GIS III: Lab 8

Rachel Steiner-Dillon

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This lab maps home to work flows in the Dallas Fort Worth Metro Area using LODES data from the U.S. Census Bureau.

```
library(tidyverse)
library(tidycensus)
library(tigris)
library(sf)
library(ggmap)
```

Step 1: Prepare Origin-Destination Table

Import LODES data at the block level and a crosswalk file that will allow us to aggregate to the tract level.

```
# Import OD
setwd("C:/Users/rache/Documents/GitHub/urban_analytics/08_Data_Viz_4_Mapping_Flows")
load("./data/tx_od_main_JT00_2014.Rdata")

# Import cross walk
XWalk <- read.csv("./data/tx_xwalk.csv")

# Turn off scientific notation
options(scipen=999)
```

Merge the OD table with the crosswalk, creating new columns for the origin and testination census tracts. Then, aggregate the flows variable, S000, to the tract level.

```
# Merge onto the home block code
OD <- merge(OD,XWalk, by.x = "h_geocode", by.y = "tabblk2010", all.x= TRUE)

# Change column names
colnames(OD) <- c("h_geocode","w_geocode","S000","h_geocode_trct")

# Merge onto the work block code
OD <- merge(OD,XWalk, by.x = "w_geocode", by.y = "tabblk2010", all.x= TRUE)

# Change column names
colnames(OD) <- c("h_geocode","w_geocode","S000","h_geocode_trct","w_geocode_trct")

# Aggregate flows into Tracts
OD_Tract <- aggregate(data=OD, S000 ~ h_geocode_trct + w_geocode_trct, sum)
```

Step 2: Prepare Spatial Data

I was not able to load the geojson file included in the lab's data file, so I downloaded Texas tracts from the Census API.

```
TX_tract <- get_acs(geography = 'tract',
                    state = '48',
                    variables = 'B01001_001',
                    geometry = TRUE)

TX_tract <- st_transform(TX_tract, 4326)
```

My tracts file is in sf format, so I was not able to use the coordinates() function to get tract centroids in a single line of code. However, the following produces the same result.

```
tract_cent = st_centroid(TX_tract)
cent_coords <- do.call(rbind, st_geometry(tract_cent)) %>%
  as_tibble() %>% setNames(c('lon', 'lat'))

TX_tract_centroids <- data.frame(TX_tract$GEOID, cent_coords) %>%
  rename(GEOID = TX_tract.GEOID)
```

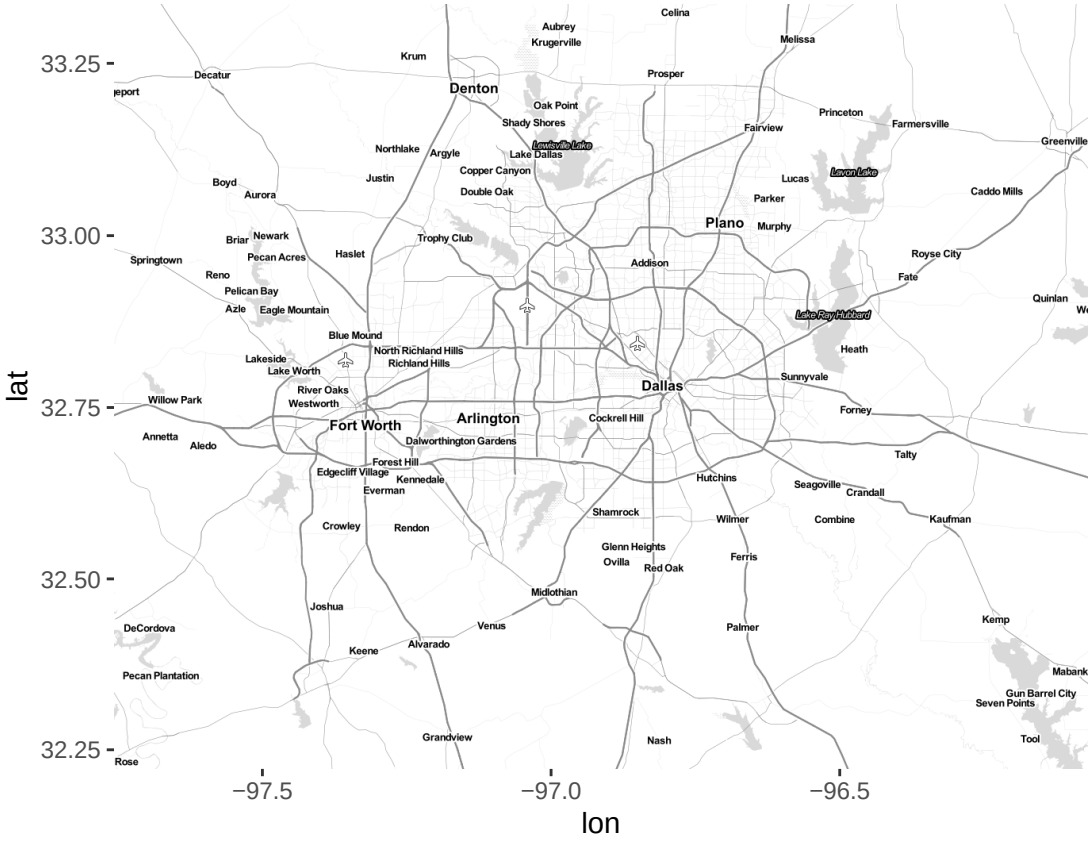
Merge the OD table with the centroids table to attach centroid coordinates to both the origin and destination tracts.

```
# Add home lat lon
OD_Tract <- merge(OD_Tract,TX_tract_centroids,by.x="h_geocode_trct", by.y="GEOID",all.x=TRUE)

# Fix column names
colnames(OD_Tract) <- c("h_geocode_trct","w_geocode_trct","S000","h_lon","h_lat")

# Add work lat lon
OD_Tract <- merge(OD_Tract,TX_tract_centroids,by.x="w_geocode_trct", by.y="GEOID",all.x=TRUE)

# Fix column names
colnames(OD_Tract) <- c("w_geocode_trct","h_geocode_trct","S000","h_lon","h_lat","w_lon","w_lat")
```

Step 3: Create Flows Map

I was not able to successfully register a Google API key, so I found an alternative method of downloading a basemap.

```
Dallas_bbox <- c(left=-97.757, bottom=32.222, right=-96.07, top=33.335)
dallas = get_stamenmap(Dallas_bbox, zoom=10, maptype='toner-lite')

ggmap(dallas)
```



I attempted to shorten the rendering time for the final map by subsetting the OD_Tract table to only the counties surrounding Dallas.

```
OD_Tract$w_geocode_trct <- as.character(OD_Tract$w_geocode_trct)
OD_Tract$h_geocode_trct <- as.character(OD_Tract$h_geocode_trct)

OD_Tract$w_cnty <- substr(OD_Tract$w_geocode_trct, 1, 5)
OD_Tract$h_cnty <- substr(OD_Tract$h_geocode_trct, 1, 5)

dallas_tracts <- subset(OD_Tract, w_cnty=='48113' | w_cnty=='48439' |
                        w_cnty=='48121' | w_cnty=='48085' | w_cnty=='48397' | w_cnty=='48257' |
                        w_cnty=='48139' | w_cnty=='48251' | h_cnty=='48113' | h_cnty=='48439' |
                        h_cnty=='48121' | h_cnty=='48085' | h_cnty=='48397' | h_cnty=='48257' |
                        h_cnty=='48139' | h_cnty=='48251')
```

```
ggmap(dallas, darken = 0.8) +
  geom_segment(data=dallas_tracts[dallas_tracts$S000 > 10,],
               aes(y = h_lat, x = h_lon, yend = w_lat, xend = w_lon, alpha= S000),
               size=0.3, colour = "white") +
  scale_alpha_continuous(range = c(0.004, 0.3))  +
  theme ( legend.position="bottom",
          axis.text = element_blank (),
          axis.title = element_blank (),
          axis.ticks = element_blank (),
          plot.title = element_text(hjust = 0.5)) +
  ggtitle('Home-Work Flows in the Dallas Fort Worth Metro Area')
```

```
## Warning: Removed 1965 rows containing missing values (geom_segment).
```