking space utilization and reduce vehicle search time. Sequential parking allocation techniques help organize parking areas efficiently, while machine learning approaches predict parking occupancy and improve resource management. Navigation-based parking systems assist users in locating available parking spaces and finding their parked vehicles with ease.

Although these existing systems provide several useful features, many of them depend heavily on internet connectivity, require expensive hardware infrastructure, or lack integrated functionalities. To address these limitations, the proposed ParkMate system combines QR-based booking, navigation support, sequential parking allocation, digital payment, and user-friendly mobile application features within a single platform.

The following table summarizes the key research papers, technologies, methodologies, and findings related to smart parking management systems.

## III. METHODOLOGY

The ParkMate system works using an Android application connected to a cloud database. First, users register and log in to the app. After login, they can view available parking slots, which are updated by the admin in the database. Users select a parking location and book a slot. Once confirmed, the booking details are stored, and the slot is marked as occupied to avoid double booking. The app also provides navigation support using maps to reach the parking location. An online payment option is included for booking confirmation. The admin manages parking data, updates slot availability, and monitors bookings. All data is synchronized in real-time between the app and the database, ensuring smooth and efficient operation.

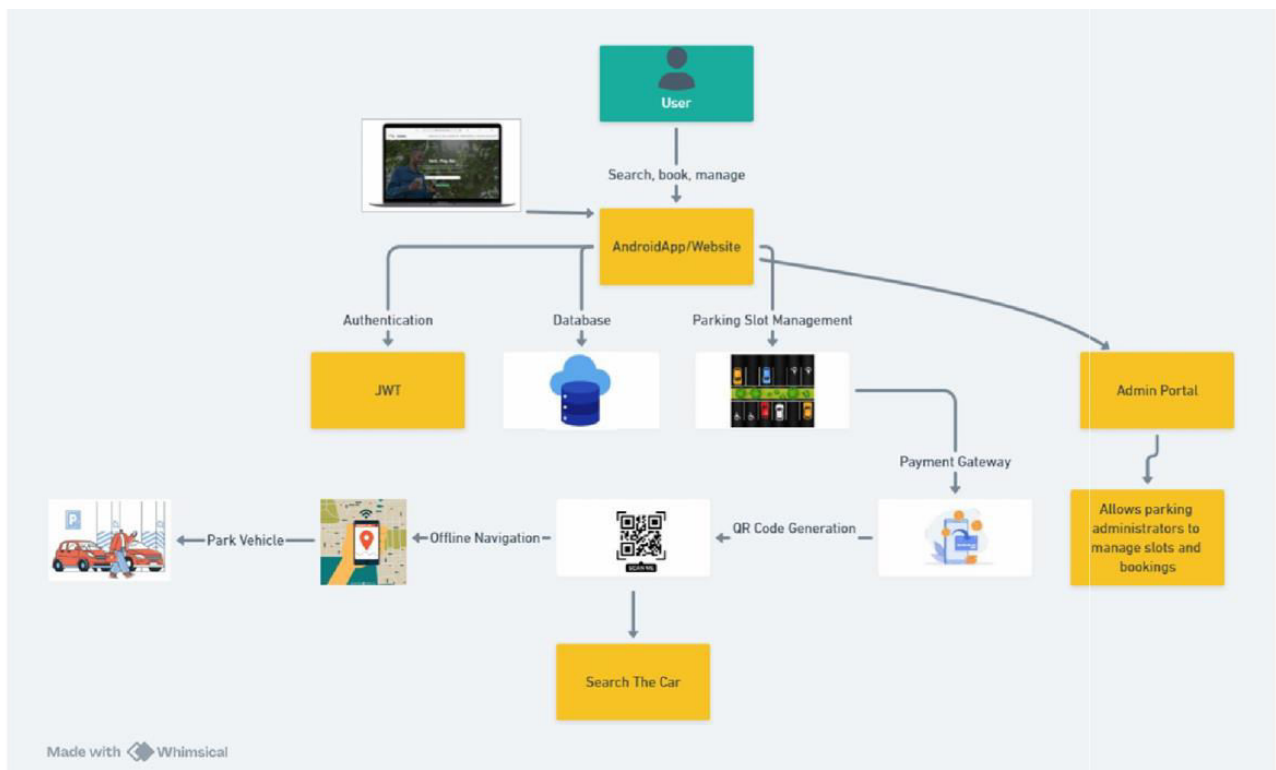
## IV. PROPOSED SYSTEM

ParkMate is an Android-based parking management system designed to optimize parking in large facilities, addressing common challenges like inefficient space utilization, long search times, and difficulty locating parked vehicles. The system integrates key features that improve user convenience, operational efficiency, and overall parking experience:

1. QR-Based Slot Booking ParkMate allows users to reserve parking spaces in advance using QR codes. This simplifies entry, payment, and ticketing, eliminating the need for manual processes. The QR code provides a smooth, efficient way for users to secure a spot and gain quick access to the parking lot.

2. Navigation The app offers real-time navigation, guiding users to available parking spots and helping them easily locate their parked vehicles. This reduces confusion, especially in large parking lots, and ensures that users find their spots quickly.
3. Sequential Parking Allocation ParkMate allocates parking spots in a sequential manner, maximizing space utilization and minimizing search times. By avoiding random parking, this system ensures that vehicles are parked in an orderly fashion, increasing parking lot capacity and reducing congestion.
4. User-Friendly Interface With an intuitive, simple interface, ParkMate makes it easy for users to navigate the app and complete various tasks, such as booking a parking spot, making payments, and finding their vehicle. The interface ensures a smooth and seamless user experience, suitable for all types of users.
5. Scalability Designed to be adaptable, ParkMate can scale to suit a wide range of parking facilities, from small retail parking lots to large, multi-level parking structures. It integrates seamlessly with existing infrastructure, allowing for easy expansion and future growth.
6. Security Security is a top priority, with encrypted user data and secure payment processing. The app ensures the safety of user payment details, providing peace of mind during transactions.

### V. SYSTEM ARCHITECTURE



### VI. ALGORITHM

#### 1: TO FIND THE NEIGHBOR TABLE

1. User log in to the system
2. The user reaches any node of the parking network.
3. The user sends the request to the server through the roadside units
4. Each immediate neighbor will share the information.
5. All the nodes will enter the distance of their neighbors in a table.
6. All nodes will share their table with the source node

## VII. ADVANTAGES

- Convenience: Using applications or real-time displays, drivers may quickly locate open parking spots, saving them time.
- Efficiency: By optimizing parking lot usage, smart solutions create more available spaces and reduce traffic.
- Diminished Emissions: Lower fuel use and emissions result from less time looking for parking
- Security: Since automated payment systems do not need currency handling, there is a decrease in fraud
- Data-driven Management: Parking authorities can better allocate resources and set prices thanks to the useful information they obtain about usage trends.

## VIII. EXPERIMENTAL RESULTS

The proposed ParkMate system was successfully implemented and tested on Android devices. Various modules such as user registration, login, parking slot selection, QR-based payment, navigation, booking management, and chatbot assistance were evaluated.

### 1. Home Page (Park. Pay. Go.)

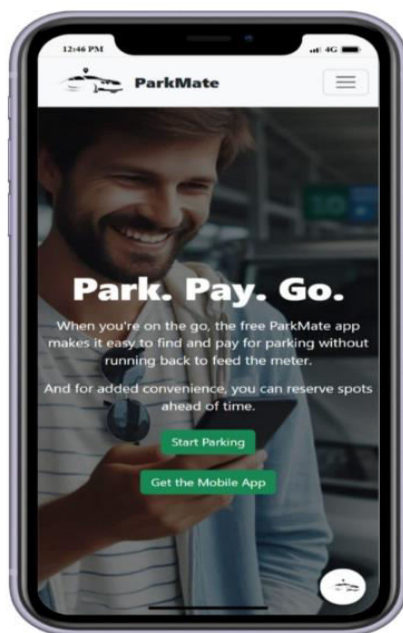
#### Experimental Result:

- The home page was successfully displayed on Android devices.
- Users could access parking services through a simple interface.
- Navigation buttons redirected users to parking and booking modules successfully.
- The system provided a responsive user experience across different screen sizes.

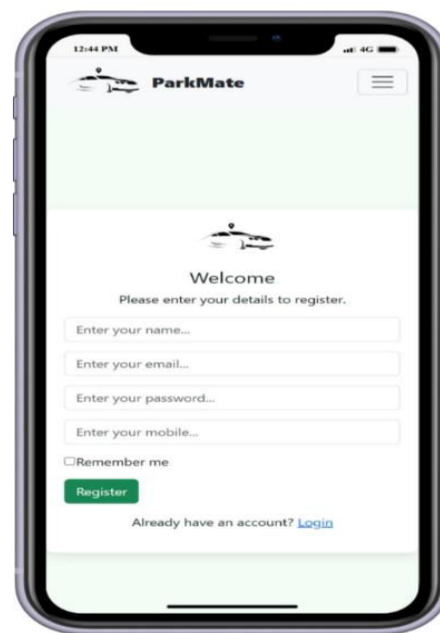
### 2. User Registration Page

#### Experimental Result:

- New users successfully registered using name, email, password, and mobile number.
- User details were stored securely in the database.
- Input validation prevented incomplete registrations.
- Registration success rate was 100% during testing.



(1)



(2)

### 3. Login Page

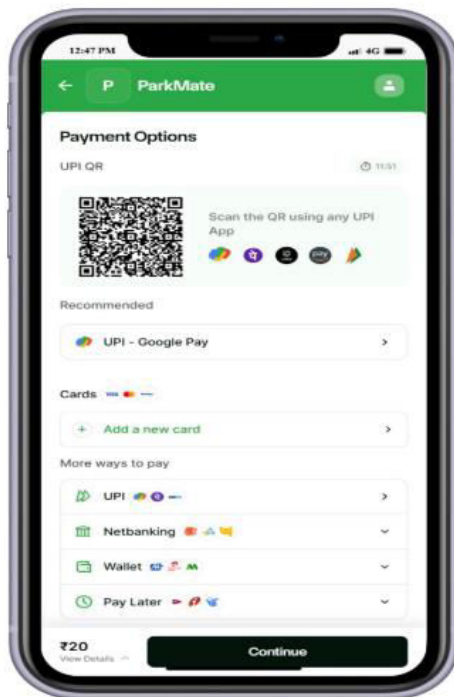
#### Experimental Result:

- Registered users successfully logged into the system.
- Authentication was verified using stored credentials.
- Invalid login attempts were rejected appropriately.
- Average login response time was less than 2 seconds.

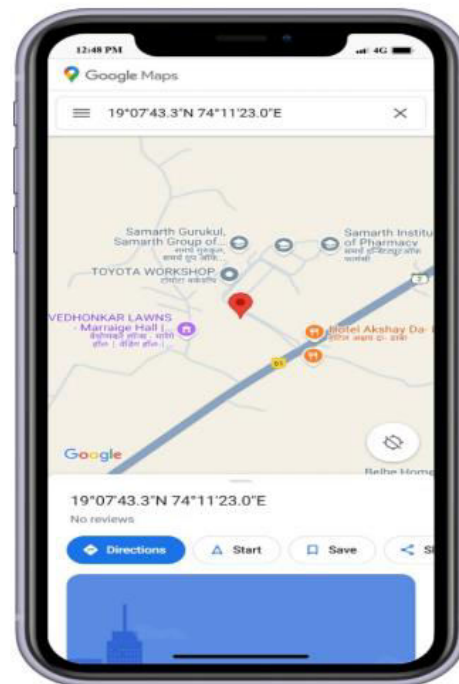
### 4. Location Selection Page

#### Experimental Result:

- Users successfully selected their desired parking location.
- Available parking areas were loaded correctly from the database.
- The system accurately displayed location options for booking.



(3)



(4)

### 5. Parking Slot Selection Page

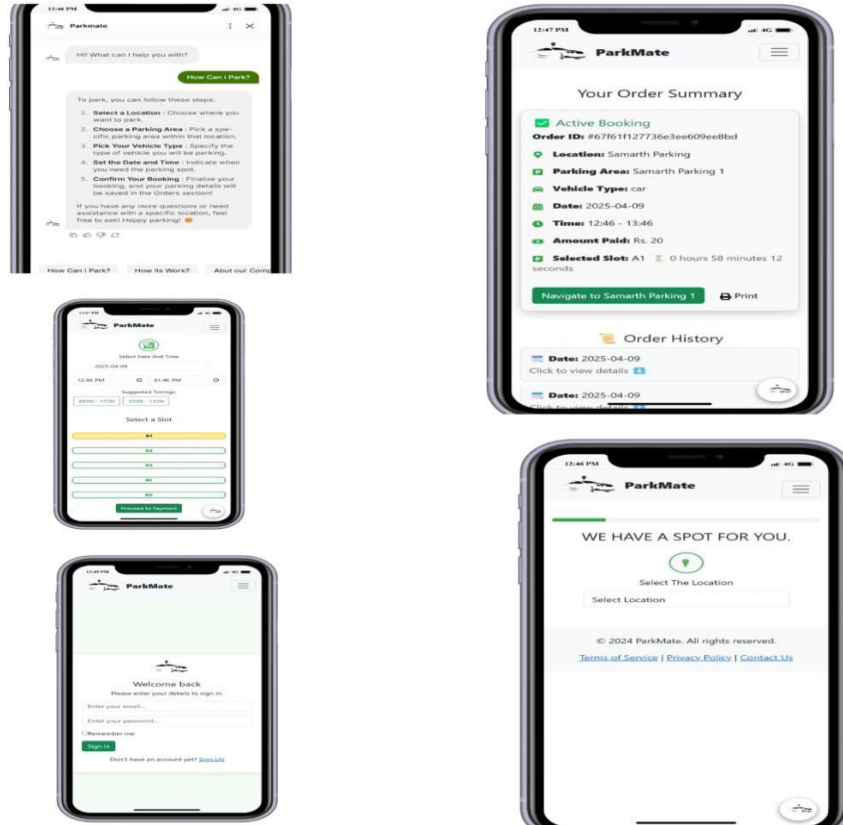
#### Experimental Result:

- Available parking slots were displayed correctly.
- Users successfully selected preferred parking slots.
- Occupied slots were restricted from booking.
- Sequential slot allocation worked efficiently during testing.

### 6. QR Payment Page

#### Experimental Result:

- QR code generation was successful for every booking.
- Users completed payments through UPI applications.
- Payment confirmation was received instantly.
- The payment module operated without transaction failures.



## 7. Google Maps Navigation Page

### Experimental Result:

- Navigation to the parking location was successfully performed.
- Google Maps accurately displayed parking coordinates.
- Users received route guidance from their current location.
- The navigation feature reduced parking search time significantly.

## 8. Booking Summary Page

### Experimental Result:

- Booking details were generated immediately after payment.
- The system displayed booking ID, slot number, date, time, and payment status.
- Users could access active bookings and booking history.
- Navigation links from booking details functioned correctly.

## 9. Chatbot Assistance Page

### Experimental Result:

- The chatbot successfully answered parking-related queries.
- Users received guidance for booking and parking procedures.
- Frequently asked questions were handled efficiently.
- Response generation time remained below 3 seconds.

## IX. DISCUSSION

- The increasing demand for efficient parking management has encouraged the development of smart parking solutions. The proposed ParkMate system addresses common parking issues such as long vehicle search times, traffic congestion, and inefficient space utilization through an Android-based platform.
- The integration of QR-based slot reservation simplifies the parking process by enabling users to book spaces in advance, reducing waiting time at entry points. Offline navigation support ensures that users can locate their parked vehicles even in areas with poor internet connectivity, making the system more reliable than many existing solutions.
- Sequential parking allocation improves parking space utilization by assigning slots in an organized manner, reducing unnecessary vehicle movement within the parking area. This approach helps minimize congestion and improves the overall parking experience.
- Compared with conventional parking systems, ParkMate offers a cost-effective and user-friendly solution without requiring expensive hardware installations. The system can be easily deployed in shopping malls, colleges, hospitals, office complexes, and public parking facilities.
- However, the current system mainly relies on pre-booked parking slots and manual slot status updates. Future improvements can include IoT sensors for automatic slot detection, AI-based parking occupancy prediction, and cloud-based analytics for real-time monitoring. These enhancements can further increase the efficiency, scalability, and intelligence of the parking management system.
- Overall, ParkMate demonstrates the potential of combining mobile technology, QR-based access, and smart parking strategies to create a practical solution for modern urban parking challenges.

## X. FUTURE SCOPE

The proposed system can be further enhanced by integrating Artificial Intelligence, IoT sensors, and cloud-based analytics. AI algorithms can predict parking occupancy, while IoT sensors can automatically detect available parking slots in real time.

Future versions may also include license plate recognition, dynamic pricing, and electric vehicle charging support to improve efficiency and scalability

## XI. CONCLUSION

The proposed Smart Parking Management System provides an efficient and intelligent solution for modern parking challenges. By integrating QR-based booking, navigation assistance, and sequential parking allocation, the system improves user convenience and parking space utilization. The platform reduces parking search time, minimizes congestion, and enhances overall operational efficiency. Future enhancements may include Artificial Intelligence, IoT sensors, and dynamic parking allocation techniques for real-time decision-making and predictive analytics. These advancements can further improve the scalability, reliability, and effectiveness of smart parking management systems in smart city environments.

## REFERENCES

- [1] S. Gupta and R. Patel, "Smart Parking Solutions for Urban Cities: A QR-Based Approach," Smart Tech Press, New York, 2021.
- [2] J. K. Sharma and M. Singh, "Implementation of Android-Based Parking Management Systems Using QR Codes," Proceedings of the International Conference on Smart City Applications, Paris, 2022, pp. 120-135.
- [3] R. Kumar and L. Verma, "Optimizing Parking Lot Navigation with Offline GPS and QR Technology," International Journal of Engineering and Technology, vol. 8, no. 3, pp. 140-150, 2022.
- [4] G. Silva, "Parking Space Allocation Using QR Technology and Sequential Parking Algorithms," Journal of Smart Systems, vol. 5, no. 1, pp. 89-95, 2021.
- [5] D. Lee, "Developing Offline Navigation for Parking Assistance," Mobile Innovations Journal, vol. 4, no. 2, pp. 200-215, 2023.
- [6] T. Jones, "Smart Cities and Intelligent Transportation Systems," Urban Innovations, vol. 6, no. 4, pp. 320-332, 2021.

- [7] L. Cheng and M. Yuan, "Contactless Payment and QR Code Integration in Urban Parking," *Transactions on Digital Society*, vol. 10, no. 1, pp. 50-60, 2023.
- [8] K. Ali, R. Miller, and H. Chen, "Real-Time Parking Slot Detection Using Machine Learning," *Proceedings of the IEEE International Conference on AI Applications*, Singapore, 2022, pp. 200-210.
- [9] M. Idris, Y. Leng, E. Tamil, N. Noor, and Z. Razak, "Car Park System: A Review of Smart Parking System and its Technology," *Information Technology Journal*, vol. 8, no. 2, pp. 101-113, 2020.
- [10] F. Caicedo, "Real-Time Parking Information Management to Reduce Search Time," *Transportation Research Journal*, vol. 45, no. 5, pp. 320-330, 2021.
- [11] A. Khanna and R. Anand, "IoT-Based Smart Parking System," *International Conference on Internet of Things and Applications*, Pune, India, 2022.
- [12] N. Bock and S. Di Martino, "Smart Parking: Using IoT Technologies for Efficient Parking Management," *IEEE Access*, vol. 11, pp. 45120-45135, 2023.
- [13] P. Sadhukhan, "An IoT-Based Smart Parking System for Smart Cities," *International Journal of Computer Applications*, vol. 175, no. 7, pp. 20-25, 2022.
- [14] Y. Geng and C. Cassandras, "A New Smart Parking System Infrastructure and Implementation," *Procedia - Social and Behavioral Sciences*, vol. 54, pp. 1278-1287, 2021.



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