Graphic Detail

Geographic Information Systems (GIS) organize and clarify the patterns of human activities on the Earth's surface and their interaction with each other. GIS data, in the form of maps, can quickly and powerfully convey relationships to policymakers and the public. This department of Cityscape includes maps that convey important housing or community development policy issues or solutions. If you have made such a map and are willing to share it in a future issue of Cityscape, please contact john.c.huggins@hud.gov.

Using Heatmaps to Explore Capital Bikeshare Data

Alexander Din
Maryland Department of Housing and Community Development

The views expressed in this article are those of the author and do not represent the official positions or policies of the State of Maryland.

Capital Bikeshare is the major bikeshare system for the Washington, D.C. area. The network has more than 4,300 bicycles that serve commuters, tourists, and others who are interested in using a bicycle to travel. In 2017, more than 3.7 million trips were made using the Capital Bikeshare service. With so many observations (trips), the best visualizations are necessary to explore and make sense of the data. In this article, I demonstrate how to use heatmaps to get an overview of the data.

A heatmap is a shaded matrix that displays values via a graduated color scheme. The greater the number of observations binned into each category in the matrix, the greater the display color. By binning the data, some precision is lost but clarity may be made of a large dataset.[1] The heatmap is a visualization that may show clusters or dispersion in the data. Results from exploratory analysis and visualization can answer basic questions about the data or provide insight how to further examine the data.

The heatmaps look at a specific subgroup of riders. To make the heatmaps, I looked at only trips taken by annual members that were less than 30 minutes and did not return to the station that the trip originated from—these are trips that were free except for the cost of the annual membership.[2]

---

1 An example of a record in the dataset might be that a ride started at 14:23:32 on April 24, 2017, and ended at 14:41:22 on April 24, 2017. Data were re-attributed based on the start time. This example ride would be re-attributed to have occurred during the 2:00 p.m. hour on a Monday in April.

2 Annual members incur time-based costs after 30 minutes: https://www.capitalbikeshare.com/pricing.

The first heatmap categorizes the data into months and days of the week, then displays the counts for each day of the week for each month. Some of the immediately noticeable trends in the data included fewer trips during the winter months and during the weekend. Although the warmer months generally had greater trip counts, fewer trips occurred during July, potentially due to the weather being too warm. During the work week in January, Monday had the fewest trips.

Exhibit 1

Month by Day of the Week
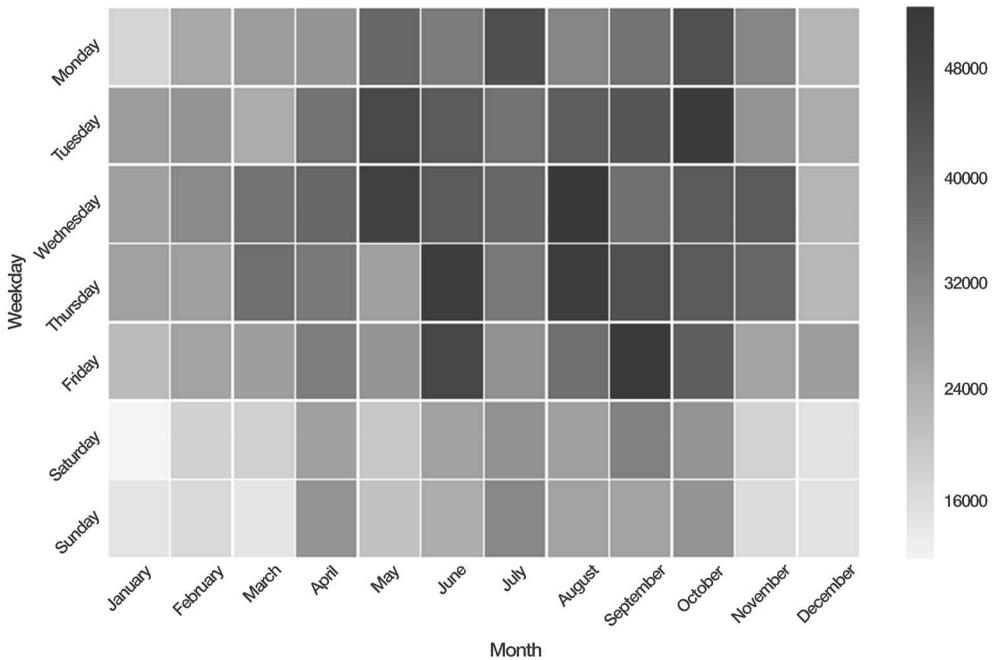
The heatmap in exhibit 2 explores the number of trips by day of the week and hour of the day. The first and most obvious trend is that ride counts cluster during commuter hours. Compared to the rest of the traditional work week, fewer trips on Friday evenings and during 7:00 p.m. occur. No obvious peak commute times appear during the weekend and instead, the number of trips increases gradually during the day. The weekend days also show more trips between 12:00 a.m. and 3:00 a.m. compared to the work week, and the relative quiet time for the system appears later in the morning.

Exhibit 2

Day of the Week by Hour
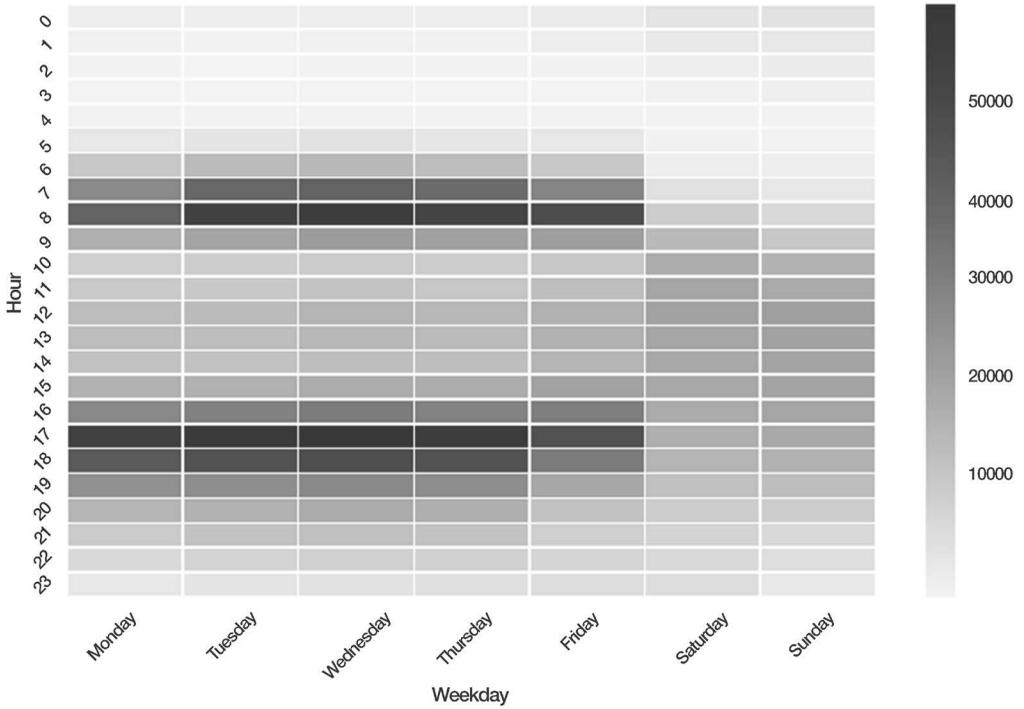
Author

Alexander Din is a housing research and GIS analyst with the Maryland Department of Housing and Community Development.