ECO DRIVE

A PROJECT REPORT

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Under the guidance of,

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in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND TECHNOLOGY

AT

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

BENGALURU

JANUARY 2025

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SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

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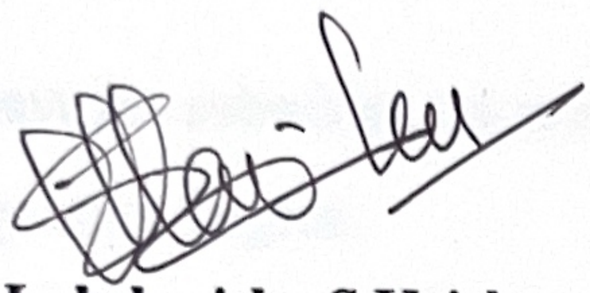

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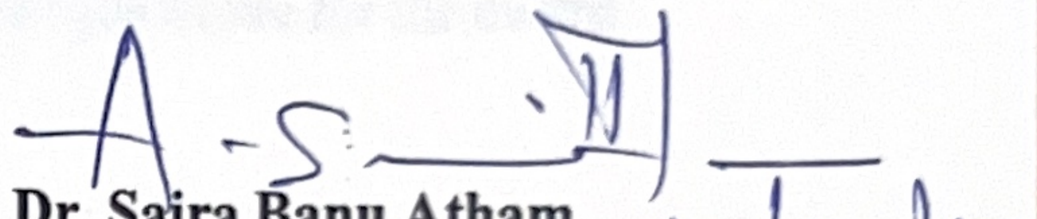

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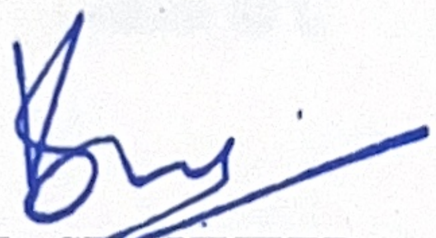

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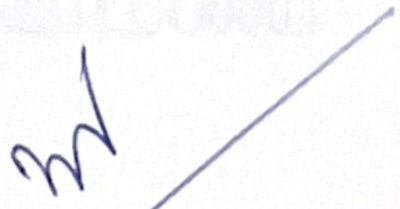

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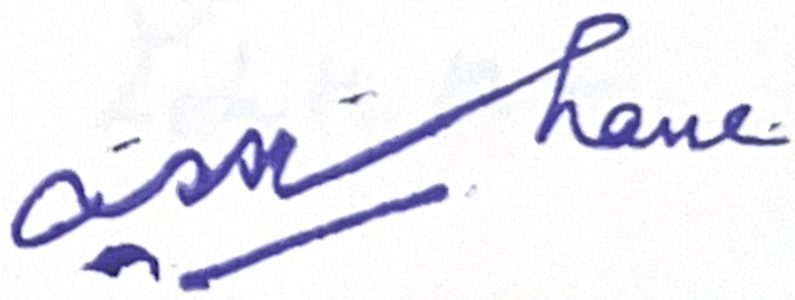

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **ECO-DRIVE** -in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Technology**, is a record of our own investigations carried under the guidance of **Mr. Lakshmisha S Krishna, Assistant Professor, School of Computer Science Engineering, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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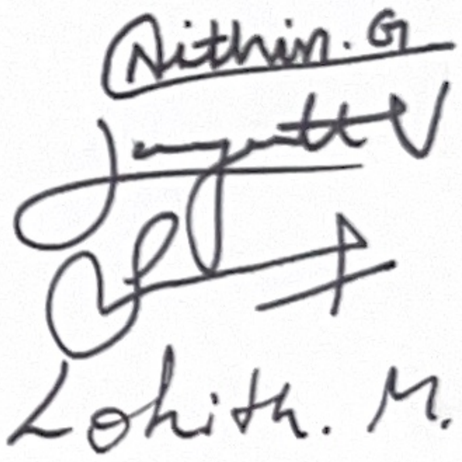
G Nithin	20211CSG0030	
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ABSTRACT

Eco Drive is a mobile application developed to address the pressing issue of vehicular emissions, one of the largest contributors to urban air pollution. By combining automated carbon footprint tracking with gamification and community engagement, Eco Drive encourages users to adopt eco-friendly travel habits. The application analyzes commute data using smartphone sensors to estimate carbon emissions and awards points for improvements in travel choices. In this paper, we present the design, implementation, and evaluation of the Eco Drive application, demonstrating its efficacy in reducing carbon footprints and fostering sustainable travel practices.

Index Terms—Carbon Footprint, Eco-Friendly Travel, Gamification, Smartphone Sensors, Mobile Application Development, Community Engagement, Sustainable Development Goals (SDG).

ACKNOWLEDGEMENT

First of all, we indebted to the **GOD ALMIGHTY** for giving me an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameeruddin Khan**, Pro-VC, School of Engineering and Dean, Presidency School of Computer Science and Engineering for getting us permission to undergo the project.

We express our heartfelt gratitude to our beloved Associate Deans **Dr. Shakkeera L and Dr. Mydhili Nair,** Presidency School of Computer Science and Engineering, and **Dr. Saira Banu Atham**, Head of the Department, Presidency School of Computer Science and Engineering, for rendering timely help in completing this project successfully.

We are greatly indebted to our guide **Mr. Lakshmisha, Assistant Professor** and Reviewer **Dr. Srabana Pramanik, Assistant Professor - Senior Scale**, Presidency School of Computer Science and Engineering, for his/her inspirational guidance, and valuable suggestions and for providing us a chance to express our technical capabilities in every respect for the completion of the project work.

We would like to convey our gratitude and heartfelt thanks to the PIP2001 Capstone Project Coordinators **Dr. Sampath A K, Dr. Abdul Khadar A and Mr. Md Zia Ur Rahman,** department Project Coordinators **Dr. Manjula H M** and Git hub coordinator **Mr. Muthuraj.**

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

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CHAPTER-1
INTRODUCTION

1.1 Background and Motivation

Air pollution has become one of the most critical environmental issues worldwide, with urban areas being disproportionately affected. According to a report by the World Health Organization (WHO), over 90% of the global population breathes air containing harmful levels of pollutants, and vehicular emissions contribute significantly to this problem. In India, transportation accounts for approximately 14% of total carbon dioxide emissions, with private vehicles being the largest contributors. Urban centers, where population density and vehicular ownership are high, face severe air quality degradation due to traffic congestion and emissions.

Table 1: Vehicular Emissions Contribution

Region	**Transportation Emissions (% of Total CO2)**	**Private Vehicle (% Contribution)**
Global	23%	75%
India	14%	60%
Developed Countries	28%	80%
Under developed Regions	8%	50%

The increasing awareness of climate change and its detrimental effects has led to calls for innovative solutions to mitigate carbon footprints. Individual action, such as opting for public transportation or carpooling, can make a significant difference. However, motivating individuals to adopt eco- friendly practices remains a challenge. Research suggests that real-time feedback and incentives, such as gamification, can play a pivotal role in promoting behavioral changes.

Eco Drive seeks to address this challenge by combining automated carbon footprint tracking with gamification and community engagement. Unlike traditional awareness campaigns, the application empowers users to take actionable steps to reduce emissions, turning sustainable travel into a rewarding and competitive activity.

1.2 Significance

The Eco Drive application aims to:

- Raise Awareness: Provide users with real-time data on the environmental impact of their daily commute.
- Encourage Eco-Friendly Behavior: Motivate users to shift to sustainable travel modes such as public transport, cycling, or walking.
- Leverage Community Dynamics: Foster a sense of community by encouraging users to collaborate and compete in reducing emissions.
- Promote Gamified Engagement: Use gamification elements such as leaderboards, badges, and virtual rewards to sustain user interest and commitment. The app aligns with global climate action goals, particularly the United Nations Sustainable Development Goal 13 (Climate Action), by enabling individuals and communities to contribute to reducing greenhouse gas emissions.

1.3 The Impact of Transportation on Air Quality

Transportation significantly contributes to air pollution, representing a large share of emissions in urban settings. The heavy dependence on personal vehicles, combined with insufficient public transit options, has resulted in heightened traffic congestion and extended travel times. Consequently, vehicle emissions adversely affect air quality, leading to health complications such as respiratory illnesses, heart disease, and other serious medical conditions. It is essential to comprehend how transportation influences air quality to devise effective strategies for pollution reduction and to encourage sustainable commuting habits.

1.4 Scope of the Study

This paper focuses on the technical design, implementation, and evaluation of the Eco Drive application. The study also explores the app's potential to influence behavior and achieve measurable reductions in carbon footprints through pilot testing.

1.5 The Importance of Community Involvement

Tackling air pollution and minimizing carbon footprints necessitates collaborative efforts from individuals and communities. While personal initiatives are valuable, their impact can be greatly enhanced when communities unite towards a shared objective. Engaging the community cultivates a sense of responsibility and accountability, motivating members to support each other in adopting sustainable practices.

By establishing a platform for community-driven initiatives, individuals can exchange experiences, challenges, and successes related to reducing their carbon footprints. This cooperative approach not only boosts motivation but also fosters a culture of sustainability within communities, ultimately resulting in more substantial environmental benefits.

1.6 The Significance of Individual Contributions

1.6.1 Enabling Individuals to Make an Impact

While systemic changes are crucial for addressing air pollution, individual actions are equally important in fostering a sustainable future. Each person's commuting decisions contribute to the overall carbon footprint, and by making mindful choices—such as carpooling, cycling, or utilizing public transport—individuals can collectively create a substantial impact. The ECO DRIVE application aims to empower users by equipping them with the tools and information necessary to understand their role in air pollution and take proactive steps to reduce their carbon footprints

1.6.2 Cultivating a Sustainability Culture

Promoting sustainable commuting practices among individuals involves more than just providing information; it requires nurturing a culture of sustainability. This means creating an environment where eco-friendly choices are recognized and rewarded. The gamification features of the ECO DRIVE app, such as virtual points and badges, are designed to inspire users to engage in sustainable behaviors while fostering a sense of community. By establishing a culture that prioritizes sustainability, the app can help shift societal norms and encourage more individuals to choose eco-friendly commuting options.

1.6.3 The Combined effect of Individual actions

The influence of individual actions goes beyond personal choices; it can generate a ripple effect within communities. When individuals embrace sustainable practices, they often motivate others to follow suit, leading to a collective movement towards environmental stewardship. The community-focused approach of the ECO DRIVE app facilitates this by enabling users to share their accomplishments and progress with friends and family. As more individuals become aware of their carbon footprints and take steps to mitigate them, the cumulative effect can result in significant improvements in air quality and a healthier environment for everyone. The Impact of Transportation on Air Quality Transportation is a significant contributor to air pollution, making up a large portion of emissions in urban areas. The heavy reliance on personal vehicles, along with a lack of adequate public transportation options, has led to increased traffic congestion and longer travel times. This, in turn, exacerbates vehicle emissions, negatively impacting air quality and leading to health issues such as respiratory conditions, heart disease, and other serious health problems. Understanding the relationship between transportation and air quality is vital for creating effective pollution reduction strategies and promoting sustainable commuting practices.

1.7 Future Prospects

Looking ahead, the ECO DRIVE initiative has the potential to expand beyond its initial scope. Future versions of the app could incorporate additional features such as integration with public transportation systems, partnerships with local businesses for rewards, and educational resources on sustainable practices. By continuously evolving and adapting to user needs, the app can remain relevant and impactful in the fight against air pollution

1.8 Anticipated developments

The effective implementation of the ECO DRIVE application is expected to produce several beneficial outcomes, including:

- Heightened Awareness: Users will develop a deeper understanding of their carbon footprints and how their travel choices affect air quality.

- Behavioral Change: The app will motivate users to adopt more sustainable commuting habits, resulting in decreased vehicle emissions.
- Community Involvement: By nurturing a sense of community, users will feel more encouraged to engage in collective efforts to lower carbon footprints, fostering a supportive atmosphere for sustainable behavior change.

CHAPTER-2
LITERATURE SURVEY

As per our findings India, as a rapidly developing nation, is grappling with the environmental consequences of industrialization, urbanization, and economic growth. Among the most pressing concerns is the carbon footprint—a measure of the total greenhouse gas emissions caused directly or indirectly by human activities. Understanding the sources and impacts of these emissions is crucial for addressing climate change and fostering sustainable development.

2.1 Major Sources of Carbon Footprint in India

India's carbon footprint stems from diverse sectors. Electricity generation is a significant contributor, with coal-fired power plants accounting for a substantial share of emissions. According to the International Energy Agency, nearly 70% of India's electricity is generated from fossil fuels, primarily coal, which emits large quantities of carbon dioxide (CO_2).

The industrial sector is another major source, driven by the production of steel, cement, and chemicals. Agricultural practices, including enteric fermentation in livestock and rice cultivation, release methane (CH_4), a potent greenhouse gas. Urbanization and population growth further exacerbate the problem through energy-intensive construction activities.

Deforestation and land-use changes add to the carbon footprint by reducing the capacity of forests to absorb CO_2. Additionally, waste management practices, such as open dumping and inadequate recycling, emit methane from decomposing organic waste.

2.2 Empasis on Vehicular Emission

The transportation sector is a critical focus in India’s carbon footprint discourse. With increasing vehicle ownership, especially in urban areas, emissions from cars, buses, and two-wheelers contribute significantly to air pollution and CO_2 levels. Vehicular emissions also include black carbon, a short-lived climate pollutant that exacerbates global warming.

The reliance on fossil fuel-based vehicles underscores the need for a shift toward electric vehicles (EVs) and cleaner fuels. Government initiatives like FAME (Faster Adoption and Manufacturing of

Hybrid and Electric Vehicles) aim to address this challenge, but the transition is gradual and requires substantial investment and public awareness.

2.3 Related Work

A review of the existing literature on sustainable transportation and related technologies has provided valuable insights into strategies and challenges for promoting eco-friendly travel behaviors. The related key works are as follows – Carbon Footprint Tracking [3], Gamification for a Behavioral Change [2], community engagement [5], Community Engagement in Sustainability [7]. These findings emphasize the importance of technological innovation, user engagement, and community participation in addressing environmental concerns.

2.4 Carbon Footprint Tracking

The concept of tracking carbon emissions at the individual level has been widely explored in recent years. Early carbon footprint calculators, such as the ones developed by the Carbon Trust, provided users with tools to estimate their emissions manually, but they required significant user input, which limited adoption [3]. These tools were primarily educational and lacked automation, making them less effective for influencing real-time behavior.

More advanced solutions have emerged that leverage smart- phone technologies to simplify and automate emission tracking. For example, the Commute Greener app uses GPS data to calculate the emissions associated with travel routes and provides users with suggestions to reduce their environmental impact [4]. However, while such tools are effective in offering personalized insights, they lack mechanisms for fostering user engagement through social or competitive dynamics. Eco Drive addresses this gap by integrating real-time tracking with gamification and community engagement.

Recent advancements in API technologies, such as Rapid API, allow applications to classify user activities (e.g., walking, cycling, or driving) based on accelerometer and location data. This approach eliminates the need for manual input and ensures higher accuracy in estimating carbon footprints. Studies highlight the importance of combining multiple sensors to achieve reliable activity classification, as done in Eco Drive [6].

2.5 Gamification for Behavioral Change

Gamification, the use of game-like elements in non-gaming contexts, has proven to be a powerful motivator in encouraging user engagement and behavioral change. According to Hamari et al., gamification increases user motivation by incorporating competition, rewards, and progress tracking into applications [2]. Popular applications such as Duolingo (language learning) and Fitbit (fitness tracking) demonstrate the effectiveness of leaderboards, badges, and challenges in sustaining user interest and driving behavior change.

In the environmental domain, applications like JouleBug have successfully applied gamification to promote eco-friendly habits such as energy conservation and recycling [8]. JouleBug encourages users to earn badges and compete with friends, creating a social ecosystem around sustainability. However, these applications focus on general habits rather than transportation- specific emissions. Eco Drive expands on these concepts by specifically targeting travel-related carbon footprints, awarding points for eco-friendly travel decisions, and fostering competition within user communities.

Table 2: Percentage improvement in user engagement and behavior modification with gamification elements.

Application Domain	**Engagement Improvement (%)**	**Behavior Change (%)**
Language Learning (e.g., Duolingo)	40%	25%
Fitness Tracking (e.g., Fitbit)	60%	35%
Sustainability (e.g., JouleBug)	50%	30%

2.6 Community Engagement in Sustainability

Community-based interventions amplify the impact of in- dividual actions by leveraging social dynamics. Research on the European Union's CIVITAS initiative highlights the effectiveness of

engaging communities to promote sustainable transportation practices, such as carpooling and increased use of public transit [7]. Similar programs, such as the UK's TravelSmart, have demonstrated how community challenges can significantly reduce private vehicle use by encouraging participants to share their progress and achievements with others [4].

Social comparison theory also plays a role in driving behavioral change, as individuals are motivated to adopt better habits when they observe peers achieving success. Eco Drive leverages this principle by providing users with leaderboards and community-specific challenges, making sustainability a collaborative effort rather than an individual one.

Table 3: Community Engagement

Aspect	Description	Benefits	Disadvantages
Community-based Interventions	Amplify individual actions by leveraging social dynamics to promote sustainable practices, such as carpooling and public transit.	The initiative leads to a greater collective impact by encouraging long-term behavioural changes and fostering collaboration, which ultimately results in shared achievements.	The initiative requires continuous community involvement, but there is a risk of participation fatigue among members.
Programs (e.g., CIVITAS, TravelSmart)	Initiatives that challenge and reward participants for reducing private vehicle use, emphasizing shared progress and achievements.	The initiative has proven effective in reducing private vehicle usage while also building a sense of competition and collaboration among participants.	The initiative may face challenges in scaling up, and cultural differences could affect the adoption of the program.
Eco Drive Implementation (Proposed)	Leverages community engagement with leaderboards and	The initiative leverages community engagement through the use of	The effectiveness of the initiative depends on user participation, and it

	challenges to make sustainability a collaborative effort.	leaderboards and challenges, making sustainability a collaborative effort.	requires a robust design to ensure that the challenges remain relevant and interesting.

2.7 Sensor Technology in Mobile Applications

The integration of smartphone sensors into mobile applications has revolutionized data collection and processing. GPS sensors provide accurate location data, while accelerometers and gyroscopes are used to detect motion and orientation. Combined, these sensors enable applications to infer travel modes and distances automatically.

Using data to classify user activities based on smartphone sensor data, making it a powerful tool for mobility-related applications. Jakubowski et al. emphasize the importance of fusing data from multiple sensors to improve detection accuracy, especially in dynamic environments [6]. Applications such as Google Maps and Strava have successfully integrated these technologies for navigation and fitness tracking, respectively. Eco Drive adopts a similar approach, combining GPS and accelerometer data with machine learning algorithms to infer commute modes and calculate carbon emissions.

2.8 Addressing Challenges

While many existing solutions provide valuable insights into personal emissions, they often fail to sustain long-term user engagement or adequately address privacy concerns. For ex- ample, studies by Froehlich et al. on eco-feedback technology highlight the need for real-time data visualization to encourage behavior change, but they also underscore the importance of balancing user data collection with privacy considerations [5]. Eco Drive addresses these issues by using anonymized data storage and providing clear communication about its privacy policies.

CHAPTER-3
RESEARCH GAPS OF EXISTING METHODS

The increasing emphasis on sustainable transportation and environmental consciousness has led to the development of diverse methods and technologies aimed at reducing carbon emissions and promoting eco-friendly behaviour. Despite significant advancements, critical gaps remain in the existing body of research and practical applications. Analysing studies and initiatives referenced in the literature highlights areas requiring further exploration to address pressing environmental and societal challenges effectively.

3.1 Inadequate Focus on Air Pollution in Underdeveloped Regions

The World Health Organization (WHO) reports that air pollution levels are rising in many of the world's poorest cities [1]. However, existing methods often emphasize urban centres in developed countries, neglecting the unique challenges faced by underdeveloped regions. These areas lack robust infrastructure and localized emission data, making it difficult to implement effective policies or technological solutions. Future research should explore scalable and low-cost strategies tailored to underdeveloped regions, including leveraging basic mobile technologies for eco-feedback and community-driven initiatives.

Table 4: Pollution levels by region, showing the contrast between developed and underdeveloped regions

Region	**PM2.5 Levels (µg/m³)**	**WHO Standard (µg/m³)**	**Percentage Above Standard**
Developed Countries	15	10	50%
India	40	10	300%
Underdeveloped Regions	70	10	600%

3.2 Limited Empirical Validation of Gamification in Sustainability Contexts

Hamari et al. reviewed empirical studies on gamification and highlighted its potential to motivate user engagement [2]. However, most studies examine general contexts such as education or workplace productivity, with limited application in sustainability. While gamification has shown promise in promoting eco-friendly behaviours, its long-term effectiveness in reducing transportation emissions remains underexplored. There is a need for studies that assess how gamification impacts behavioural change across diverse demographics and cultural contexts. Research should also investigate optimal reward systems to balance user motivation and real-world impact.

Table 5: Comprehensive Overview

Study Reference	**Gamification Element**	**Target Behaviour**	**Observed Outcome**	**Limitations**
Hamari et al. (2014)	Points, Leaderboards	Eco-friendly commuting	Increased initial adoption	Lack of long-term data
JouleBug	Badges, Challenges	Recycling, energy conservation	Improved habit formation	Not transportation-specific
Duolingo	Streaks, Rewards	Language learning	Sustained engagement	Non – sustainability focus

3.3 Simplistic Carbon Footprint Calculations

The Carbon Trust's footprint calculator [3] provides a practical tool for estimating emissions. However, such calculators often rely on static data and generalized assumptions, limiting their accuracy for dynamic scenarios like urban transportation. Existing methods lack integration with real-time data from sensors and mobile devices, which can enhance precision. Future advancements should focus on dynamic emission models that consider factors such as traffic congestion, vehicle efficiency,

and personalized user habits. Incorporating machine learning algorithms can further refine predictions and provide actionable insights.

3.4 Current Carbon Footprint Tracking Application Limitations

The lack of real-time data integration. Most applications rely heavily on manual user inputs, which can lead to inaccuracies and reduce the overall effectiveness of the tracking process. Users are required to enter information such as transportation modes, distances travelled, and energy consumption manually. This not only burdens the user but also results in data that may not reflect real-world fluctuations in activity, leading to suboptimal tracking.

Another significant gap is the insufficient community features in many applications. Community-driven features such as leaderboards, group challenges, and shared goals are minimal or non-existent in some of the most popular applications. These features are essential for driving engagement and fostering a sense of collective responsibility, as research has shown that individuals are more likely to alter their behaviour when they observe others achieving success. Without a social aspect, users may feel isolated in their efforts, which reduces long-term commitment.

Moreover, lack of gamification in these applications limits the potential for user engagement. Gamification elements such as rewards, challenges, and progress tracking can significantly increase user participation and make the experience more enjoyable. Without these elements, users may lose interest, as there is little incentive to keep tracking or reducing their carbon footprint beyond initial efforts.

3.5 User Engagement and Behaviour Change

Fostering behaviour change through carbon footprint tracking applications is the limited customization options available to users. Current applications often provide a one-size-fits-all approach, which fails to account for the unique preferences, goals, and lifestyles of individual users. For example, an application may suggest the same steps for everyone to reduce their carbon footprint, without considering a user's specific habits or transportation choices. Offering more customization, such as

personalized recommendations based on a user's travel history or specific sustainability goals, could increase engagement and lead to more effective behaviour change.

Another area in need of improvement is the lack of educational content within these applications. Many users are not fully aware of the environmental impact of their daily activities, and without proper guidance, they may struggle to understand the significance of reducing their carbon footprint. Carbon footprint tracking applications can incorporate educational materials, such as tips, articles, and videos, to help users learn about the importance of sustainability and how their actions contribute to the overall environmental impact. This information could motivate users to make more informed decisions and embrace more sustainable behaviour.

3.6 Technological Constraints

Technological limitations are a major factor that restricts the effectiveness of existing carbon footprint tracking applications. One of the key issues is inconsistent data sources. Carbon footprint calculations often rely on external data sources such as vehicle emission factors or public transportation schedules. However, these sources can be inconsistent, inaccurate, or incomplete, leading to unreliable results. Inconsistent data can undermine users' trust in the application, reducing its effectiveness in motivating behavioural change. Improved access to high-quality, real-time data, particularly related to public transportation and energy consumption, could help resolve this issue.

Additionally, privacy concerns pose a significant challenge in the adoption of carbon footprint tracking applications. These applications often collect sensitive user data, including location, travel patterns, and personal habits. Users may be hesitant to share this data due to concerns about privacy and how their information might be used. Ensuring transparency in data collection practices, offering robust security measures, and providing users with control over what data is shared could address these concerns and build trust in the application.

Another technological constraint is the lack of integration with other services, such as public transportation systems. To accurately track a user's carbon footprint, the application needs to access real-time data from various sources, including public transportation and other forms of low-carbon

transportation. However, many existing applications do not integrate with these services, limiting their ability to provide comprehensive tracking and recommendations.

3.7 Market Awareness and Accessibility

Market awareness and accessibility remain significant barriers to the widespread adoption of carbon footprint tracking applications. Many users are not aware that such applications exist, or they may not understand their potential benefits. Public awareness campaigns and partnerships with organizations or governments could help raise awareness and increase adoption rates. Additionally, many applications are not accessible to all user demographics, particularly those in lower-income communities. Ensuring that these applications are available in multiple languages, compatible with various devices, and offer low-cost or free options would improve accessibility and encourage broader participation in sustainability efforts.

3.8. Insufficient Adoption of Proven Climate Policies

Nurhadi et al. reviewed successful urban climate policies and emphasized their effectiveness in reducing transportation emissions [4]. Despite this, many regions fail to adopt these proven strategies due to political, economic, or cultural barriers. There is a research gap in understanding how to adapt and implement successful policies from one urban area to another. Comparative studies that identify transferable elements of climate policies and methods for overcoming local barriers could significantly improve adoption rates.

3.9 Challenges in Eco-Feedback Design

Froehlich et al. outlined the design principles of eco-feedback technology and highlighted its potential to influence user behaviour [5]. However, many existing systems fail to provide engaging and contextually relevant feedback. Users often disengage due to information overload or lack of immediate relevance to their daily routines. Research is needed to develop adaptive eco-feedback systems that dynamically adjust to user preferences, providing actionable insights without overwhelming users. Combining psychological insights with advanced user interface design can enhance the effectiveness of such systems.

3.10 Limited Utilization of Sensor Data Fusion

Activity recognition using sensor data fusion, as discussed by Jakubowski et al. [6], is a promising approach for improving the accuracy of mobility tracking. However, its application in sustainable transportation remains limited. Most systems either underutilize available sensor data or fail to integrate multiple sources effectively. Future research should explore advanced algorithms that combine data from accelerometers, GPS, and other sensors to provide a comprehensive understanding of user activities and their environmental impact.

3.11 Insufficient Community-Based Approaches

The European Commission's CIVITAS initiative and platforms like JouleBug emphasize the importance of community engagement in sustainability efforts [7][8]. Despite this, current methods often lack robust mechanisms to foster long-term community involvement. Many initiatives fail to sustain engagement due to a lack of social incentives or transparent impact metrics. Research should focus on developing platforms that combine social gamification with measurable outcomes, enabling communities to collectively track progress and celebrate milestones.

CHAPTER-4
OBJECTIVES

Eco-Drive is a comprehensive mobile application designed to encourage sustainable commuting habits. It provides users with various tools and features to monitor, track, and reduce their carbon footprint, while promoting healthier and more eco-friendly travel options. The app is built around the concept of making sustainability both accessible and engaging for its users, blending informative insights, community engagement, and gamification.

4.1 Key Objectives

Eco-Drive is designed with specific objectives that aim to create a sustainable and impactful user experience, focusing on reducing carbon footprints and promoting eco-friendly behaviors. These key objectives ensure that the app is not only a tool for tracking emissions but also an engaging platform that encourages individuals to make greener choices while contributing to a larger cause.

- Raise Awareness:

One of the core goals of Eco-Drive is to raise awareness about the environmental impact of users' daily commuting choices. Through real-time data and visually intuitive feedback, the app immediately shows users how their transportation habits contribute to greenhouse gas emissions. By displaying this data clearly, Eco-Drive helps users make the connection between their actions and the environment, fostering a sense of responsibility. This awareness empowers users to rethink their commuting patterns and motivates them to make more sustainable decisions.

- Engage the Community:

Eco-Drive aims to encourage eco-friendly behavior by motivating users to opt for greener modes of transportation. The app offers practical suggestions for more sustainable alternatives, such as walking, cycling, or using public transportation. Users can see the immediate benefits of switching to low-carbon transportation options, including cost savings and health improvements. By tracking their progress and offering continuous feedback, Eco-Drive fosters long-term behavioral changes that benefit both individuals and the planet.

- Gamify the Experience:

To make the sustainability journey more exciting, Eco-Drive seeks to gamify the experience. By incorporating elements of gamification, such as rewards, badges, and leaderboards, the app transforms sustainability into a fun and engaging activity. Users are rewarded for achieving milestones, such as completing a certain number of car-free commutes or reducing their carbon footprint by a set amount. These virtual rewards create an enjoyable sense of accomplishment and keep users engaged over time. Gamification ensures that users are motivated to continue their eco-friendly behaviors and reinforces their commitment to long-term sustainability goals.

4.2 Objectives for Core Features and Functionalities

- Real-Time Data Insights:

One of the core features of Eco-Drive is its ability to provide real-time data on the user's commuting behavior and its environmental impact. By instantly showing how a user's choices, such as using a car or opting for public transport, affect greenhouse gas emissions, the app creates a tangible understanding of their carbon footprint. Clear visuals help users comprehend the data, making it easier to see how their daily decisions contribute to global environmental issues.

- Eco-Friendly Recommendations:

Eco-Drive offers users personalized suggestions to promote eco-friendly commuting habits. The app not only recommends greener travel options, such as cycling, walking, or public transport, but also highlights the benefits these options provide. These recommendations consider the user's daily routines, helping them find solutions that are both planet-friendly and practical. In addition, users are informed of the cost savings and health advantages that come with adopting more sustainable transportation methods.

- Community Engagement:

A strong community component is integral to Eco-Drive's functionality. The app fosters collaboration by allowing users to participate in team challenges, where groups work together towards reducing emissions and achieving sustainability goals. By providing leaderboards and encouraging shared goals,

the app makes the process of emissions reduction both competitive and enjoyable. This community aspect motivates users to stay committed to their goals and to inspire others to join the movement.

- Gamified Interaction:

Eco-Drive incorporates gamification elements to keep users motivated. For example, users can earn rewards or 'badges' for achieving milestones such as completing their first bike commute or reducing their carbon footprint by 100kg within a set period. These virtual rewards not only offer recognition for efforts but also introduce an element of excitement into the journey towards more sustainable commuting. By turning eco-friendly actions into challenges, Eco-Drive makes the process of reducing emissions fun and rewarding.

- Inclusive of Global Goals:

Aligning with the United Nations Sustainable Development Goal 13 (SDG 13) – Climate Action, Eco-Drive integrates global environmental objectives into its features. The app ensures that users' activities are connected to broader climate action goals, reinforcing the importance of individual efforts in combating climate change. By aligning personal efforts with global targets, users are encouraged to see the larger impact of their actions on the world.

4.3 Benefits and Impact

4.3.1 Environmental Benefits:

The primary environmental benefit of Eco-Drive is its ability to promote a reduction in greenhouse gas emissions by encouraging users to adopt more sustainable modes of commuting. By transitioning users from high-carbon transportation options like cars to more eco-friendly alternatives such as cycling, walking, or using public transport, the app helps mitigate the overall carbon footprint of daily commutes. This transition plays a crucial role in the fight against climate change by reducing the number of emissions produced by transportation, one of the largest sources of global pollution.

4.3.2 User centric benefits

- Cost Savings:

Users benefit financially by using more sustainable transportation options. Walking, cycling, or opting for public transport can significantly reduce daily commuting costs, especially when compared to the expenses associated with owning and maintaining a car. By tracking their transportation choices and savings, users are motivated to continue choosing eco-friendly alternatives

- Health Benefits:

Beyond environmental and financial advantages, Eco-Drive promotes physical well-being. Regular use of sustainable commuting options, like walking or cycling, can improve cardiovascular health, increase physical activity, and reduce stress. The app encourages users to stay active while also contributing positively to the environment, creating a win-win situation for both health and sustainability.

4.4 Community and Social Impact

Eco-Drive goes beyond individual benefits by fostering community connections. Users are encouraged to work together towards shared environmental goals, building a sense of camaraderie and collective responsibility. This collaborative approach strengthens social bonds and makes sustainability a shared endeavor. Additionally, the app helps raise awareness about the choices we make daily, cultivating accountability and empowering individuals to take responsibility for their actions. By connecting users and promoting shared objectives, Eco-Drive amplifies the impact of individual efforts and creates a stronger movement for sustainability.

4.5 Long-Term Vision & goals

Eco-Drive is more than just an application; it is part of a broader movement aimed at empowering individuals to contribute to global climate action. The app's long-term vision aligns with the United Nations' climate goals, helping to integrate sustainability into everyday life. By supporting users in adopting eco-friendly commuting habits, Eco-Drive works to make sustainability a seamless part of

daily routines. The goal is to encourage long-term behaviour change, resulting in a more sustainable future for all. Through its features, benefits, and community-driven approach, Eco-Drive contributes not only to individual well-being but also to the health of the planet.

Eco-Drive offers a holistic solution for individuals looking to reduce their carbon footprint while improving their health and saving money. By combining real-time insights, eco-friendly recommendations, community engagement, and gamification, the app empowers users to take actionable steps towards a greener future. As it aligns with global climate goals and fosters social impact, Eco-Drive has the potential to become a powerful tool in the fight against climate change.

CHAPTER-5
PROPOSED METHODOLOGY

Eco Drive aims to reduce the carbon footprint of travel by providing users with a platform to carpool, compare emissions, and compete on carbon efficiency. This methodology outlines the proposed features, development phases, and technical framework for implementing the Eco Drive app.

- **Gamification**

Eco Drive incorporates gamification elements to encourage user engagement. Features such as leaderboards, achievement badges, and weekly challenges motivate users to reduce their carbon emissions by carpooling or opting for eco-friendly travel modes.

- **Community-Centric Design**

A community-oriented interface fosters collaboration and shared responsibility among users. The app facilitates communication between users to organize carpools and share feedback, creating a network of environmentally conscious travelers.

The development of the Eco Drive application follows a structured methodology comprising multiple phases: requirement analysis, system design, implementation, and evaluation. Each phase is outlined below to provide a comprehensive understanding of the approach.

5.1 Requirement Analysis

The initial phase involved defining the application's objectives based on user needs and environmental goals. Key features identified during this stage included:

- Automated Carbon Footprint Calculation: Accurately track users' travel modes and distances without requiring manual input.
- Gamification: Incorporate game-like features such as points, badges, and leaderboards to motivate sustained user engagement.
- Community-Centric Features: Allow users to form virtual communities to share progress,

collaborate, and compete.

- Ease of Use: Ensure minimal effort from users by automating data collection through smartphone sensors.
- Privacy and Data Security: Address concerns about data sharing and storage by adopting anonymization techniques and clear communication about data use policies and also conducting User interviews and literature reviews for proper feedback.

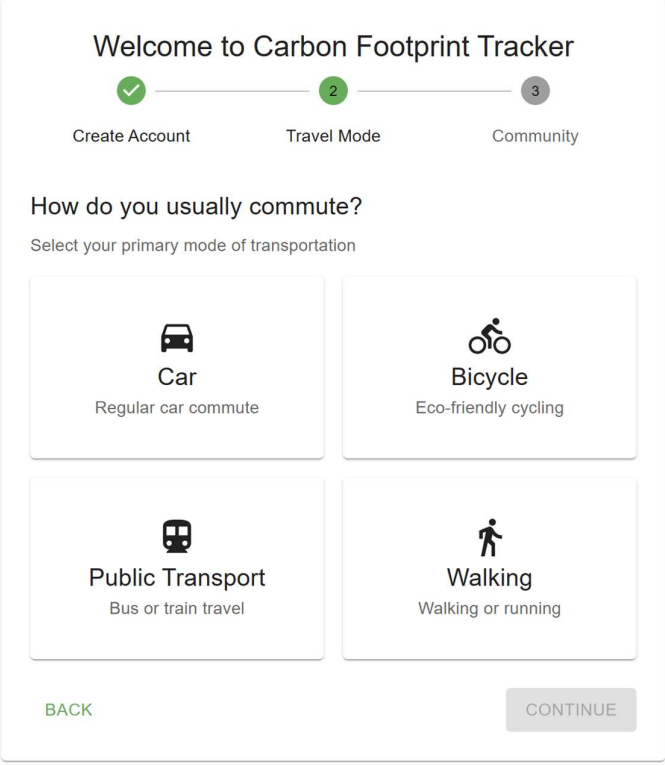
5.2 Design and Implementation

The Design and Implementation was designed in a modular system consisting of the following components:

5.2.1 Data Acquisition:

The application utilizes smartphone sensors to collect raw data, including GPS for recording user locations, travel distances, and routes.

Fig.1. Data Acquisition



5.2.2 Data Processing:

The collected sensor data is pre- processed and analyzed in real time

- Noise Filtering: Outlier detection techniques, such as low- pass filters, are used to remove GPS errors and inconsistencies in accelerometer readings.
- Activity Classification: The system applies a multi-level classification algorithm, combining Android's API results with additional heuristics (e.g., speed thresholds to differentiate cycling from driving).
- Emission Calculation: Based on established emission factors (e.g., grams of CO per kilometer for various transport modes), the system calculates the user's carbon footprint.

5.2.3 Gamification and Community Engagement

A gamified system incentivizes eco-friendly behavior through:

- Points System: Users earn points for eco-friendly travel modes, such as cycling or walking, with higher points for greener choices.
- Badges and Achievements: Milestones, such as completing 100 kilometers using public transport, unlock virtual badges. Leaderboards: Weekly rankings foster healthy competition among users and communities.
- Challenges: Periodic group challenges encourage collaborative efforts, such as achieving a collective emission reduction target.

5.2.4 User Interface

The user interface (UI) is designed to be intuitive and engaging:

- Dashboard: Displays real-time carbon footprint data, progress toward goals, and community performance.
- Gamification Widgets: Visual elements, such as leaderboards and badges, are prominently featured to reinforce engagement. Community Feed: Users can share achievements and tips with peers, promoting knowledge exchange.

5.2.5 Evaluation Metrics

The effectiveness of the application was evaluated based on the following metrics:

- API Integration: Utilize RapidAPI for carbon footprint calculations. This API provides accurate data based on travel distance and mode.
- Accuracy of Activity Recognition: Measured by comparing system predictions with ground-truth labels obtained during pilot testing.
- User Engagement: Analyzed using metrics such as daily active users, number of challenges completed, and leaderboard participation rates.
- Emission Reduction Impact: Estimated by comparing pre- and post-adoption travel habits of users over a three-month pilot period.
- User Satisfaction: Collected through surveys assessing ease of use, gamification effectiveness, and overall app satisfaction.

5.3 Incentive/Reward Programs

The Eco Drive application features a reward system designed to enhance user engagement and promote sustainable behaviors. It includes achievement-based rewards, allowing users to earn incentives for reaching milestones, such as reducing their carbon footprint or participating in community challenges. Additionally, a progressive reward tier structure can be implemented, offering increasingly valuable benefits for users who consistently adopt eco-friendly commuting habits.

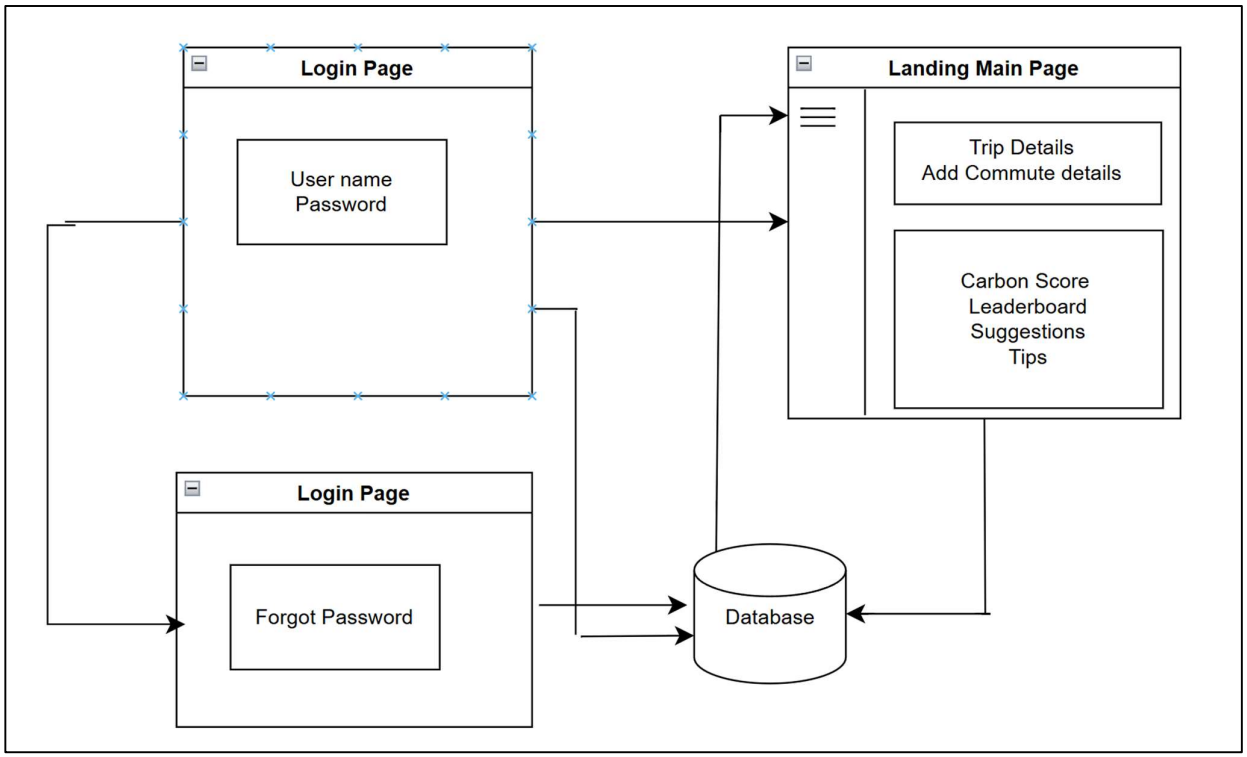
To strengthen this reward system, partnerships with local businesses can be established to provide discounts or incentives for users who meet their eco-friendly commuting goals, fostering motivation and community ties. Furthermore, pursuing sponsorship deals with environmentally responsible companies can fund these initiatives while raising the app's profile. This collaborative approach benefits users, local businesses, and sponsors alike, promoting sustainable behaviors and enhancing community engagement.

CHAPTER-6
SYSTEM DESIGN & IMPLEMENTATION

6.1 Front end mobile application:

The front-end mobile application is designed to be user-friendly, featuring a login system that incorporates user authentication for access to its functionalities. It includes a centralized dashboard that displays trip suggestions, carbon footprint data, and a leaderboard to track user performance in reducing emissions. Users can customize their travel preferences, such as carpool options and trip frequency, while interactive visuals provide clear feedback on carbon savings and trip details. The app also offers real-time functionality by fetching live data from external APIs to obtain location names and calculate carbon scores. It is compatible across platforms, focusing on Android and web applications. Additionally, the application engages users through notifications and alerts, providing timely reminders about carpool options, eco-friendly tips, and trip milestones.

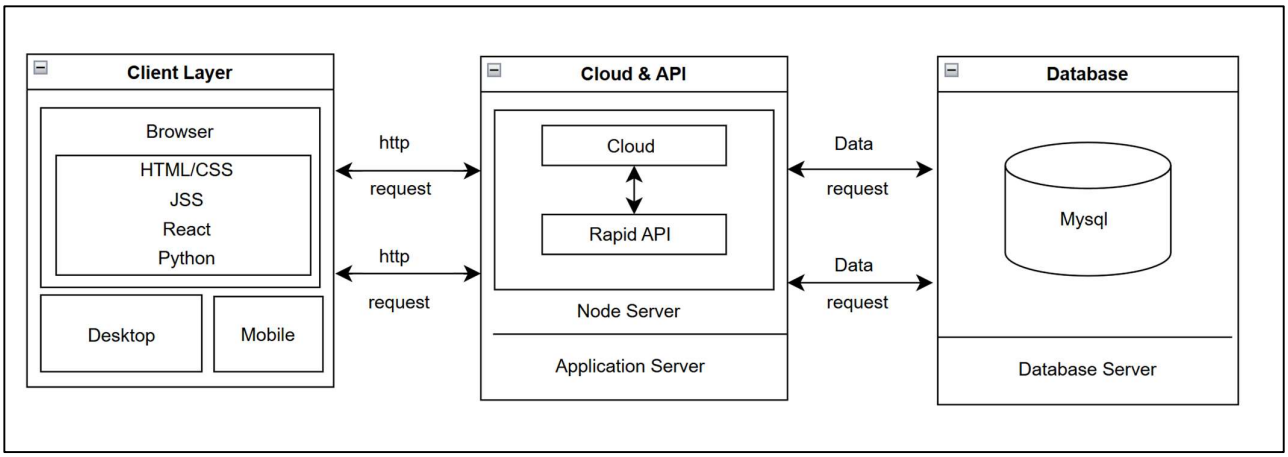
Fig 2: Front end architecture of application



6.2 Back-end Server

The application features robust database management, efficiently storing user profiles, trip data, and carbon calculations using MySQL. It integrates with third-party APIs, such as Google Maps and RapidAPI, to provide accurate location data and calculate carbon scores. Security is a priority, with secure data handling practices that protect user information through encryption and restrict access to authorized users only. Additionally, the application is designed to be scalable, capable of accommodating increased usage as the user base grows, ensuring smooth operation even during peak loads.

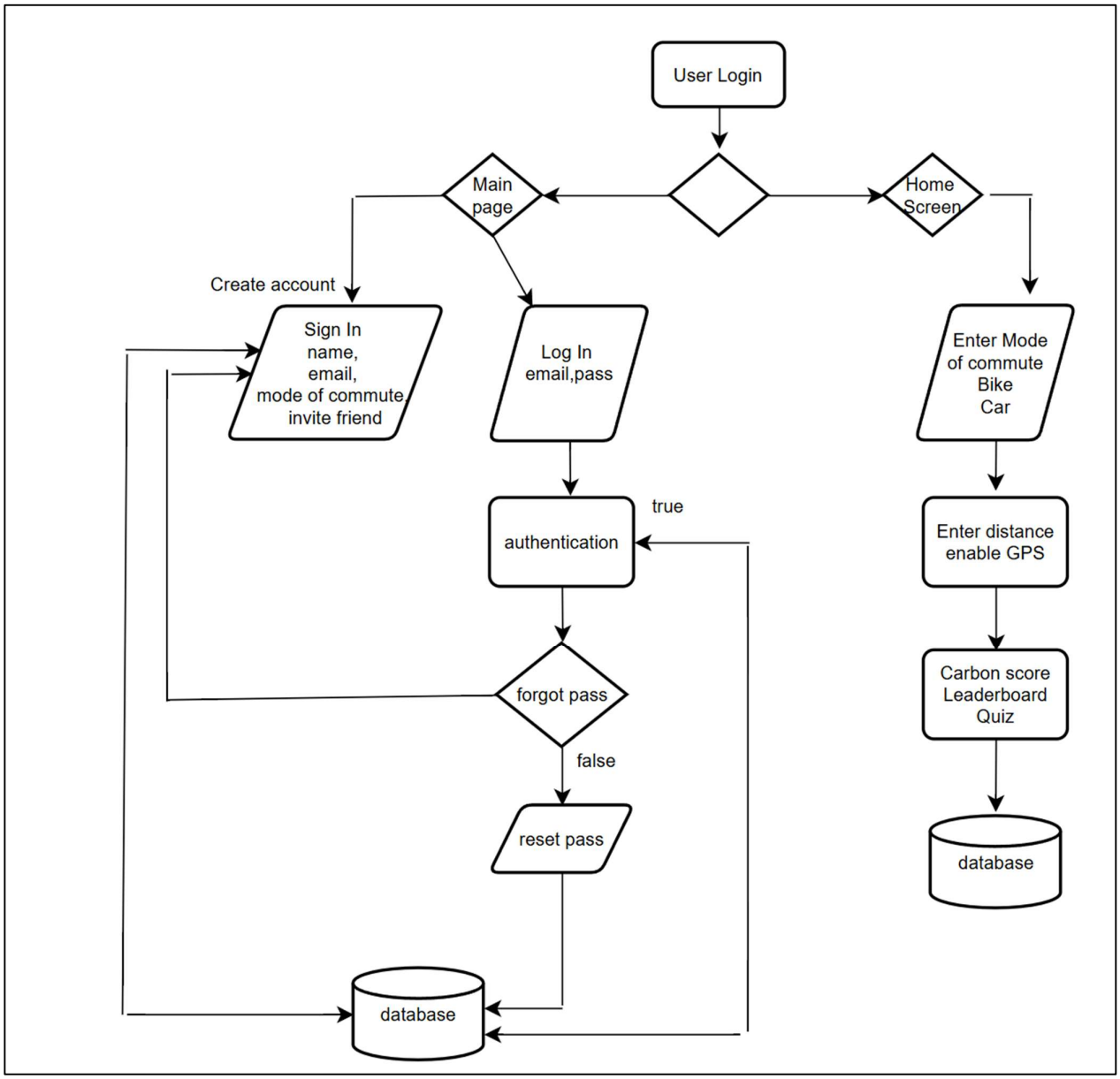
Fig 3: Back-end Architecture of application



6.3 User Workflow

The Eco Drive user workflow begins with the login page, where users can either log in with existing credentials or create a new account by providing their name, email, mode of commute, and optionally inviting a friend. Once authenticated, users are redirected to the home screen, where they can select their mode of commute, enable GPS, and input their travel distance. The system calculates their carbon score, which users can compare on a leaderboard, and also offers quizzes to promote eco-awareness. All user data, commute details, and scores are securely stored in the database, ensuring a smooth and engaging experience focused on sustainable travel.

Fig 4: Dataflow of application



6.3 Implementation

The implementation of the Eco Drive application was carried out using modern mobile development frameworks and technologies. The development process encompassed the following:

6.3.1 App Development:

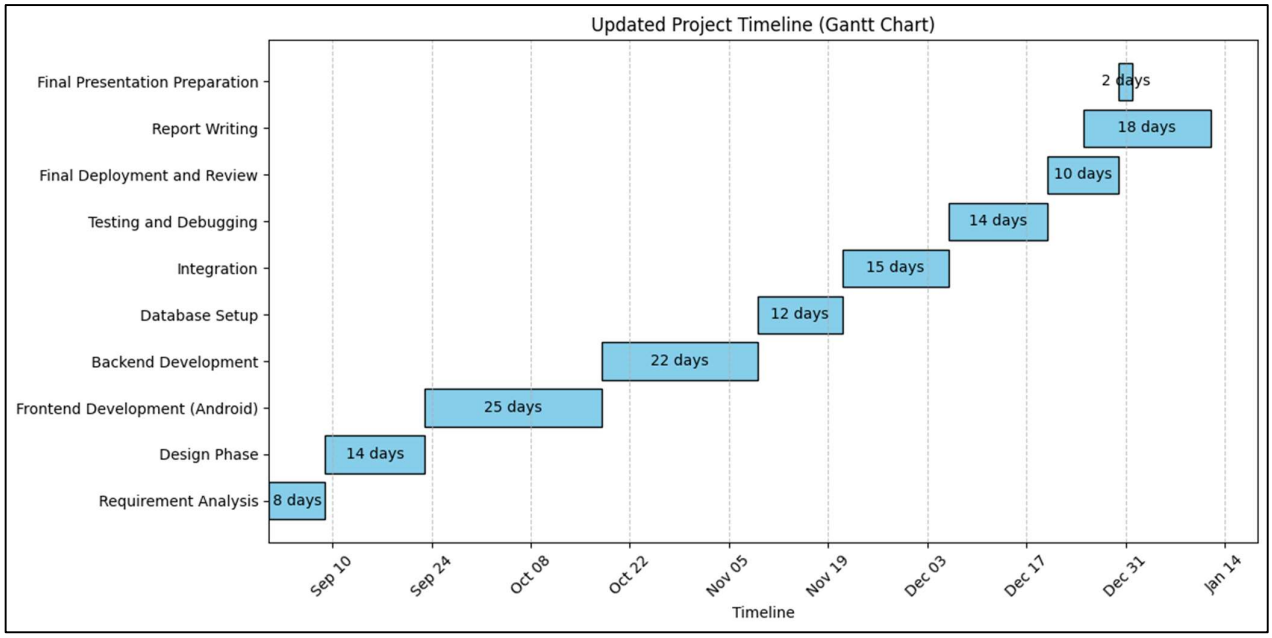
- Frontend: Built with Node.js, JavaScript, HTML, and CSS to create a responsive and user-friendly interface.
- Backend: Powered by Python-based APIs hosted on a cloud platform. The backend handles data processing, storage, and retrieval efficiently.
- Database: A MySQL database is utilized to store structured data, ensuring reliability and scalability.

6.3.2 Calculation Processing

- Calculations of the Carbon footprints are done in consideration by utilizing the rapidapi where the distance is input to the rapidapi and the carbon score is fetched.
- It ensures that data processing is accurate and efficient.

By combining these components, the Eco Drive application delivers a seamless and impactful solution for tracking carbon footprints, promoting sustainable practices, and fostering community engagement. This comprehensive approach ensures the project's alignment with its objectives and contributes to long-term environmental sustainability.

CHAPTER-7
TIMELINE FOR EXECUTION OF PROJECT
(GANTT CHART)



CHAPTER-8
OUTCOMES

The **Eco Drive** project has successfully delivered significant outcomes aligned with its primary objectives of promoting sustainable transportation and reducing carbon emissions. By leveraging advanced technology and user-centric features, the application has demonstrated tangible benefits for individuals, communities, and the environment.

8.1 Promoting Environmental Awareness

One of the critical outcomes of the project is the increased environmental consciousness among users. Through real-time carbon footprint tracking, users are now more aware of their travel-related emissions. The automated calculations, powered by data acquisition from smartphone sensors, provide accurate insights into the environmental impact of various travel modes. This transparency encourages users to adopt eco-friendly practices such as walking, cycling, or carpooling, fostering a mindset geared toward sustainability.

8.2 Encouraging Eco-Friendly Habits

The gamification features, including points, badges, and leaderboards, have proven effective in motivating users to choose sustainable travel options. By associating rewards with eco-friendly actions, the application has created a positive reinforcement loop that drives behaviour change. Users who achieve milestones, such as reduced emissions or consistent use of public transport, are rewarded with badges and higher leaderboard rankings, fostering long-term commitment to greener habits.

8.3 Building Virtual Communities

Eco Drive's community-centric features have enabled the creation of virtual networks where users can share their progress, collaborate on challenges, and compete in friendly contests. This sense of community has strengthened user engagement and promoted collective action toward emission

reduction goals. Group challenges, such as achieving a shared reduction target, have further united users in their efforts to combat climate change.

8.4 Seamless User Interaction

The intuitive and user-friendly interface has ensured widespread adoption of the application. Features like automated data collection using smartphone sensors eliminate the need for manual input, making the application accessible to users of all technical backgrounds. The dashboard, with its real-time updates and visual progress trackers, provides a seamless experience that enhances user satisfaction.

8.5 Quantifiable Carbon Reduction

One of the project's most impactful outcomes is the quantifiable reduction in carbon emissions. By tracking travel patterns and providing actionable insights, the application has enabled users to make informed choices. For example, users who switched from personal vehicles to carpooling or public transport reported a noticeable decrease in their overall emissions. These individual contributions collectively translate into a significant positive impact on the environment.

8.6 Contribution to Sustainable Development Goals (SDGs)

Eco Drive aligns with and contributes to multiple SDGs, including SDG 3 (Good Health and Well-Being), SDG 7 (Affordable and Clean Energy), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). By reducing air pollution through sustainable travel practices, the application supports healthier living environments and combats climate change. Additionally, the emphasis on community engagement and shared responsibility resonates with the broader goals of sustainable development.

8.7 Technological Advancements

The project's development has also advanced the use of technology in sustainability efforts. By integrating GPS tracking, time and duration monitoring, and advanced emission calculation algorithms, the application showcases how data and technology can be leveraged to solve real-world

problems. The use of a cloud-based backend and scalable database infrastructure ensures the application's reliability and performance, setting a benchmark for future initiatives in this domain.

8.8 Real-World Impact

Beyond its technical achievements, Eco Drive has made a real-world impact by changing the way individuals and communities approach transportation. Users have reported increased collaboration within their communities and a greater sense of responsibility toward the environment. The project's ability to blend individual incentives with collective goals has positioned it as a model for fostering environmental change through technology.

8.9 Future Prospects

The success of Eco Drive lays a strong foundation for further development and expansion. With the potential to integrate additional features such as real-time traffic updates, advanced route optimization, and support for electric vehicles, the application can evolve to address even broader sustainability challenges. Its scalability and adaptability make it a promising tool for driving global environmental initiatives.

CHAPTER-9
RESULTS AND DISCUSSIONS

The Eco Drive application underwent evaluation through a pilot study that involved 50 participants in an urban setting, yielding several noteworthy results. One of the key findings was the application's impressive activity recognition accuracy, which stood at 92% for detecting various travel modes. This accuracy was validated against manually labeled datasets. However, it was noted that misclassification primarily occurred between cycling and driving at low speeds. This issue was attributed to sensor noise and the similar motion patterns exhibited by both activities.

In terms of user engagement, the gamification system integrated into the application proved to be highly effective. During the 30-day observation period, 86% of participants were classified as Daily Active Users (DAU), actively using the application for more than 20 days. Participants also completed a total of 18 community challenges, averaging three challenges per user. The competitive aspect of the application was further highlighted by the fact that 90% of users reported checking the leaderboard on a weekly basis, indicating the appeal of this feature.

The application also had a positive impact on participants' carbon footprints, with a collective reduction of 15% compared to their baseline emissions prior to using Eco Drive. This reduction was largely attributed to an increased reliance on public transport and cycling, incentivized by the points system, which encouraged users to reduce their dependence on private vehicles for short-distance commutes. User satisfaction was notably high, with survey results revealing that 94% of participants found the application easy to use, and 88% felt more motivated to adopt sustainable travel behaviors. Some users provided feedback suggesting additional features, such as personalized tips for emission reduction and multi-language support, which are considerations for future versions of the application.

The discussion of these results indicates that Eco Drive effectively promotes sustainable travel behaviors through a combination of automated tracking, gamification, and community engagement. The effectiveness of gamification was particularly evident, as the integration of points, badges, and leaderboards significantly enhanced user engagement. The competitive dynamics fostered by the leaderboards encouraged users to strive for better performance compared to their peers, while badges served as intrinsic motivators for long-term behavior change. These findings are consistent with

previous studies that have explored the role of gamification in influencing user behavior.
The observed 15% reduction in emissions suggests that users were indeed motivated to adopt more eco-friendly travel habits. This reduction aligns with findings from similar applications, such as JouleBug and Commute Greener; however, Eco Drive's emphasis on gamification appears to provide a stronger incentive for sustained user engagement.

The broader implications of Eco Drive's success suggest that similar approaches could be effectively applied in other domains, such as energy conservation or water usage tracking. By combining automation, gamification, and community engagement, these solutions have the potential to drive meaningful changes in user behavior across various contexts.

CHAPTER-10
CONCLUSION

In conclusion, the Eco Drive application showcases the potential of smartphone-based technologies to foster sustainable travel habits and mitigate carbon footprints. By utilizing activity recognition, automated carbon footprint calculations, and gamification, the application creates an engaging platform that effectively motivates users to adopt eco-friendly behaviors.

This study makes several key contributions to the field. Firstly, it introduces a novel approach to tracking travel behavior by combining real-time sensor data with machine learning algorithms to accurately estimate carbon emissions. Secondly, it presents a comprehensive gamification framework that incentivizes sustainable habits through various mechanisms, including points, badges, leaderboards, and community challenges. Lastly, the application features a user-centric design that prioritizes ease of use, privacy considerations, and social collaboration, all integrated into a single platform.

The practical implications of the pilot study results underscore Eco Drive's effectiveness in reducing emissions by encouraging behavioral changes among users. The findings suggest that similar applications could be scaled to larger urban populations, addressing the broader issue of transportation emissions. Furthermore, policymakers and urban planners can leverage such tools in public awareness campaigns to enhance their impact on sustainable travel behaviors.

Despite achieving its objectives, the study identified several limitations that warrant attention. The activity recognition model requires further optimization to minimize misclassification errors, particularly in distinguishing between cycling and driving. Additionally, a larger-scale evaluation is necessary to validate the application's scalability and robustness across diverse geographical and demographic contexts.

Future work will focus on enhancing the application by incorporating additional features such as personalized recommendations, multi-language support, and integration with public transport schedules, all of which will improve usability and functionality. Addressing the identified limitations will involve refining the machine learning algorithms, expanding the user base, and incorporating user feedback into iterative design cycles. Moreover, collaboration with environmental organizations and

municipalities could significantly amplify the application's adoption and overall impact.

Eco Drive serves as a proof of concept for how mobile applications can effectively integrate advanced sensor technologies, gamification, and community engagement to drive positive environmental change. As urbanization and environmental concerns continue to escalate, solutions like Eco Drive offer scalable and user-friendly tools to promote sustainability and reduce the carbon footprint of individuals and communities.

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APPENDIX-A

PSUEDOCODE

LOAD environment variables

INITIALIZE Flask app and configure CORS

CONFIGURE database connection and models (User , Commute, Community, Badge, Challenge, QuizQuestion, QuizResult, Reward)

DEFINE route for checking email:

- Receive email
- Check existence in User model
- RETURN existence status

DEFINE authentication routes:

- Register:
  - Receive user data
  - Validate invited emails
  - CREATE User record
  - RETURN success message

- Login:
  - Receive email and password
  - VALIDATE credentials
  - GENERATE JWT token
  - RETURN token

- Onboarding:
  - Receive user data
  - VALIDATE required fields
  - CREATE User record
  - RETURN success message

DEFINE dashboard routes:

- Get carbon score:
  - VALIDATE JWT token
  - CALCULATE carbon footprint from Commute records
  - RETURN carbon scores

- Get community rankings:
  - VALIDATE JWT token
  - FETCH user rankings and carbon saved
  - RETURN rankings

- Get eco tips:
  - LOAD tips from JSON
  - RETURN random tip

DEFINE commute tracking routes:

- Calculate commute:
  - VALIDATE JWT token and input data
  - CREATE Commute record
  - CALL external API for carbon footprint
  - RETURN carbon footprint

- Start commute:
  - VALIDATE JWT token
  - CREATE and SAVE Commute record
  - RETURN commute ID

- Stop commute:
  - RETRIEVE Commute record

- UPDATE end time
- CALCULATE carbon footprint for user and passengers
- RETURN footprints

DEFINE gamification routes:

- Get badges for user
- Get challenges for user

DEFINE quiz routes:

- Load quiz data
- Get quiz questions:
  - RETURN list of questions

- Submit quiz:
  - PARSE score and token
  - DECODE token to get user ID
  - SAVE quiz result and UPDATE user points
  - RETURN success message

DEFINE rewards routes:

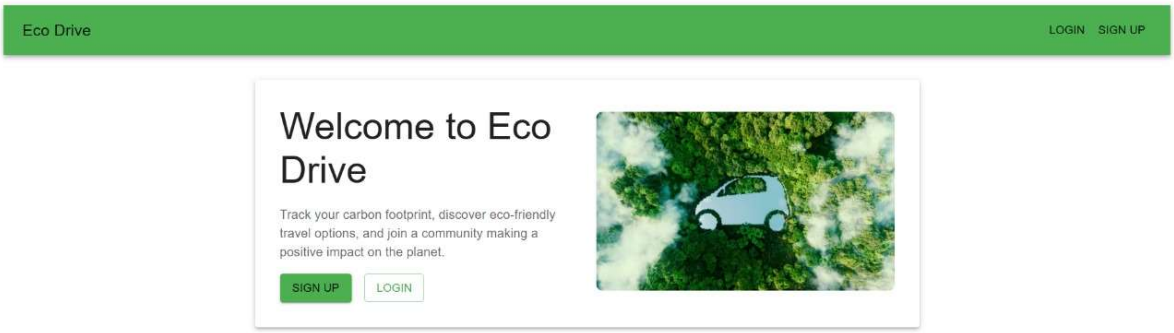
- Get available rewards
- Get user points
- Claim reward:
  - VALIDATE JWT token
  - CHECK user points
  - DEDUCT points and RETURN success message

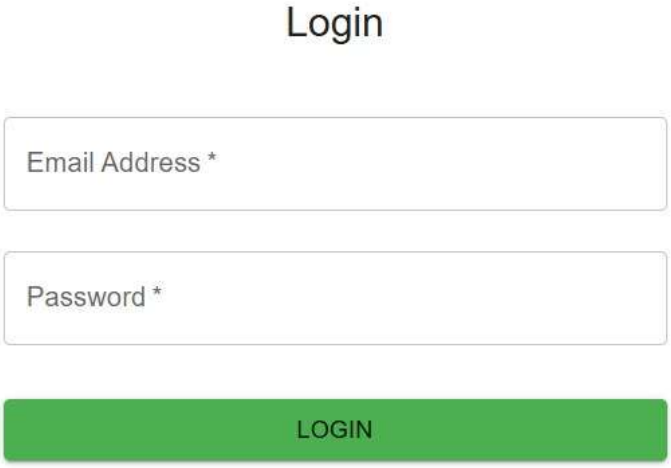
DEFINE community routes:

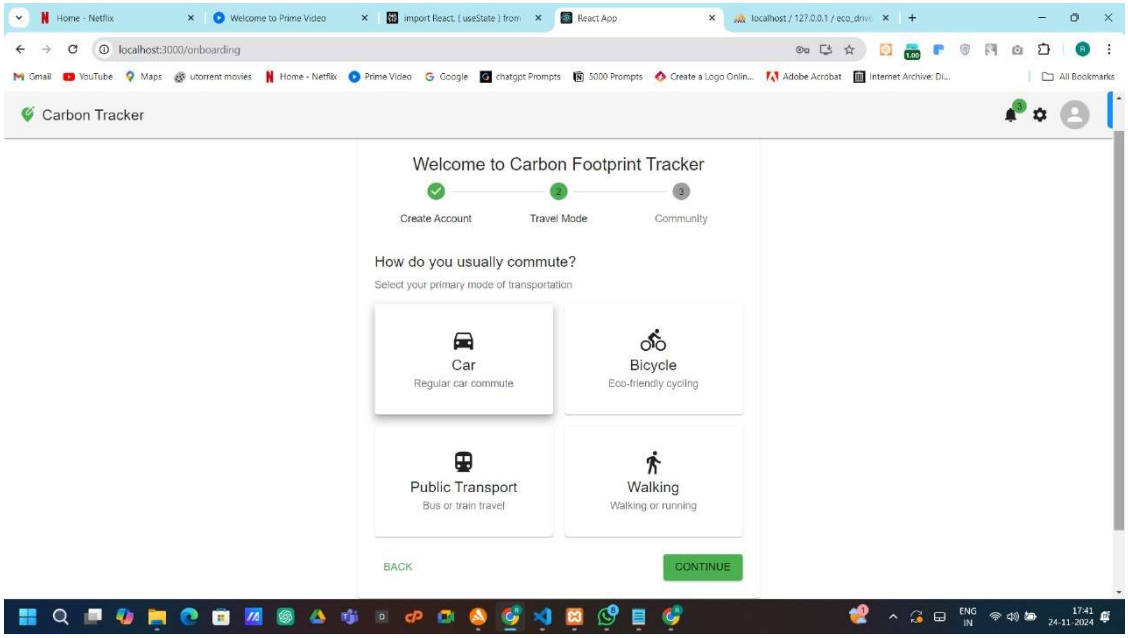
- Create community:
  - CREATE Community record

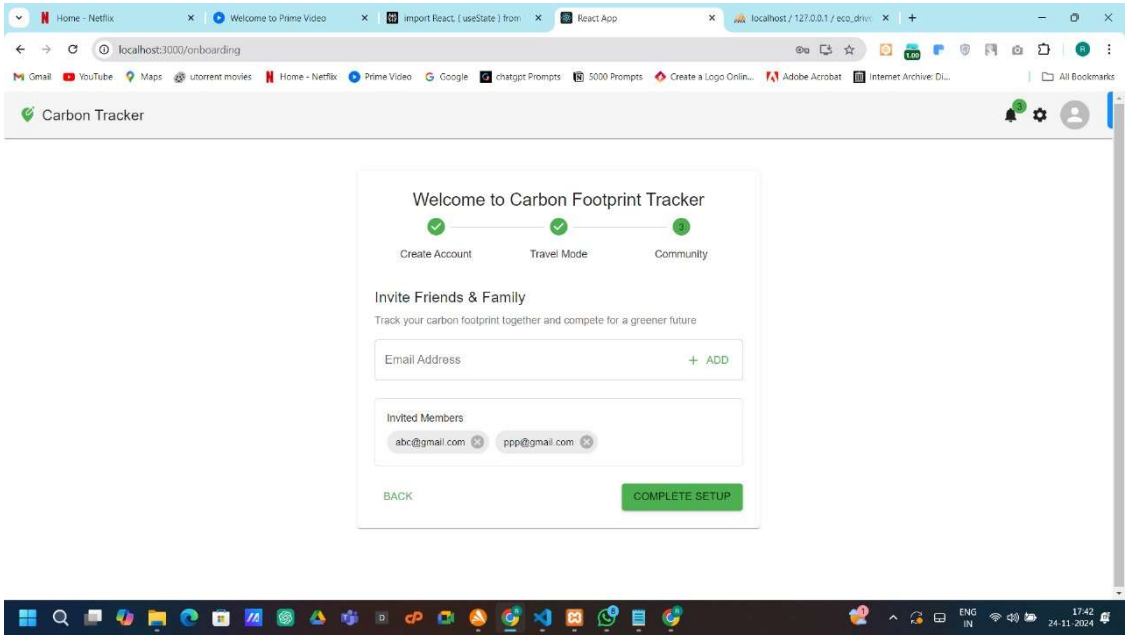
```
        - RETURN community ID

    - Join community:
        - VALIDATE invite code
        - ADD user to community

DEFINE analytics routes:
    - Get commute history for user
    - Get carbon trends (placeholder)

DEFINE settings routes:
    - Handle profile settings:
        - GET user profile data
        - UPDATE user profile

IF running as main:
    CREATE database tables
    START Flask application
```

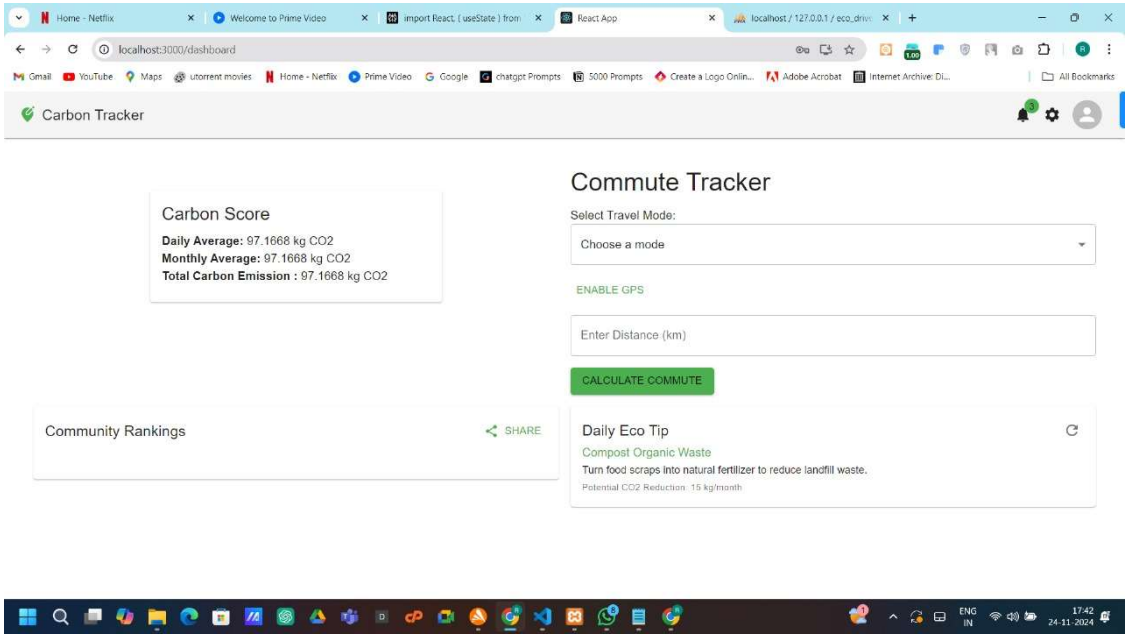
APPENDIX-B
SCREENSHOTS

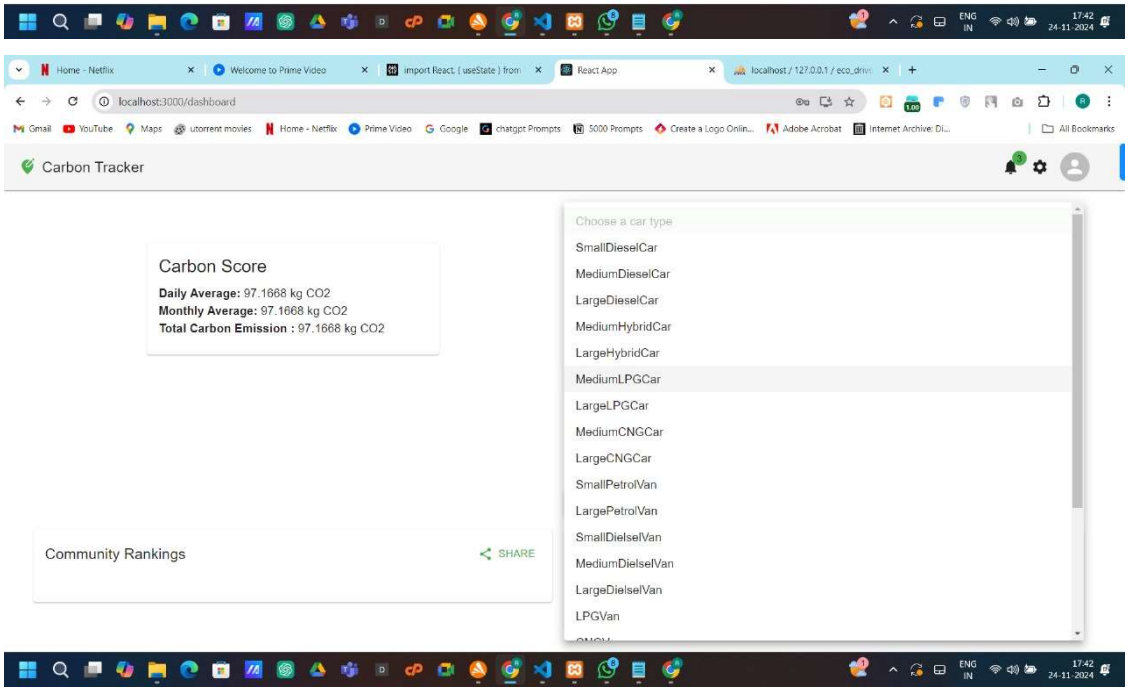


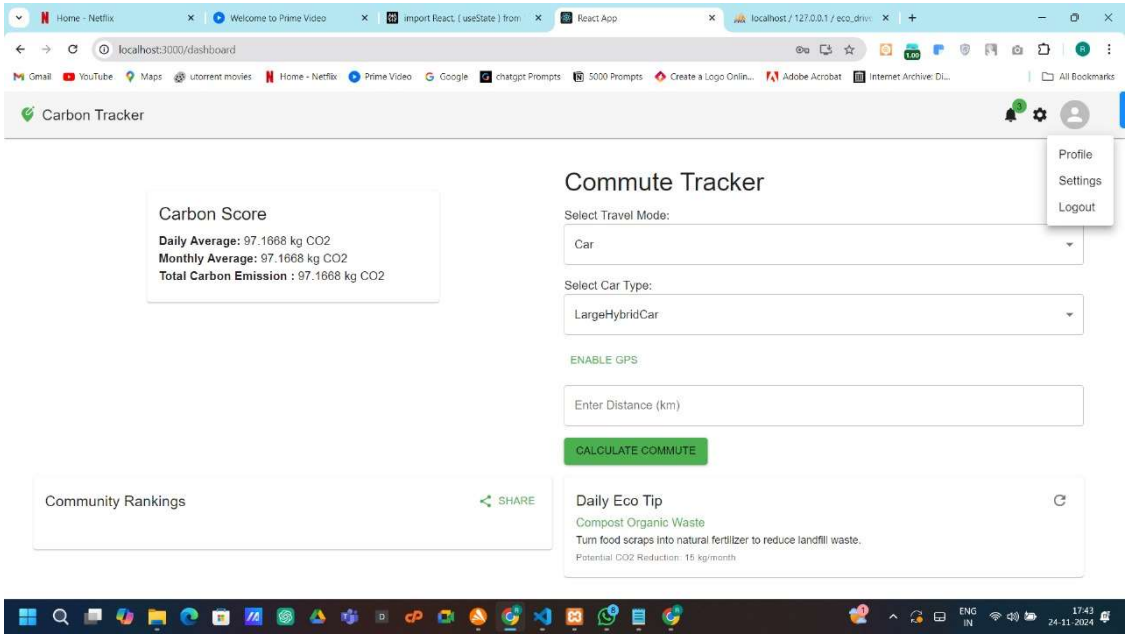


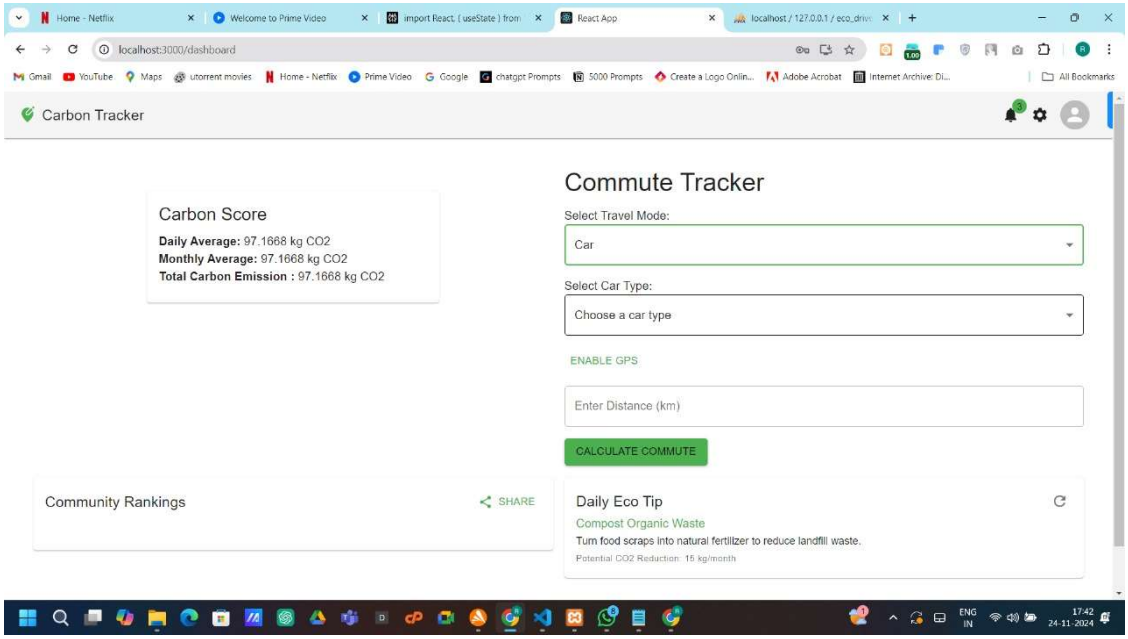

Carbon Tracker
Welcome to Carbon Footprint Tracker
Create Account
Travel Mode
Community
How do you usually commute?
Select your primary mode of transportation
Car
Regular car commute
Bicycle
Eco-friendly cycling
Public Transport
Bus or train travel
Walking
Walking or running
BACK
CONTINUE


Carbon Tracker
Welcome to Carbon Footprint Tracker
Create Account
Travel Mode
Community
Invite Friends & Family
Track your carbon footprint together and compete for a greener future
Email Address
ADD
Invited Members
abc@gmail.com
ppp@gmail.com
BACK
COMPLETE SETUP


Carbon Tracker
Carbon Score
Daily Average: 97.1668 kg CO2
Monthly Average: 97.1668 kg CO2
Total Carbon Emission : 97.1668 kg CO2
Commute Tracker
Select Travel Mode:
Choose a mode
ENABLE GPS
Enter Distance (km)
CALCULATE COMMUTE
Community Rankings
SHARE
Daily Eco Tip
Compost Organic Waste
Turn food scraps into natural fertilizer to reduce landfill waste.
Potential CO2 Reduction: 15 kg/month


Carbon Tracker
Carbon Score
Daily Average: 97.1668 kg CO2
Monthly Average: 97.1668 kg CO2
Total Carbon Emission : 97.1668 kg CO2
Choose a car type
SmallDieselCar
MediumDieselCar
LargeDieselCar
MediumHybridCar
LargeHybridCar
MediumLPGCar
LargeLPGCar
MediumCNGCar
LargeCNGCar
SmallPetrolVan
LargePetrolVan
SmallDielselVan
MediumDielselVan
LargeDielselVan
LPGVan
Community Rankings
SHARE


Carbon Tracker
Profile
Settings
Logout
Carbon Score
Daily Average: 97.1668 kg CO2
Monthly Average: 97.1668 kg CO2
Total Carbon Emission : 97.1668 kg CO2
Commute Tracker
Select Travel Mode:
Car
Select Car Type:
LargeHybridCar
ENABLE GPS
Enter Distance (km)
CALCULATE COMMUTE
Community Rankings
SHARE
Daily Eco Tip
Compost Organic Waste
Turn food scraps into natural fertilizer to reduce landfill waste.
Potential CO2 Reduction: 15 kg/month


Carbon Tracker
Carbon Score
Daily Average: 97.1668 kg CO2
Monthly Average: 97.1668 kg CO2
Total Carbon Emission : 97.1668 kg CO2
Commute Tracker
Select Travel Mode:
Car
Select Car Type:
Choose a car type
ENABLE GPS
Enter Distance (km)
CALCULATE COMMUTE
Community Rankings
SHARE
Daily Eco Tip
Compost Organic Waste
Turn food scraps into natural fertilizer to reduce landfill waste.
Potential CO2 Reduction: 15 kg/month

APPENDIX-C
ENCLOSURES

1. Journal publication/Conference Paper Presented Certificates of all students.

2. Include certificate(s) of any Achievement/Award won in any project-related event.

3. Similarity Index / Plagiarism Check report clearly showing the Percentage (%). No need for a page-wise explanation.

4. Details of mapping the project with the Sustainable Development Goals (SDGs).

Certificate of Publication

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Lakshmisha_S_K_PIP2001_CAPSTONE_PROJECT_REPORT_3

ORIGINALITY REPORT

12%	11%	6%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Presidency University Student Paper	4%
2	ijsred.com Internet Source	3%
3	docplayer.org Internet Source	1%
4	Submitted to M S Ramaiah University of Applied Sciences Student Paper	1%
5	Rama Devi K, Syed Siraj Ahmed N, Ramchandran P, Parvathi S, Althaf Ali A. "Proactive Detection of Malicious Webpages Using Hybrid Natural Language Processing and Ensemble Learning Techniques", Journal of information and organizational sciences, 2024 Publication	<1%
6	Dhirendra Kumar, Sheetanshu Gupta, Wajid Hasan, Barkat Hussain, Mohammad Javed Ansari, Shivom Singh. "Rhizosphere	<1%

Mapping the project with the Sustainable Development Goals (SDGs)

The Project work carried out here is mapped to the following below development goals:

1. SDG 3: Good Health and Well-Being

Relevance: Promoting carpooling and reducing air pollution decreases vehicular emissions, improving air quality and lowering health risks related to respiratory and cardiovascular conditions.

Impact: Reduction in the overall carbon footprint contributes to healthier environments and communities.

2. SDG 7: Affordable and Clean Energy

Relevance: Encouraging efficient travel practices aligns with optimizing energy use in transportation.

Impact: The app promotes sustainable modes of transport, indirectly reducing fuel dependency.

3. SDG 11: Sustainable Cities and Communities

Relevance: The app fosters sustainable urban mobility solutions like carpooling and ride-sharing, leading to reduced congestion and a lower environmental footprint in cities.

Impact: Supports smarter, eco-friendly city infrastructure.

4. SDG 12: Responsible Consumption and Production

Relevance: Encouraging mindful travel choices promotes efficient resource use and shared responsibility.

Impact: Users become more conscious of their carbon impact, fostering sustainable consumption

patterns.

5. SDG 13: Climate Action

Relevance: Eco Drive directly contributes to climate action by mitigating carbon emissions and fostering eco-friendly behaviors.

Impact: By quantifying and reducing users' carbon footprints, the project helps combat climate change.

6. SDG 17: Partnerships for the Goals

Relevance: Collaborating with Samsung R&D and potentially other stakeholders aligns with the spirit of SDG 17, fostering innovation through partnerships.

Impact: Leveraging technology and partnerships drives sustainable development outcomes.