The Status and Mitigation of Ride-Hailing Services on the UCSC Campus

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(Lifsher, 2014)

Introduction:

Ride-hailing services, also known as Transportation Network Companies (TNCs), have been growing like wildfire ever since they were introduced to the world. Given that these services are less than a decade old, their impacts have not been clearly delineated. However, recent studies have started to shine light on TNCs' paradoxical nature. While these services do decrease individual car use, they are likely to increase overall vehicle miles traveled. Uber and Lyft, the two reigning ride-hailing companies, are responsible for diverting individuals from more sustainable methods of transportation. Studies have shown that nearly 60% of ride-hailing users would have otherwise walked, biked, taken public transit or skipped the trip altogether if TNCs were not available (CPR, 2018).

Additionally, it has become apparent that TNCs commit dangerous traffic behaviors such as double parking and stopping in bike lanes, transit stops and crosswalks. The San Francisco Police Department stated that in Spring 2017, Uber and Lyft drivers made up two thirds of all traffic violations in the downtown area (Pyzyk, 2018). Such violations not only endanger individuals but also inhibit traffic flow which increases congestion and contributes to an increase in greenhouse gas emissions.

The issues discussed above are not unique to big cities; the University of California, Santa Cruz has witnessed similar patterns with ride-hailing services: increased vehicles on campus, more congestion and anecdotal evidence of traffic violations such as entering restricted areas and loading and unloading in bus stops, bike lanes and crosswalks. Although these problems are concerning, there are positive aspects to the presence of TNCs on the UCSC campus. Ride-hailing services play a large role in reducing driving under the influence. In various cities, the introduction of TNCs has been found to correlate with a decrease in DUI incidents (Badger, 2014). Figure 1 below shows San Francisco's DUI arrests trends over a period of ten years, including the years when ride-hailing was initiated. In addition to creating a safe alternative to intoxicated driving, TNCs also allow students to come to college without a car and create more options for students to get around quickly and efficiently.
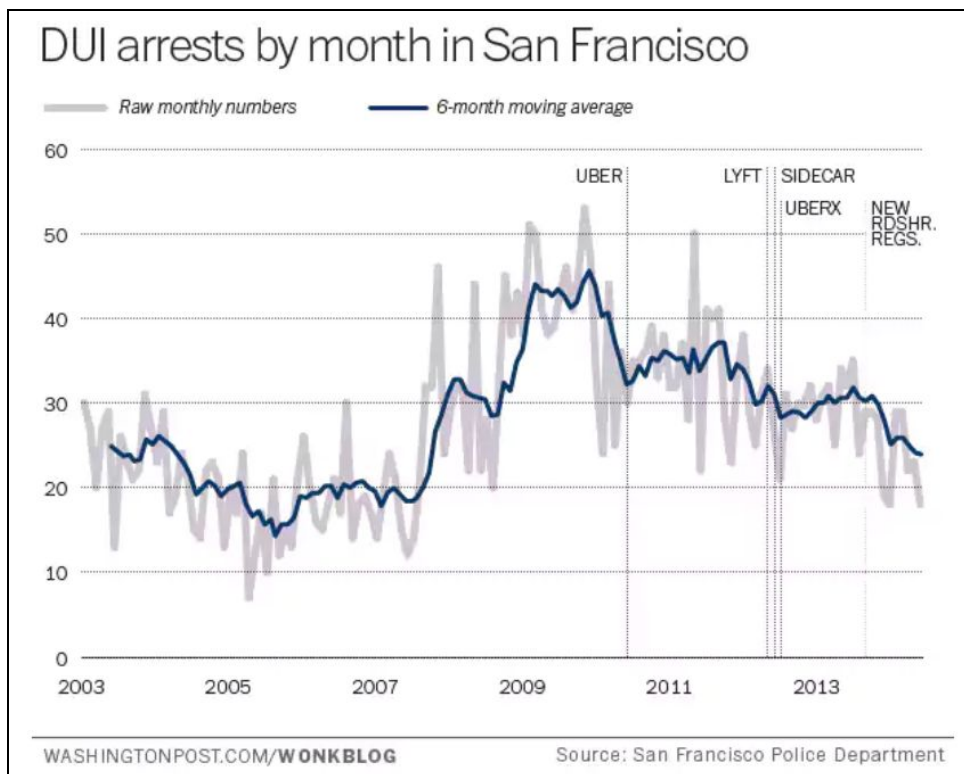
Figure 1: San Francisco DUI arrest records from 2003 to 2013 (Badger, 2014)

The goal of this analysis is to understand the current state of ride-hailing services on campus by surveying UCSC's members and to propose mitigation techniques such as designated pick-up zones and partnerships with TNCs to decrease the negative impacts of their use.

Existing Conditions:

Lyft Data:

Tracking Uber and Lyft ridership is a challenging task; both companies like to keep their data private for various reasons. Because of this, it is difficult to understand to what extent ride-hailing is taking place on the UCSC campus. However, Lyft provided UCSC with a map of their services' pick-ups and drop-offs on campus to give us an indication of its use and demand:
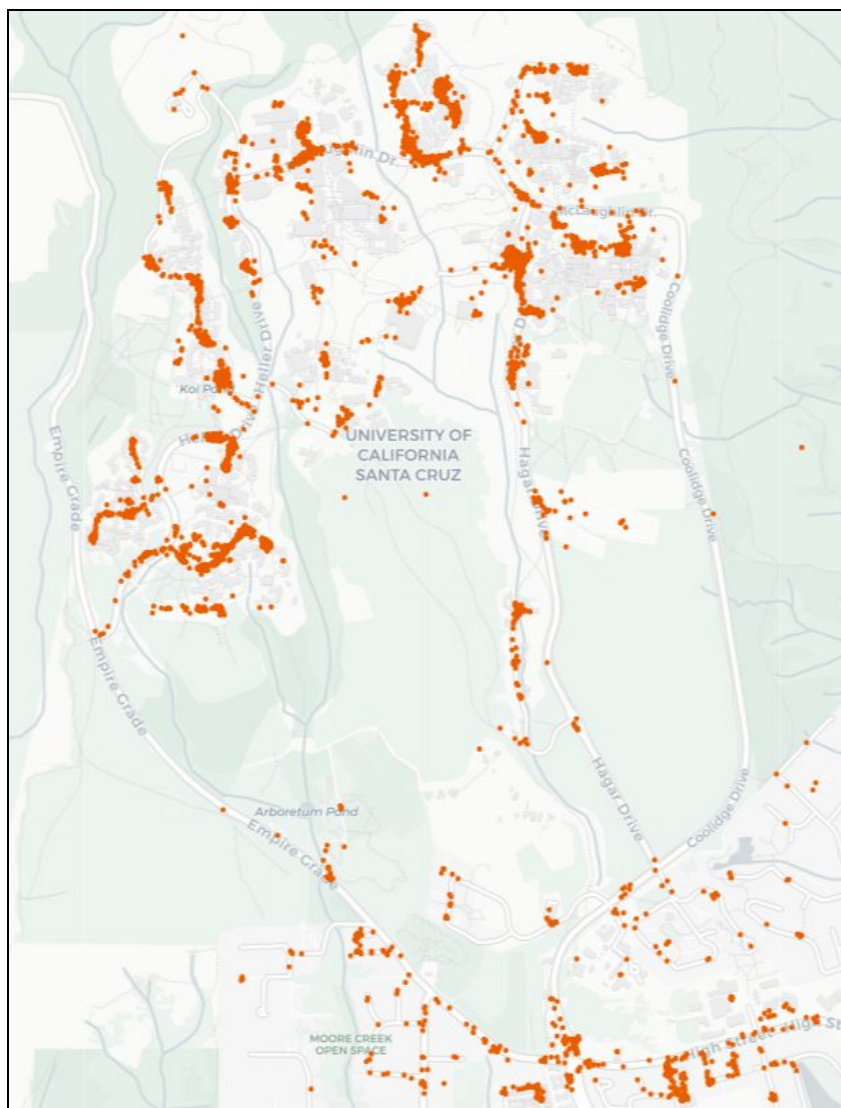
Figure 2: Map of Lyft pick-ups and drop-offs on the UCSC campus over the span of 180 days (October 2017 - March 2018)

The map reflects pick-up and drop-off locations over a span of 180 days, from October 2017 through March 2018. Lyft estimated that there is approximately a total of 20,000 trips reflected on this map, whether they be pick-ups or drop-offs. This suggests that there were on average 111 Lyft trips being made on campus daily during this time period.

As shown in the map, Lyft pick ups and drop offs are occurring widespread throughout the UCSC campus. Almost every college, department and building on campus is receiving Lyft requests or drop-offs. It is important to note that this is also only about half the amount of TNC rides occurring at UCSC since Uber rides are not included on this map. Additionally, it is crucial to point out that the map shows that there are pick-ups and drop-offs occuring in restricted areas such as Steinhart Way, which leads to the McHenry Library. This suggests that Ubers and Lyfts

are committing traffic violations, unless the occupants have a medical permit, and are contributing to unsafe driving as well as traffic congestion on campus. Lastly, there are some clear inaccuracies in this map, for example, there are two points located in the Great Meadow, a location not accessible by vehicle. Discrepancies like these are most likely due to errors in GPS tracking or data processing.

Survey Results:

To get a better understanding of the usage of Uber and Lyft on our campus, it is important to hear first hand from the users of the services. Each year, a campus transportation survey is conducted at UCSC. Both the 2017 and 2018 surveys have included questions about TNC usage on campus and have registered self recorded responses from Uber and Lyft users. The 2017 survey contained basic questions on ride-hailing travel habits, travel patterns (commuting or on campus) and demographics on TNC users. In 2018, a supplemental (opt-in) section of the survey asked additional questions about TNC usage, including trip purpose, reasonings behind choosing to use TNCs and more.

The surveys illustrated that the primary users of ride-hailing services are students, making up 98.1% of its ridership at UCSC (Figure 3). In 2017, it was found that 77.3% of all
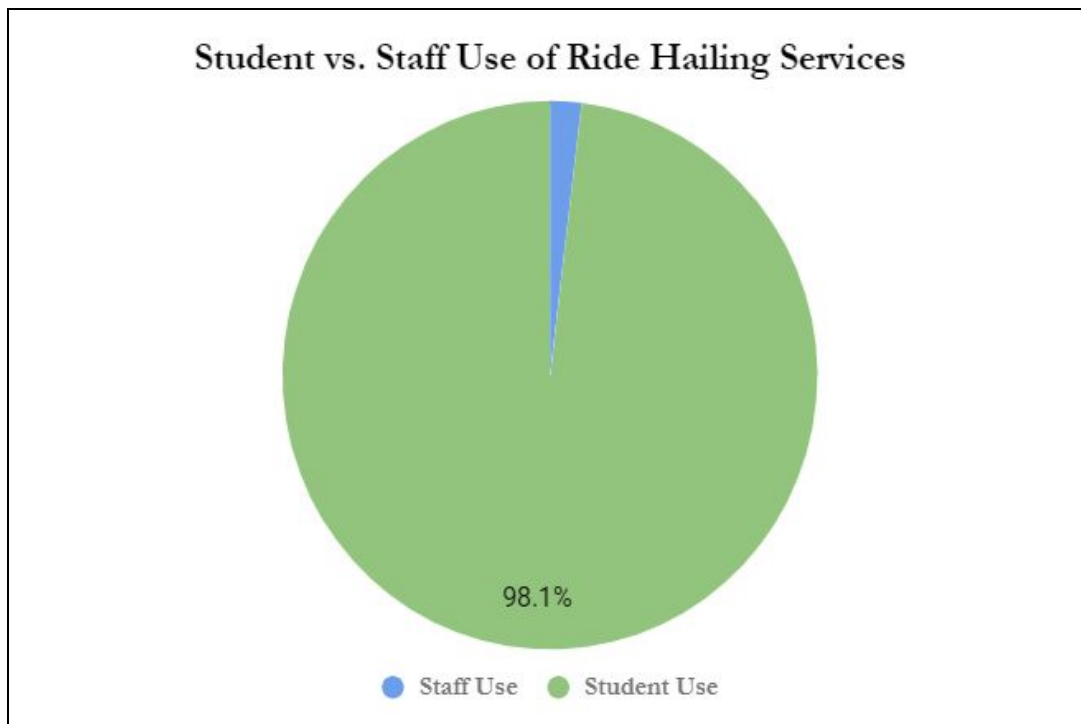
**Figure 3:** The distribution of ride-hailing use among the UCSC population (2017)

TNC rides were made to commute to and from campus and the remaining 22.7% consisted of rides from one location on campus to another location on campus (Figure 4). However, the 2018 results found that the intra-campus rides jumped to 33.50% of the total TNC rides occuring at UCSC, an increase of 10.8% in one year (Figure 4). This suggests that students may not feel as if on campus transit is reliable enough to support their daily campus travel needs.
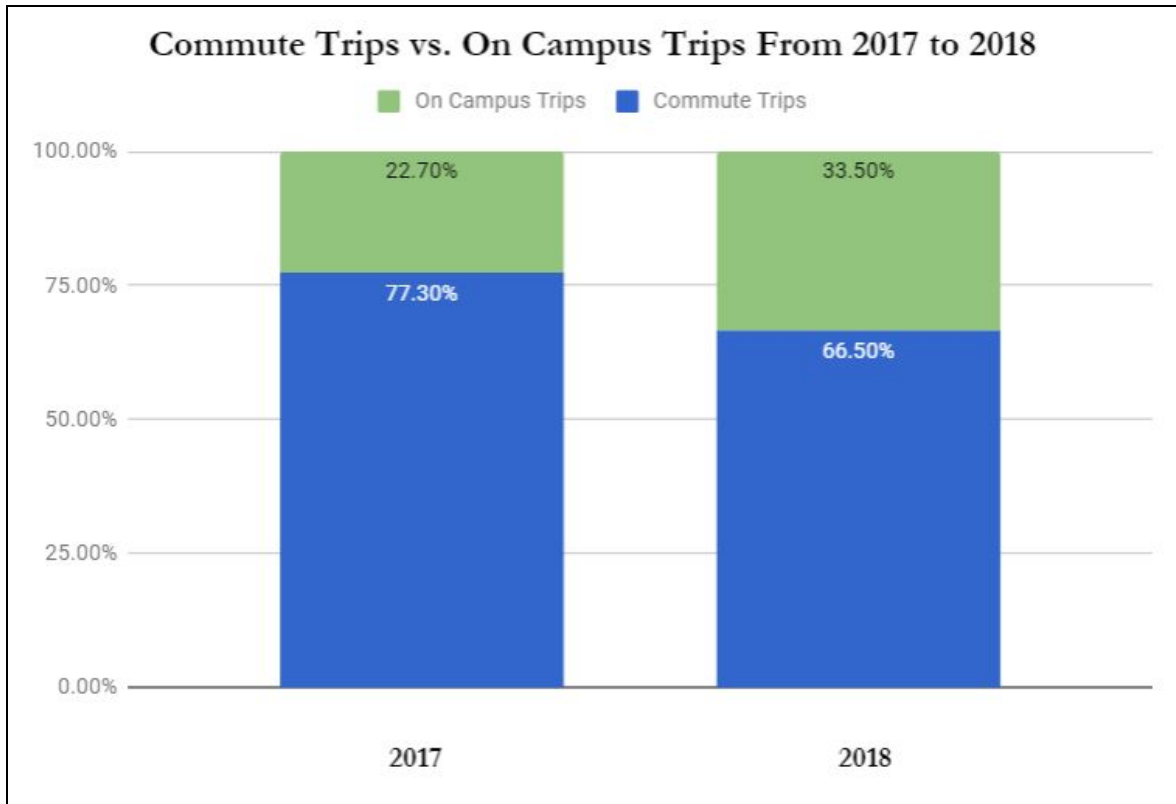
Figure 4: Comparing 2017 and 2018 results of commute trips using TNCs versus on campus trips using TNCs (2018)

Diving deeper into the results, Figure 5 shows the distribution of travel patterns using TNCs on campus. The majority of trips are made by residential students (i.e., students who live on campus) traveling to and from campus; demonstrating that Metro bus services might not be frequent, reliable or widespread enough to accommodate students' needs. The second most common type of trip made is by residential students traveling within campus with a ride-hailing service; again, suggesting that campus shuttle bus services may not support the needs of its students.
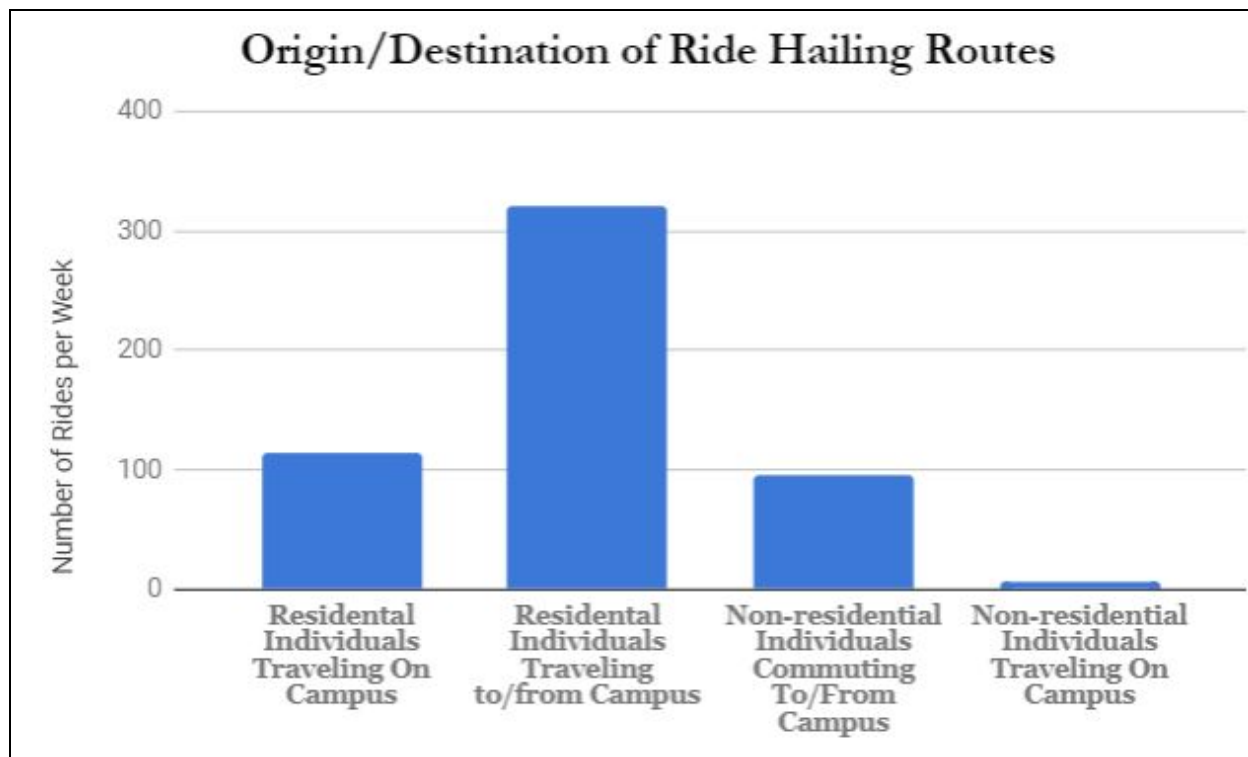
Figure 5: Origin and destination patterns of Uber/Lyft rides on the UCSC campus (2017)

Figures 6 and 7 illustrate the time of day patterns of both commute trips and on campus trips. Looking first at commuter patterns (i.e., trips between campus and an off-campus location), the highest demand period for ride-hailing services is between 6pm and midnight, indicating that perhaps individuals feel safer in an Uber or Lyft at night in comparison to transit, walking or biking. Also, transit services are less frequent at this time of day. Coming in second and third in highest demand periods, with only a small difference between the two, are respectively 9am to 4pm and 4pm to 6pm.

Looking now at on-campus travel patterns, the highest TNC demand period is also between 6pm and midnight. During this period, on campus transit services do decrease, which could be a factor in this result. Additionally, it is possible that this is a time period where students are intoxicated and therefore, are looking to travel safely, conveniently and quickly from one location on campus to another. The second highest demand period for on campus travel using TNCs is from 9am to 4pm. This is the time period where most classes are held, indicating that students may sense that Uber and Lyft could get them to class quicker than alternate options.
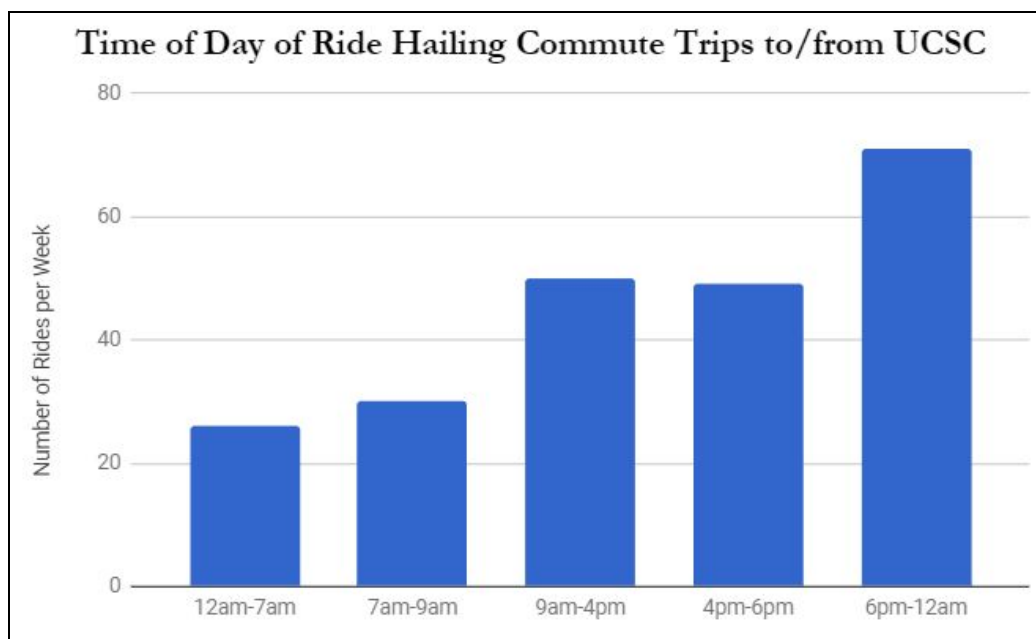
Figure 6: Time of day of ride-hailing commute trips to and from the UCSC campus (2018)
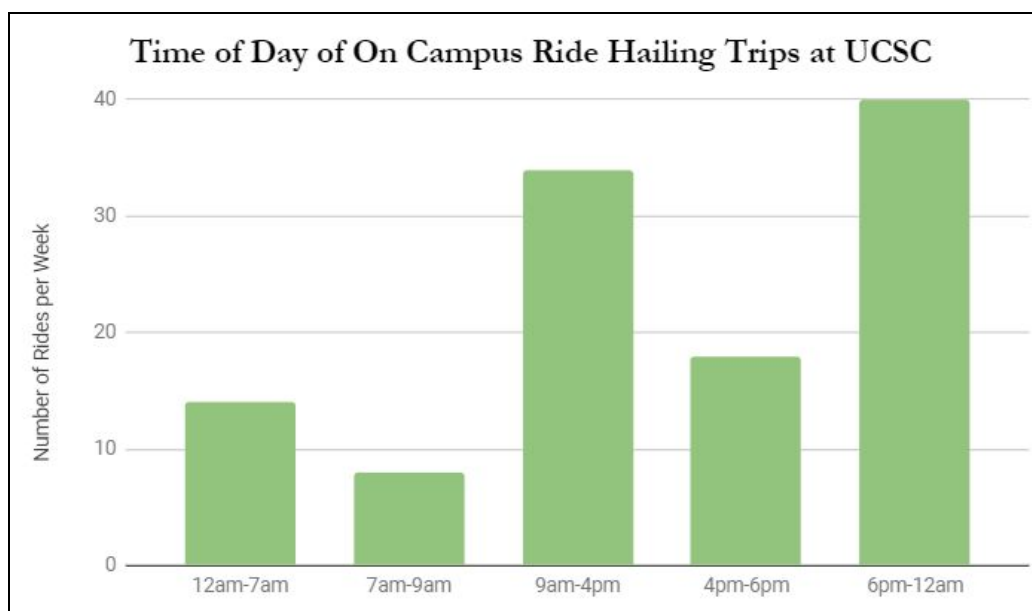

Figure 7: Time of day of on campus ride-hailing trips at UCSC (2018)

One of the concerns about TNCs previously mentioned was regarding their impact on the use of more sustainable modes of transportation. Therefore, in the 2018 survey, the question "If Uber or Lyft were not available, how would you get to your destination?" was asked. Results showed that the majority, 21.3%, responded that they would have taken public transportation, 15.4% would have walked, 5.4% would have biked and 13.9% would have not gone at all (Figure 8). Combined, this 56% represents the amount of TNC rides occuring at UCSC that

replaced trips that would have otherwise been committed in a sustainable way or would not have occured at all. Therefore, 56% of Uber and Lyft rides are adding additional cars to the road. However, it is still important to recognize that 19.9% and 17.7% of TNC rides respectively replaced individuals from driving and getting a ride from a friend to get to their destination (Figure 8).
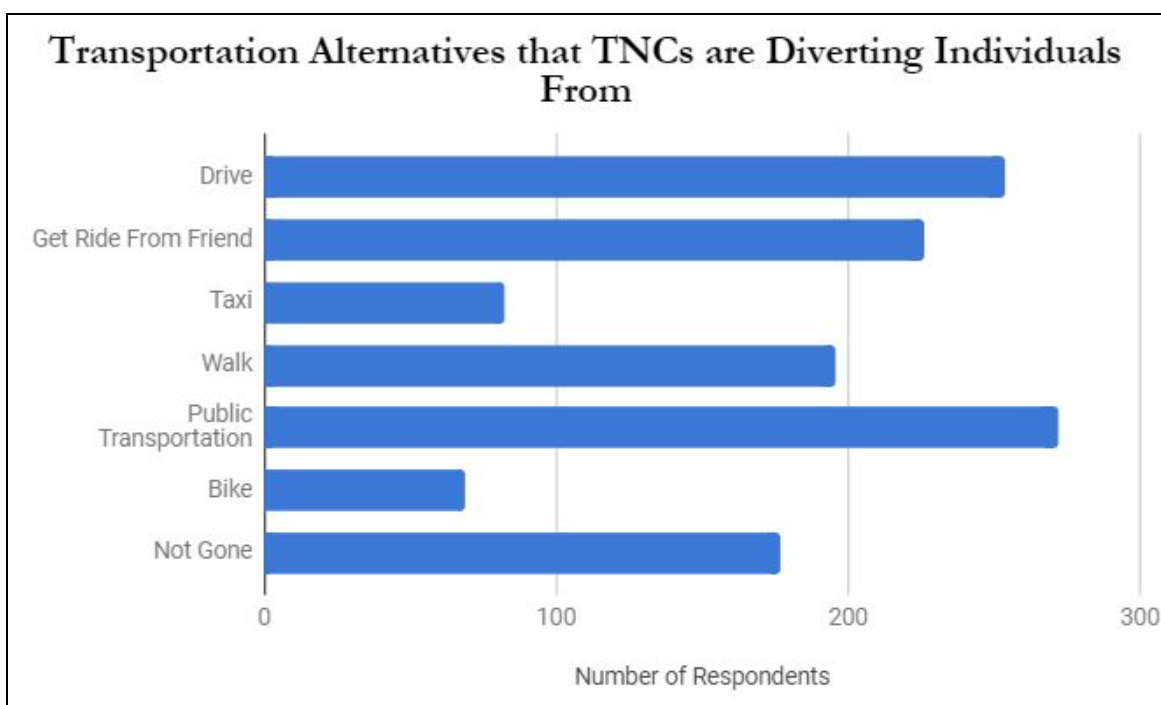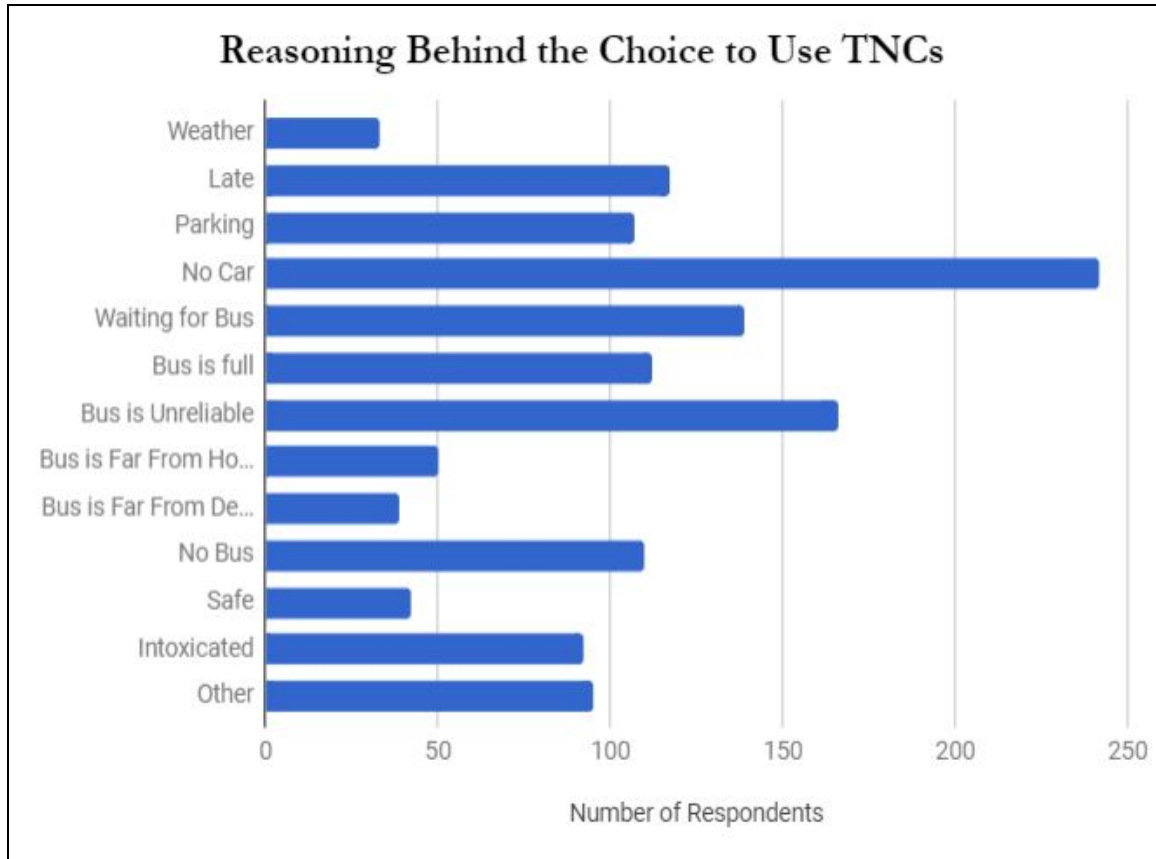

Figure 8: Survey results from the 2018 campus travel survey illustrating what modes of transportation individuals would have used if Uber and Lyft were not available (2018)

When asked for the purpose of their trip, the leading survey response, with 27.2%, was for social activities. This could again be an indication that students are using Uber/Lyft for its convenience and to avoid driving while intoxicated. Additionally, it is important to note that students may be sharing Uber/Lyft rides to attend social activities and therefore, the fares are very low and worth skipping taking the bus. The second most popular answer to this question, with 16.3%, was to connect to an outside area. This suggests that transit systems connecting to further areas, such as airports, are not strong or efficient enough to support the needs of travelers. The remaining choices offered in the survey received similar amounts of selections; see Figure 9 below for details.
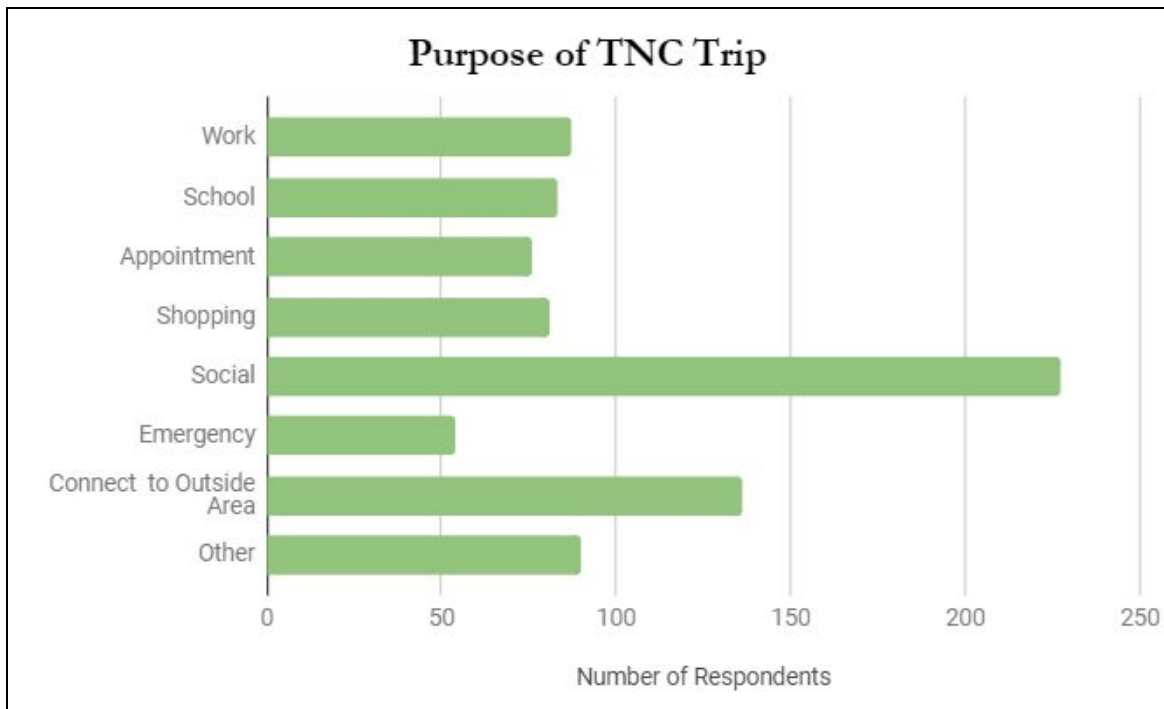
Figure 9: 2018 survey responses when asked the purpose of the TNC trip

In the 2018 survey, respondents were also asked the reasoning behind their choice to use a TNC for their travel. The leading response was "No Car", showing that ride-hailing provides a mean of transportation for those who come to Santa Cruz without a car. The second most popular response, with 12.4%, was "Bus is Unreliable". It is important to point out that 45.8% of all responses were reasons related to bus issues; reinforcing the idea that students do not believe the bus system within Santa Cruz and UCSC is adequate enough to support their needs. Lastly, survey results indicate that 6.8% of Uber and Lyft riders stated that they use TNCs to avoid driving while intoxicated.

Figure 9: 2018 survey responses when asked the reasoning behind choosing to use a TNC

Recommendations:

There are two main takeaways from the results found on the use of TNCs on the UCSC campus. Firstly, it appears that the poor quality of transit services, both to get on campus and also to get around campus, are a key driving factor behind ride-hailing usage on campus. Secondly, it has become clear that TNCs' popularity is growing exponentially and without any large policy changes, it will be difficult to eliminate its use. Therefore, programs and initiatives must be implemented to manage the most concerning aspects of TNC usage which are safety and traffic congestion. The recommendations listed below are ways that UCSC and the City of Santa Cruz can mitigate the use and effects that TNCs have on the campus.

1) Improve Transit Service
2) Geofenced Pick Up Locations
3) UberPool & Lyft Line Promotion

Recommendation #1: Improve Transit Service:

As mentioned above, poor transit service is one of the main explanations for the use of TNCs on the UCSC campus. In 2018, 56% of survey respondents stated that they chose to use Uber/Lyft because of a transit related issue. If UCSC wants to decrease the amount of TNC rides taking place on the campus, the factors causing the transit problems must be addressed.

One of the factors contributing to the quality of transit is speed. Buses, whether they be city buses or campus buses, make many stops along their routes. These stops add minutes to individuals' trips, and can cause them to choose to use a TNC for a quicker trip. To address the speed of buses, the University and the city could consider eliminating a few stops along their routes. An example of this would be taking away the East Remote stop from Metro bus routes entering from the East side of campus. This stop is almost purely used by individuals getting around campus, and therefore can be covered solely by the campus Loop buses.

An additional option to address speed of transit is to have an express bus from downtown Santa Cruz to UCSC. The express route could potentially only have five to ten stops total, picking up from the highest demand areas only. This could significantly decrease the length of the trip to get to campus and could encourage individuals to use transit more.

Another factor adding to the quality of transit in Santa Cruz is the capacity of buses. 8.6% of survey respondents indicated that they used a ride-hailing service because the bus was too full and passed them. To address this issue, both UCSC and the city of Santa Cruz could implement more articulated buses into their routes as they have shown to address most transit capacity concerns.

Lastly, a final contributor to transit service quality is frequency; 10.3% of survey respondents stated that they used a TNC because they were waiting too long for a bus. The city as well as the University should consider adding more buses to some of their routes, especially the routes with limited frequency, such as the 20 and 22 routes.

Overall, there are many ways to address transit issues. However, if the city and University want to make a significant difference, a good place to start is by addressing the speed, capacity and frequency of transit options.

Recommendation #2: Geofencing Pick Up Locations:

Need:

Two of the largest concerns with ride-hailing services are traffic delays and safety. These problems stem from the drivers of these services disobeying traffic laws and committing unsafe actions such as double parking, illegally pulling over and obstructing transit, biking and walking infrastructure. A solution to these issues can be addressed and managed with geofenced pick-up locations. By geofencing locations for pick-ups, Ubers and Lyfts are forced to pick up their

riders in the designated areas, ensuring they are stopping in safe areas that are out of the way of traffic. Implementing geofenced pick-up locations can mitigate the negative effects of ride-hailing services while still allowing them to exist.

Geofencing has been a very effective technique that many airports have recently implemented. Hundreds of large airports in the United States have a designated ride sharing zone that increases the efficiency, safety and timeliness of airport rides (MWCG, 2017). In addition, cities are beginning to consider designating specific pick-up zones throughout their streets to decrease traffic congestion and traffic violations committed by TNCs. Cities such as San Francisco, Chicago, Washington and Fort Lauderdale have all already introduced pilot programs in which they will convert parking spaces in the highest density areas of their cities into reserved pick-up and drop-off locations for rideshare vehicles (McFarland, 2017). The director of the mobility research lab at Perkins + Will, Gerry Tierney, stated that he believes most cities will have these pick-up and drop-off spots in crowded downtown areas within the next few years (McFarland, 2017).

This management technique could be instrumental on the University of California, Santa Cruz campus. With designated locations, ride-hailing vehicles will no longer block the flow of traffic or endanger other drivers, cyclists or pedestrians. Additionally, the UCSC campus is quite complex, and often confuses drivers. This implementation would simplify the process for drivers to navigate campus and eliminate them circling campus to find their riders. Other universities such as University of California, Los Angeles (UCLA), University of Southern California (USC), University of California, Santa Barbara (UCSB) and more have all partnered with either Uber or Lyft to have geofenced pick-up locations on their campuses (Soriano, 2018). On a temporary basis, geofencing was implemented to mitigate traffic congestions during the June 2018 commencement ceremonies at UC Santa Cruz and was shown improve traffic flow.

UCLA Case Study:

The University of California, Los Angeles (UCLA) implemented geofenced Uber/Lyft pick-up locations in September of 2017. The decision to put them into place was made in early 2017; it was initiated when the campus began to notice a large increase of ride-hailing services on campus and realized that they were continuously breaking safety and traffic rules. Concerned about the implications of these services, UCLA decided that geofenced pick-up locations were the most applicable action to take to manage the issue.

On the UCLA campus, there are now 14 pick-up locations that students can choose from when trying to leave campus. These locations are all safe areas to pull over out of traffic flow and are at most a 5 minute walk from anywhere on campus. The only area that does not have geofenced pick ups enforced is near UCLA's medical facilities as campus administrators do not want to impede any emergency rides.

The program does have some restrictions to its use. The geofenced locations are only active on weekdays from 7am to 6pm. UCLA's planning and policy analyst, Abdallah Daboussi,

explained that this decision was made in response to students backlash to the new implementation. Therefore, to compromise, they decided to only have the pick-up locations active during the times where campus is busiest. Additionally, the restricted times were also chosen to protect students' safety. By having the pick-up locations end at 6pm, it is certain that no student will have to walk through campus in the dark.

The geofenced locations are also confined to pick ups only, leaving ride-hailing drivers able to drop off their riders anywhere. Daboussi stated that this is because once a rider is in the driver's car, it is extremely difficult to ignore the rider's instructions as to where to stop. Pick-up locations, on the other hand, are much easier to control as the driver and rider are separated and can only meet at the geofenced location. However, UCLA mentioned that they are soon going to embark on a partnership with Lyft where there would be "suggested drop-off" locations. This would allow the driver to suggest a drop-off location, leaving the rider with the choice to either opt in or out of using it.
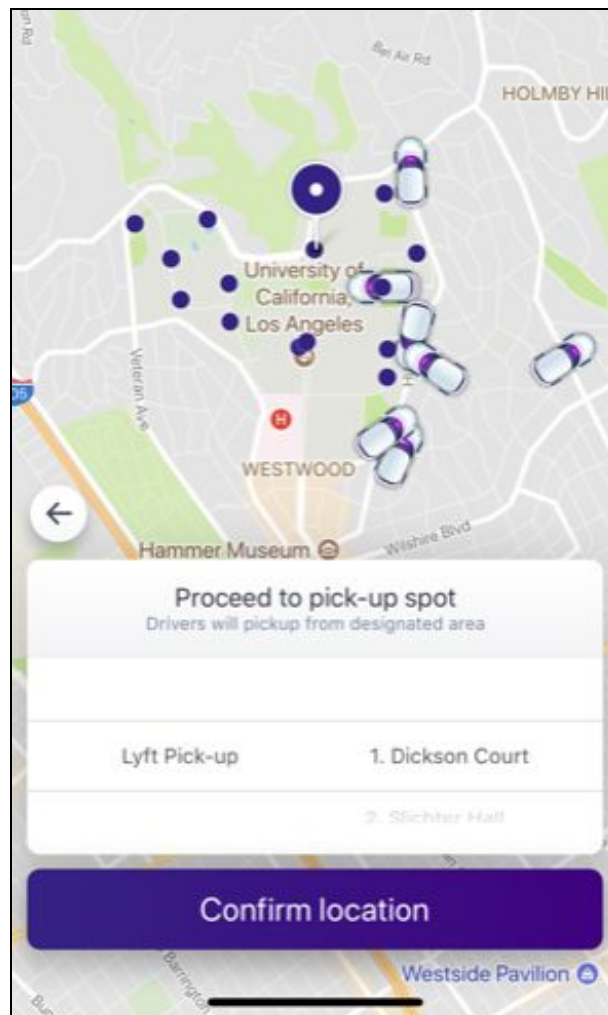
Figure 10: Screenshot of Lyft app when attempting to order a Lyft at UCLA

As previously mentioned, there was backlash upon the program's initiation. A large component of the complaints were from students that were upset about the inconvenience of a five-minute walk to their ride. Daboussi explained that students' resistance was expected and that it would soley take time for them to adjust to the new pick-up rules. As projected, time has solved the complaints and students are now accustomed to the new policies with Uber/Lyft.

Another concern students had was how the geofenced locations would affect individuals with disabilities. Daboussi stated that this was their biggest worry; to address it they worked with other departments as well as with Uber and Lyft to come up with two solutions. The first was for the UCLA disability van to pick up the individual anywhere on campus and drive them to the geofenced locations to then call their ride. The second, and more realistic, approach is that individuals with disabilities can bypass the geofenced pick up by calling their Uber or Lyft driver and explain that they are incapable of meeting them at the location. This is the only situation where a unrestricted pick up is allowed.

Overall, the program has been a large success on the UCLA campus. Heat maps provided by Uber and Lyft illustrate that the geofencing is working and that almost every Uber/Lyft pick up on the UCLA campus is occuring in a safe zone that does not impair traffic flow. After implementing the geofenced locations, UCLA has noticed a decrease in traffic congestion and traffic violations.

UCSC Implementation:

Twenty-two geofenced pick-up locations are recommended to be placed throughout campus with the goal of having one within a 5-minute walk from any location on campus. The pick-up locations would be located out of traffic flow and in areas that are safe and legal to stop in. Figure 11 is a map illustrating the suggested geofenced pick-up locations on the UCSC campus. The points are surrounded by circles which represent a quarter-mile radius from each point; in other words, the circles show all the locations within a 5-minute walk from each point. As you can see, these 22 locations will more than supply all the areas on campus which need access to ride-hailing services.
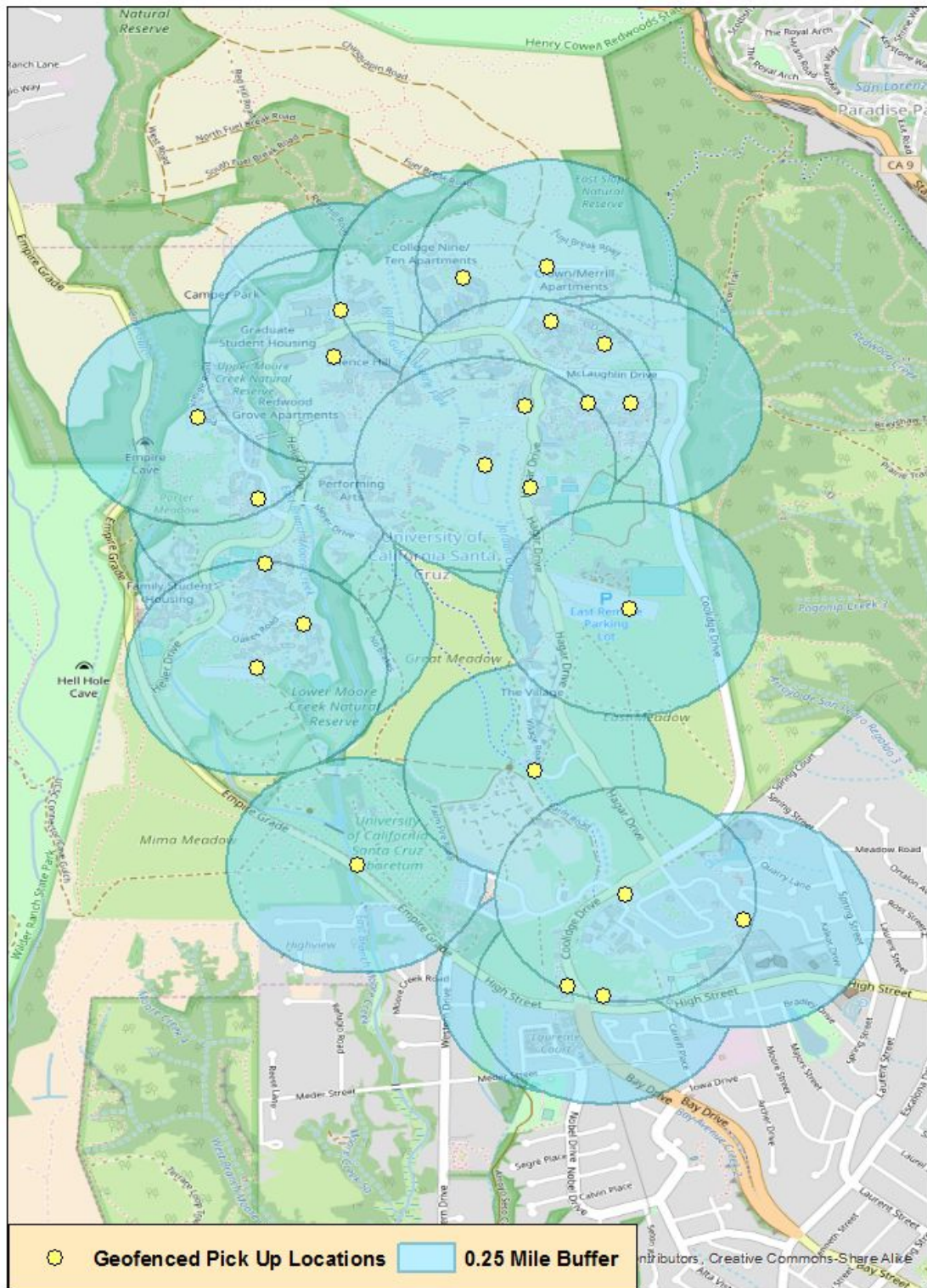
Figure 11: Suggested locations for geofenced pick-ups and buffers illustrating a 5 minute walk radius from each location

Similar to UCLA, the recommendation is to begin with only pick-up locations and in time, transition to a "suggested drop-off" program. Additionally, the geofenced locations should only be active from 7am to 6pm since that is when traffic is heaviest on campus and because students' safety is a priority. Prior to the implementation I recommend that all students are notified with a thorough explanation of the program and its necessity. This will help decrease the amount of backlash the University receives.
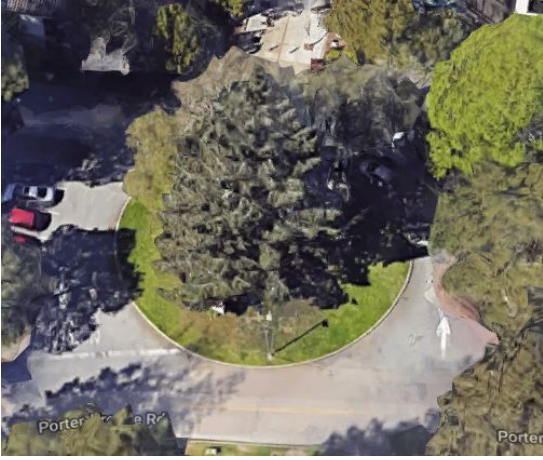
Given the state of our campus, there are limited areas where designated pick-up/drop-off locations will work. Therefore, there are three different actions that UCSC can take to bring these areas to life:

1. **Adding signage that indicates a ride-hailing zone**. This option is for locations that are already conveniently structured to pick up passengers such as circles or cul de sacs. The signage should be added to the curb in the form of white paint and the lettering stating "passenger loading zone". The signage would help both riders and drivers find the location, speed up the pick-up/drop-off process, and also facilitate drop-offs and pick-ups by private (non-TNC) vehicles.

2. **Convert 1-2 parking spots into ride-hailing loading zone.** This option is for locations that do not have curbside space for a pick-up. Therefore, the only option is to convert 1-2 (depending on the total size of the area) parking spaces into spots for Uber or Lyft vehicles. This way, the ride-hailing drivers can wait in those spots instead of block the flow of traffic. These spots would have signage indicating their purpose.

3. **Add signage in parking lots with wide enough roads.** In some cases, parking lots are wide enough for a vehicle to stop with enough room for other cars to easily go around it. Therefore, instead of taking a parking spot away from these lots, the recommended solution is to add signage indicating a passenger loading zone on a curb where the width of the road is sufficient for a car to stop in without impeding traffic.

Some of the locations listed below are low demand areas; therefore, I suggest to roll out this program out in two phases. Phase One would implement the higher-demand pick-up locations numbered 1 through 15, and Phase Two would consist of implementing the remaining 7 locations. Below are the 22 locations chosen for geofenced pick-up/drop-off locations for ride-hailing services on the UCSC campus:

	Location	Recommendation	Photo
1	Base of Campus	Convert 1-2 parking spots into ride-hailing loading zone	
2	West Remote	Add signage in parking lots with wide enough roads	
3	Oakes Circle	Add signage indicating ride-hailing zone	
4	R. Carson Entrance	Add signage in parking lots with wide enough roads	

5	Porter Circle	Add signage indicating ride-hailing zone	
6	Kresge Parking Lot	Add signage in parking lots with wide enough roads	
7	West Core Old Stop	Add signage indicating ride-hailing zone	

8	Engineering Circle	Add signage indicating ride-hailing zone (Already has white passenger loading zone)	
9	9/10 Circle	Add signage indicating ride-hailing zone	
10	Merrill Circle	Add signage indicating ride-hailing zone	

11	Crown Circle	Add signage indicating ride-hailing zone	
12	Cowell Circle	Add signage indicating ride-hailing zone	
13	Stevenson Circle	Add signage indicating ride-hailing zone	

14	Bookstore	Convert 1-2 spots in the center of the circle into ride-hailing loading zone	
15	Hahns	Convert 1-2 parking spots into ride-hailing loading zone	
16	OPERS Parking Lot	Convert 1-2 parking spots into ride-hailing loading zone	

| 17	East Remote	Convert 1-2 parking spots into ride-hailing loading zone: Pull from spots near the loop bus stop	
18	TAPS	Add signage in parking lots with wide enough roads	
19	Arboretum	Convert 1-2 parking spots into ride-hailing loading zone	

20	North Remote	Add signage in parking lots with wide enough roads	
21	Farm Parking Lot	Convert 1-2 parking spots into ride-hailing loading zone	
22	Staff Housing	Add signage indicating ride-hailing zone	

Recommendation #3: UberPool & LyftLine promotion

UberPool and LyftLine are respectively Uber's and Lyft's carpooling programs. Through this feature on the apps, riders can choose to share their ride with other individuals heading in the same direction in exchange for a discounted price (Schwieterman, 2016). This both saves

individuals money, and decreases vehicle miles traveled and traffic congestion (Schwieterman, 2016).

By partnering with either or both Uber and Lyft, UCSC could provide a discounted arrangement to encourage students and staff to utilize the carpool feature of the ride-hailing apps. Other schools have taken similar steps to discourage single occupancy rides in TNCs. UCLA partnered with Uber to offer a flat rate of $5.99 for any UberPool ride taken 5 miles within UCLA (Daboussi, 2018). In February of 2018, University of Southern California (USC) partnered with Lyft to offer free rides to students who use Lyft Line between the hours of 7pm and 2am (Lyft Blog, 2018). Both programs are relatively new, but are showing an increase in shared rides (Daboussi, 2018). If UCSC is able to come to an agreement with either Uber or Lyft, or both, there is large potential for decreased congestion on campus and in Santa Cruz in general.
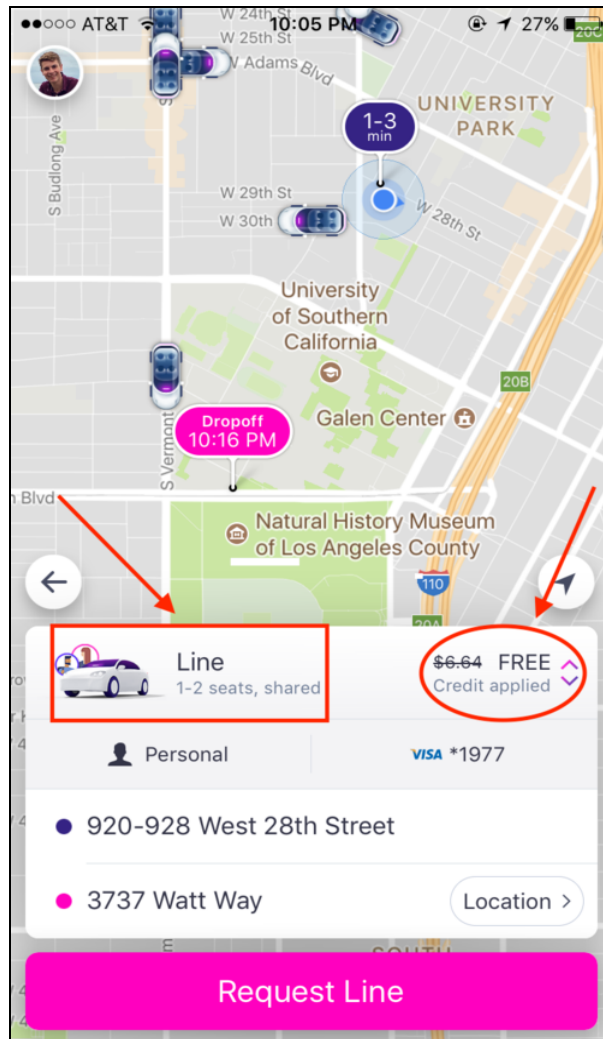
Figure 12: Screenshot of a student using LyftLine at the University of Southern California (Lyft Blog, 2018)

Conclusion:

It is clear that ride-hailing services are now a prominent feature in transportation networks worldwide and that their popularity and use will not recede anytime soon. As discussed, their services can be disruptive to traffic flow and affect the safety of our roads. However, with the proper management, TNCs have the potential to decrease the amount of cars on the road while getting everyone where they need to go in a safe and efficient manner. Designated pick-up zones and programs initiations to encourage carpooling with TNCs are first steps to reach the ultimate goal of sustainable ride-hailing services.

Acknowledgments:

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