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| **Project Title:**  SafeCyclePath: Smart Safety Navigation for Cyclists & Pedestrian |
| **Project Summary:**  We are developing SafeCyclePath, a smartphone app offering safety-focused navigation for cyclists and pedestrians. While standard map software provides speed- or distance-optimised routes, SafeCyclePath uses numerous data streams, including crime statistics, accident records, infrastructure integrity, user reporting of dangers and real-time environmental data, to assign a safety index to every road segment. This index determines recommended routes, enabling users to select the safest route in their area and match users who live in the same neighbourhood and take similar routes at similar times, allowing them to connect, chat and commute together for safety, motivation and social benefits.  Walking or cycling through cities offers numerous advantages such as being green, cheap and healthy. Notwithstanding, safety becomes an essential issue to most commuters as it causes:   * Hotspots and dark streets, both of which put people in danger at nighttime; * Infrastructural gaps, potholes and hazardous traffic interactions, and they pose increased risks to cyclists.   Current navigation systems (like Google Maps, Waze and Strava) do not take note of safety information, compromising passenger safety. Target Users:  * **Students & young commuters**: Who tend to walk or cycle to save money, and enjoy the convenience of locating fellow commuters from university or their area. * **International residents & visitors:** who do not always know the local “safe” vs. “unsafe” areas and become more confident traveling solo when they join others traveling the same routes. * **Daily urban commuters**: cyclists and walkers aiming to avoid crowded public transport and to travel in greater safety with others for companionship, and comfort in numbers. * **Local councils & planners**: who can combine hazard data with public commentary to enhance safety and infrastructure of emerging communities. * **Community-oriented users:** the philosophy of “No one walks or cycles alone” and the Find a Mate feature allows users to plan safer journeys with others in the same area.  Use Case #1 **Scenario: A TU Dublin student walking from the Grangegorman campus to the Parnell Luas stop in the evening (Not Accurate Imaginary).**   1. The student opens the SafeCyclePath app and fills in the ‘going to’ field. 2. The app generates and suggests two route options: Fastest and Safest.    1. The Fastest 🔴 route is about 10 minutes.    2. The Safest 🟢 is 12 minutes with only 2 minutes longer. 3. The student’s map shows that the fastest route takes the student through a number of poorly lit side streets and an area marked as a unsafe hotspot 🔴. 4. The student chooses the Safest Route 🟢 which is likely the better route as it along better lit streets which has high pedestrian traffic and many crosswalks. 5. During the student journey, real-time alert pops up from the map: Roadworks reported near Bolton Street, rerouting suggested. 6. The student arrived safely at the Parnell Luas stop and he/she reports a broken streetlight, improving safety data for future users.  Use Case#2 **Scenario**: **It is a young employee living in Sandyford who cycles daily from home by bike to the Leopardstown Business Park. Although the distance is not significant (about 3 km), part of the route involves busy junctions (e.g., Leopardstown Road) and intervals without separated cycle facilities.**   1. The rider launches the SafeCyclePath app the next morning and enters the destination: Leopardstown Business Park. 2. Prior to the development of the route, the app\_requested: "Would you like to find cycling companions nearby?" 3. The cyclist enables **Find a mate** and sees: "2 other passengers from Sandyford heading for Leopardstown around 8:30 am." 4. The app also shows both options:    1. Fastest Route (12 min): Sandyford Road route (wider intervals between cycle routes, more traffic).    2. Safest Route (14 min): cycle through Leopardstown Park, avoiding busiest junctions. 5. The rider takes the Safest Route and participates as part of a small group ride with two other users, which appears on the in-app map. 6. Along the way, the app shows a real-time message: "Accident on Sandyford Road, your group has been diverted through Kilgobbin Road." 7. The team arrives safely at Leopardstown as a group, and one member reports a hazard for a pothole on Drummartin Link Road, which bolsters later recommendations. |
| **Project Development:**  Our MVP will be a web-based safety routing application focused on Manhattan with basic crime-aware routing capabilities. Users can input origin-destination pairs and receive three route options: shortest path, safest path, and balanced path. The system will integrate NYPD crime data and basic infrastructure information to generate simple safety scores for route segments.  MVP core features are a minimum web-based route input and display interface, incorporation of NYPD crime data (2022–2024) for Manhattan, a simple safety scores program based on crime density, comparison of routes with safety scores vs. travel time displayed, and collection of user feedback about preferred routes. The learning objectives are primarily to assess acceptance of safety-aware routes vs. shortest routes by users, comprehend how closely safety scores reflect user perceptions, and comprehend what tradeoff of safety and efficiency are acceptable to users. To quantify these goals, the key metrics will be patterns of route choice (percent of users selecting safe vs. quick routes), satisfaction ratings of users with a 1–7 Likert ordering, accuracy of safety scores as measured through correlation with user-reported perceptions, average time penalty acceptable to users as a tradeoff for safety, system usability scores (SUS method), and geographic patterns of use across Manhattan neighborhoods.  **Front-End Components**  The system's front end will be a React.js web application that will have a responsive design so that it can be easily used on multiple devices. The front end will have an interactive map interface, likely using Leaflet.js or Mapbox, allowing users to visualize dynamic routes. There will be a route comparison panel that shows alternate routes side-by-side, and preference sliders that allow users to modify preferred weightings between safety and efficiency according to personal preference. Lastly, feedback forms will be included so that users can rate routes and report hazards to contribute to community-based data collection.  **Back-End Components**  On the back end, a Flask or Django REST API will manage routing and facilitate communication between the client interface. Spatial data will be stored and managed in a PostgreSQL/PostGIS database. The routing engine will be based on Python libraries such as NetworkX and OSMnx. For improved route safety, a machine-learning pipeline based on scikit-learn will calculate and update safety scores based on input data. Secondary features will include an authentication system for user preference storage, and a Redis caching layer for improved query performance and responsiveness.  **Data Sources**  This system will bring together several datasets, including the NYPD Crime Data API to access data on historical and current crimes, OpenStreetMap (OSM) data to analyze street networks and infrastructure, and NYC Open Data for records of motor vehicle collisions. The application will also include user-reported data which can include hazard reports and preferred routes, along with a Weather API to track contextual condition factors that can impact the safety of routes. Development Methodology The project will follow an **Agile SCRUM methodology**, enabling iterative development, regular feedback, and continuous refinement of both functionality and user experience. |
| **Evaluation:**  Approximately 200 words.   * How will you evaluate your system? (Initial ideas) * How will the evaluation inform your future development? |
| **Project Management:**  Approximately 200 words.   * How will you run the project? * What deadlines will you set? * What is success?   You must use a Project Management tool (e.g.,Github/Zenhub) |

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| **Team Name:** |
| **Team Members:**   |  |  |  | | --- | --- | --- | | **Name** | **Student Number** | **Contact Number** | | Huda Ibrahim | D24126339 | **0834477463** | | Karan Joseph | D24125555 | **0874924547** | | Shalini Kuruguntla | D24126048 | **0892134144** | | Sai Priyanka Basa Shanker | D24125575 | **0899761927** | | Hina Kausar | D24127853 | **0899484178** | |
| **Team Meetings:**  Approximately 200 words.  Discuss issues like:   * Does everyone have to attend all meetings? * How often will there be meetings? * Are there topics that are out-of-bounds? * Online or face-to-face? * Decision making (Majority rule/Unanimous/Expertise wins)? * How will turn taking happen? |
| **Team Conflict:**  Approximately 150 words  Discuss issues like:   * How do you deal with habits of individual members? * How do you deal with unresolved issues? * How will you deal with conflict? * How will you avoid it? * Who will have the ultimate veto? |