Photo courtesy of Bluebikes.

STATUS: LOADED

Meet Bluebikes!

Bluebikes on Harvard's campus, and you.

By Erica Wu, Daniel Rodrigues, Jacob Moore, and Lara Zeng

REGION

Harvard

DATA WINDOW

2018 - 2019

Bluebikes, **Boston's bikesharing program**, was launched in 2011. Ten years later, there are now over **3,800 bikes deployed in ten municipalities.** In our exploratory analysis, we shed light on how users interact with Bluebikes in one representative **pre-pandemic** year.

We present 2018-2019 data centered on Harvard, which is representative of a city environment and college campus, and spans Longwood, Allston/Harvard Business School,

and Harvard Square. As you take a ride through our data story, try to understand how ridership varies across **demographics**, and how the **greater Harvard community** *really* interacts with the bikes that are so ubiquitous around campus.
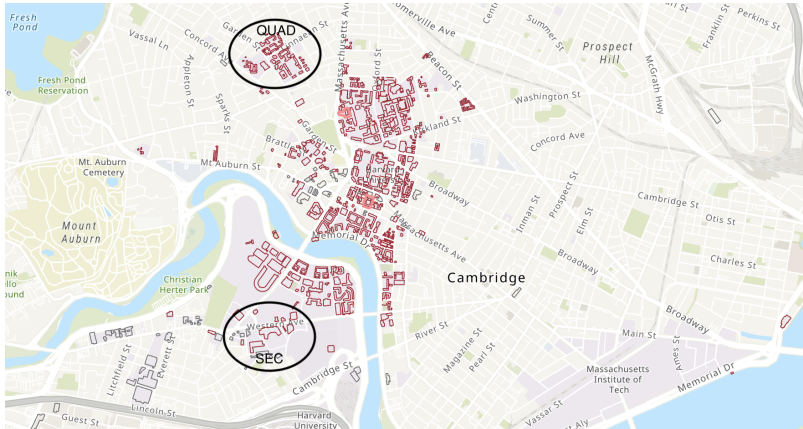
Harvard's campus is nearly three miles across from the Radcliffe Quadrangle (Quad) to the Science and Engineering Complex (SEC).

How does Bluebikes work? Let's follow a bike.

Welcome to Cambridge! Put on your helmets, because we're about to go on a virtual ride around town.

Click **"next"** to move from one station along the trip to another.

Click on the circular icons (🔵 🚲) to view trip information. You can also select a different bike to follow!

Leaflet | © OpenStreetMap contributors

Previous Stop	Next Stop	Look at a different bike

As you can see, each trip between stations is one ride. A bike may be checked out from one station, ridden for a certain amount of time, and then returned to another station. Then, another user may borrow the bike from that station, beginning a new ride.

During your virtual ride, you may have noticed that some stations are *more frequented* than others.

Which stations on Harvard's campus are the **most popular**?

Explore the answer in the map below. Popularity is based on **total traffic** or solely on departures from or arrivals to each station. Note that the areas where circles overlap denote the areas with higher traffic, which are perfect places to add more Bluebikes capacity. **"Net Bikes,"** or the difference between arrivals and departures, shows us which stations tend to gain or lose bikes. Purple circles are net positive, while red circles are net negative.

Click a station circle to view its name and traffic information. Take a look at some of the stations and see if you can make any interesting comparisons!

Total departures and arrivals

Leaflet | © OpenStreetMap contributors
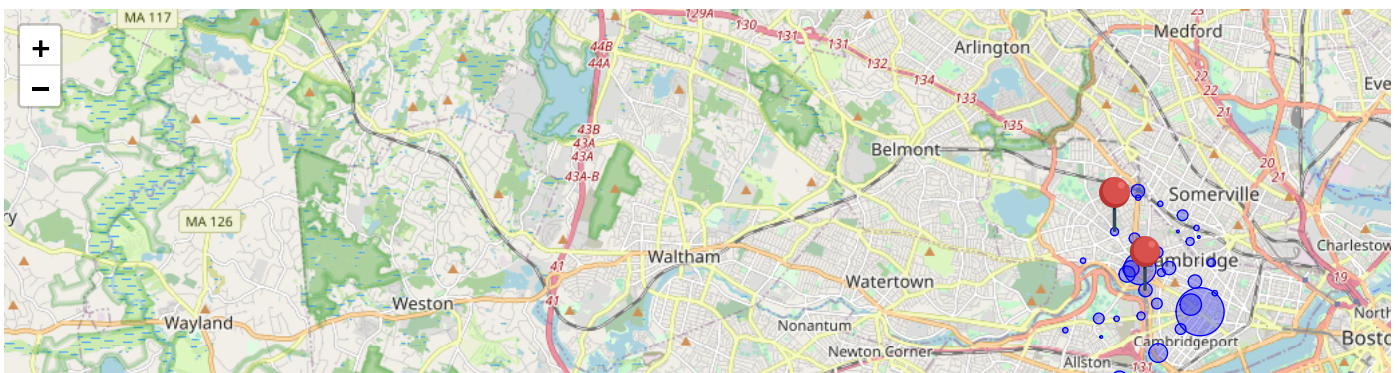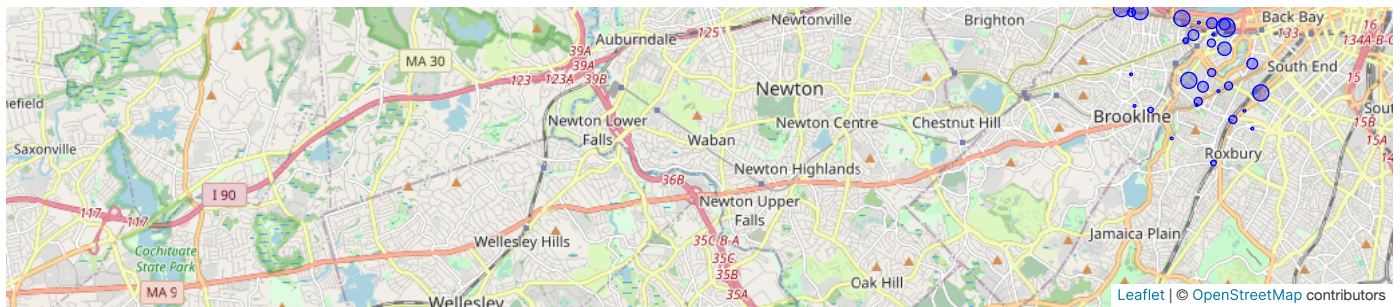
From this map, most stations have roughly **equal numbers of departures** as **arrivals.**

There are few egregious imbalances of departures and arrivals, which means the flow and placement of bikes is relatively well-designed. The Bluebikes station in **Central Square** ("Central Square at Mass Ave / Essex St") is the most popular station by far, with a conspicuously large radius for both Departures, Arrivals, and Total Departures and Arrivals. This makes sense given that it is conveniently located between Harvard's and MIT's campuses.

Of all the undergraduate dorms, Mather/Dunster and the Quad are the furthest from main campus. Do you think Quad or Mather/Dunster students make more Bluebikes trips? Check out the red pins (📍) on the map to see.

Reveal answer

Looking at the Garden St station near the Quad and the DeWolfe St station near Mather/Dunster, roughly 20,000 more rides were taken by Mather/Dunster students than Quad students. Interestingly, the station closest to Mather/Dunster also had the largest net arrivals of bikes compared to any other station. The Mather/Dunster station is conveniently located on the Charles River and Memorial Drive, which tends to be more a more trafficked area than the Quad.

Wow! There sure are a lot of stations. Let's take a *closer look at which stations are the most and least highly trafficked.*

Because there is little difference between departures and arrivals for a given station, we can use departures to measure the popularity of a station. Shown in the left barchart are the 5 most popular stations on Harvard's campus, each with the count of rides that depart from that station. The right barchart shows the 5 least popular stations. Hover over a bar to see the exact number of rides.

Most Popular Stations

Least Popular Stations
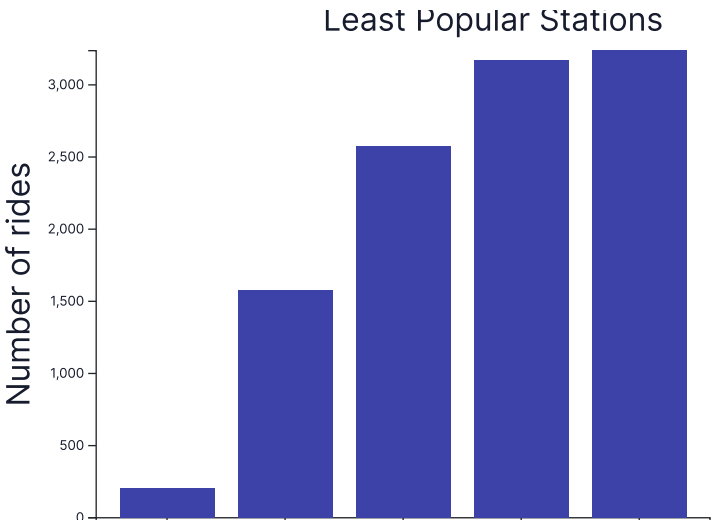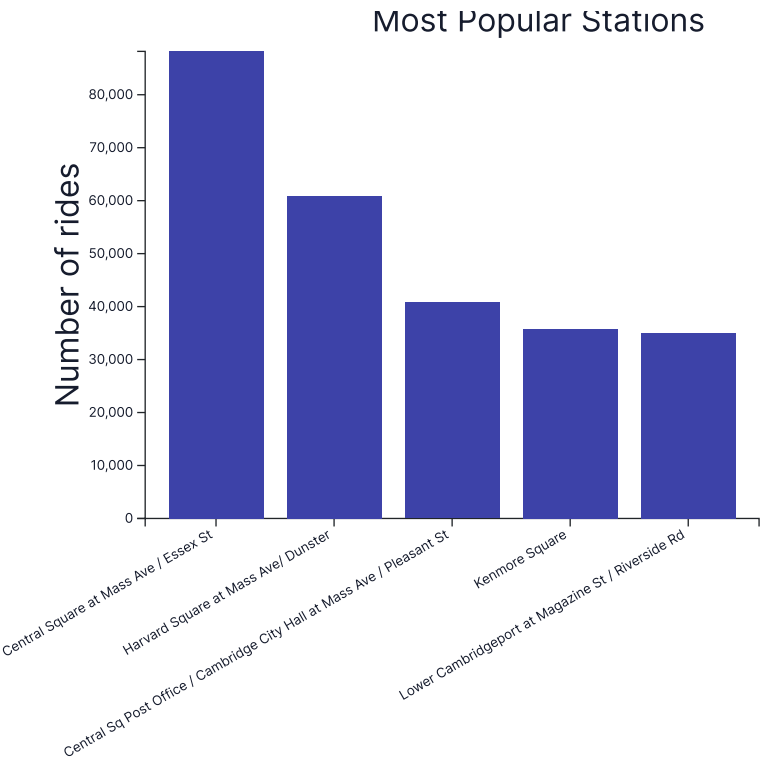
Whittier St Health Center   700 Commonwealth Ave.   Bartlett St at John Elliot Sq   Marion St at Harvard St   Big Papi Station

All five of the most popular stations are located at junctions. It makes sense that major transit sites tend to be junctions between busy roads. For example, Kenmore Square is a square in Boston consisting of the intersection of several main avenues: the convergence of Commonwealth Avenue, Brookline Avenue, and Beacon Street.
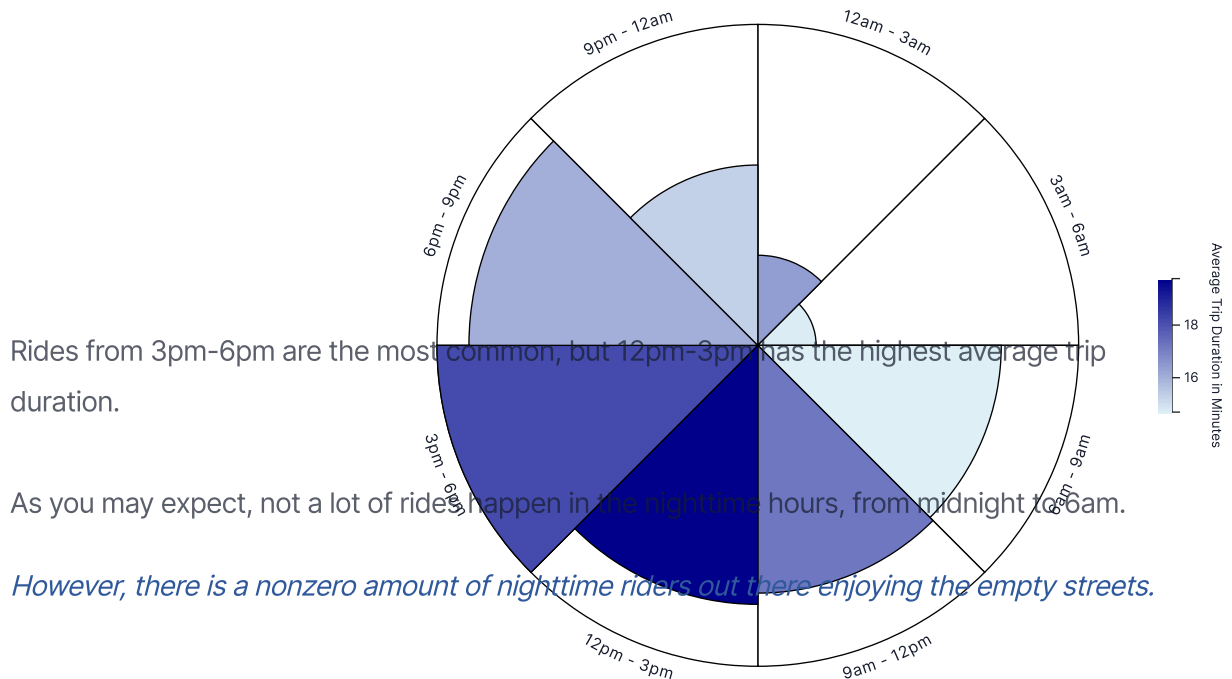
We've seen *where* users bike.

But *when* do they do it?

How does usage vary in the course of a day, and when do most rides occur? In addition, how long do rides tend to be?

Rides and Average Trip Durations by Time of Day

Rides from 3pm-6pm are the most common, but 12pm-3pm has the highest average trip duration.

As you may expect, not a lot of rides happen in the nighttime hours, from midnight to 6am.

However, there is a nonzero amount of nighttime riders out there enjoying the empty streets.

These rides tend to be short and sweet, compared to mid-afternoon rides.

Beyond the day-to-day, we are also interested in longer term trends in ridership.

Can you guess in what season most rides occur?

We created a dashboard to find out the answer to this, and more.

Dashboard: explore *breakdown by user demographics*

As is expected, there are more rides in the summer months than in the dead of winter.

In the charts below, you can dive further into the demographics of Bluebikes users to see how bike usage varies across categories and time. You can brush on the chart to the left to zoom in on selected time frames on the charts below. Clicking out of the brush selection will reset the charts.

It is important to note that, due to privacy constrictions on the data structures, rides are not associated with specific users. Therefore, our analysis is based on rides rather than on users.

Toggle below to switch between analyzing the number of rides or the average trip duration.

Number of Rides

2018-01-2019-12-31

By User Type
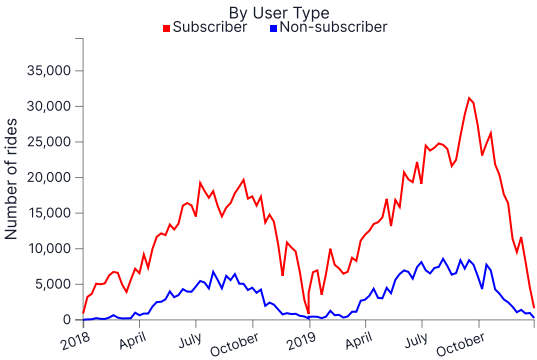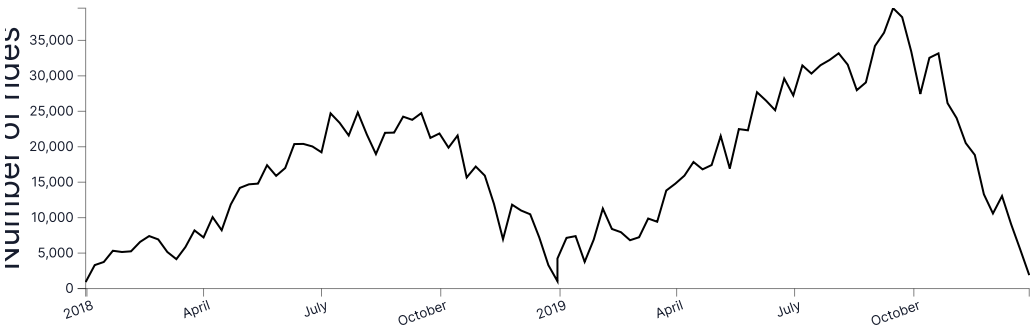
More rides are consistently completed by subscribers than non-subscribers. The difference in rides between membership types is usually at least 5,000 rides, but ridership is very low across both membership types in January, around the holiday. This trend makes sense because subscribers pay a flat rate for unlimited 45-minute rides, so it would be more cost-effective for subscribers to ride more.
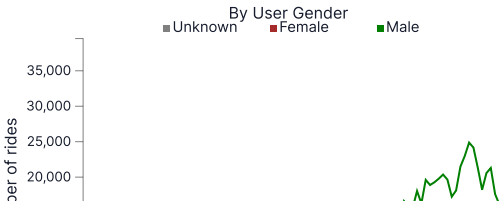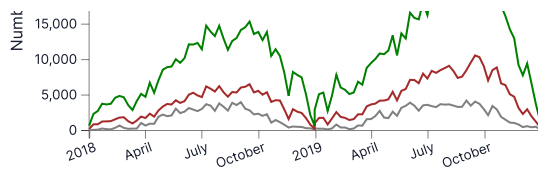
By User Gender

Most rides are completed by Male users, then Female users, and finally by users of unknown gender. Because rides are not associated with specific users, this trend could be because of a few reasons: 1) the existence of particular male users who are very avid bikers, 2) there are more male Bluebike users than females, and/or 3) males tend to ride more than females.
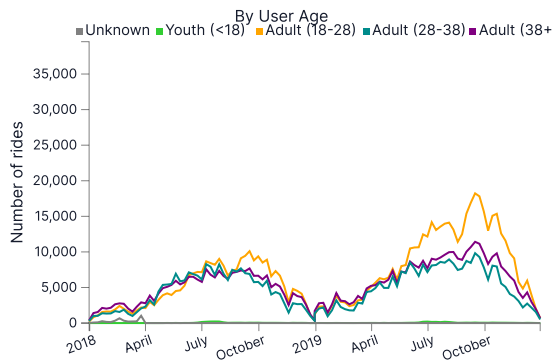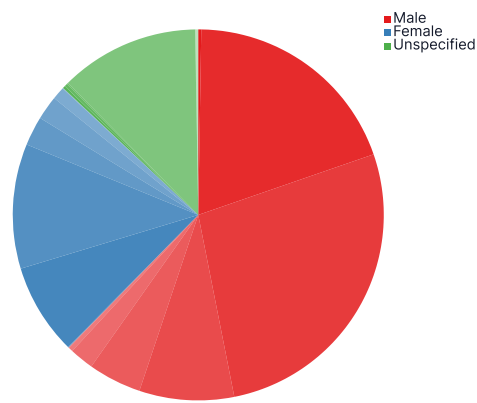

There are a similar number of rides completed by adults aged 18-28, 28-38, and 38+, though there are slightly more rides completed by adults aged 18-28. There are very few rides completed by youth <18 and users of unknown age.
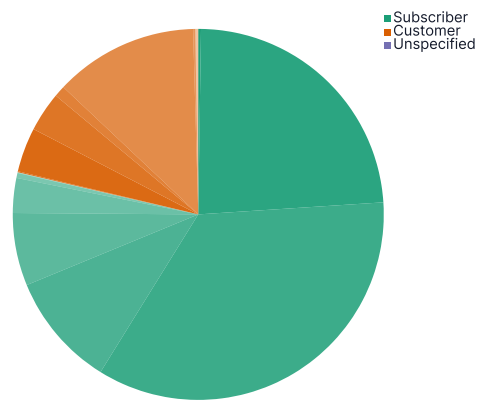
How do demographic factors *intersect*?

Now that we've explored the demographics over time, let's take a closer look at specific age groups and the intersections between different demographic factors. Can you see which demographics you fit into? What are your thoughts on how closely the demographics match your particular usage of Bluebikes?
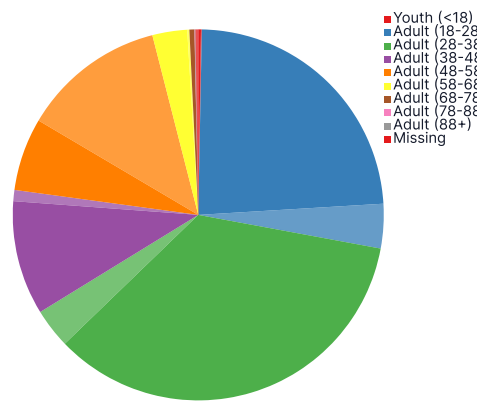
Gender Pie Chart (Hover for Age)

■ Male
■ Female
■ Unspecified

User Pie Chart (Hover for Age)

■ Subscriber
■ Customer
■ Unspecified

Age Pie Chart (Hover for User)

■ Youth (<18)
■ Adult (18-28)
■ Adult (28-38)
■ Adult (38-48)
■ Adult (48-58)
■ Adult (58-68)
■ Adult (68-78)
■ Adult (78-88)
■ Adult (88+)
■ Missing

From these pie charts, the trends seen in the dashboard are still apparent in an aggregated fashion. We see that most Bluebikes users are Males, then Females. Users with unspecified gender are likely customers who were not registered members, so their demographic information is unavailable. Interestingly, users with unknown gender are mainly 48 and older.

We might notice that there are more male rides than female rides. However, it is important to note that this pie chart refers to the number of rides and not the number of users (because users are anonymized). As in the dashboard, this invites questions of whether this is due to a difference in the number of users by sex or the number of average rides per user by sex. In this new pie chart, we can see that within every age group, there are more male rides than female rides. In addition, there exist male rides above 78 years old, but there are no female rides above 78.

From the user pie chart, *subscribers tend to be younger* (mainly 18-38) and customers tend to be older (mainly 48-58).

The age pie chart further reveals that for most age groups, there are more subscribers than customers, with the exception of the 48-58 bracket which has more customers than subscribers.

Furthermore, we see that the number of rides for ages 28-38 is close to or greater than the number of rides for ages 18-28. This is interesting because we are looking at rides centered around the Harvard campus.

We can infer that there is probably a low percentage of undergraduate users. These stations are centered around Harvard which combined have an undergraduate population of almost ten thousand. If we divide the number of rides by 10,000, and consider the total time frame, we see that the number of rides is quite low.

Taken in summary, it seems like most rides are completed by young people on Harvard's campus, but the actual proportion of Harvard students who take rides is low.

Conclusions

Both interest and need for sustainable and usable public transportation systems are growing. Transportation is a key part of student life, as well as city and campus planning. Walk times, shuttles, buses, trains, and bikes are all transportation systems that impact the day-to-day life of students, residents, and college administrators.

We presented information about usage across demographics, temporal and seasonal ebbs and flows which may inform the transportation habits of yourself and those around you.

We encourage you to evaluate what the services that are supposed to be serving you and your community are and how they are being used. Whether they are suiting your needs, and the neighborhoods and campus in which you study and work and live. And to provide you with the resources to actively understand and interrogate the structures around you so that you can make informed choices about what you use or don't use, how Bluebikes might or might not fit into your life and what you might do about it. Whether that is:

- going out to buy a Bluebikes membership of your own

- getting a subsidized membership through Harvard

- using more public transportation

- buying a bike

- or simply engaging with the urban environment around you.

Key takeaways

- The Mather/Dunster station gets more traffic than the Quad station, and bikes tend to arrive at the Mather/Dunster station more than they depart.

- The most popular stations are at large traffic junctions.

- Most rides occur from 3-6 pm, but rides from 12-3pm have the longest average trip duration.

- Subscribers take on average 15 minute shorter rides.

- Although more rides are completed by males, rides by females tend to be longer throughout the year.

- Similarly, although more rides are completed by subscribers, their rides tend to be shorter.

- Most rides are completed by young people on Harvard's campus, but the actual proportion of Harvard students who take rides is low.

Sources

The repository of Bluebikes usage data can be found [here](#).

Bluebikes features we referenced in the New York Times include [Those Bright Bluebikes, to Love and to Hate](#) and [Color Me Blue](#). Features we referenced in The Crimson include [Engineering a Unified Campus](#) and [SEAS Students Adjust to Allston Commute](#).