Heatmap Overlays

```
library(DT)
library(data.table)
```

```
## Warning: package 'data.table' was built under R version 3.5.2
```

```
library(magrittr)
library(sf)
```

```
## Warning: package 'sf' was built under R version 3.5.2
```

```
## Linking to GEOS 3.7.2, GDAL 2.4.2, PROJ 5.2.0
```

```
library(tidyverse)
```

```
## ── Attaching packages ─────────────────────────────────────── tidyverse 1.2.1 ──
```

```
## ✔ ggplot2 3.2.1     ✔ purrr   0.3.1
## ✔ tibble  2.0.1     ✔ dplyr   0.8.3
## ✔ tidyr   0.8.3     ✔ stringr 1.4.0
## ✔ readr   1.3.1     ✔ forcats 0.4.0
```

```
## Warning: package 'ggplot2' was built under R version 3.5.2
```

```
## Warning: package 'tibble' was built under R version 3.5.2
```

```
## Warning: package 'tidyr' was built under R version 3.5.2
```

```
## Warning: package 'purrr' was built under R version 3.5.2
```

```
## Warning: package 'dplyr' was built under R version 3.5.2
```

```
## Warning: package 'stringr' was built under R version 3.5.2
```

```
## Warning: package 'forcats' was built under R version 3.5.2
```

```
## ── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
## ✖ dplyr::between()   masks data.table::between()
## ✖ tidyr::extract()   masks magrittr::extract()
## ✖ dplyr::filter()    masks stats::filter()
## ✖ dplyr::first()     masks data.table::first()
## ✖ dplyr::lag()       masks stats::lag()
## ✖ dplyr::last()      masks data.table::last()
## ✖ purrr::set_names() masks magrittr::set_names()
## ✖ purrr::transpose() masks data.table::transpose()
```

```
library(gtfsr)
library(leaflet.extras)
```

```
## Loading required package: leaflet
```

```
library(dplyr)

dat.baltimore<-fread("/Users/11kolop/Downloads/Baltimore_cleaned.csv")
dat.chapel_hill<-fread("/Users/11kolop/Downloads/Chapel_Hill_Cleaned.csv")
dat.chicago<-fread("/Users/11kolop/Downloads/chicago_cleaned.csv")
dat.cincinnati<-fread("/Users/11kolop/Downloads/cincinnati_cleaned.csv")
dat.la<-fread("/Users/11kolop/Downloads/la_cleaned.csv")
dat.nyc<-fread("/Users/11kolop/Downloads/nyc_cleaned.csv")



gtfs_routes_sf <- function(gtfs) {
    shape_key <- gtfs$trips_df %>%
        select(route_id, shape_id) %>%
        unique()
    route_key <- gtfs$routes_df %>%
        select(route_id, route_short_name) %>%
        mutate(route_short_name = paste("route", route_short_name)) %>%
        inner_join(shape_key)
        if ( !is.null(gtfs$routes_df$route_color) ) { # extract if they exist
        route_key %<>% inner_join(select(gtfs$routes_df, route_color, route_id) )
    }
    else {
        route_key %<>% mutate(route_color = rep(ggsci::pal_d3()(10),
                                                length.out = nrow(route_key)))
    }
        sfc <- gtfs$shapes_df %>%
        split(.$shape_id) %>%
        map(~ select(., shape_pt_lon, shape_pt_lat) %>%
            as.matrix %>%
            st_linestring) %>%
        st_sfc(crs = 4326)

    unique(gtfs$shapes_df$shape_id) %>%
        sort() %>%
        st_sf(shape_id = ., geometry = sfc) %>%
        inner_join(route_key)
}
```

```
cincinnati_gtfs_obj<-import_gtfs("https://transitfeeds.com/p/cincinnati-metro/218/lates
t/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee3586df193f4'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "routes.txt"         "shapes.txt"         "stop_times.txt"
## [7] "stops.txt"          "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
chapel_hill_gtfs_obj <- import_gtfs("https://transitfeeds.com/p/chapel-hill-transit/367/
latest/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee358f28b090'...
```

```
##  [1] "agency.txt"                "areas.txt"
##  [3] "calendar_attributes.txt"   "calendar_dates.txt"
##  [5] "calendar.txt"              "directions.txt"
##  [7] "fare_attributes.txt"       "fare_rider_categories.txt"
##  [9] "fare_rules.txt"            "farezone_attributes.txt"
## [11] "feed_info.txt"             "frequencies.txt"
## [13] "linked_datasets.txt"       "rider_categories.txt"
## [15] "routes.txt"                "runcut.txt"
## [17] "shapes.txt"                "stop_attributes.txt"
## [19] "stop_times.txt"            "stops.txt"
## [21] "timetable_stop_order.txt"  "timetables.txt"
## [23] "transfers.txt"             "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading areas.txt
```

```
## File areas.txt not recognized. No meta data exists. Reading file as csv.
```

```
## Reading calendar_attributes.txt
```

```
## Reading calendar_dates.txt
```

```
## Warning: Missing column names filled in: 'X3' [3]
```

```
## Reading calendar.txt
```

```
## Reading directions.txt
```

```
## Reading fare_attributes.txt
```

```
## Reading fare_rider_categories.txt
```

```
## Reading fare_rules.txt
```

```
## Reading farezone_attributes.txt
```

```
## Reading feed_info.txt
```

```
## Reading frequencies.txt
```

```
## Reading linked_datasets.txt
```

```
## File linked_datasets.txt not recognized. No meta data exists. Reading file as csv.
```

```
## Reading rider_categories.txt
```

```
## Reading routes.txt
```

```
## Warning: Missing column names filled in: 'X12' [12]
```

```
## Reading runcut.txt
```

```
## File runcut.txt not recognized. No meta data exists. Reading file as csv.
```

```
## Reading shapes.txt
```

```
## Reading stop_attributes.txt
```

```
## Reading stop_times.txt
```

```
## Warning: Missing column names filled in: 'X11' [11], 'X12' [12],
## 'X13' [13], 'X14' [14], 'X15' [15], 'X16' [16], 'X17' [17], 'X18' [18],
## 'X19' [19], 'X20' [20]
```

```
## Reading stops.txt
```

```
## Warning: Missing column names filled in: 'X13' [13], 'X14' [14]
```

```
## Reading timetable_stop_order.txt
```

```
## Reading timetables.txt
```

```
## Warning: Missing column names filled in: 'X13' [13]
```

```
## Reading transfers.txt
```

```
## Reading trips.txt
```

```
## Warning: Missing column names filled in: 'X11' [11], 'X12' [12],
## 'X13' [13], 'X14' [14], 'X15' [15], 'X16' [16], 'X17' [17], 'X18' [18]
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
chicago_gtfs_obj <- import_gtfs("http://gtfs.s3.amazonaws.com/chicago-transit-authority_
20160416_0123.zip")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee358385fc5b6'...
```

```
##  [1] "agency.txt"                       "calendar_dates.txt"
##  [3] "calendar.txt"                     "developers_license_agreement.htm"
##  [5] "frequencies.txt"                  "routes.txt"
##  [7] "shapes.txt"                       "stop_times.txt"
##  [9] "stops.txt"                        "transfers.txt"
## [11] "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading developers_license_agreement.htm
```

```
## File developers_license_agreement.htm not recognized. No meta data exists. Reading fi
le as csv.
```

```
## Warning: 181 parsing failures.
## row col  expected    actual
file
##   1  -- 3 columns 1 columns '/private/var/folders/x3/7_5q1js120x0gk9v43wr_ml00000gn/
T/RtmpqH7T5u/filee358385fc5b6/developers_license_agreement.htm'
##   2  -- 3 columns 1 columns '/private/var/folders/x3/7_5q1js120x0gk9v43wr_ml00000gn/
T/RtmpqH7T5u/filee358385fc5b6/developers_license_agreement.htm'
##   3  -- 3 columns 9 columns '/private/var/folders/x3/7_5q1js120x0gk9v43wr_ml00000gn/
T/RtmpqH7T5u/filee358385fc5b6/developers_license_agreement.htm'
##   4  -- 3 columns 1 columns '/private/var/folders/x3/7_5q1js120x0gk9v43wr_ml00000gn/
T/RtmpqH7T5u/filee358385fc5b6/developers_license_agreement.htm'
##   5  -- 3 columns 1 columns '/private/var/folders/x3/7_5q1js120x0gk9v43wr_ml00000gn/
T/RtmpqH7T5u/filee358385fc5b6/developers_license_agreement.htm'
## ... ... ......... .........
..........................................................................................

## See problems(...) for more details.
```

```
## Reading frequencies.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading transfers.txt
```

```
## Reading trips.txt
```

```
## Warning: Missing column names filled in: 'X7' [7], 'X9' [9]
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
chicago_gtfs_obj$agency_df$agency_id<-"230"
chicago_gtfs_obj$agency_df<-chicago_gtfs_obj$agency_df[,c(7,1:6)]
chicago_gtfs_obj$routes_df$agency_id<-"230"
chicago_gtfs_obj$routes_df<-chicago_gtfs_obj$routes_df[,c(8,1:7)]
la_gtfs_obj <-import_gtfs("https://transitfeeds.com/p/la-metro/184/latest/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee35817ad4ca4'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "feed_info.txt"      "routes.txt"         "shapes.txt"
## [7] "stop_times.txt"     "stops.txt"          "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading feed_info.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Warning: Missing column names filled in: 'X10' [10]
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
la_gtfs_obj$routes_df$agency_id<-"LACMTA"
baltimore_gtfs<-import_gtfs("https://transitfeeds.com/p/mta-maryland/247/latest/downloa
d")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee3587282af20'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "routes.txt"         "shapes.txt"         "stop_times.txt"
## [7] "stops.txt"          "transfers.txt"      "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading transfers.txt
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
bronx_gtfs<-import_gtfs("https://transitfeeds.com/p/mta/81/latest/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee35861b7989b'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "routes.txt"         "shapes.txt"         "stop_times.txt"
## [7] "stops.txt"          "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
brooklyn_gtfs<-import_gtfs("https://transitfeeds.com/p/mta/80/latest/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee3585c841a3b'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "routes.txt"         "shapes.txt"         "stop_times.txt"
## [7] "stops.txt"          "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
manhattan_gtfs<-import_gtfs("https://transitfeeds.com/p/mta/82/latest/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee35864d646f0'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "routes.txt"         "shapes.txt"         "stop_times.txt"
## [7] "stops.txt"          "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
queens_gtfs<-import_gtfs("https://transitfeeds.com/p/mta/83/latest/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee3582fcb6a48'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "routes.txt"         "shapes.txt"         "stop_times.txt"
## [7] "stops.txt"          "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
staten_island_gtfs<-import_gtfs("https://transitfeeds.com/p/mta/84/latest/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee35853aeb57b'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "routes.txt"         "shapes.txt"         "stop_times.txt"
## [7] "stops.txt"          "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
nyc_subway_gtfs<-import_gtfs("https://transitfeeds.com/p/mta/79/latest/download")
```

```
## Unzipped the following files to directory '/private/var/folders/x3/7_5q1js120x0gk9v43
wr_ml00000gn/T/RtmpqH7T5u/filee358730cc928'...
```

```
## [1] "agency.txt"         "calendar_dates.txt" "calendar.txt"
## [4] "routes.txt"         "shapes.txt"         "stop_times.txt"
## [7] "stops.txt"          "transfers.txt"      "trips.txt"
```

```
## Reading agency.txt
```

```
## Reading calendar_dates.txt
```

```
## Reading calendar.txt
```

```
## Reading routes.txt
```

```
## Reading shapes.txt
```

```
## Reading stop_times.txt
```

```
## Reading stops.txt
```

```
## Reading transfers.txt
```

```
## Reading trips.txt
```

```
## ...done.
```

```
## Testing data structure...
```

```
## ...passed. Valid GTFS object.
```

```
##
```

```
## NOTE: Parsing errors and warnings while importing data can be extracted from any give
n dataframe with `attr(df, "problems")`.
```

```
##
```

```
cincinnati <- gtfs_routes_sf(cincinnati_gtfs_obj)
```

```
## Joining, by = "route_id"
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(cincinnati$geometry)<-NULL
cincinnati.stops<-cincinnati_gtfs_obj$stops_df[,c(3,5:6)]
rm(cincinnati_gtfs_obj)

chapel_hill<-gtfs_routes_sf(chapel_hill_gtfs_obj)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(chapel_hill$geometry)<-NULL
chapel_hill.stops<-chapel_hill_gtfs_obj$stops_df[,c(4,6:7)]
rm(chapel_hill_gtfs_obj)

chicago<-gtfs_routes_sf(chicago_gtfs_obj)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(chicago$geometry)<-NULL
chicago.stops<-chicago_gtfs_obj$stops_df[,c(3,5:6)]
rm(chicago_gtfs_obj)

la<-gtfs_routes_sf(la_gtfs_obj)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(la$geometry)<-NULL
la.stops<-la_gtfs_obj$stops_df[,c(3,5:6)]
rm(la_gtfs_obj)

baltimore<-gtfs_routes_sf(baltimore_gtfs)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(baltimore$geometry)<-NULL
baltimore.stops<-baltimore_gtfs$stops_df[,c(3,5:6)]
rm(baltimore_gtfs)

bronx<-gtfs_routes_sf(bronx_gtfs)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(bronx$geometry)<-NULL
bronx.stops<-bronx_gtfs$stops_df[,c(2,4:5)]
rm(bronx_gtfs)

manhattan<-gtfs_routes_sf(manhattan_gtfs)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(manhattan$geometry)<-NULL
manhattan.stops<-manhattan_gtfs$stops_df[,c(2,4:5)]
rm(manhattan_gtfs)

brooklyn<-gtfs_routes_sf(brooklyn_gtfs)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(brooklyn$geometry)<-NULL
brooklyn.stops<-brooklyn_gtfs$stops_df[,c(2,4:5)]
rm(brooklyn_gtfs)

staten_island<-gtfs_routes_sf(staten_island_gtfs)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(staten_island$geometry)<-NULL
staten_island.stops<-staten_island_gtfs$stops_df[,c(2,4:5)]
rm(staten_island_gtfs)

queens<-gtfs_routes_sf(queens_gtfs)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(queens$geometry)<-NULL
queens.stops<-queens_gtfs$stops_df[,c(2,4:5)]
rm(queens_gtfs)

nyc_subway<-gtfs_routes_sf(nyc_subway_gtfs)
```

```
## Joining, by = "route_id"
```

```
## Joining, by = "route_id"
```

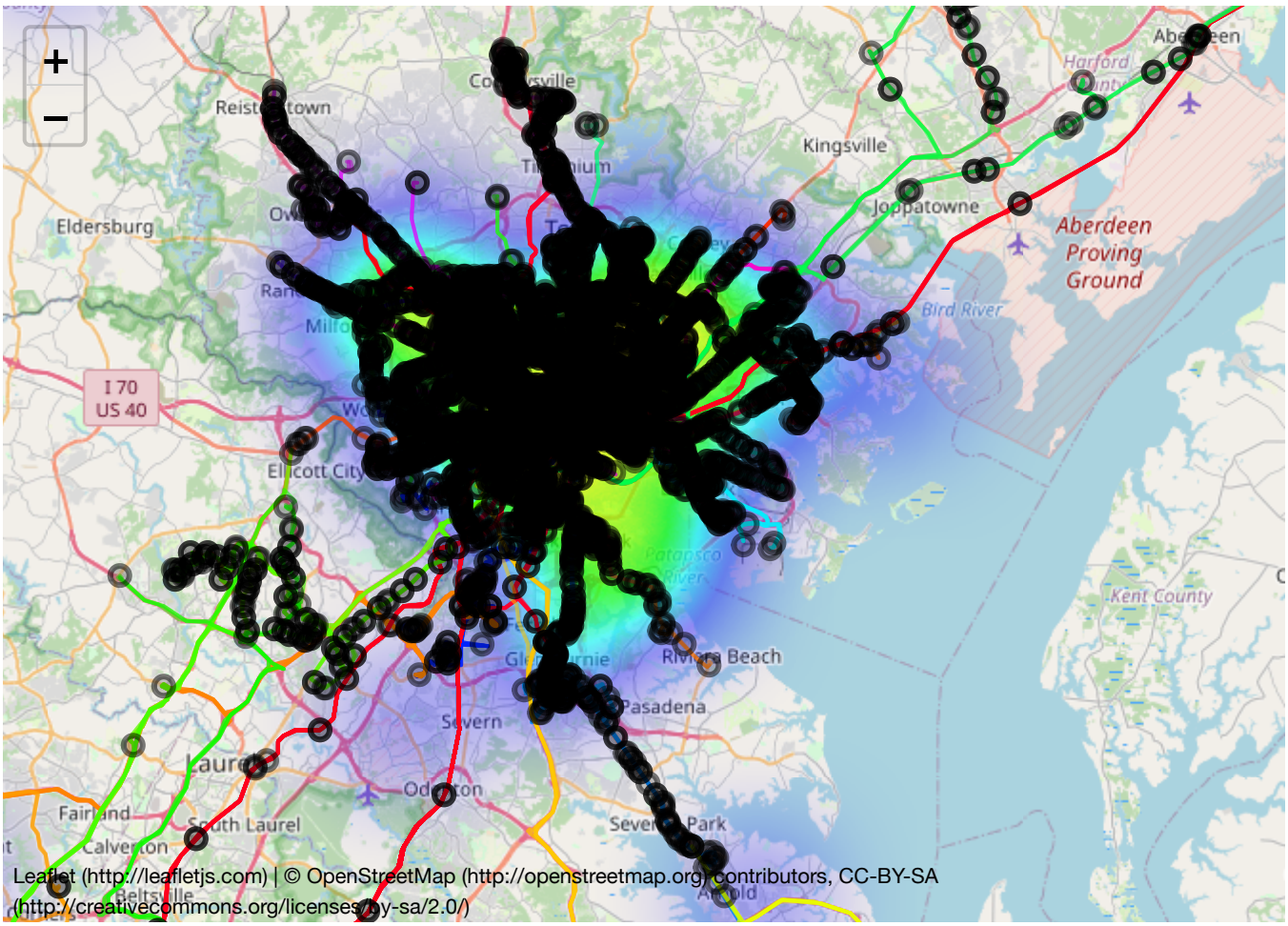
```
## Joining, by = "shape_id"
```

```
## Warning: Column `shape_id` joining factor and character vector, coercing
## into character vector
```

```
names(nyc_subway$geometry)<-NULL
nyc_subway.stops<-nyc_subway_gtfs$stops_df[,c(3,5:6)]
rm(nyc_subway_gtfs)
```

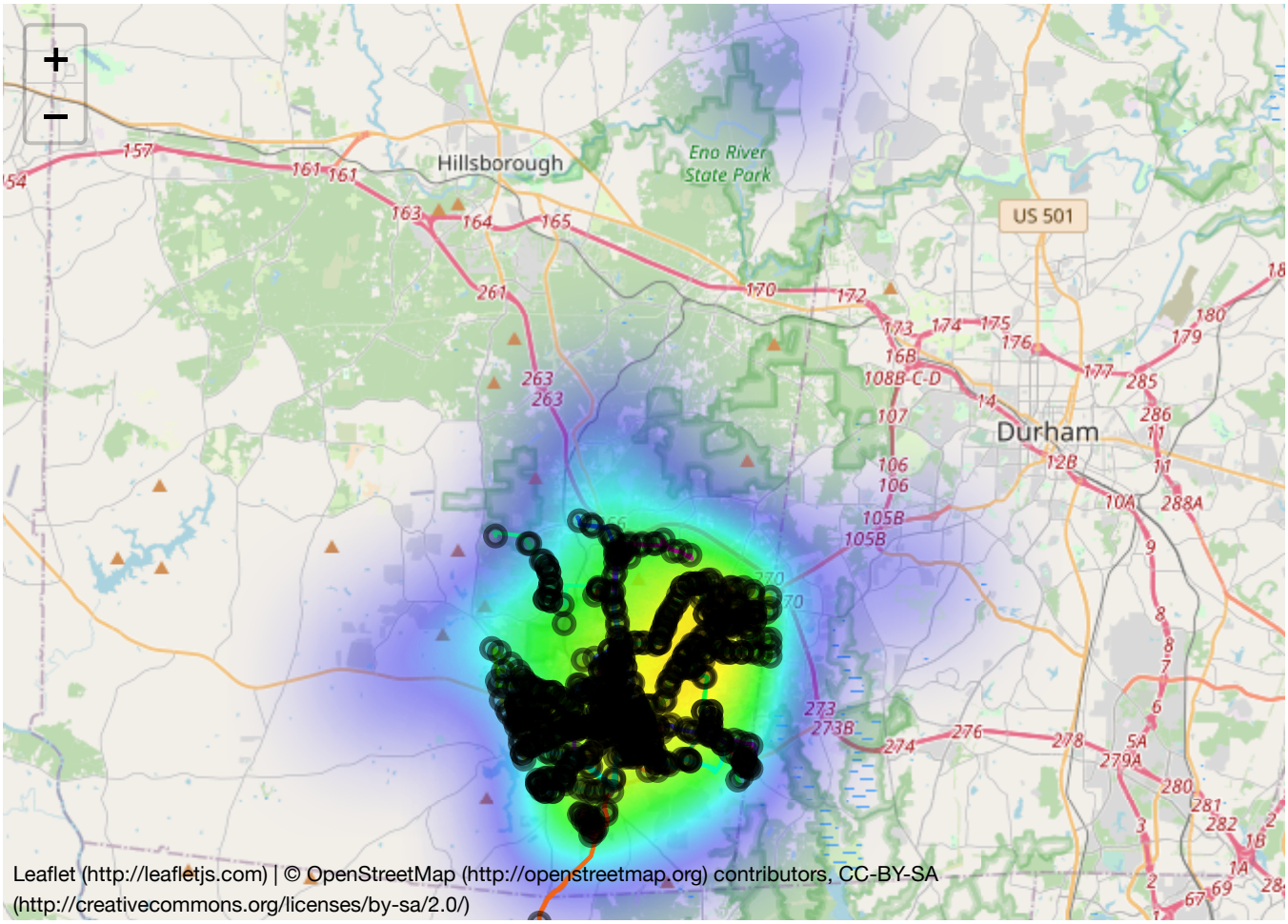
```
factpal <- colorFactor(rainbow(length(unique(baltimore$route_short_name))), baltimore$ro
ute_short_name)
baltimore$route_color<-factpal(baltimore$route_short_name)

leaflet() %>%
     addTiles() %>%
     addPolylines(data=baltimore,color = ~as.factor(route_color),
                  label = ~as.character(route_short_name),weight= 2) %>%
      addCircleMarkers(lng=~stop_lon,lat=~stop_lat,data = baltimore.stops,color = "blac
k", radius = 5, weight = 3,label = ~as.character(stop_name)) %>%
      addHeatmap(group="heat", lng=~longitude, lat=~latitude,dat=dat.baltimore, max=.9,b
lur = 60)  %>%
  fitBounds(lng1=min(dat.baltimore$longitude),lng2=max(dat.baltimore$longitude),lat1=min
(dat.baltimore$latitude),lat2=max(dat.baltimore$latitude))
```



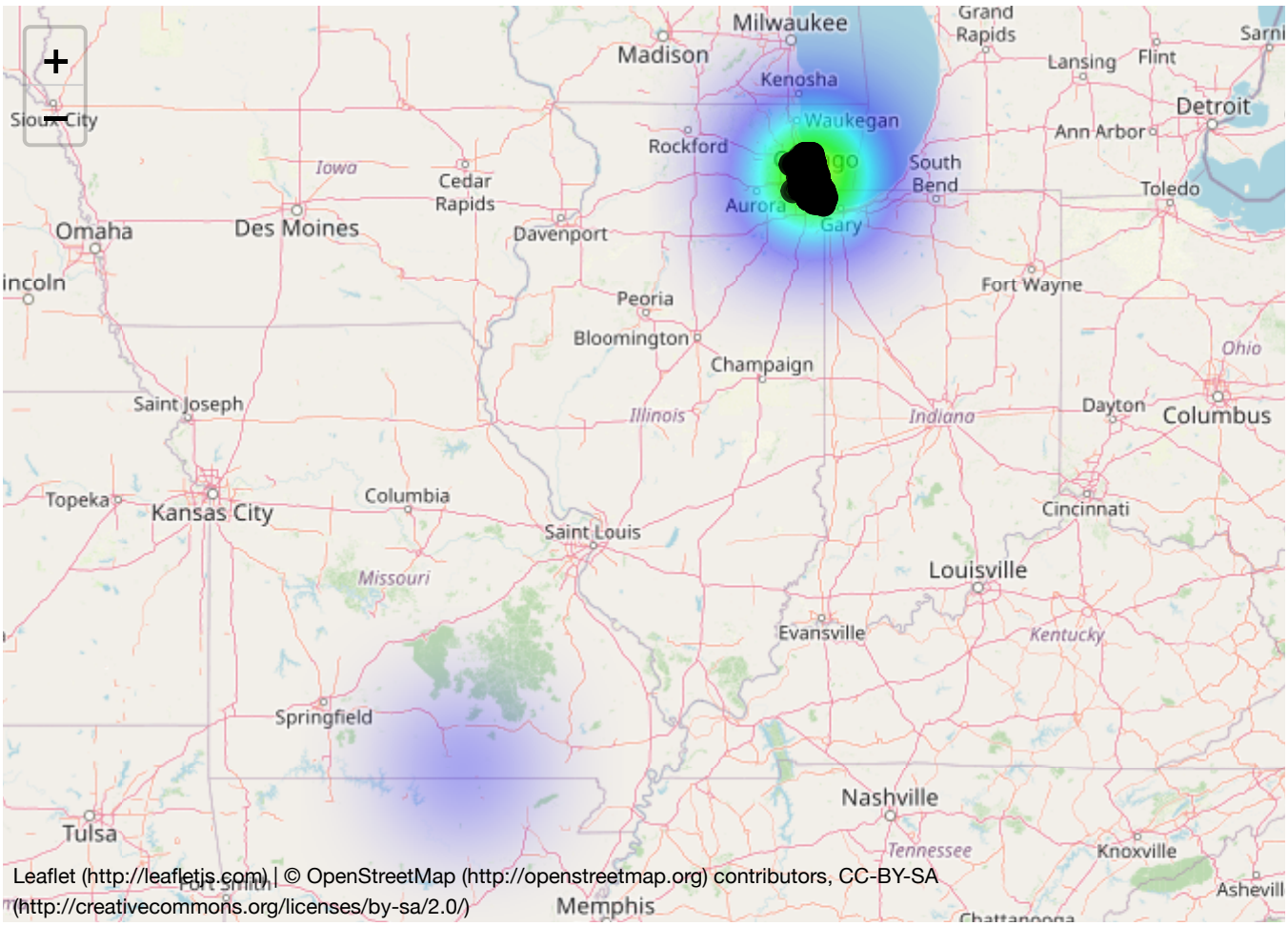
```
factpal <- colorFactor(rainbow(length(unique(chapel_hill$route_short_name))), chapel_hil
l$route_short_name)
chapel_hill$route_color<-factpal(chapel_hill$route_short_name)

leaflet() %>%
     addTiles() %>%
     addPolylines(data=chapel_hill,color = ~as.factor(route_color),
                  label = ~as.character(route_short_name),weight= 2) %>%
      addCircleMarkers(lng=~stop_lon,lat=~stop_lat,data = chapel_hill.stops,color = "bla
ck", radius = 5, weight = 3,label = ~as.character(stop_name)) %>%
     addHeatmap(group="heat", lng=~longitude, lat=~latitude,dat=dat.chapel_hill, max=.9,
blur = 60)  %>%
  fitBounds(lng1=min(dat.chapel_hill$longitude),lng2=max(dat.chapel_hill$longitude),lat1
=min(dat.chapel_hill$latitude),lat2=max(dat.chapel_hill$latitude))
```



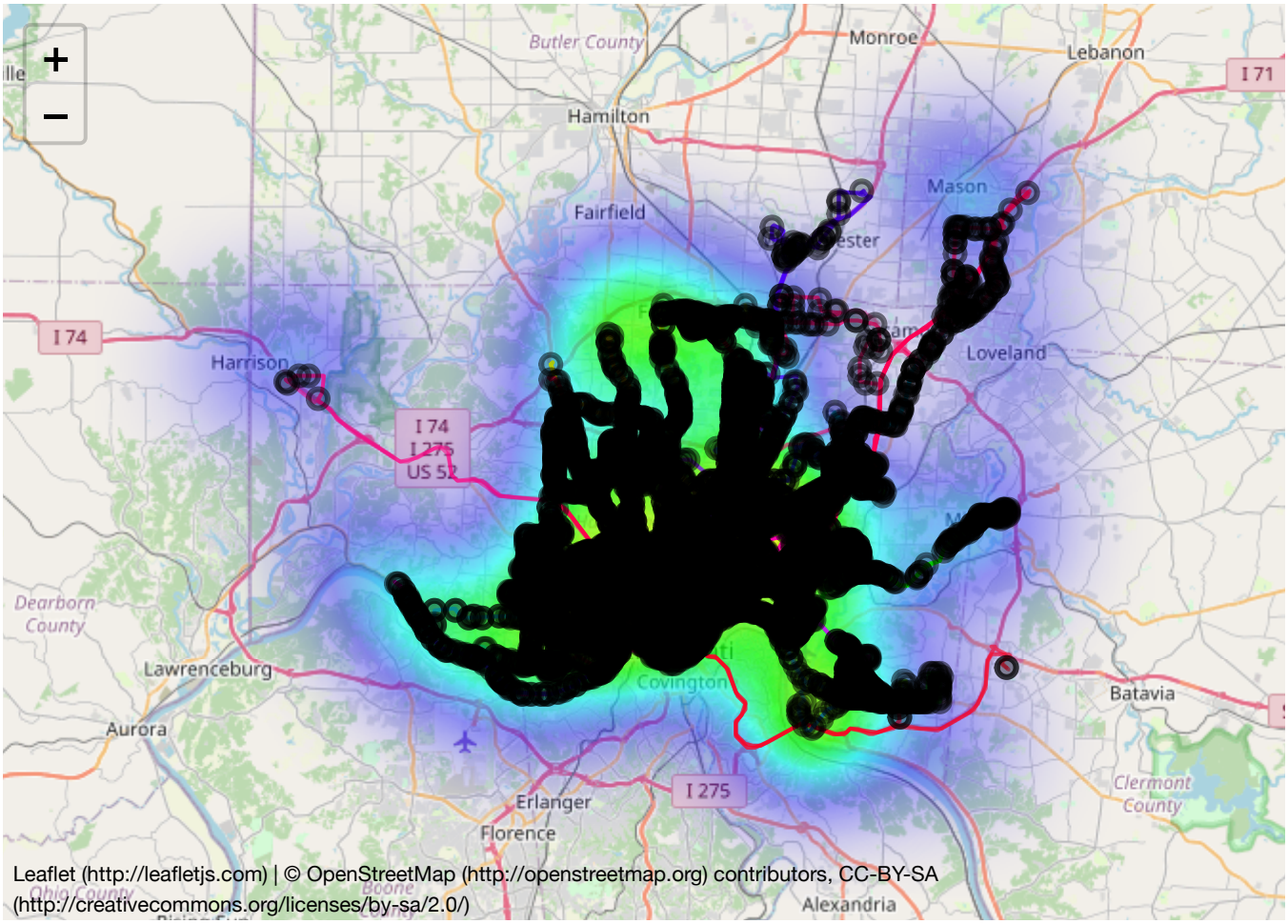
```
factpal <- colorFactor(rainbow(length(unique(chicago$route_short_name))), chicago$route_
short_name)
chicago$route_color<-factpal(chicago$route_short_name)

leaflet() %>%
     addTiles() %>%
     addPolylines(data=chicago,color = ~as.factor(route_color),
                  label = ~as.character(route_short_name),weight= 2) %>%
      addCircleMarkers(lng=~stop_lon,lat=~stop_lat,data = chicago.stops,color = "black",
radius = 5, weight = 3,label = ~as.character(stop_name)) %>%
      addHeatmap(group="heat", lng=~longitude, lat=~latitude,dat=dat.chicago, max=.9,blu
r = 60)  %>%
  fitBounds(lng1=min(dat.chicago$longitude),lng2=max(dat.chicago$longitude),lat1=min(da
t.chicago$latitude),lat2=max(dat.chicago$latitude))
```

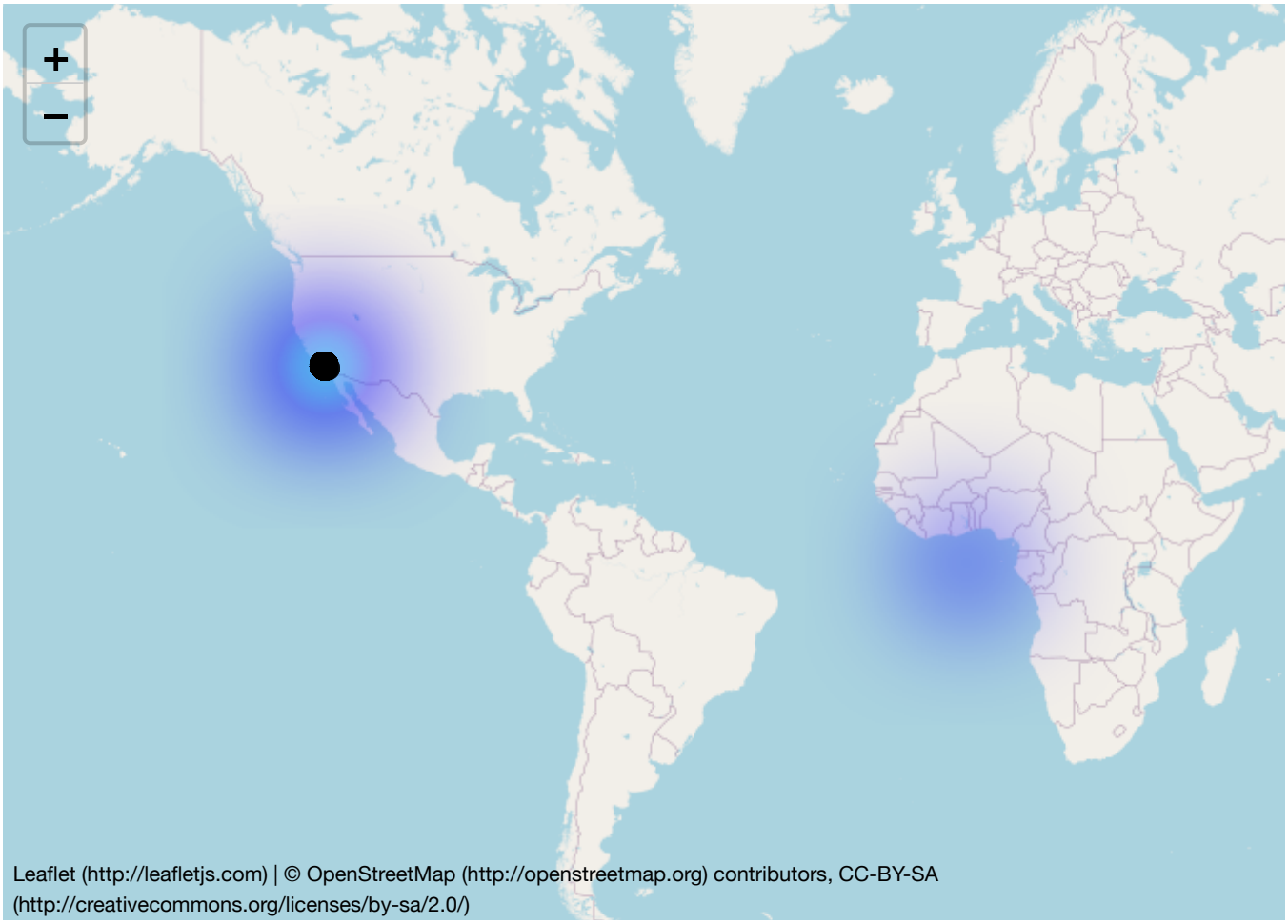
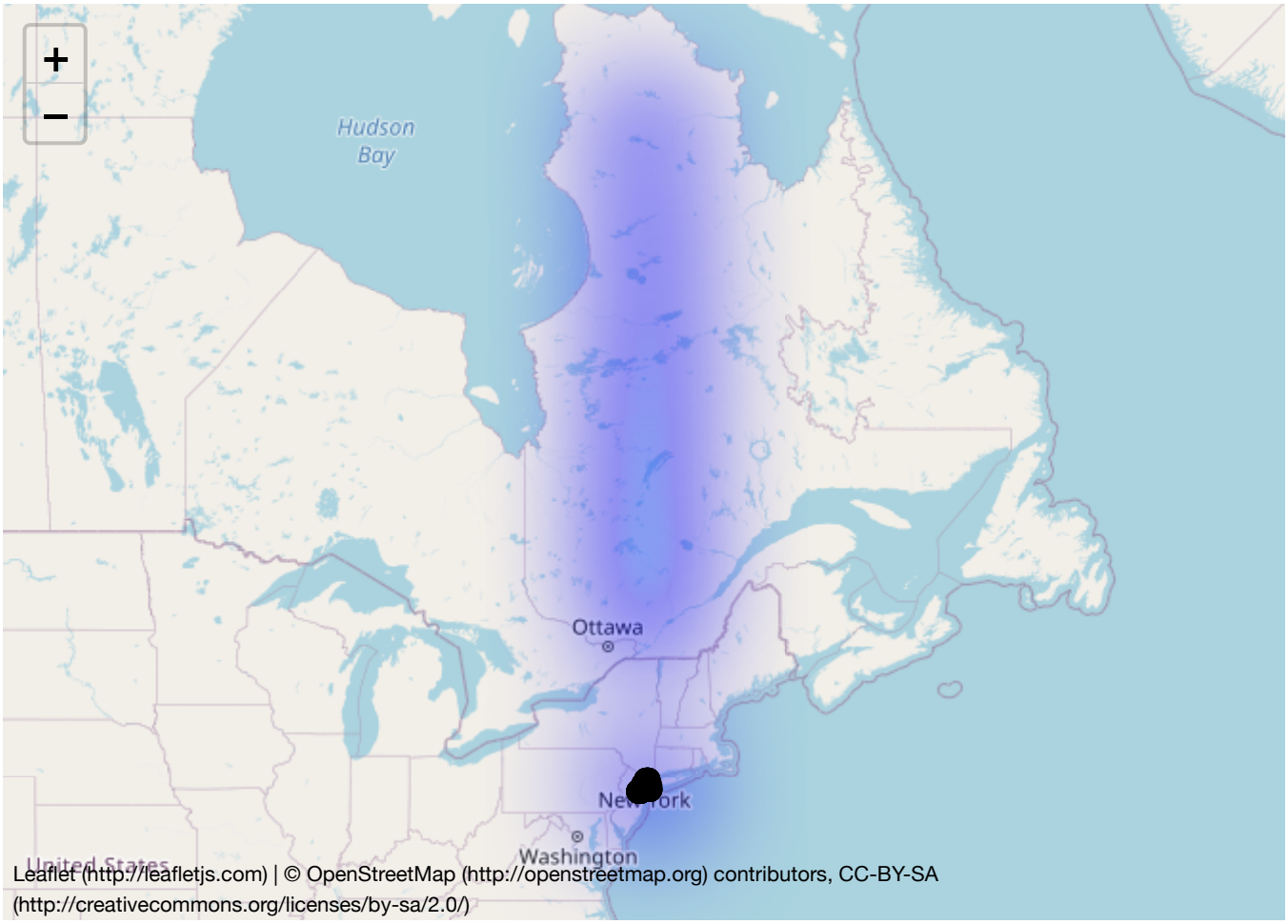


```
factpal <- colorFactor(rainbow(length(unique(cincinnati$route_short_name))), cincinnati
$route_short_name)
cincinnati$route_color<-factpal(cincinnati$route_short_name)

leaflet() %>%
     addTiles() %>%
     addPolylines(data=cincinnati,color = ~as.factor(route_color),
                  label = ~as.character(route_short_name),weight= 2) %>%
    addCircleMarkers(lng=~stop_lon,lat=~stop_lat,data = cincinnati.stops,color = "black"
, radius = 5, weight = 3,label = ~as.character(stop_name)) %>%
      addHeatmap(group="heat", lng=~longitude, lat=~latitude,dat=dat.cincinnati, max=.9,
blur = 60)  %>%
  fitBounds(lng1=min(dat.cincinnati$longitude),lng2=max(dat.cincinnati$longitude),lat1=m
in(dat.cincinnati$latitude),lat2=max(dat.cincinnati$latitude))
```



```
factpal <- colorFactor(rainbow(length(unique(la$route_short_name))), la$route_short_nam
e)
la$route_color<-factpal(la$route_short_name)
leaflet() %>%
     addTiles() %>%
     addPolylines(data=la,color = ~as.factor(route_color),
                  label = ~as.character(route_short_name),weight= 2) %>%
      addCircleMarkers(lng=~stop_lon,lat=~stop_lat,data = la.stops,color = "black", radi
us = 5, weight = 3,label = ~as.character(stop_name)) %>%
      addHeatmap(group="heat", lng=~longitude, lat=~latitude,dat=dat.la, max=.9,blur = 6
0)  %>%
  fitBounds(lng1=min(dat.la$longitude),lng2=max(dat.la$longitude),lat1=min(dat.la$latitu
de),lat2=max(dat.la$latitude))
```



```
factpal <- colorFactor(rainbow(length(unique(nyc_subway$route_short_name))), nyc_subway
$route_short_name)
nyc_subway$route_color<-factpal(nyc_subway$route_short_name)
leaflet() %>%
     addTiles() %>%
     addPolylines(data=nyc_subway,color = ~as.factor(route_color),
                  label = ~as.character(route_short_name),weight= 2) %>%
      addCircleMarkers(lng=~stop_lon,lat=~stop_lat,data = nyc_subway.stops,color = "blac
k", radius = 5, weight = 3,label = ~as.character(stop_name)) %>%
      addHeatmap(group="heat", lng=~longitude, lat=~latitude,dat=dat.nyc, max=.9,blur =
60) %>%
  fitBounds(lng1=min(dat.nyc$longitude),lng2=max(dat.nyc$longitude),lat1=min(dat.nyc$lat
itude),lat2=max(dat.nyc$latitude))
```