CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT

Team C1-4
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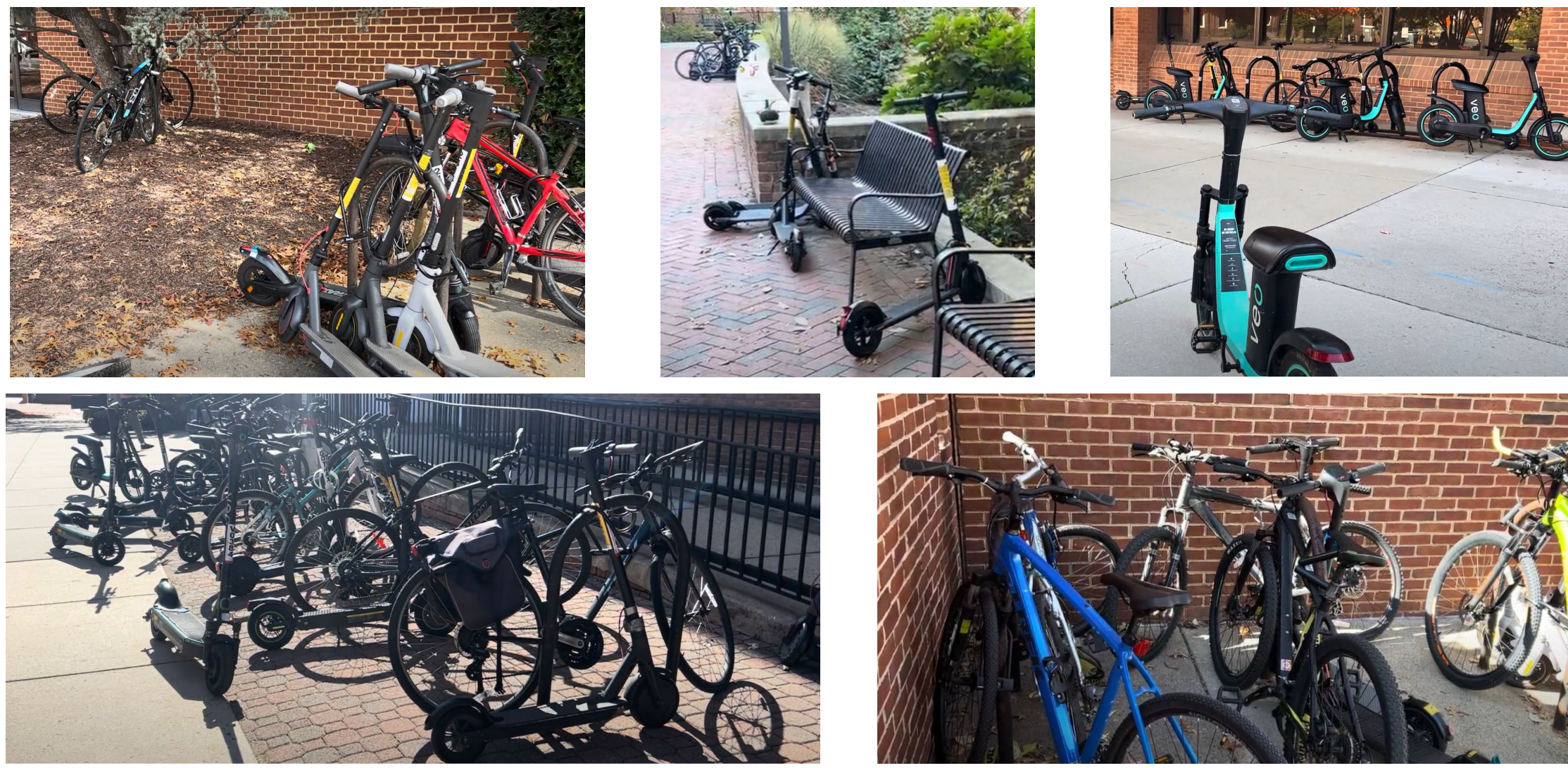A. James Clark SCHOOL OF ENGINEERING

# Enhancing Data Quality For Bicycle Parking Locations At The University of Maryland Campus

## PROJECT BACKGROUND

**Project Goal:** To improve the user data quality of micromobility systems throughout the University of Maryland campus.

**Project Objectives:**

1. Expand on the university's understanding of micromobility user values by identifying the top three factors influencing positive and negative experiences with micromobility systems.
2. Increase survey influence by reaching 500 students at the University of Maryland; [Based on 10% of the 5,000 registered bicycle population (University of Maryland, Office of Sustainability)].
3. Expand students' understanding of UMD-affiliate organizations positive and negative experiences with micromobility systems around campus.



## DATA RESULTS

### FINAL SURVEY (500 respondents):



Charts: Micromobility Parking Quality, Current Parking Demand, Future Parking Demand, Concern of Theft, Traffic Flow, Need for Dedicated Infrastructure. Legend: Quadrant 1, Quadrant 2, Quadrant 3, Quadrant 4.
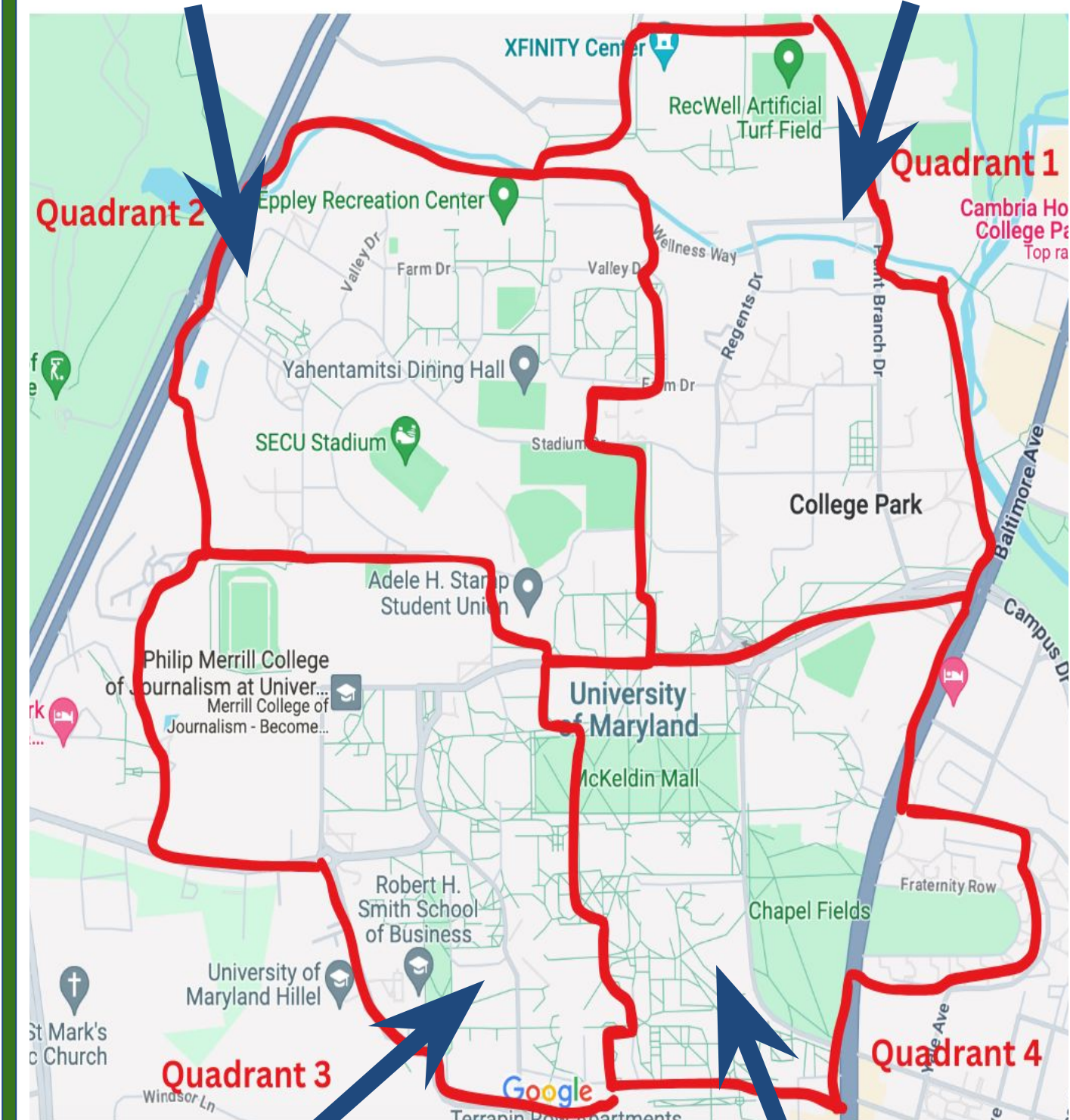
### CONSULTATIONS (8 total):

To gather stakeholder concerns, our team conducted consultations with UMD-affiliated organizations. These interviews provided insight into less obvious issues affecting the micromobility community on campus as well as recommendations on how to solve them. Following are notable recommendations from these conversations.

➢ There is a lack of effort to promote micromobility safety and bicycle parking allocation. To alleviate safety concerns, the university could incentivise students to complete micromobility safety training.
➢ Multiple consultants made recommendations for implementing infrastructure techniques to slow down traffic. Bike lanes, crosswalk lights, roundabouts, and formal traffic lights for pedestrians, bike lanes, and cars could reduce collisions.
➢ Bicycle users and pedestrians experience collision risks due to lack of built infrastructure. Collision events often go unreported. This creates potential liabilities for the university.
➢ The rate of increase for bicycle usage on campus is linear, while e-scooter usage has been growing exponentially.
➢ Strong opinions were indicated surrounding the construction of the Purple Line Metro. Specifically, concerns for increase of theft and collisions due to high volume of people and lack of infrastructure.
➢ Quotes:
　a. "We need a place for wheels, and place for feet." - Proteus Bike Shop
　b. "Bike lanes are coming." - Terps For Bike Lanes

## METHODOLOGY



Surveyed by: Jesses Thill
Surveyed by: AJ Accad
Surveyed by: Justin Wagner
Surveyed by: Alyssa Elliott
Quadrant 1, Quadrant 2, Quadrant 3, Quadrant 4

**Preliminary Plan**

➢ Four (4) Quadrants
➢ Start Preliminary Survey
　a. Qualtrics QR Code & In-person Surveying
➢ Analyze Preliminary Survey Results & Revise.
➢ Start Final Survey (Goal: 500 students)
➢ Consultations with eight (8) UMD-affiliate organizations
　a. Recwell Bike Shop
　b. Terps For Bike Lanes
　c. UMD Cycling Club
　d. UMD Department of Transportation Services
　e. University of Maryland Police Department
　f. Proteus Bike Shop
　g. VEO
　h. Dr. Xianfeng Yang - UMD Professor of Transportation
➢ Analyze data received from consultations & Final Survey Results.
➢ Develop conclusions & provide holistic recommendations.

**Changes and Additions**

➢ After concluding the preliminary survey, our team found that obtaining frequent and serious responses was not achievable by reaching people via asynchronous methods such as QR codes or emails. Instead, surveying willing participants in person provided significantly more thoughtful responses.
➢ After collecting data of underacomidated parking locations on campus, we identified that there was a strong disconnect between the areas observed by students and areas observed by consultations. To address this, we designed two heatmaps to visually represent these differences.

## HEAT MAP OF DATA

Our team developed two heat maps of the UMD campus to provide a visual representation of locations that need improvement identified by the 500 student population surveyed, compared to the locations identified during our consultations.
➢ Spots in the darker purple to red indicate highly-stressed locations that need improvement, while the lighter purple indicate less-stressed locations that need improvement.

### Survey Heat Map

From the student heat map, a viewer can immediately identify: Denton Quad, Ellicott Quad, Heritage Community, Cambridge Community, Glen L. Martin Building, John S. Toll Physics Building, Chemistry Building Edward St. John Building, Mckeldin Library, Washington Quad, Allegany Hall, & South Campus Commons are all highly stressed locations.
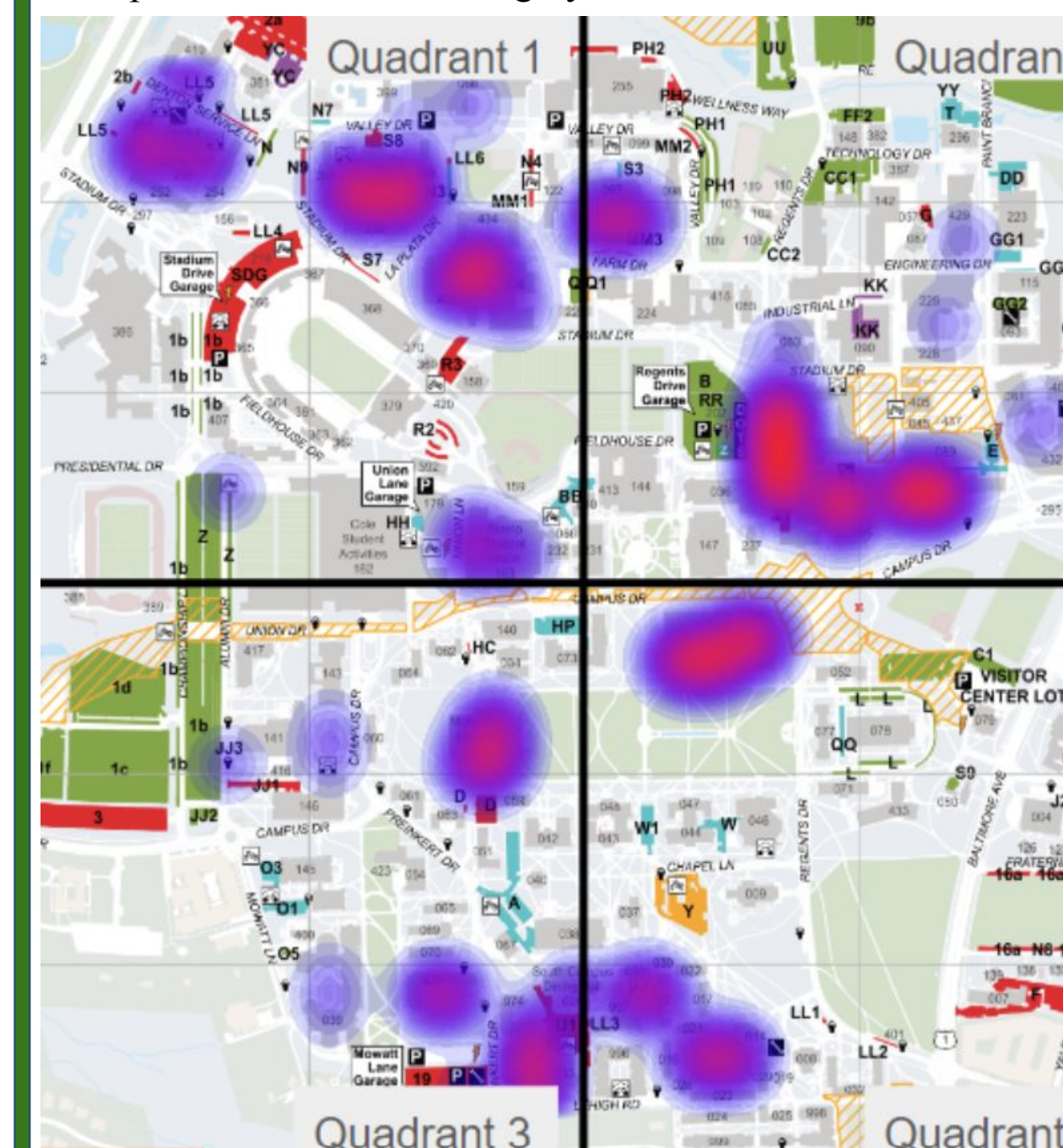


### Consultations Heat Map

From this consultations heat map, a viewer can immediately identify: Ellicott Quad, Chemistry Building, John S. Toll Physics Building, Regents Drive Garage, Glen L. Martin Building, John S. Toll Physics Building, Allegany Hall, & South Campus Commons are all highly-stressed locations.
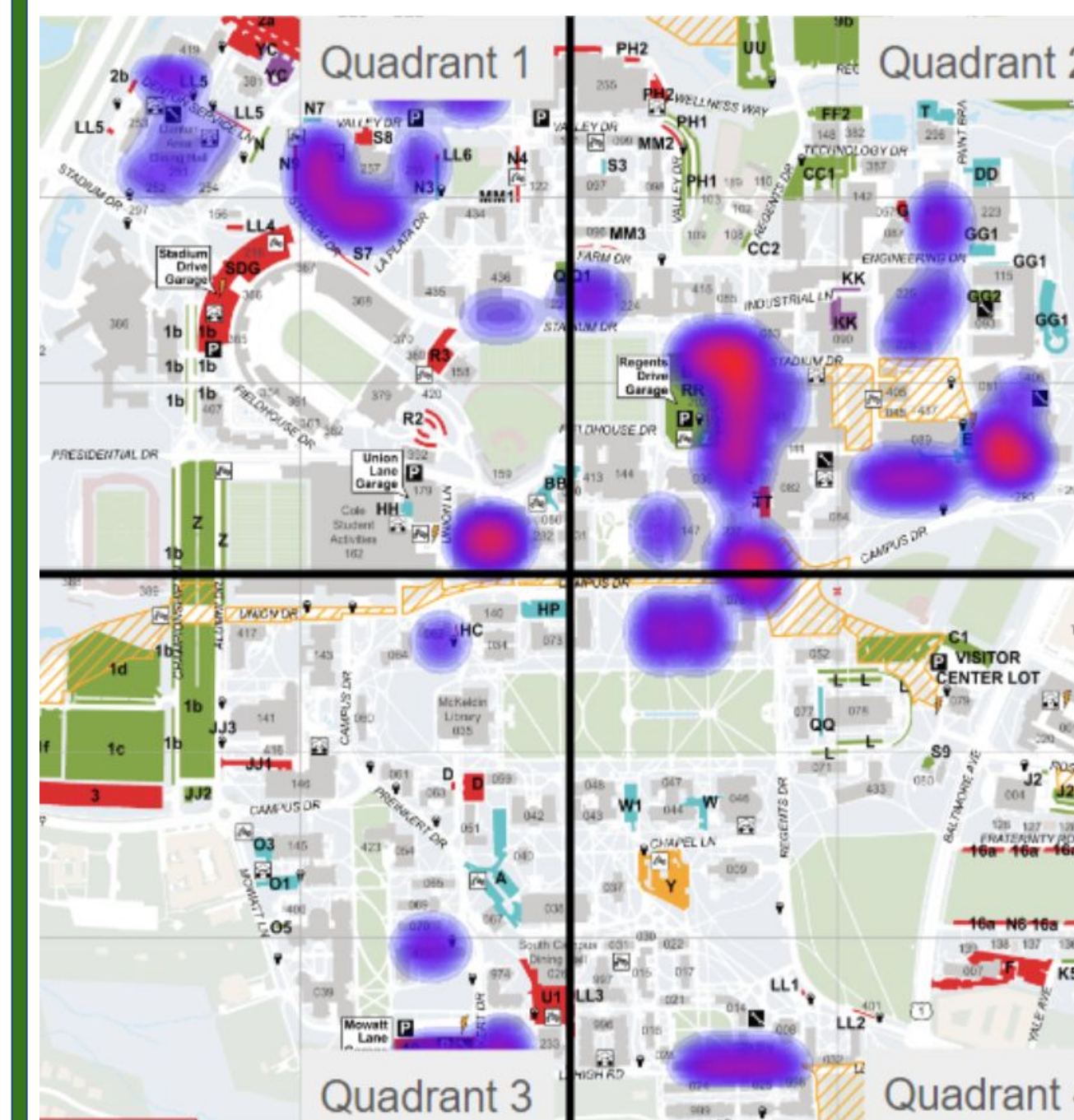


The data from students is situated near dormitories, cafeterias, class and study locations, showing a wider campus perspective compared to the problem areas from consultations. The data from consultations is isolated near Regents Garage, Ellicott Quad, and campus edges. This is visual aid provides insightful perspectives on how UMD could improve micromobility infrastructure.

## CONCLUSIONS & RECOMMENDATIONS

➢ **Our Conclusions:**
　a. As noted by almost every student surveyed, collision safety is the most notable issue to be addressed. This is validated by all of our consultations.
　b. 49% of surveyed students indicated parking options at most locations around campus need improvement. This could include options that accommodate additional vehicle types or a greater number of parking spaces, depending on location.
　c. 45.5% of surveyed students indicated that most parking locations need improvement and 45.5% indicate that this issue will continue in the future. In locations indicated by our heat map, more micromobility parking options should be implemented.
　d. Interestingly, only 31.4% of surveyed students indicated that theft is a concern. This data indicates that our campus is relatively safe for micromobility users, however, there are still various concerns. As noted by our Recwell Bike Shop, the construction of the Purple Line Metro is expected to introduce additional theft.
　e. 76.7% of surveyed students indicated that a majority of locations around the UMD campus need improved traffic flow devices. All of our consultations agree that infrastructure such as bike lanes and traffic signals would improve micromobility transportation safety and efficiency. Additionally, we believe our data indicates that crossing signals, speed bump, and one way roads would be valuable to our community.
　f. 79.3% of surveyed students indicated that the flow of traffic between cars, micromobility devices, and pedestrians is not optimal. This is the main cause of collisions on campus. View our collision map to see problem areas.

➢ **Our Recommendations:**
　a. Our evidence suggests that the university should prioritize educating our community on micromobility safety. This could potentially reduce reckless driving on campus.
　b. Establishing natural traffic control techniques such as speed bumps, bike-lanes, and formal traffic lights would immensely improve micromobility safety and efficiency.
　c. Regarding our heat map, there is clear evidence to suggest that the student population would benefit from additional parking devices near Glen L. Martin Hall, Edward St. John Building, & Mckeldin Library.
　d. The best way for UMD to receive consistent and reliable data from students is by implementing in person surveys. Our team struggled to receive legitimate responses from emailed or scanned surveys.
　e. The use of electric micromobility vehicles is growing, but with the recent ban on lithium-ion battery vehicles indoors, charging stations should be offered outside of dormitories. Most commuters either use veo scooters or traditional micromobility devices that do not require charging stations.



What is Important to Micromobility Users?

Pie chart legend: Parking Options 21%, Parking Demand 16%, Future Parking Demand 21%, Theft 5%, Traffic Flow 24%, Infrastructure 13%