

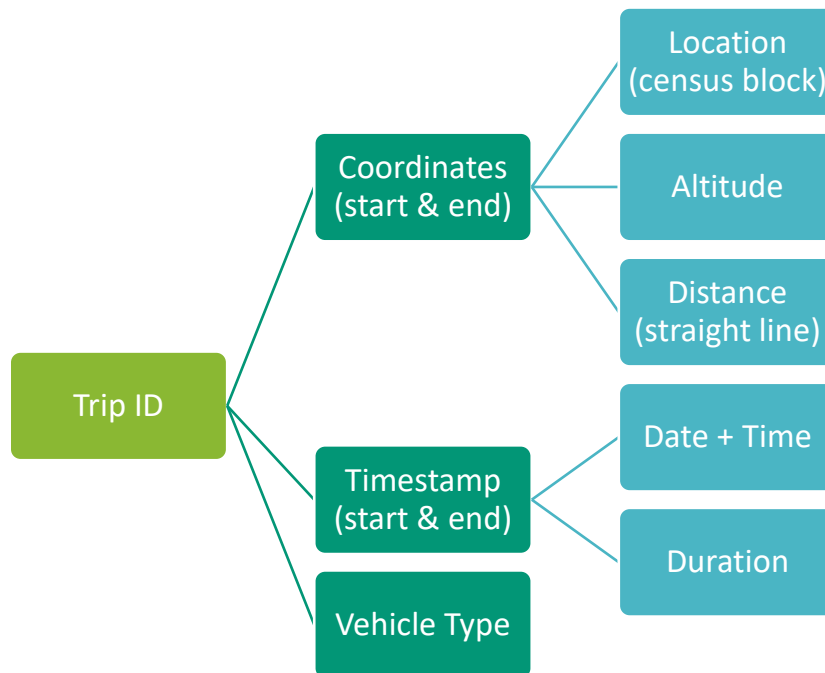
ABOUT THE DATA

Lime provides trip data exports for all bicycle rides in Ithaca to the City of Ithaca and Bike Walk Tompkins. The data export records the following information for each trip: a unique trip ID number, start coordinates (latitude and longitude), start date and time, end coordinates, end date and time, and an estimation of distance traveled. **Trip data is devoid of info identifying the user of the bike and the specific bike that was used.**

To confirm the integrity of the data, we cross-referenced trips made by Lime users as recorded on the consumer app to the trip data provided by the company. Lime collects GPS and timestamp data from two sources: the GPS module integrated into the lock as well as the user's smartphone. **By cross-referencing trips, we were able to determine that start/end coordinates and time are highly accurate** because they are sourced from the bike's lock. Distance travelled data is not as accurate because it is sourced from users' smartphones. **Therefore, this analysis only uses coordinate data and time data corrected to match Eastern Time.**

Lime separates data exports by vehicle type, so we can determine whether a trip was made on a pedal bike or e-bike. Using time data, we calculated the duration of each trip and whether the trip was made before ("summer") or after ("fall") Lime's expansion into Collegetown and East Hill on August 17, 2018. Furthermore, using coordinate data, we calculated the trip distance as the crow flies, the start and end altitude above sea level, and the intersecting census block. This allowed us to determine whether someone rode uphill or downhill and what point of interest, neighborhood, municipality, and county they started and ended their trip.

Figure 1 – Hierarchy of Data Provided by Lime (left two columns) and Data Computed for This Analysis (right)



The data was then imported into Tableau for analysis. In 2018, there were 89,245 individual trip records for Lime's vehicles across the Southern Tier. For this analysis, we filtered for rides that started or ended within Tompkins County, which brought the number of records down to 85,784. Lastly, we also filtered out rides that were likely to be short "test rides," defined as all rides that have start and end locations less than 0.05 miles apart (i.e. the length of an average Ithaca city block) with a trip duration of less than 10 minutes. **This leaves us with 77,606 trips to analyze, which is Bike Walk Tompkins' best estimate for the bona fide number of rides (ridership) for the Lime system in Tompkins County in 2018.**

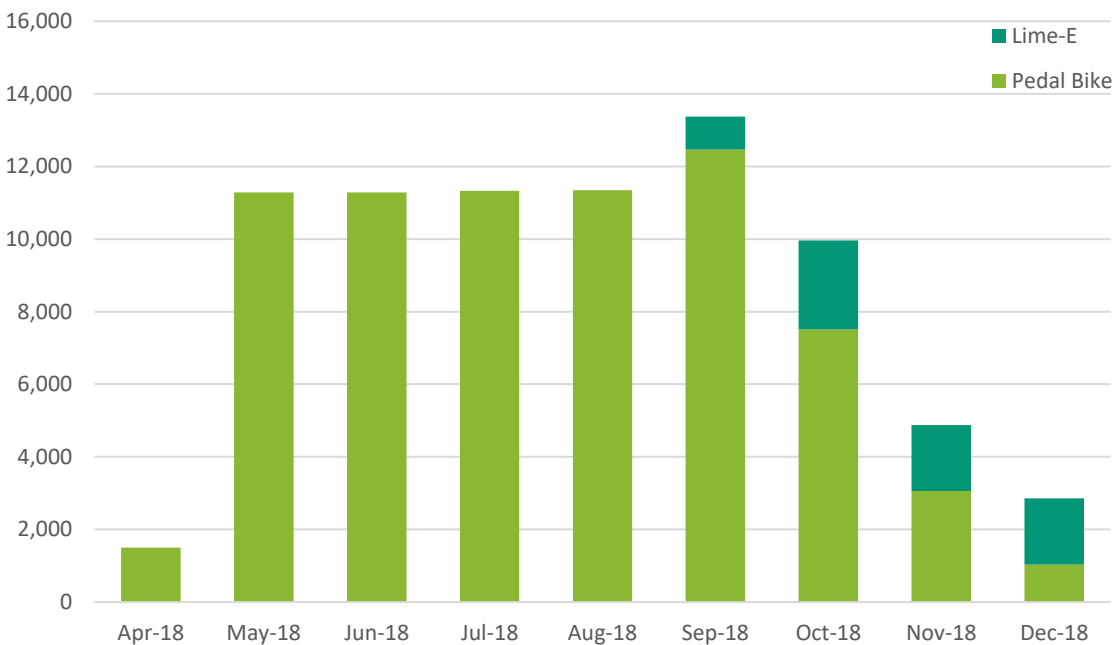
ANALYSIS OF TRIPS BY TRIP START AND END TIME

MONTHLY RIDERSHIP

Bicycling use is affected by the seasons, and Lime ridership followed the seasons of Ithaca closely. After its launch at the end of April 2018, Lime had consistent ridership of around 11,250 rides per month throughout the summer from May until August. With the return of students to Ithaca, Lime's expansion into Collegetown, and the introduction of its Lime-E electric bikes, Lime's ridership reached nearly 13,500 in September. The return of cold weather and subsequent fleet reduction, however, brought ridership down to 2,850 in December.

Higher ridership figures in the start of the system were likely influenced by free trial periods, low rates for pedal bikes, wide availability of coupons, ideal weather for bicycling, and the appeal of a new mode of transportation. Lower ridership figures in the latter half of the year were likely influenced by less ideal weather, higher rates for e-bikes compared to pedal bikes, fewer discounts available, and fewer bicycles available as more of the fleet was put into storage.

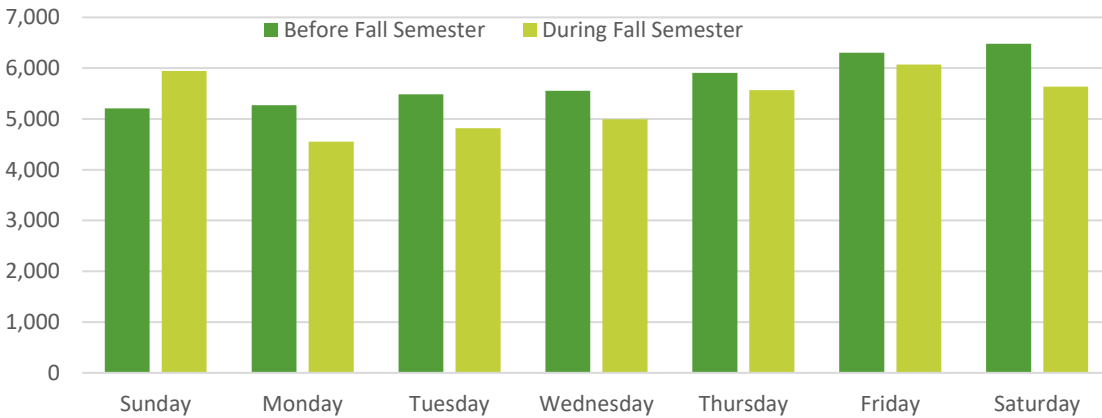
Figure 2 – All 2018 Rides by Month and Vehicle Type



DAY OF WEEK RIDERSHIP

During its more stable summer months, **the Lime system in Tompkins County averaged between 350-400 rides per day**, with a slight increase in rides on weekend days compared to weekdays (see Figure 3). During the fall semester, the most popular days to ride are also on the weekends, with a noticeable increase on Sunday. The lower totals for the days of the week during the fall semester can be accounted by the lower ridership from October through December.

Figure 3 – All 2018 Rides by Day of Week and Season



TIME OF DAY RIDERSHIP

Because one can take Lime trips one-way, **the weekday peak hour for the Lime system in Tompkins County is 5 PM with no corresponding AM peak**. On weekends, activity peaks at 1 PM and steadily decreases after that. Activity after midnight is minimal but still existent, even at 4 AM. Activity picks up again at 8 AM.

Figure 4 – All 2018 Rides by Hour of Day and Weekday/Weekend

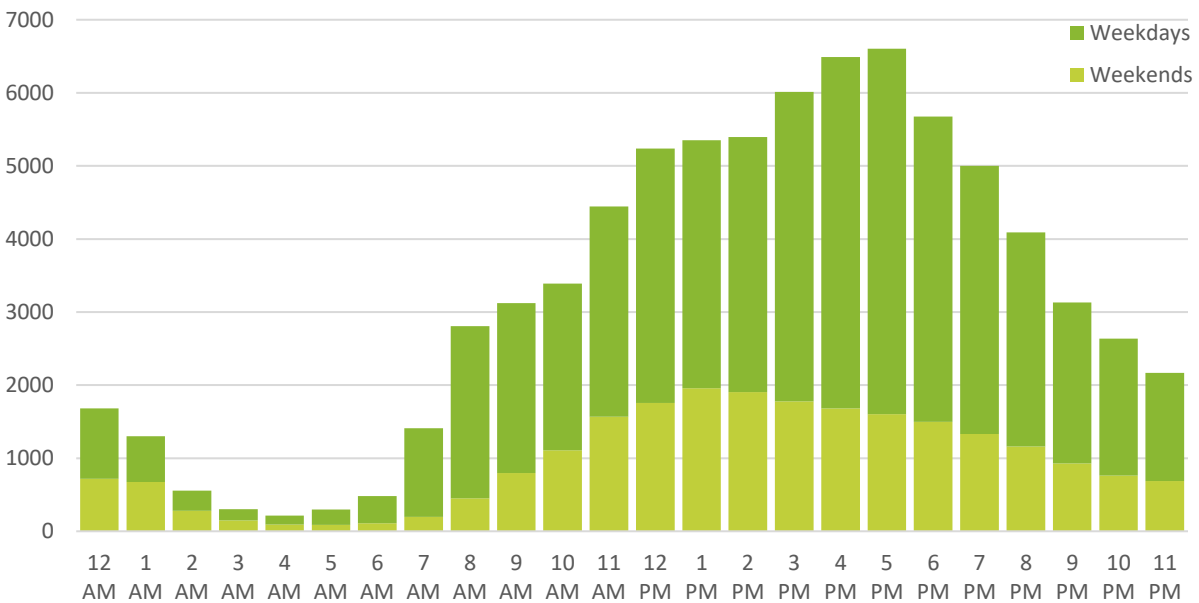
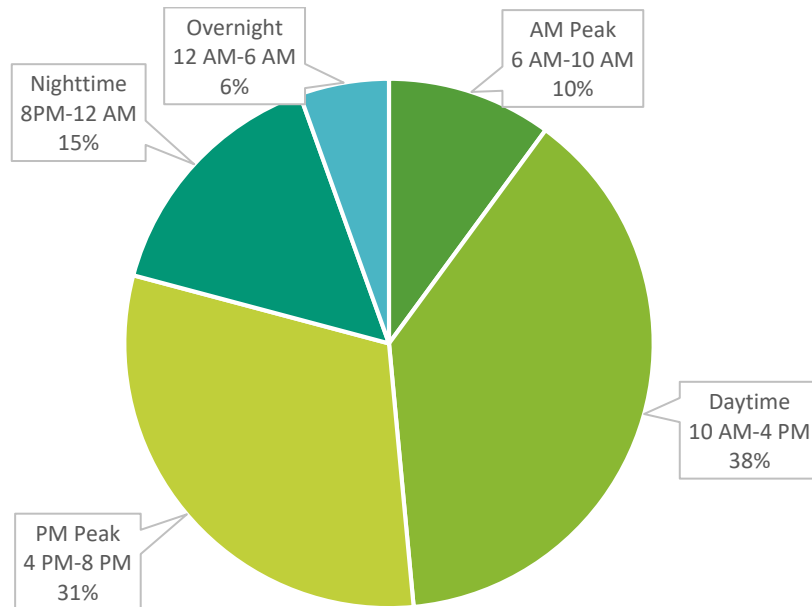


Figure 5 - Distribution of All 2018 Rides by Time of Day



TRIP DURATION

Looking at trip duration data on Figures 5 and 6, there is a very clear right-skewed curve with a peak (or mode) at the 5-minute mark. **The median trip duration is 10 minutes and the average trip duration is 26 minutes.** The reason for this discrepancy in averages, and the right-skewness of the charts, is the higher number of long bicycle rides during the summer as well as riders who forgot to lock their bikes after ending their trip. Table 1 demonstrates this tendency for longer bike rides in the summer. It also shows that rides on the electric bikes take less time than those on a pedal bike.

Figure 6 - Distribution of Rides from 0 to 30 Minutes

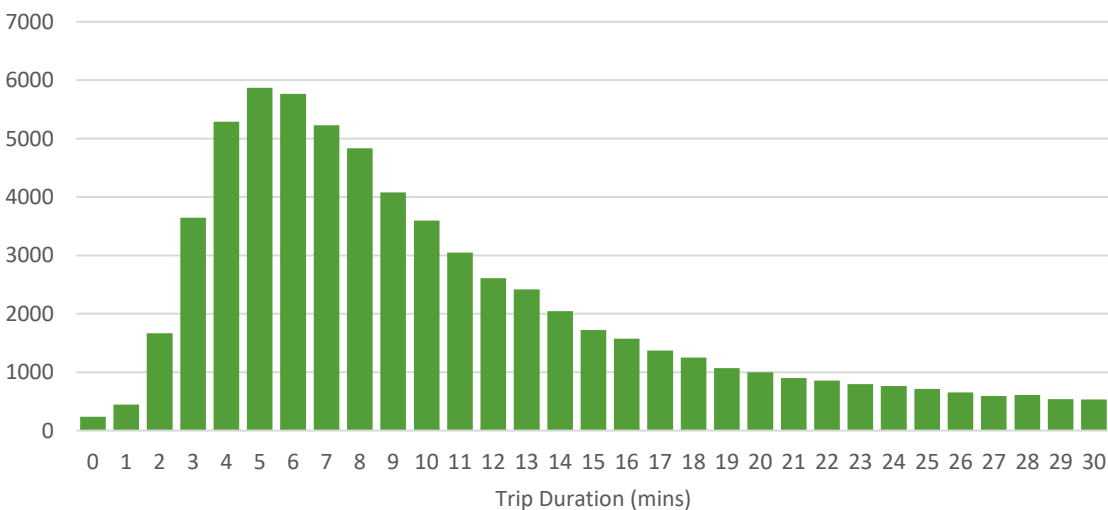


Figure 7 – Distribution of All 2018 Lime Rides by Trip Duration

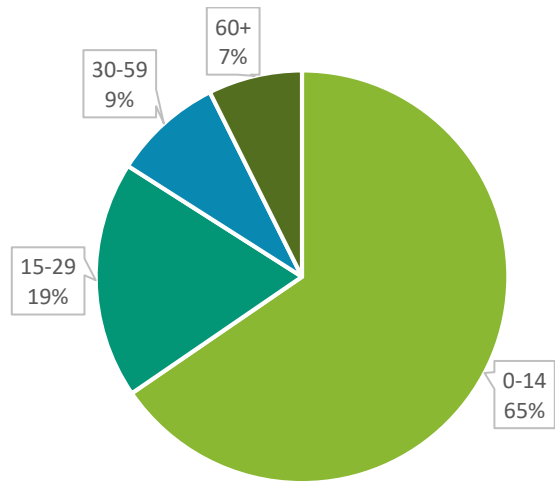


Table 1 – Average Duration of Rides by Season

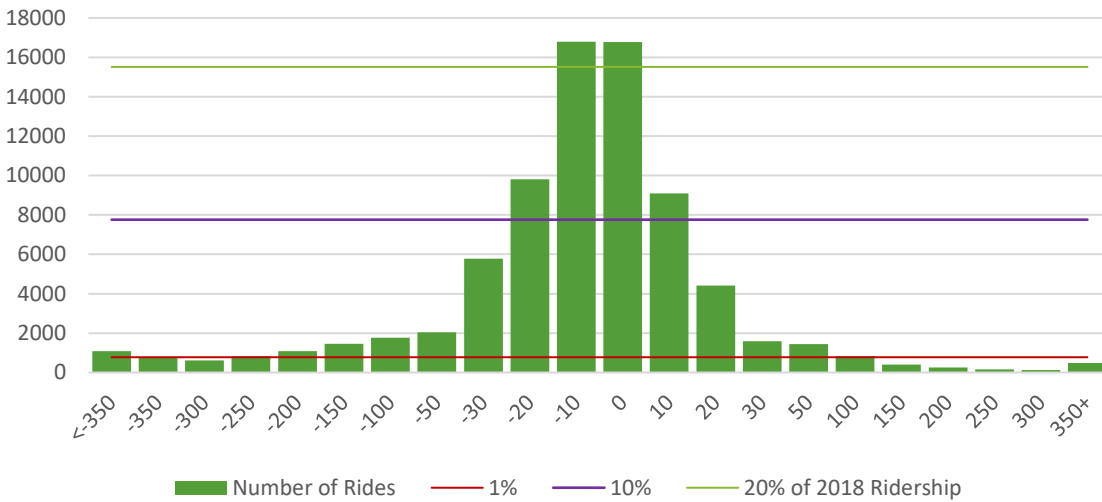
Season	Vehicle Type	Average Duration	Median Duration	Mode Duration	Total Trip Time
Summer	Pedal Bike	32	12	6	1,268,885
Fall	Pedal Bike	19	9	5	585,930
	E-Bike	18	7	5	129,425
2018 Average	Both Types	26	10	5	1,984,240

ANALYSIS OF TRIPS BY START AND END COORDINATES

ELEVATION CHANGE

Most Lime riders did not use the bikes to go up or down Ithaca's steep hills; more than 60% of rides went up or down less than 20 feet in elevation (see Figure 8). Even when filtering for just the rides that occurred in the fall semester after Lime expanded into Collegetown, uphill rides that climbed 150 feet or more made up less than 5% of all rides combined (see Figure 9). For reference, the elevation change from downtown to Stewart Avenue is 170 feet, followed by 260 feet to Eddy St, and 325 feet to College and Dryden (see Table 2).

Figure 8 – All 2018 Rides by Elevation Change Intervals



After the expansion of Lime into Collegetown, downhill rides became more frequent. Nearly 10% of all rides during the fall semester went down elevations of 150 feet or more (see Figure 8). This preference for downhill riding over uphill is not surprising, particularly when there's no need to bring the bikeshare bicycle back uphill.

Figure 9 – 2018 Fall Semester Rides by Elevation Change Intervals

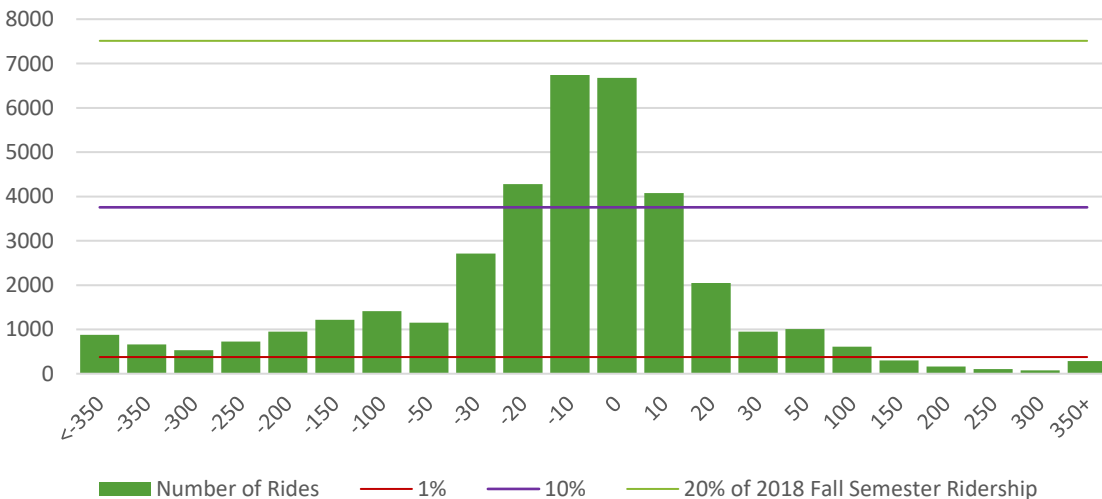
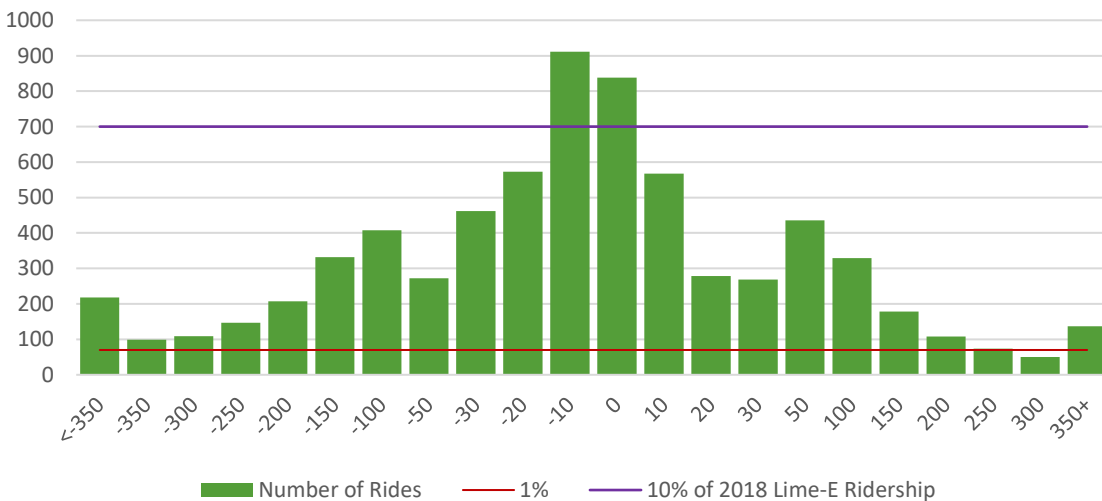


Table 2 - Comparison of Elevation Above Sea Level and Change in Elevation

Intersection	Elevation (ft)	Change
Buffalo at Aurora	410	-
University at Ithaca City Cemetery	465	55
Buffalo at Stewart	580	170
College at Mitchell	650	240
Buffalo at Eddy	670	260
College at Dryden	735	325
Cornell Arts Quad	805	395
Five-Point Intersection (Rt 366)	845	435
East Hill Plaza	935	525

The introduction of Lime-E pedal-assist electric bikes in late September was seen as a way to address the difficulty of bicycling up the steep hills of Ithaca. **Preliminary data shows that the discrepancy between downhill and uphill riding was reduced when looking at the ridership of Lime-E bikes by themselves** (see Figure 9). In fact, among Lime-E rides that changed 50-100 feet in elevation, there were more that went uphill than downhill. Nevertheless, there were more rides going downhill than uphill overall. Bike Walk Tompkins will continue to monitor Lime-E rides to see if these findings hold up as more people use the bikes in 2019.

Figure 10 – 2018 Lime-E Rides by Elevation Change Intervals



TOMPKINS COUNTY MUNICIPALITIES & POLITICAL BOUNDARIES

By far, most trips started and ended within the City of Ithaca, but Lime also operates in the Villages of Trumansburg and Dryden. Since the bicycles can be ridden past municipal boundaries, some riders have used them to go to neighboring municipalities that are not served by Lime such as the Village of Cayuga Heights and the Town and Village of Lansing. The only local municipality that was not been visited by a Lime vehicle in 2018 is the Village of Freeville.

Table 3 – All 2018 Trip Starts and Ends by Tompkins County Municipalities

Start Municipality	Trip Starts	Trip Ends	Start Municipality	Trip Starts	Trip Ends
City of Ithaca	73,373	72,785	Town of Lansing (except village)	6	13
Town of Ithaca (except village)	1,547	1,963	Town of Enfield	3	8
Town of Dryden	888	882	Town of Danby	2	9
Village of Trumansburg	826	752	Town of Newfield	2	17
Town of Ulysses (except village)	510	559	Town of Caroline	1	3
Village of Dryden	195	211	Village of Groton	1	2
Vlge. of Cayuga Heights	147	200	Town of Groton (except village)	0	1
Village of Lansing	100	145	Village of Freeville	0	0
Out-of-County*	11	69			

* only includes trips that started or ended within Tompkins County

Given the high number of rides within the City of Ithaca, **the rest of this analysis will focus on rides happening within the City's boundaries and its immediate surroundings** (the Ithaca Urbanized Area). The urbanized area includes the City of Ithaca, Town of Ithaca (including the Village of Cayuga Heights), Village of Lansing, and the hamlets of Varna and Etna.

ITHACA URBANIZED AREA

As evidenced by Figure 11, within the flats of Ithaca nearly all streets have been visited at least once by a LimeBike or Lime-E since the system's launch. Using GIS software, we can create heatmaps based on the trip start and end locations (see Figures 12 and 13). These maps show downtown Ithaca as a very strong hub of activity, but also highly active are the West State Street corridor, Greenstar, Wegmans, Collegetown, the Ithaca Farmers Market, and TCAT bus stops with frequent service, among other areas.

Figure 11 – All 2018 Trip Start (Orange) and End Locations (Blue)

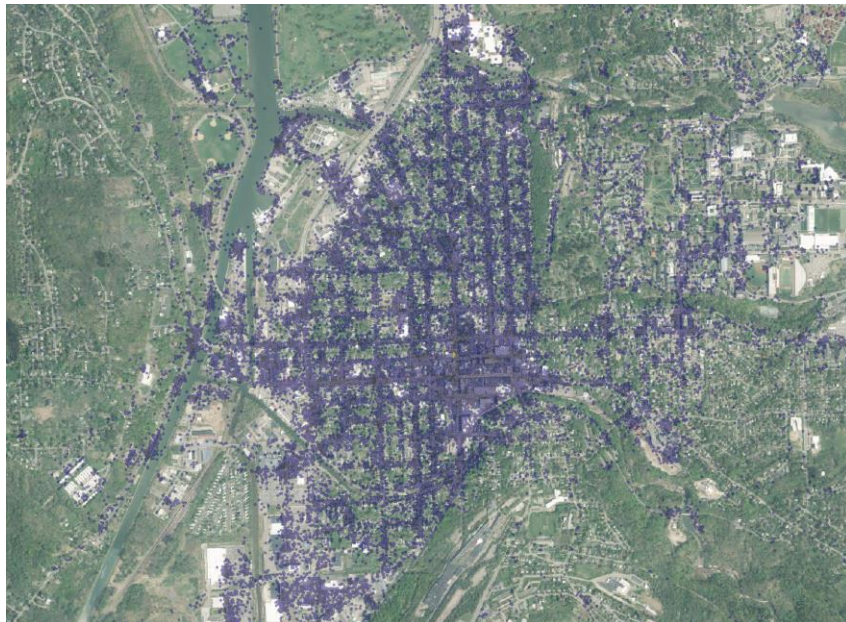
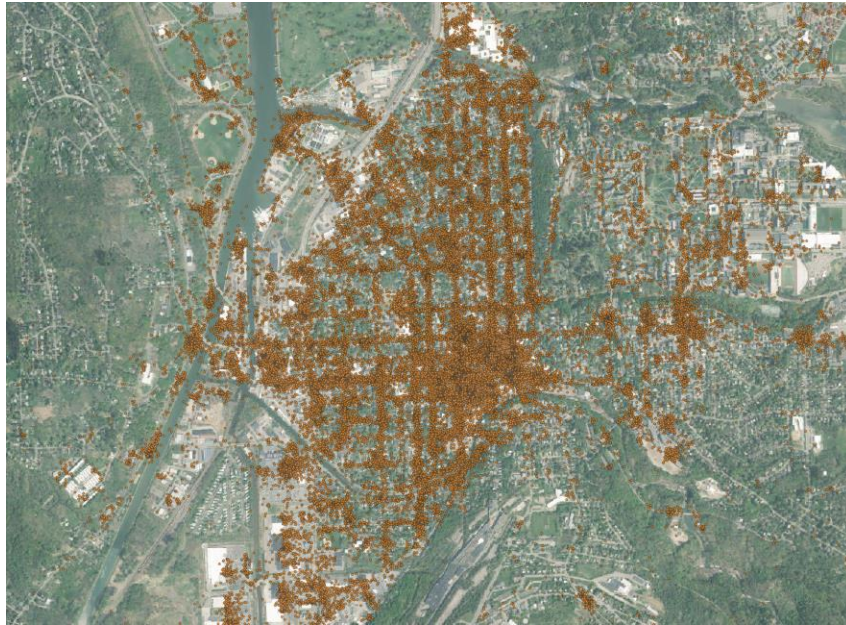
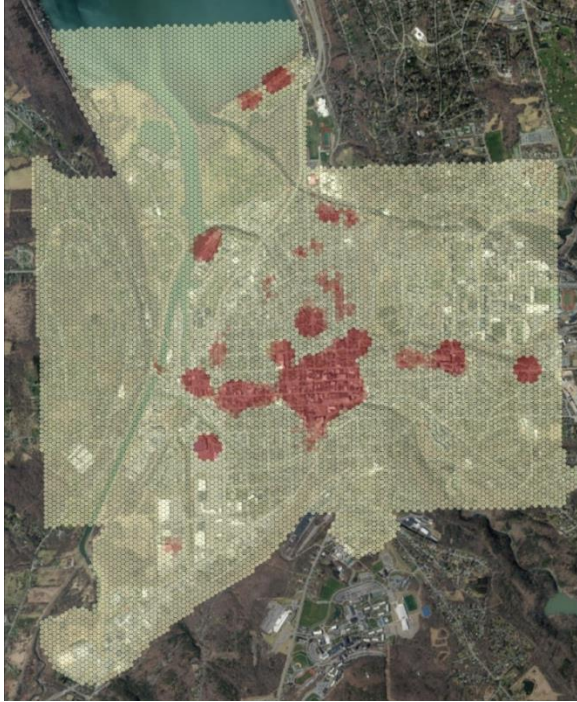


Figure 12 - Heat Map of All 2018 Trip Starts



To understand the use of Lime within the City of Ithaca and surrounding urban and suburban neighborhoods, we separated the Urbanized Area of Ithaca into 13 distinct neighborhoods to be able to count the number of rides starting and ending in each neighborhood (see Figure 13). While some neighborhoods are consistent with the general community consensus of their boundaries (ex. Fall Creek, Southside), other neighborhoods used in this analysis are an amalgamation of different neighborhoods and even municipalities. This is because the number of Lime rides would be too low to be noticeable if these amalgamated areas were subdivided into the actual neighborhoods.

Figure 13 - Map of Ithaca Urbanized Area Neighborhoods for Lime Analysis



Table 4 ranks the neighborhoods by number of trips started within them. Of note is the difference between trips taken before the fall semester started compared to while the semester was ongoing. While Downtown, Fall Creek, and Northside remain at the top, **activity in and around Collegetown and Cornell increased tenfold as Lime expanded into these areas and students returned for classes.**

Table 4 – All 2018 Trip Starts by Neighborhood

<i>Trip Start Neighborhood</i>	2018 Total	Summer	Fall
<i>Downtown</i>	20,065	11,799	8,266
<i>Fall Creek</i>	12,277	7,117	5,160
<i>Northside</i>	7,301	4,237	3,064
<i>West End</i>	6,168	3,521	2,647
<i>South Meadow Street</i>	5,497	2,991	2,506
<i>Southside</i>	5,100	2,552	2,548
<i>Waterfront (IFM & Stewart Pk.)</i>	5,000	3,560	1,440
<i>Collegetown</i>	4,360	362*	3,998
<i>West Hill</i>	2,866	1,928	938
<i>Cornell Campus</i>	2,733	258*	2,475*
<i>South Hill & Ithaca College</i>	1,632	498	1,134
<i>Maplewood & East Hill</i>	1,397	100	1,297
<i>North Campus & NE Ithaca</i>	780	113*	667*
<i>Total Rides Starting in the Ithaca Urbanized Area</i>	75,176	39,036	36,140

* Lime not actively placing bikes in these neighborhoods during the indicated season

Looking at trip end locations on Table 5, we see a similar pattern where trips in Collegetown and the Cornell Campus expanded tenfold as Lime began placing bikes on East Hill in the fall. An analysis of end locations is important because it shows the places people want to go by bike, rather than where they started. Table 6 shows points of interests in and around Ithaca with the total number of rides in 2018 that ended on their block.

Table 5 – All 2018 Trip Ends by Neighborhood

<i>Trip End Neighborhood</i>	2018 Total	Summer	Fall
<i>Downtown</i>	18,324	9,977	8,347
<i>Fall Creek</i>	13,212	7,463	5,749
<i>Northside</i>	7,921	4,461	3,460
<i>West End</i>	6,825	3,814	3,011
<i>South Meadow Street</i>	6,394	3,412	2,982
<i>Southside</i>	5,736	2,921	2,815
<i>Waterfront (IFM & Stewart Pk.)</i>	5,162	3,614	1,548
<i>West Hill</i>	3,035	2,053	982
<i>Cornell Campus</i>	2,865	268*	2,597*
<i>Collegetown</i>	2,669	269*	2,400
<i>South Hill & Ithaca College</i>	1,528	530	998
<i>North Campus & NE Ithaca</i>	902	139*	763*
<i>Maplewood & East Hill</i>	535	83*	452
Total Rides Ending in the Ithaca Urbanized Area	75,108	39,004	36,104

* Lime not actively placing bikes in these neighborhoods during the indicated season

Table 6 – All 2018 Trip Ends at Selected Points of Interests (POIs)

<i>Trip End POIs</i>	2018 Trips	% Total	<i>Trip End POIs</i>	2018 Trips	% Total
<i>Stewart Park</i>	2,779	3.7%	<i>Ithaca High School</i>	773	1.0%
<i>Green St Stn./TC Library</i>	2,693	3.6%	<i>GIAC</i>	661	0.9%
<i>Wegmans/Tops</i>	2,181	2.9%	<i>TCAT Linn St Stop</i>	604	0.8%
<i>Seneca St Station</i>	1,732	2.3%	<i>Greenstar</i>	603	0.8%
<i>Cass Park</i>	1,666	2.2%	<i>IHA Developments</i>	566	0.8%
<i>Ithaca Farmers Market</i>	1,404	1.9%	<i>Gimme! on Cayuga</i>	553	0.7%
<i>Gimme! on State Block</i>	1,279	1.7%	<i>Shortstop Deli</i>	513	0.7%
<i>S. Meadow Strip Malls</i>	1,278	1.7%	<i>Collegetown Terraces</i>	499	0.7%
<i>Walmart/Lowes</i>	1,175	1.6%	<i>College at Dryden</i>	486	0.6%
<i>Inlet Island</i>	1,123	1.5%	<i>Ithaca Falls</i>	482	0.6%
<i>Major INHS Developments</i>	1,093	1.5%	<i>Feet of South Hill</i>	466	0.6%
<i>NY-15 Below Elmira Rd</i>	996	1.3%	<i>Foot of West Hill</i>	458	0.6%
			Sub-Total	26,063	34.7%

ORIGIN-DESTINATION FLOWS

GENERAL SYSTEM FLOW

By comparing total trip starts and ends in each neighborhood on Table 7, we can understand the general flows of Lime riders in Ithaca in the summer. From this comparison, we find that **trips that originate in neighborhoods on top of a hill** (i.e. Collegetown, Maplewood & East Hill) **generally do not return**. Similarly, there is an **outward flow of rides from the downtown core to outlying neighborhoods** (i.e. Northside, Southside, South Meadow). This may be caused by the fact that Lime places more bikes in the downtown core, and some people may choose a different mode of transportation for their return trip.

Table 7 – Summer Trip Starts, Ends, and Percentage Difference by Neighborhood

<i>Neighborhood</i>	Summer Trip Starts	Summer Trip Ends	% Difference
<i>North Campus & NE Ithaca</i>	113	139	19%
<i>Southside</i>	2,552	2,921	13%
<i>South Meadow</i>	2,991	3,412	12%
<i>West End</i>	3,521	3,814	8%
<i>West Hill</i>	1,928	2,053	6%
<i>South Hill & Ithaca College</i>	498	530	6%
<i>Northside</i>	4,237	4,461	5%
<i>Fall Creek</i>	7,117	7,463	5%
<i>Cornell Campus</i>	258	268	4%
<i>Waterfront (IFM & Stewart Pk.)</i>	3,560	3,614	1%
<i>Downtown</i>	11,799	9,977	-18%
<i>Maplewood & East Hill</i>	100	83	-20%
<i>Collegetown</i>	362	269	-35%

As Lime expanded into East Hill neighborhoods in the fall, the strong downhill flow from Collegetown and Maplewood strengthened further. These downhill rides ended in downtown, replacing the outward flow from that neighborhood that was seen in the summer. Outlying neighborhoods in the Flats, however, are still net receivers of rides. These patterns become more apparent in the next subsection.

Table 8 – Fall Trip Starts, Ends, and Percentage Difference by Neighborhood

<i>Neighborhood</i>	Fall Trip Starts	Fall Trip Ends	% Difference
<i>South Meadow</i>	2,506	2,982	19%
<i>North Campus & NE Ithaca</i>	667	763	14%
<i>West End</i>	2,647	3,011	14%
<i>Northside</i>	3,064	3,460	13%
<i>Fall Creek</i>	5,160	5,749	11%
<i>Southside</i>	2,548	2,815	10%
<i>Waterfront (IFM & Stewart Pk.)</i>	1,440	1,548	8%
<i>Cornell Campus</i>	2,475	2,597	5%
<i>West Hill</i>	938	982	5%
<i>Downtown</i>	8,266	8,347	1%
<i>South Hill & Ithaca College</i>	1,134	998	-12%
<i>Collegetown</i>	3,998	2,400	-40%
<i>Maplewood & East Hill</i>	1,297	452	-65%

NEIGHBORHOOD-TO-NEIGHBORHOOD FLOW

Using the start and end locations, **we can determine the number of rides between neighborhood origin-destination (O-D) pairs.** As an example, we can determine how many rides started in West Hill and ended in Collegetown. With 13 distinct neighborhoods defined in our spatial analysis, that means that rides could be counted amongst a possible 169 (13 x 13) neighborhood origin-destination pairs. Tables 9 and 10 show the top 10 neighborhood O-D pairs in the summer and fall respectively.

Table 9 – Top 10 Neighborhood O-D Pairs (Summer)

<i>Neighborhood O-D Pair</i>	Rides	% Total
<i>Downtown–Downtown</i>	2,997	7.7%
<i>Downtown–Fall Creek</i>	2,580	6.6%
<i>Fall Creek–Fall Creek</i>	2,521	6.5%
<i>Fall Creek–Downtown</i>	2,114	5.4%
<i>Waterfront–Waterfront</i>	1,973	5.1%
<i>Downtown–Northside</i>	1,461	3.8%
<i>Downtown–West End</i>	1,414	3.6%
<i>Northside–Downtown</i>	1,201	3.1%
<i>West End–Downtown</i>	1,147	2.9%
<i>S. Meadow–S. Meadow</i>	1,053	2.7%
Sub-Total	18,461	47.4%

Table 10 – Top 10 Neighborhood O-D Pairs (Fall)

<i>Neighborhood O-D Pair</i>	Rides	% Total
<i>Downtown–Fall Creek</i>	1,965	5.5%
<i>Fall Creek–Fall Creek</i>	1,696	4.7%
<i>Fall Creek–Downtown</i>	1,617	4.5%
<i>Downtown–Downtown</i>	1,614	4.5%
<i>Downtown–Northside</i>	1,186	3.3%
<i>Collegetown–Collegetown</i>	1,114	3.1%
<i>Northside–Downtown</i>	995	2.8%
<i>Downtown–West End</i>	981	2.7%
<i>West End–Downtown</i>	933	2.6%
<i>Downtown–S. Meadow</i>	860	2.4%
Sub-Total	12,961	36.1%

By comparing the two tables above, we can see that **the top 4 rides in either season happen within and between Downtown and Fall Creek**, which made up more than 1 in 4 Lime rides in the summer and almost 1 in 5 Lime rides in the fall. **The biggest change is the drop of rides that happen within the Waterfront neighborhood**, composed of the Ithaca Farmers' Market and Stewart Park. While this O-D pair had the fifth highest ridership in the summer, it was ranked 17th in the fall and therefore not on Table 10. **Another big change is that rides within Collegetown became the 6th most frequent O-D pair in the fall**, after Lime expanded to that neighborhood. In fact, while the top 10 O-D pairs made up nearly half of all rides within the Ithaca Urbanized Area in the summer, the top 10 O-D pairs in the fall only made up 36% of all rides in that season because of the increasing usage of Lime starting and ending in neighborhoods on East Hill. **The chord diagrams on Figures 14 and 15 provide a representation of the ridership on all neighborhood O-D pairs in the summer and fall respectively.** These chord diagrams can be accessed online at <https://www.bikewalktompkins.org/2018-lime-analysis>.

Figure 14 – Chord Diagram of Neighborhood Origin-Destination Pairs in the Summer

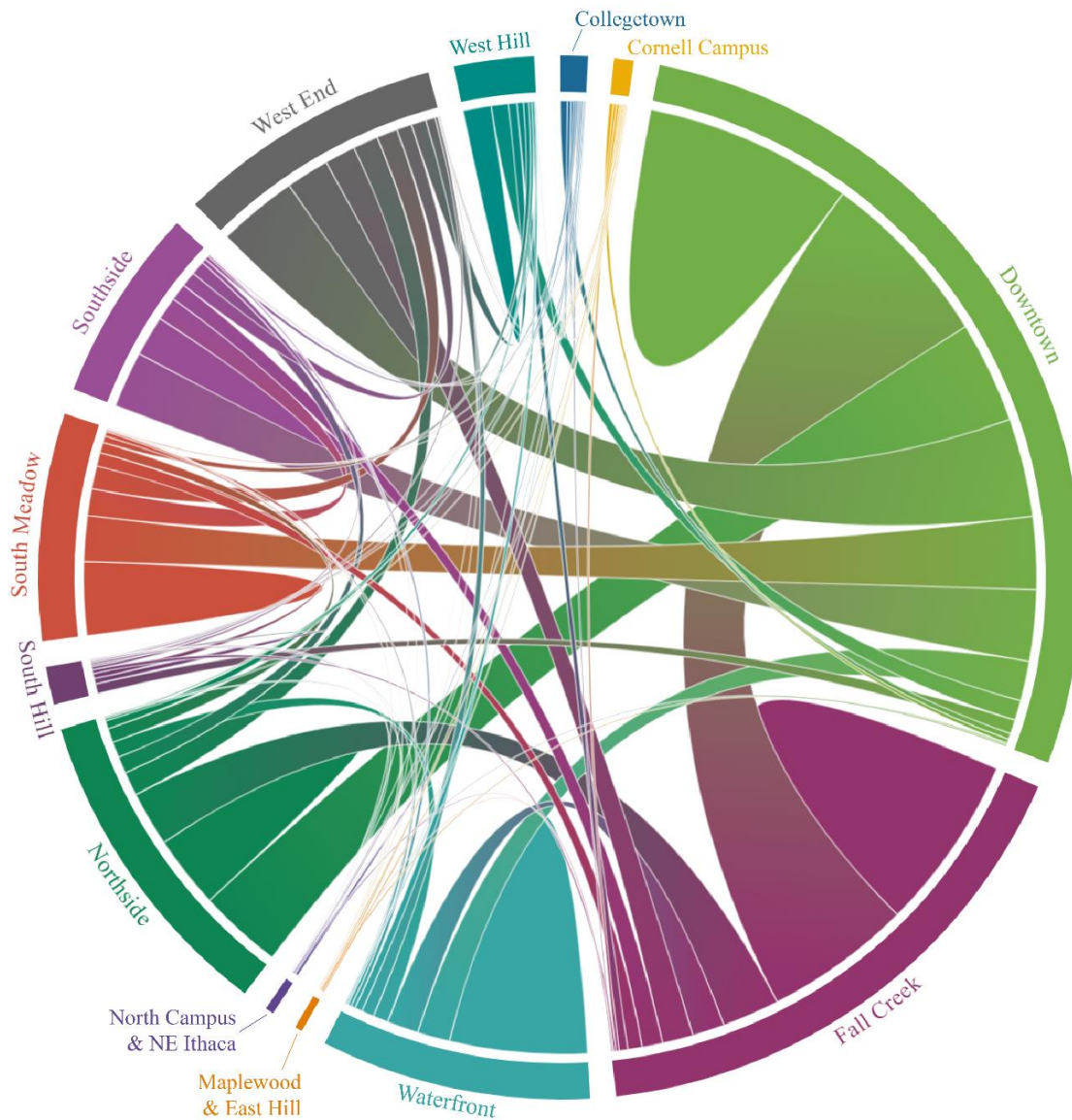


Figure 15 – Chord Diagram of Neighborhood Origin-Destination Pairs in the Fall

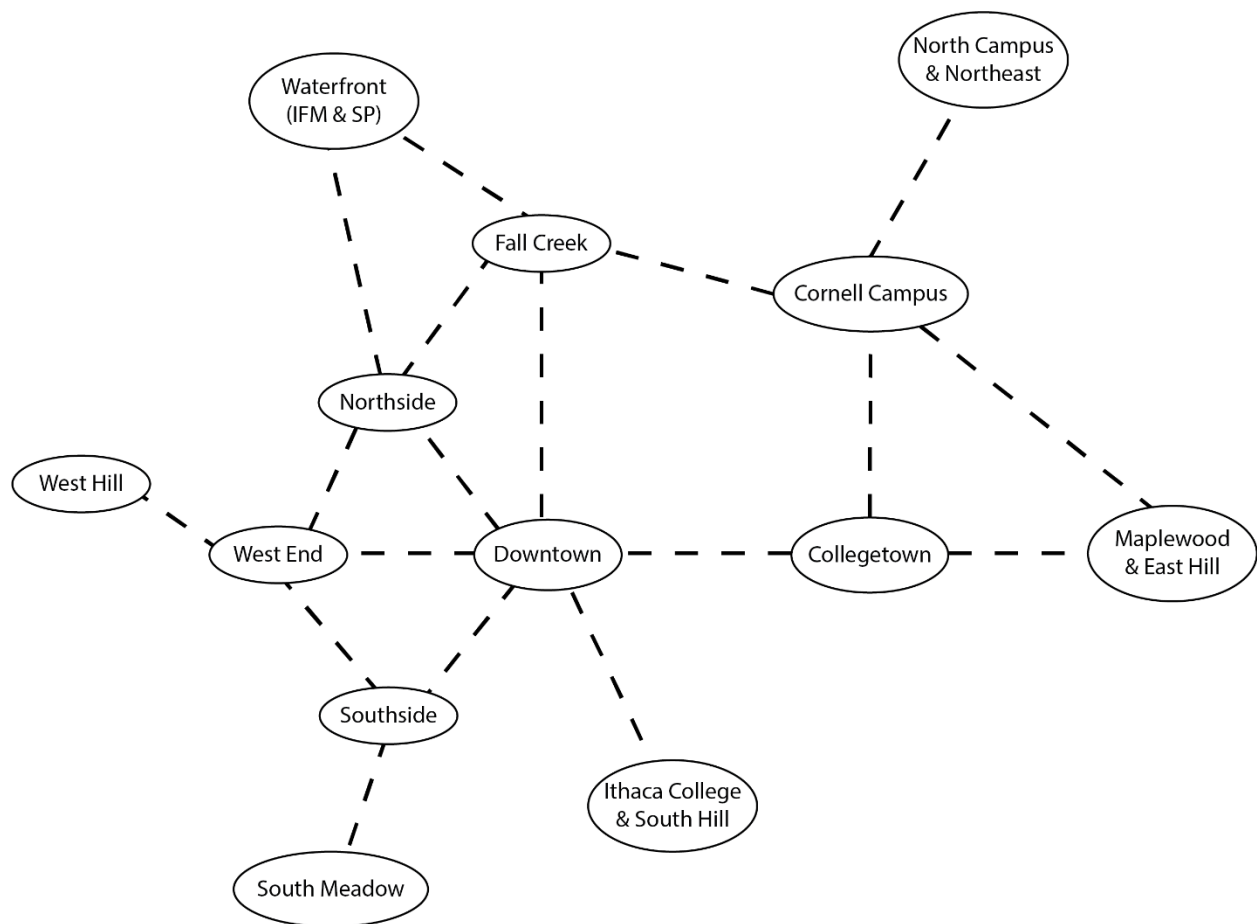


NEIGHBORHOOD-TO-NEIGHBORHOOD SPATIAL FLOW

Because Lime only provides location data for the start and end of each trip and not the points in between, we cannot build an accurate street-by-street ridership model. However, **using the neighborhood origin-destination pair data and some logical assumptions, we can build a schematic diagram of the flow of Lime rides between neighborhoods** that accounts for the trips that were made between two neighboring neighborhoods but also the trips that traversed through those two neighborhoods to go someplace else.

To build the schematic diagram, three assumptions were made. The first is that the 13 distinct neighborhoods that were defined for this analysis are to be connected in a geographically relevant way as described on Figure 16. What this means is that, for example, all trips originating from West Hill and going somewhere else will use the link between West Hill and West End (and traverse through the West End) to get to their destination neighborhood.

Figure 16 – Schematic Diagram of Links Between Neighborhoods



The second assumption is that all rides will take the path with the fewest links between their originating neighborhood and destination neighborhood. For example, this analysis assumes that all rides that go from Cornell Campus to Waterfront will connect through Fall Creek instead of a longer route. Therefore, a limitation of this analysis is that it cannot account for rides that may have taken a more circuitous path. The limited geographic data provided by Lime prevents us from accounting for longer routes.

The third assumption is that, in cases where a neighborhood O-D pair has several paths with the same number of links, we chose the path that followed the most “logical” geographic orientation. For example, for trips between Collegetown to Waterfront, there are three possible paths of equal length between the two neighborhoods. In the analysis, we assumed that all trips between those two neighborhoods took the path through Downtown and Northside instead of the other two other path choices. The thinking behind this decision is that there is an uphill climb between Collegetown and Cornell, and Northside is closer than Fall Creek to the Ithaca Farmers Market, a popular destination in the Waterfront neighborhood. Due to this assumption, an additional inherent limitation of this analysis is that of trust in the data analyst’s judgement. Spreadsheets used for the analysis are available upon request.

With those assumptions in place, **we assigned each of the 169 possible neighborhood origin-destination pairs a specific “path” of connecting neighborhood links and counted the occurrences of each link.** Tables 11 and 12 show the top 10 neighborhood links in the summer and fall, respectively, based on this analysis. As expected, the Fall Creek–Downtown link is at the top for both seasons. In second and third place, however, is the Downtown–Southside and Southside–South Meadow links. The spatial analysis reveals the influence of trips between South Meadow and neighborhoods north and east of Downtown on the Downtown–Southside link. **This deeper analysis demonstrates the shortcoming of relying solely on neighborhood origin-destination pairs, which only accounts for where people started and ended their Lime rides but not the links and intermediate neighborhoods where they most likely went through on said rides.**

Table 11 – Top 10 Neighborhood Links by Trips (Summer)

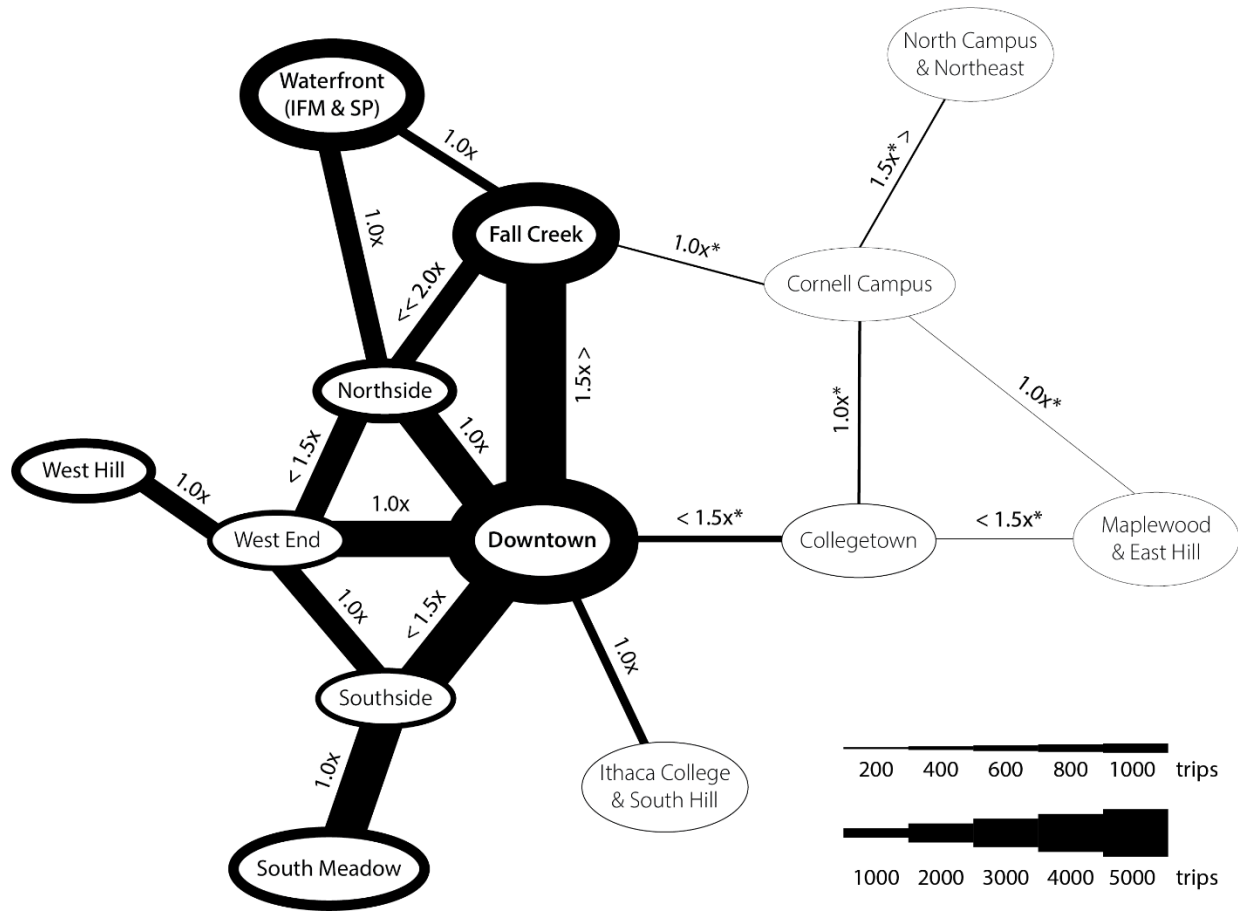
<i>Neighborhood Link</i>	<i>Trips</i>	<i>% of Total</i>
<i>Fall Creek–Downtown</i>	6,317	12.6%
<i>Downtown–Southside</i>	4,796	9.5%
<i>Southside–South Meadow</i>	4,290	8.5%
<i>Northside–Downtown</i>	3,823	7.6%
<i>West End–Downtown</i>	3,788	7.5%
<i>Northside–West End</i>	3,038	6.0%
<i>Solely within Downtown</i>	2,997	6.0%
<i>Solely within Fall Creek</i>	2,521	5.0%
<i>West End–Southside</i>	2,365	4.7%
<i>Northside–Fall Creek</i>	2,237	4.4%

Table 12 – Top 10 Neighborhood Links by Trips (Fall)

<i>Neighborhood Link</i>	<i>Trips</i>	<i>% of Total</i>
<i>Fall Creek–Downtown</i>	5,068	10.8%
<i>Downtown–Southside</i>	4,778	10.1%
<i>Southside–South Meadow</i>	4,029	8.6%
<i>West End–Downtown</i>	3,096	6.6%
<i>Northside–Downtown</i>	2,969	6.3%
<i>Downtown–Collegetown</i>	2,925	6.2%
<i>Northside–West End</i>	2,366	5.0%
<i>Cornell–Collegetown</i>	2,158	4.6%
<i>West End–Southside</i>	1,971	4.2%
<i>Northside–Fall Creek</i>	1,718	3.6%

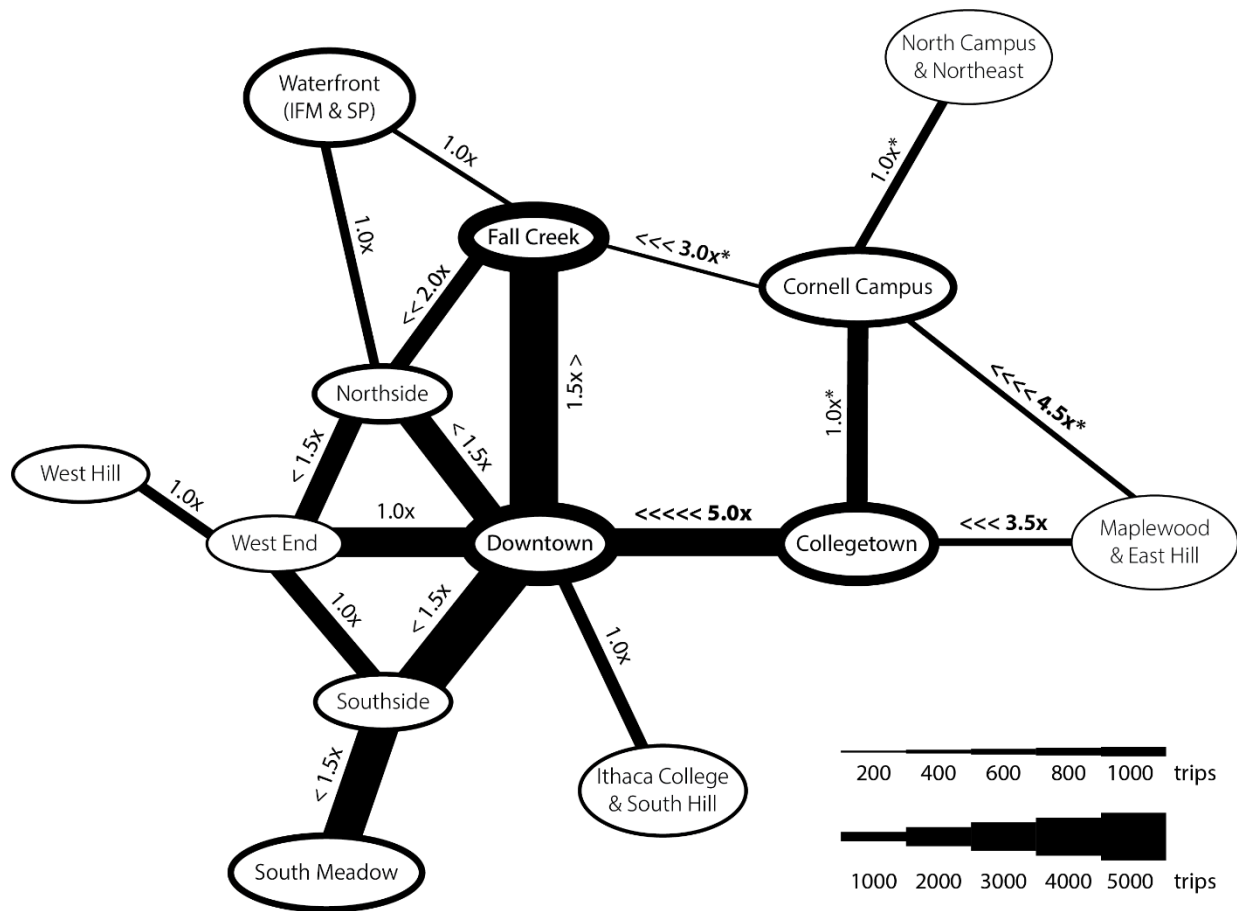
By combining the numerical results of the analysis with the diagram on Figure 16, we can create a graphical representation of the flow of Lime rides amongst the 13 neighborhoods in the urbanized area of Ithaca. In Figures 17 and 18, the thickness of the lines between neighborhoods is representative of the estimated number of trips for each neighborhood link, and the thickness of the oval around each neighborhood is representative of the number of trips that happened solely within that neighborhood. We also added a ratio on each link, which shows how directional the flow of bikes is on each link.

Figure 17 – Schematic Flow Diagram of Trips Between Neighborhoods (Summer)



* Lime not actively placing bikes in one or both neighborhoods along this link

Figure 18 – Schematic Diagram of Trips Between Neighborhoods (Fall)



* Lime not actively placing bikes in one or both neighborhoods along this link

By comparing the two diagrams, we can see that **the Fall Creek–Downtown–Southside–South Meadow axis carries a significant proportion of Lime rides in both the summer and fall.** Other strong links across both seasons include the Downtown–West End and the Downtown–Northside links, the latter aided by a seasonally strong link between Northside and Waterfront most likely caused by the popular Ithaca Farmers Market. Secondary links that show consistency between summer and fall include the Fall Creek–Northside–West End–Southside axis, the connection to West Hill, and the connection to South Hill.

As previously stated, links within neighborhoods on East Hill and between these neighborhoods and the flats of Ithaca were affected by the lack of bikes on the hill during the summer. **Once bicycles were placed on East Hill neighborhoods in the fall, a clear pattern emerges where many of the trips that start on the hill end up in the flats.** For example, five bikes go down from Collegetown to Downtown for every one that goes up. However, we also see trips along an emerging Collegetown–Cornell–North Campus axis, which has shallower gradients particularly well-suited to the Lime-E pedal-assist electric bikes.