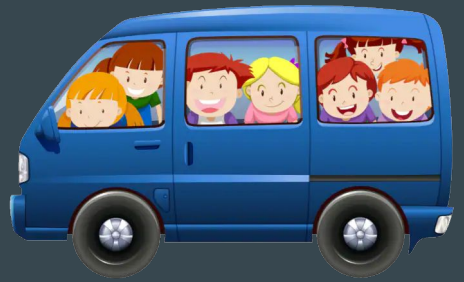
Panther Carpooling & Parking

Improving On-Campus Traffic and Parking



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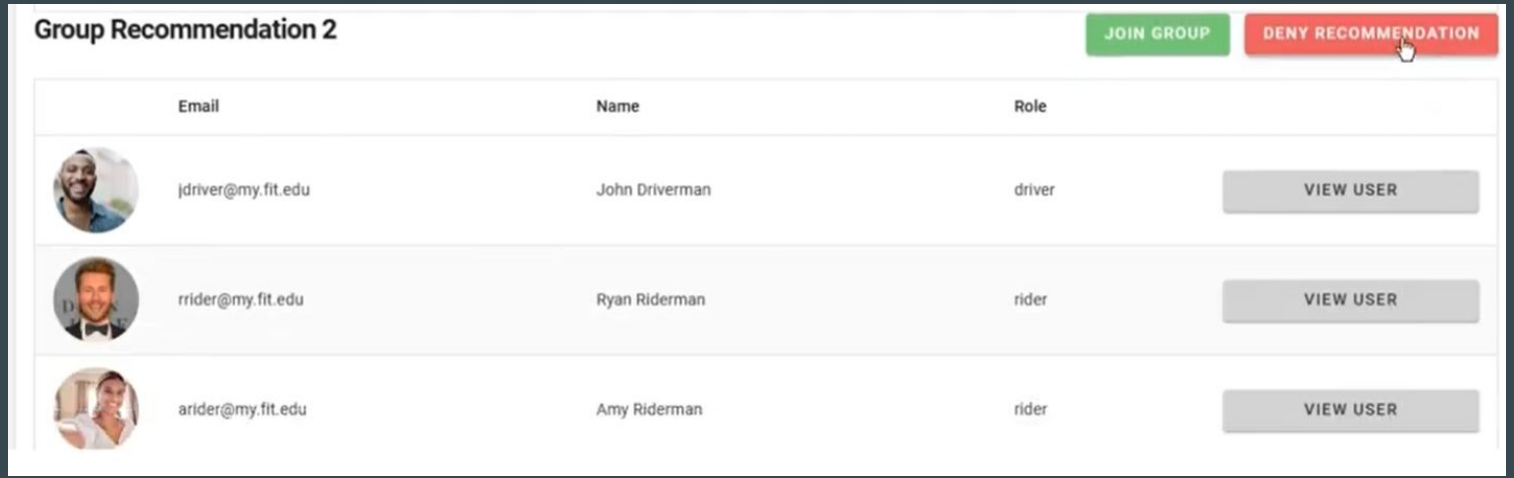
Goal and Motivation

- Motivation:
  - Limited parking on campus
  - Congested traffic
- Goal:
  - Alleviate parking and traffic problems at Florida Institute of Technology
    - Reduce stress and carbon footprint
    - Get to class on time
    - Save gas
- Develop an app to find and create carpooling groups based on students preference, schedule, and location.

Approach (Key Features of the System)

1. Receive Recommended Groups Based on User Profile

- Algorithm suggests carpooling groups based on users'...
  - Proximity to other users
  - Similarity in class schedule
  - Vehicle type/capacity
- Considers users preferences for a clean, safe, and comfortable ride

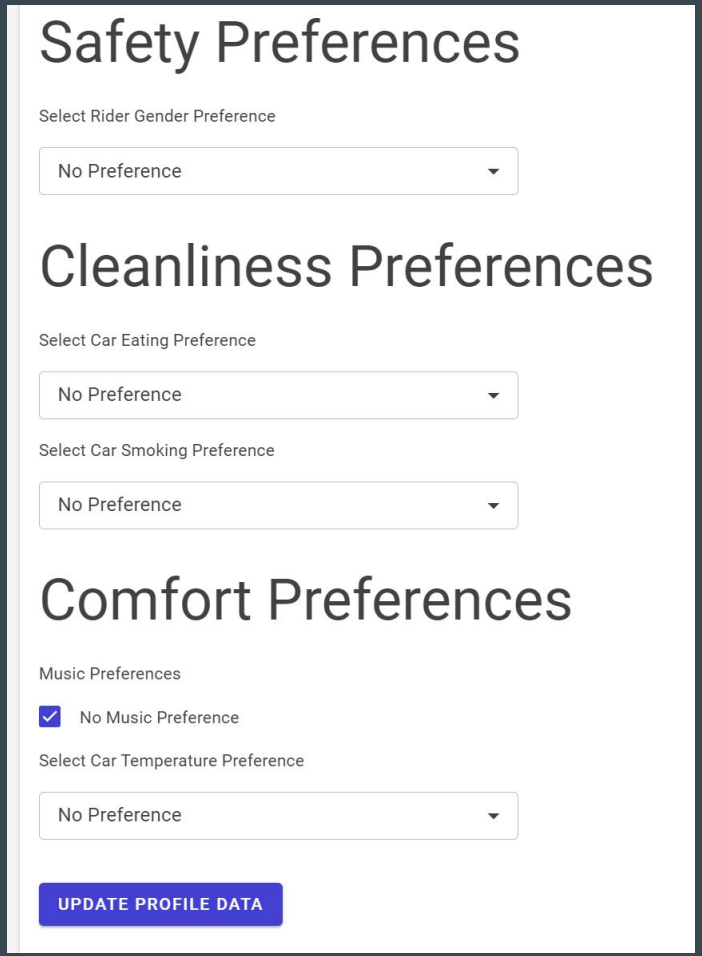


2. Stay Informed about your trip

- **Efficient Routes:** Drivers can access optimal routes for picking up riders within the group.
- **Real-time Location:** Riders can track the live location of the driver to anticipate arrivals and receive estimated arrival times at Florida Tech.
- **Identification Assurance:** Riders receive a photo of the driver and their vehicle for easy identification and safety.
- **Feedback System:** Both riders and drivers can provide feedback on their carpooling experience, fostering a secure community for carpooling at Florida Tech

3. Customize User Preferences

- Preferences
  - Safety
    - Gender specification
  - Cleanliness
    - Eating, drinking, smoking.
  - Comfort
    - Music
- Saved in the user's profile



4. Connect to Other FIT Students

- FIT students can connect with other similar students using the app.
- Students can use the app's messaging feature to either...
  - Talk one-on-one with group leaders, using the direct message feature.
  - Talk with the group they joined, using the group chat feature.
- Group leaders can also organize public meeting spots for group pickups.

Algorithms and Tools

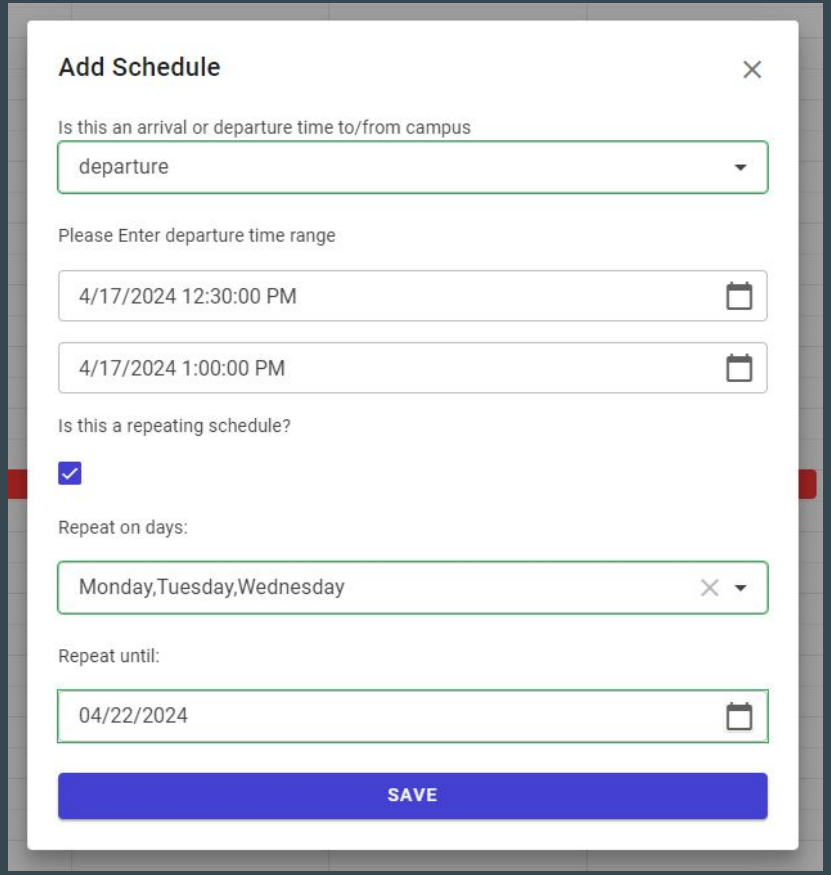
- Group Matching Algorithm
  - Purpose:
    - Recommends carpooling groups based on user preferences and geographical proximity.
  - Inputs:
    - Driver's Car Capacity: Number of seats available.
    - Timing: Range of arrival/departure times.
    - Geographic Data: User locations.
    - User Preferences: Customizable preferences.
  - Comparison Matrices:
    - Developed matrices to compare non-numeric values, enhancing the accuracy of group recommendations.

Algorithms and Tools

- Google Maps API Integration
  - Purpose:
    - Provides real-time map data.
  - Uses:
    - Gathers distance data between users to generate the most ideal group for a user to join.
    - Displays the driver's current location in real time.
  - Route Guidance:
    - Provides the driver with a Google Maps route link, including pickup/drop-off points and final destination.
- .NET Blazor Web Application Framework
  - Purpose:
    - Facilitates interactive client interfaces with tight backend integration.
  - Advantages:
    - Enables the use of C# for both frontend and backend, ensuring consistency and streamlining development.
    - Utilizes WebSocket connections to send real-time changes between the client and server without page reloads, enhancing the user experience

Novel Features/Functionalities

- **Schedule-Based Carpool Matching:** Unique algorithm to match users not just based on location but also on their daily/weekly class schedules.
- **Integrated Communication System:** Enables in-app messaging among users and within carpool groups, enhancing coordination and flexibility.



Technical Challenges

Authentication System

- **Challenge** : Ensuring users have a simple and secure way to access their profile
- **Importance:** Only allow users with a Florida Tech Tracks account access to the application

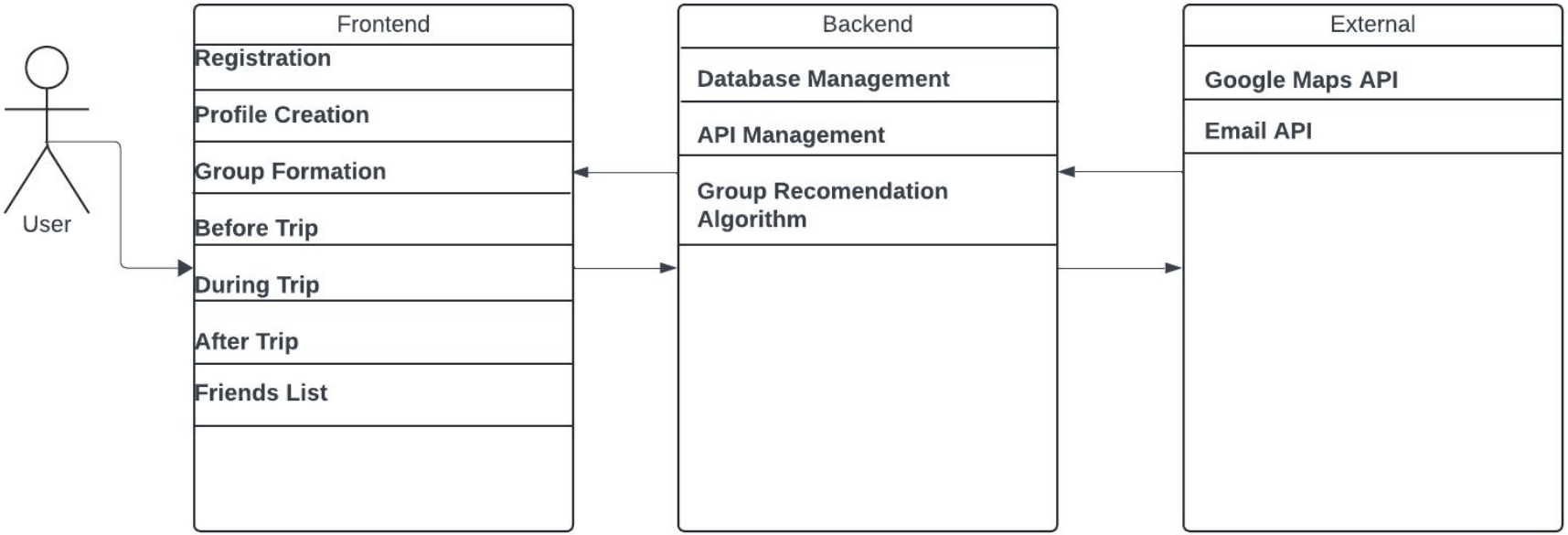
Matching Algorithm

- **Challenge** : Enhancing user satisfaction through accurate matches.
- **Importance:** Creating carpooling groups that fit user's preferences and schedule is key to the application

Role-Based Access Control

- **Challenge** : Restricting user access based on roles for data security
- **Importance:** Given that user profiles may contain sensitive information, it is essential to implement access controls within the application to safeguard this data

System Architecture Diagram



Evaluation

- Accuracy of Group Recommendations
  - Primary Metric
    - Ensures groups match users' preferences
    - Optimizes routes to avoid redundant driving
  - Evaluation Method
    - Algorithm Performance Testing
- Trip Satisfaction
  - Primary Metric
    - User ratings
  - Method
    - Send users end of ride surveys
- Efficiency of User Interface
  - Primary Metric
    - How fast a specific task can be done
  - Method
    - Time a new user and how long it takes them to complete a specific task

Module/Feature	Completion %	To Do
User Profile and Preferences	85%	-Max Driver distance -Viewing another user's profile -Long and Short views
Creating Group Recommendations and Forming Groups	60%	-Integrate Algorithm -Modify to fit mobile view -Add group interface functionality
Friends	25%	-Add backend functionality on adding removing and viewing friends
Before Trip Actions	90%	-Determining driver algorithm -Prompt users to confirm rides -Allow riders and drivers to cancel rides
During Trip Actions	95%	-Link to Florida Tech Safe
After Trip Actions	10%	-Implement user rating system

Milestone 4

- Group Recommendation with difference scenarios;
  - Same time different location clusters; Could increase testing from 8 -> 16 users; 4 location clusters North - East - West - South of campus
- Develop and test long and short views for user profiles
  - Long View is your profile view
  - Short View is another user's profile
- Finding Friends, Add and Remove Friends
- Interface for entering ratings and reviews
- Integrate accept and deny group recommendations into the database;
  - Once they decline show more recommendations if available
- Develop Rider confirmation and Ride Cancel options

Milestone 5

- Research, develop and test alternatives to using Google Distance Matrix API due to high cost of the service
- Develop and test a home page that displays the user's upcoming trips
- Develop and test a group management page
- Develop and test a communication page for messaging and sending confirmations for trips
- Integrate a shortcut to the Florida Tech Safe website

Milestone 6

- Implement, test, and demo account email confirmation during account registration
- Test/demo of the entire system
- Conduct evaluation and analyze results
- Create user/developer manual
- Create demo video

Questions?