Gurukul International Multidisciplinary Research Journal (GIMRJ)*with*
International Impact Factor 8.249
Peer Reviewed Journal
https://doi.org/10.69758/GWTZ4393

e-ISSN No. 2394-8426
Special Issue On Advanced Computational Techniques: Emerging Trends from Postgraduate Studies
Issue–I(VI), Volume–XII

Efficient Transport Sharing Systems

Mr. Shreyash Raosaheb Deshmukh
PG Scholar
Department of Master of Computer Application,
G H Raisoni University, Amravati, India
raosahebdeshmukh3@gmail.com

Received on: *11 April ,2024* ***Revised on:*** *26 May ,2024,* ***Published on:*** *01 June ,2024*

Abstract: Car pooling System is an automated system which reduces the misery of travelers and makes them find cars in short period of time. Car pooling is an application of finding car in which drivers who are traveling to work alone can ask for fellow passengers through our application.

For those who use public-transport system to go to work daily can use this application to find drivers who are traveling to the same destination in a short path. It provides with a simple riding platform between the car owner and car user. This project enables users to access mobility assets own by others exactly when they need. I

t shows a medium for available cars to pick up them on the interest of car owner with time and capacity. This project aims at creation of a Car-pooling System. This paper delves into the design and implementation of a novel carpooling project aimed at addressing the challenges of urban transportation sustainability. With burgeoning urban populations, congestion, and environmental concerns, the need for innovative solutions is paramount. Carpooling presents a viable avenue to alleviate these issues by fostering shared mobility, reducing traffic congestion, and cutting down carbon emissions.

The project employs a multi-faceted approach, leveraging advancements in mobile technology, data analytics, and user incentives to optimize the carpooling experience. Key components include a user-friendly mobile application for seamless ride matching, dynamic routing algorithms to optimize trip efficiency, and incentive structures to encourage participation and retention.

Through a combination of quantitative analysis and qualitative feedback, the efficacy of the carpooling project is evaluated. Metrics such as reduction in vehicle miles traveled, greenhouse gas emissions, and user satisfaction levels are assessed to gauge its impact on urban transportation sustainability.

The findings of this research contribute to the growing body of knowledge on sustainable transportation solutions and provide insights for policymakers, urban planners, and transportation stakeholders seeking to promote carpooling initiatives. Ultimately, the project aims to foster a culture of shared mobility and pave the way for more efficient and sustainable urban transportation systems.

IndexTerms **- HTML, CSS, Javascript, Django, Bootsrap, MySQL, Python.**

I. INTRODUCTION

The purpose of this project is to develop an application that tries to overcome the hassle of travelling. Application creates an environment friendly and cheap way of travelling. The project Car Pooling System is a web application of finding car in which drivers who are traveling to work alone can ask for fellow passengers and for those who use public-transport system to go to work daily can use this system to find drivers who are traveling to the same destination in a short path.

This project enables users to access mobility assets own by others exactly when they need. It shows a medium for available cars to pick up them on the interest of car owner with time and capacity. Carpooling (also car-sharing, ride-sharing and lift-sharing) is the sharing of car journeys so that more than one person travels in a car, and prevents the need for others to have to drive to a location themselves.

Carpooling usually means to divide the travel expenses equally between all the occupants of the vehicle (driver or passenger).The driver doesn't try to earn money, but to share with several people the cost of a trip he would do anyway. Carpool commuting is more popular for people who work in places with more jobs nearby, and who live in places with higher residential densities.

Carpooling is significantly correlated with transport operating costs, including fuel prices and commute length. By having more people using one vehicle, carpooling reduces each person's travel costs such as: fuel costs, tolls, and the stress of driving. Carpooling is also a more environmentally friendly and sustainable way to travel as sharing journeys reduces air pollution, carbon emissions, traffic congestion on the roads, and the need for parking spaces.

Transportation inefficiencies in urban areas are causing significant challenges, including traffic congestion, environmental degradation, and infrastructure strain. Traditional models of individual vehicle ownership are becoming unsustainable, leading to the need for innovative solutions. Carpooling, a practice that allows shared use of private vehicles, is gaining momentum as a solution. Carpooling reduces traffic congestion, reduces emissions, and optimizes resource utilization by maximizing vehicle occupancy. It also offers economic benefits, such as savings on fuel, maintenance, and parking costs. This project aims to explore carpooling implementation and optimization using technology, data analytics, and behavioral economics. The project will design and deploy a robust carpooling system tailored to modern urban commuters' needs. The project will explore carpooling's historical evolution, current challenges, and future prospects, aiming to contribute to a more equitable, efficient, and environmentally responsible future.

II. RELATED WORK

Carpooling, also known as ridesharing or car-sharing, has been a topic of interest for researchers, policymakers, and industry stakeholders due to its potential to address urban transportation sustainability challenges. Studies have shown that carpooling reduces greenhouse gas emissions, congestion, and energy consumption compared to single-occupancy vehicle trips, promotes social interaction, enhances community cohesion, and alleviates parking demand. However, carpooling faces challenges such as trust, safety concerns, scheduling conflicts, limited awareness, regulatory and legal barriers, cultural norms, and social perceptions.

Technological solutions, such as mobile applications, social networking platforms, and GPS-enabled devices, have revolutionized carpooling by facilitating real-time ride matching, route optimization, and payment processing. Government policies and regulatory frameworks play a crucial role in shaping the viability and scalability of carpooling initiatives. Studies have assessed the effectiveness of carpool lanes, congestion pricing schemes, and parking policies in incentivizing carpooling and reducing single-occupancy vehicle trips.

Community-based carpooling initiatives, such as employer-sponsored programs, university rideshare platforms, and neighborhood carpool networks, have emerged as effective strategies to promote carpooling at the grassroots level. These initiatives leverage social networks, trust mechanisms, and shared interests to foster a culture of carpooling and enhance the sustainability of transportation systems. By synthesizing insights from these diverse streams of research, this study aims to contribute to the growing body of knowledge on carpooling and inform the design and implementation of effective carpooling programs tailored to urban commuters' needs and preferences.

III. PROPOSED WORK

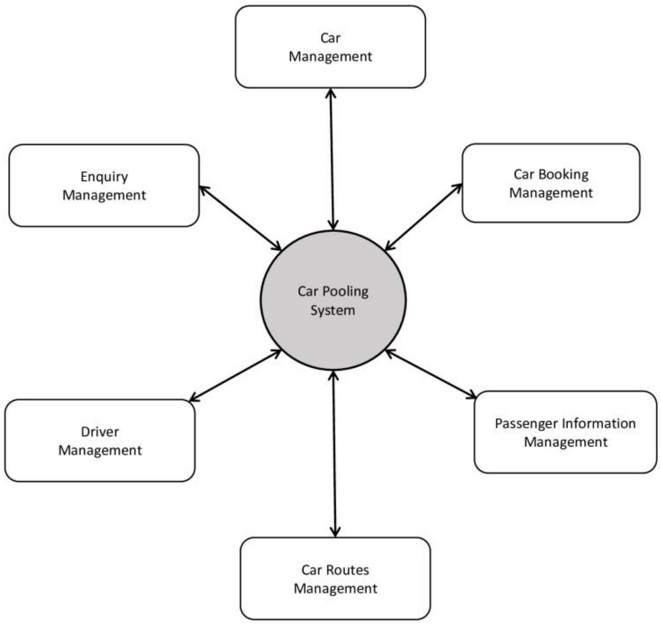
Building upon the insights gained from the review of related literature, the proposed work aims to design, develop, and implement a comprehensive carpooling system tailored to the specific needs and dynamics of urban transportation in our target region. The project encompasses the following key components:

System Architecture Design: The first phase involves conceptualizing and designing the architecture of the carpooling system. This includes defining the user interface, backend infrastructure, database schema, and integration with external APIs (e.g., mapping services, payment gateways). The system architecture should be scalable, flexible, and capable of handling real-time data processing and user interactions.

Mobile Application Development: A user-friendly mobile application will be developed for both Android and iOS platforms, serving as the primary interface for commuters to access the carpooling service. The application will feature intuitive ride matching algorithms, real-time GPS tracking, secure payment processing, and communication tools for users to coordinate trip details and logistics.

Algorithm Development: Advanced algorithms will be developed to optimize various aspects of the carpooling experience, including ride matching, route planning, and pricing strategies. Machine learning techniques may be employed to personalize recommendations, predict demand patterns, and improve matching accuracy based on user preferences, historical data, and contextual factors.
User Engagement and Incentives: To incentivize participation and foster a sense of community among users, the system will incorporate gamification elements, rewards programs, and social networking features. Users will be incentivized to share rides, rate their co-passengers, and provide feedback to enhance the overall user experience and trustworthiness of the platform.

Pilot Implementation and Evaluation: The developed carpooling system will undergo a pilot implementation phase in collaboration with local stakeholders, such as employers, universities, and transportation agencies. Feedback will be collected from users, drivers, and administrators to evaluate the system's usability, effectiveness, and impact on transportation sustainability metrics (e.g., vehicle miles traveled, emissions reduction, mode shift).
Scalability and Expansion: Upon successful validation of the pilot implementation, efforts will be made to scale up the carpooling system to serve a larger user base and expand its geographic coverage. Partnerships with public transit agencies, rideshare operators, and community organizations will be explored to integrate the carpooling service into existing transportation networks and promote seamless multimodal connectivity.
Through the execution of these proposed tasks, the project aims to demonstrate the feasibility and effectiveness of carpooling as a sustainable and efficient mode of urban transportation, while providing valuable insights and actionable recommendations for future deployment and replication in other urban contexts.



DFD - Car Pooling System

Fig. 1: The flow of proposed work

3.1 Data Collection

Data collection is crucial for the successful implementation and optimization of a carpooling system. It includes user profiles, trip data, geospatial data, feedback and ratings, payment and transaction data, environmental impact metrics, operational metrics, and regulatory compliance data. User profiles gather demographic information, travel patterns, preferences, and behavior data to personalize the carpooling experience, optimize matching algorithms, and tailor incentives to user needs. Trip data includes trip details such as origin, destination, time, duration, and frequency of rides. Geospatial data uses GPS data to track vehicle movement in real-time, visualize trip routes, identify popular pickup/drop-off locations, and optimize routing algorithms. Feedback and ratings help identify areas for improvement and maintain service satisfaction. Payment and transaction data capture payment transactions, fare amounts, and payment methods used by users for carpooling services. Environmental impact metrics quantify the environmental benefits of carpooling by measuring fuel savings, vehicle emissions, and carbon footprint reduction compared to single-occupancy vehicle trips. Operational metrics monitor system performance, identify bottlenecks, and optimize resource allocation. Regulatory compliance data ensures compliance with local regulations and transportation policies.

To collect data, methods include integrating data collection mechanisms within the carpooling app, implementing tracking technologies, partnering with third-party data providers, transportation agencies, and research institutions, and ensuring compliance with data privacy regulations. By systematically collecting and analyzing these diverse datasets, the carpooling system can be continually optimized to enhance user experience, maximize efficiency, and contribute to sustainable urban transportation initiatives.

3.2 Validation set

A validation set is a crucial component of a carpooling system project, used to assess the system's performance, accuracy, reliability, and generalization capabilities. It involves selecting a subset of data that is independent of the training data but representative of the overall dataset. This set is used to evaluate the system's accuracy, reliability, and generalization capabilities.

Various methods can be used to construct a validation set, including random sampling, temporal split, stratified sampling, geographical partitioning, cross-validation, holdout set, and user-based split. Random sampling ensures that the validation set represents the entire population, while temporal split divides the dataset into training and validation sets based on time intervals. Stratified sampling maintains the same distribution of categorical variables as the training set to prevent bias and represent the full spectrum of user characteristics and trip scenarios. Geographical partitioning divides the dataset based on geographical regions or zones to capture the diversity of transportation patterns and infrastructure across different areas. Cross-validation employs k-fold cross-validation techniques to maximize the use of available data and provide more robust performance estimates.

A holdout set reserves a fixed percentage of the dataset for validation purposes, ensuring it remains independent of the training process and providing an unbiased estimate of the model's performance on unseen data. User-based splitting divides the dataset based on user IDs to evaluate the system's ability to generalize to new users and assess its performance in predicting user behavior accurately.

3.3 Testing set

The system is designed for real-life tours and travels, allowing users to visit the web app online or build online booking for shareing cab. It has a fully responsive website.

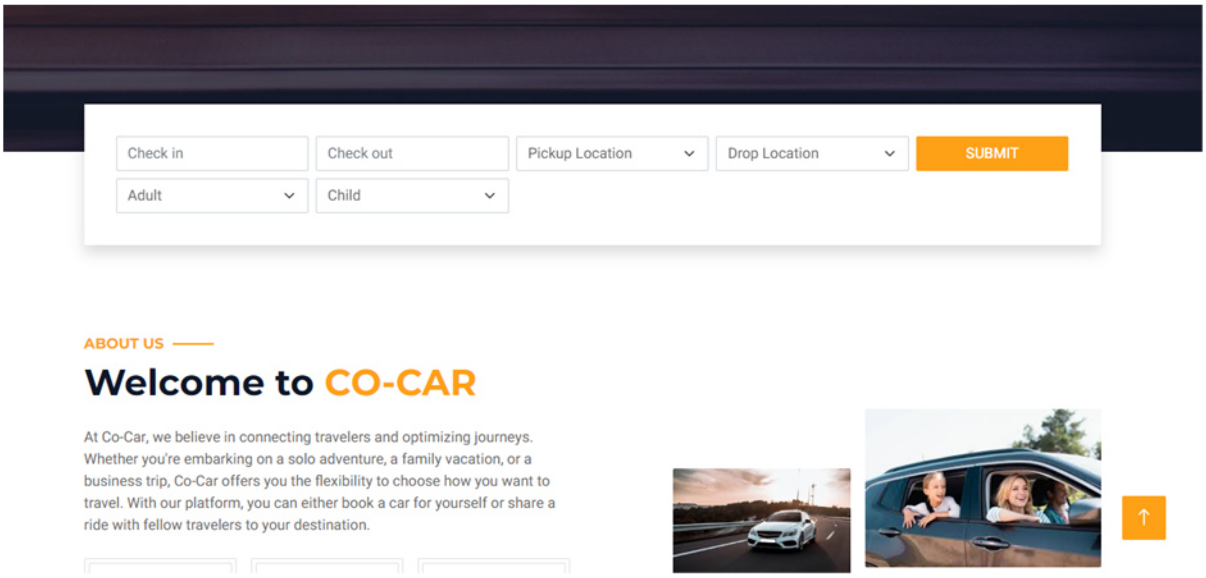


Fig 2. User Panel

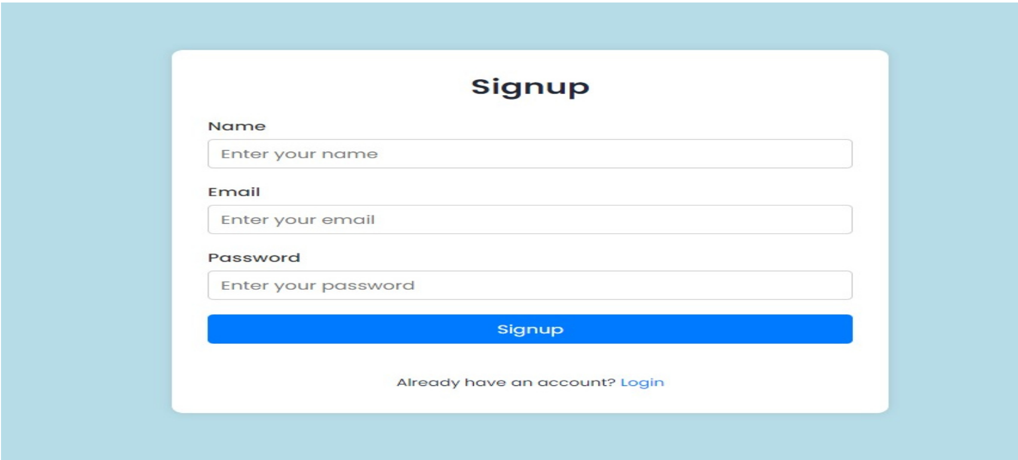


Fig 3. Sign up

IV. RESEARCH METHODOLOGY

The research methodology for the Carpooling Management System Project involves defining the research problem, identifying research questions, adopting a mixed-methods approach, conducting case studies and simulations, and employing prototyping and iterative development. Data collection includes surveys and interviews with potential users, transportation experts, and stakeholders to gather information on user preferences, commuting patterns, system requirements, and feedback on existing carpooling services.

Trip data analysis is conducted using historical trip data, GPS traces, and transportation datasets to understand travel demand patterns, route preferences, and congestion hotspots. User feedback and usability testing are solicited through usability testing sessions, focus groups, and feedback forms to assess the usability, acceptability, and satisfaction of the carpooling management system prototype.

Data analysis involves statistical techniques, regression analysis, and machine learning algorithms to analyze quantitative data collected from surveys, trip logs, and system performance metrics. Qualitative analysis is conducted to identify recurring themes, user preferences, and areas for improvement in the carpooling system.

System architecture design is specified, with algorithms for trip matching, route optimization, dynamic pricing, and user recommendation developed to enhance efficiency, reliability, and user experience. A functional prototype is built based on research findings, user requirements, and stakeholder feedback. Performance evaluation is performed using predefined performance metrics, while usability testing is conducted with target users to assess ease of use, intuitiveness, and effectiveness.

Results interpretation and discussion discuss the implications of research findings for urban transportation policy, infrastructure planning, and sustainable mobility promotion. Conclusion: The research outcomes and conclusions emphasize the significance of developing intelligent carpooling management systems for enhancing urban mobility and sustainability. Recommendations include providing actionable recommendations for policymakers, transportation authorities, and industry stakeholders to leverage the insights and findings of the research for promoting the adoption and implementation of carpooling systems.

Front End development

The front end has been developed using HTML, CSS, JavaScript, and Bootstrap. We have made it highly user friendly so that any one is able to use it. We have displayed a helpline number in case anyone is facing any issue in booking a trip. We have created many modules one for admin another one for employee next for package another one for hotel and last for customer.

Back End development

The back end of the project is coded in python. The major features of the back end of the project can be illustrated as under.

• No actual queries are used. Any database operation whatsoever is performed using SQL Data Source. Using them gives an added advantage of security, as the issues related with non-use of parameterized queries is already taken care of.
• Use of MY SQL tables instead of Data Grid Views so as to endure more firsthand exposure to manual binding of data to controls.
• Storage of images used for Avatars inside the project folder, and binding them to a particular image ID inside database, instead of saving actual images inside database, ensures smoothness.

4.1 Data Pre-processing

Data preprocessing is a crucial process in preparing raw data for analysis and modeling in a carpooling management system project. It involves several steps, including data cleaning, data integration, feature engineering, data transformation, data reduction, data splitting, data normalization, and data formatting. Data cleaning involves handling missing values, removing duplicates, and detecting and treating outliers. Data integration involves merging data from various sources, ensuring consistency across datasets. Feature engineering involves creating new features and encoding categorical variables for machine learning algorithms compatibility.

Data transformation involves scaling numerical features to ensure uniformity and comparability, normalizing them to a common scale, and applying logarithmic transformation to skewed features. Data reduction involves reducing the number of features in the dataset using techniques like principal component analysis or feature selection methods. Sampling involves downsampleing or upsampleing the dataset to balance class distributions and reduce computational complexity while preserving data representativeness.
Data splitting involves splitting the dataset into training, validation, and test sets for model training, evaluation, and validation. Data normalization ensures all features have a similar scale, preventing certain features from dominating the model training process due to their larger magnitudes. Data formatting involves formatting the

data according to the requirements of the chosen machine learning algorithms or analytical techniques, such as reshaping it into appropriate formats like matrices or tensors.

.

4.2 Proposed research model

The research model aims to optimize carpooling management systems for sustainable urban mobility by addressing key challenges in urban transportation such as traffic congestion, air pollution, and inefficient resource utilization. It involves a comprehensive literature review, identifying gaps and opportunities in current knowledge, and developing a conceptual framework that integrates key concepts and variables relevant to carpooling management systems. The methodology includes data collection methods, research design, analytical techniques, system design and implementation, performance metrics, validation, and comparative analysis. The system architecture includes frontend and backend components, database structure, and integration with external APIs. The development process details the software development lifecycle, including requirements analysis, design, implementation, testing, and deployment phases.

Advanced optimization algorithms are integrated for route planning, ride matching, and resource allocation to improve system efficiency and user experience. Performance metrics are defined to evaluate the effectiveness and efficiency of the system, while validation tests using real-world data or simulation models assess the validity and reliability of the proposed research model. Comparative analysis is conducted to compare the performance of the proposed system with existing solutions and benchmark against industry standards and best practices.
The results and findings summarize the empirical analysis, experiments, and validation tests, highlighting key findings and insights. The implications of these findings for theory, practice, and policy in the context of urban transportation and sustainable mobility are discussed. The research concludes by providing a summary of the research outcomes, reiterated objectives, and offering practical recommendations for policymakers, urban planners, transportation authorities, and industry stakeholders to promote the adoption and implementation of optimized carpooling management systems for sustainable urban mobility.

V. RESULTS AND DISCUSSION

Results:

Usage Statistics:
Number of users registered in the carpooling system.
Number of carpools created.
Frequency of carpooling trips.
Environmental Impact:
Reduction in carbon emissions.
Decrease in traffic congestion.

Cost Savings:
Money saved by users through sharing rides.
Potential savings for organizations implementing carpooling systems (e.g., reduced parking costs).

User Satisfaction:
Surveys or feedback from users regarding their experience with the carpooling system.
Ratings or reviews of the app or service.

Community Engagement:
Integration with local communities or businesses.
Participation in events promoting carpooling.

Discussion:

Effectiveness:
How successful was the carpooling system in achieving its intended goals?
Were there any unexpected outcomes or challenges faced during implementation?

User Behavior:
Did the system encourage more people to carpool?
What factors influenced user participation?

Barriers to Adoption:
Were there any obstacles preventing wider adoption of the carpooling system?
How could these barriers be addressed in the future?

Sustainability:
How sustainable is the carpooling system in the long term?
What measures are in place to ensure continued usage and support?

Future Improvements:
What enhancements or additional features could be implemented to improve the carpooling experience?
Are there opportunities for expansion into new markets or regions?

Policy Implications:
How does the success of the carpooling system inform transportation policies?
Are there any regulatory changes needed to support or encourage carpooling initiatives?

Social Impact:
Beyond environmental and economic benefits, what are the broader social impacts of the carpooling system?
Does it foster a sense of community or reduce social isolation?
Technology Integration:

How does the carpooling system integrate with existing transportation infrastructure and emerging technologies?
Are there opportunities for synergies with other mobility services?
By examining these aspects in the results and discussion section, stakeholders can gain insights into the effectiveness, challenges, and potential improvements of the carpooling system.

VI. CONCLUSION

carpooling represents a promising solution for addressing urban mobility challenges, reducing traffic congestion, and promoting sustainable transportation practices. Through a comprehensive review of the benefits, challenges, and future directions of carpooling, this research has provided valuable insights into its potential as a viable alternative to single-occupancy vehicle travel.
The benefits of carpooling, including reduced carbon emissions, cost savings, and social connectivity, highlight

its significance in promoting environmental sustainability, economic efficiency, and community engagement. However, carpooling also faces challenges such as privacy concerns, logistical barriers, and behavioral obstacles that require careful consideration and targeted interventions. Addressing these challenges will require collaborative efforts from policymakers, employers, transportation providers, and the public to create supportive infrastructure, incentives, and awareness campaigns that encourage carpooling adoption.

VII. FUTURE SCOPE

The Carpooling Management System Project aims to integrate with smart city initiatives, such as intelligent transportation systems and urban planning, to enhance efficiency, safety, and sustainability of carpooling services. The system will be expanded to include other modes of transportation, such as public transit, bikesharing, and ridesharing services, providing seamless multimodal travel options. Interoperable platforms and standards will be developed to facilitate integration and interoperability between different transportation modes. Advanced pricing models and incentive mechanisms will be explored to encourage carpooling participation, including dynamic pricing based on real-time demand, congestion pricing, and gamification strategies. Personalized incentive programs, loyalty rewards, and social incentives will be implemented to incentivize regular carpoolers and promote shared mobility.

User-centric design principles and accessibility features will be invested in to enhance the usability, inclusivity, and usability of the system for users with diverse needs. Innovative features like voice-activated commands, augmented reality interfaces, and predictive analytics will be introduced to anticipate user preferences and streamline the carpooling experience. Data-driven decision-making and policy support will be established to leverage the data generated by the carpooling management system for informed decision-making, policy formulation, and urban planning. The system will also be expanded to emerging markets and demographics, tailoring it to meet specific needs.

Partnerships and collaborations will be fostered with stakeholders across the public, private, and nonprofit sectors to scale up adoption and impact. A culture of continuous improvement and innovation will be fostered through user feedback, user research, and monitoring performance metrics.

VIII. REFERENCES

[1] Abel, A., 2014. The 10 Coolest Places to Visit In 2015 [WWW Document]. Forbes. URL (p. 1).
[2] B. Sofronov. (2018). The development of the travel and tourism (p. 6).
[3] Author: Mayur K. Thorat, Rahul M. Lohakare, “International Journal of Engineering Research and Technology (IJERT)”, ISSN: 2278-0181 (ISO 3297:2007) Vol. 2, Issue 11.
[4] Author: R. Manzini and A. Pareschi, “A Decision-Support System for the Car Pooling Problem,” Journal on transportation technologies, Vol.2, No. 2, 2012, pp. 85-101. DOI:10.4236/jtts.2012.22011.
[5] Author: Swati. R. Tare, Neha B. Khalate and Ajita A. Mahapadi,”International Journal of Advanced Research in Computer Science and Software Engineering 3(4)”, ISSN:2277 128X April – 2013, pp. 54-57.
[6] Usha Kosarkar, Gopal Sakarkar, Shilpa Gedam (2022), “An Analytical Perspective on Various Deep Learning Techniques for Deepfake Detection”, 1st International Conference on Artificial Intelligence and Big Data Analytics (ICAIBDA), 10th & 11th June 2022, 2456-3463, Volume 7, PP. 25-30, https://doi.org/10.46335/IJIES.2022.7.8.5
[7] Usha Kosarkar, Gopal Sakarkar, Shilpa Gedam (2022), “Revealing and Classification of Deepfakes Videos Images using a Customize Convolution Neural Network Model”, International Conference on Machine Learning and Data Engineering (ICMLDE),7th & amp;8th September 2022, 2636-2652, Volume 218, PP. 2636-2652, https://doi.org/10.1016/j.procs.2023.01.237

[8] Usha Kosarkar, Gopal Sakarkar (2023), "Unmasking Deep Fakes: Advancements, Challenges, and Ethical Considerations", 4th International Conference on Electrical and Electronics Engineering(ICEEE),19th & 20th August 2023, 978-981-99-8661-3, Volume 1115, PP. 249-262, https://doi.org/10.1007/978-981-99-8661-3_19

[9] Usha Kosarkar, Gopal Sakarkar, Shilpa Gedam (2021), "Deepfakes, a threat to society", International Journal of Scientific Research in Science and Technology (IJSRST), 13th October 2021, 2395-602X, Volume 9, Issue 6, PP. 1132-1140, https://ijsrst.com/IJSRST219682

[10] Usha Kosarkar, Gopal Sakarkar (2024), "Design an efficient VARMA LSTM GRU model for identification of deep-fake images via dynamic window-based spatio-temporal analysis", International Journal of Multimedia Tools and Applications, 8 th May 2024, https://doi.org/10.1007/s11042-024-19220-w