

NYC Traffic:

The Most Dangerous Intersections in Manhattan

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The Data

- Maintained and updated by the NYPD
- Over 100,000 recorded collisions in Manhattan between 7/1/2012 and 1/12/2015, approximately 2.5 years
- Each record contains information on the time, location, number of injuries/fatalities, vehicle type(s), and possible contributing factors of each collision
- Location is specified by geodetic coordinates

The Method

1. Use **kernel density estimation (KDE)** to get an estimate of crash frequency for each location in Manhattan
2. Identify the greatest local maxima. These points will correspond to areas with the highest collision rates.
3. Record the location of each of the most dangerous intersections and visualize them on a map

Step 1: Kernel Density Estimation

- Use Gaussian kernels. They are symmetrical and fall off quickly from the peak.
- Make the bandwidth small enough so that each collision contributes density to the nearest intersection.
- Expect a “rough” looking distribution with many small peaks and valleys

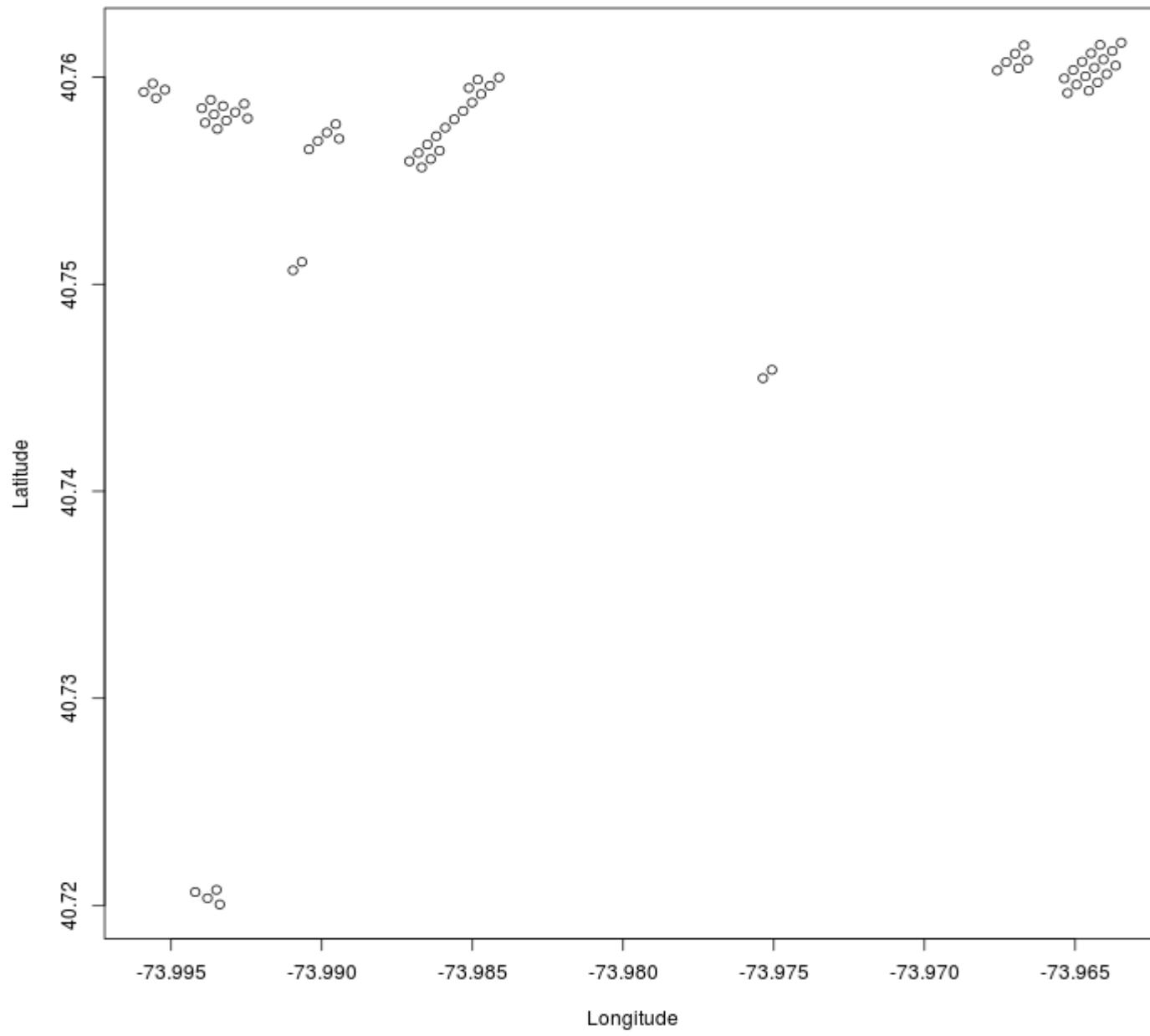
Step 1a: KDE Calculation Considerations

- Focus on Manhattan because the entire city would be too difficult to model
- Split Manhattan into upper and lower portions for both ease of modeling and so that areas of higher density
- Rotate coordinates so that the avenues are facing east/west

Step 2: Peak Detection

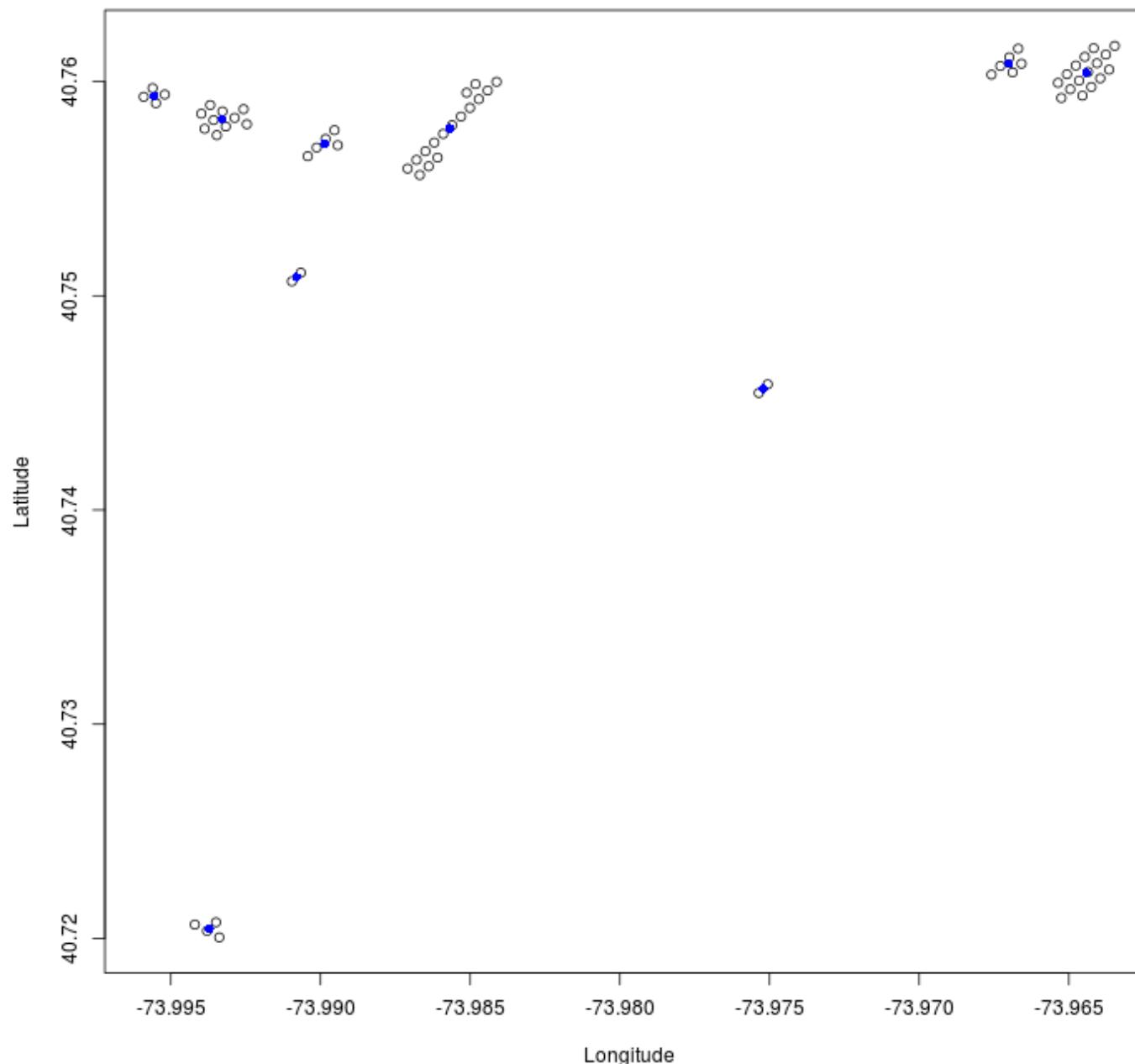
- Consider all points for which the density function is above a certain cutoff value
- This will generate a small number of tight clusters around the highest peaks
- Use k-means to find the center of each cluster
- Rely heavily on visualization

Step 2: Peak Detection, Visualization Example



Area is approximately 2.5 by 5 kilometers

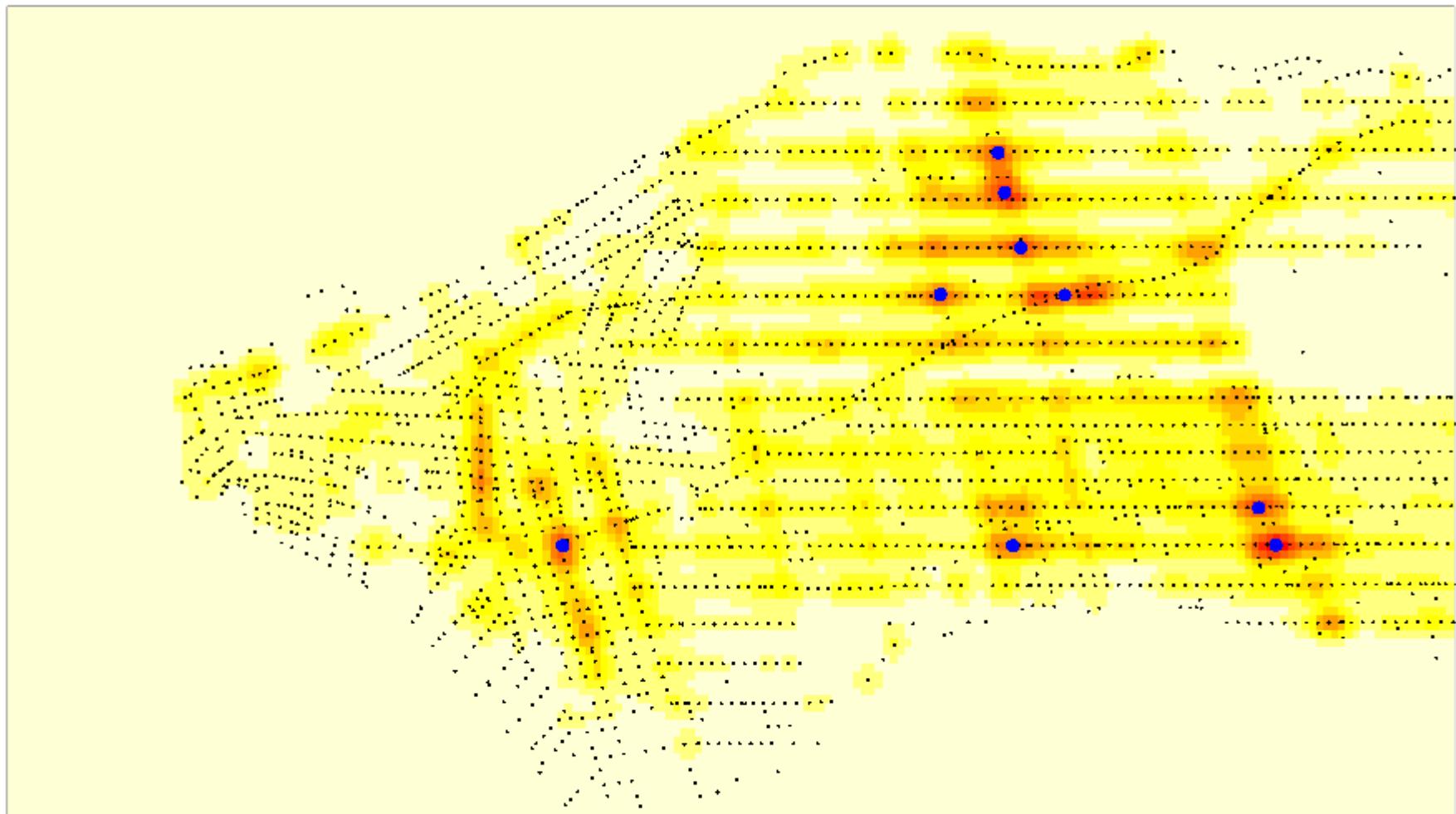
Step 2: Peak Detection, Visualization Example



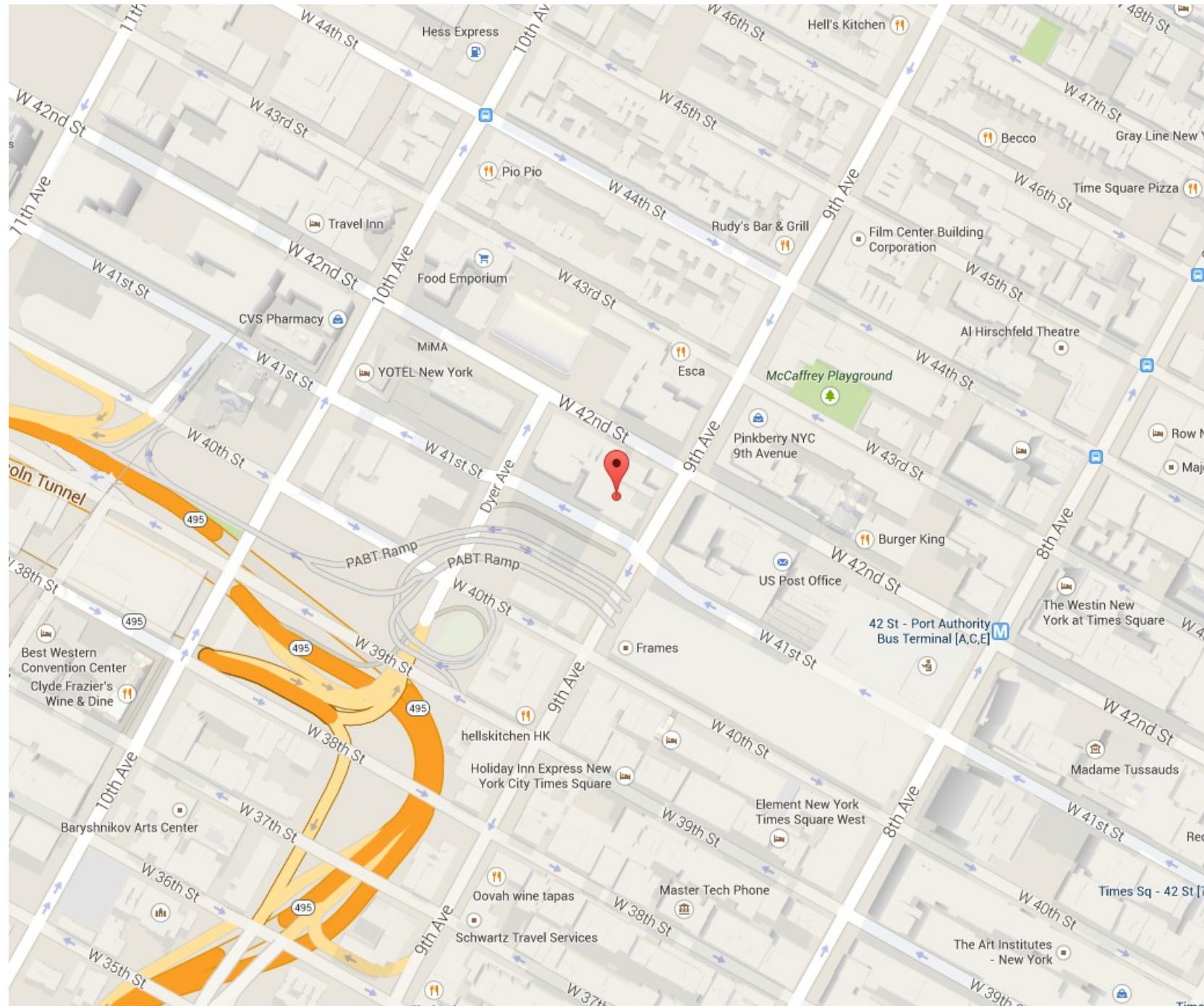
Area is approximately 2.5 by 5 kilometers

Step 3: Visualize!

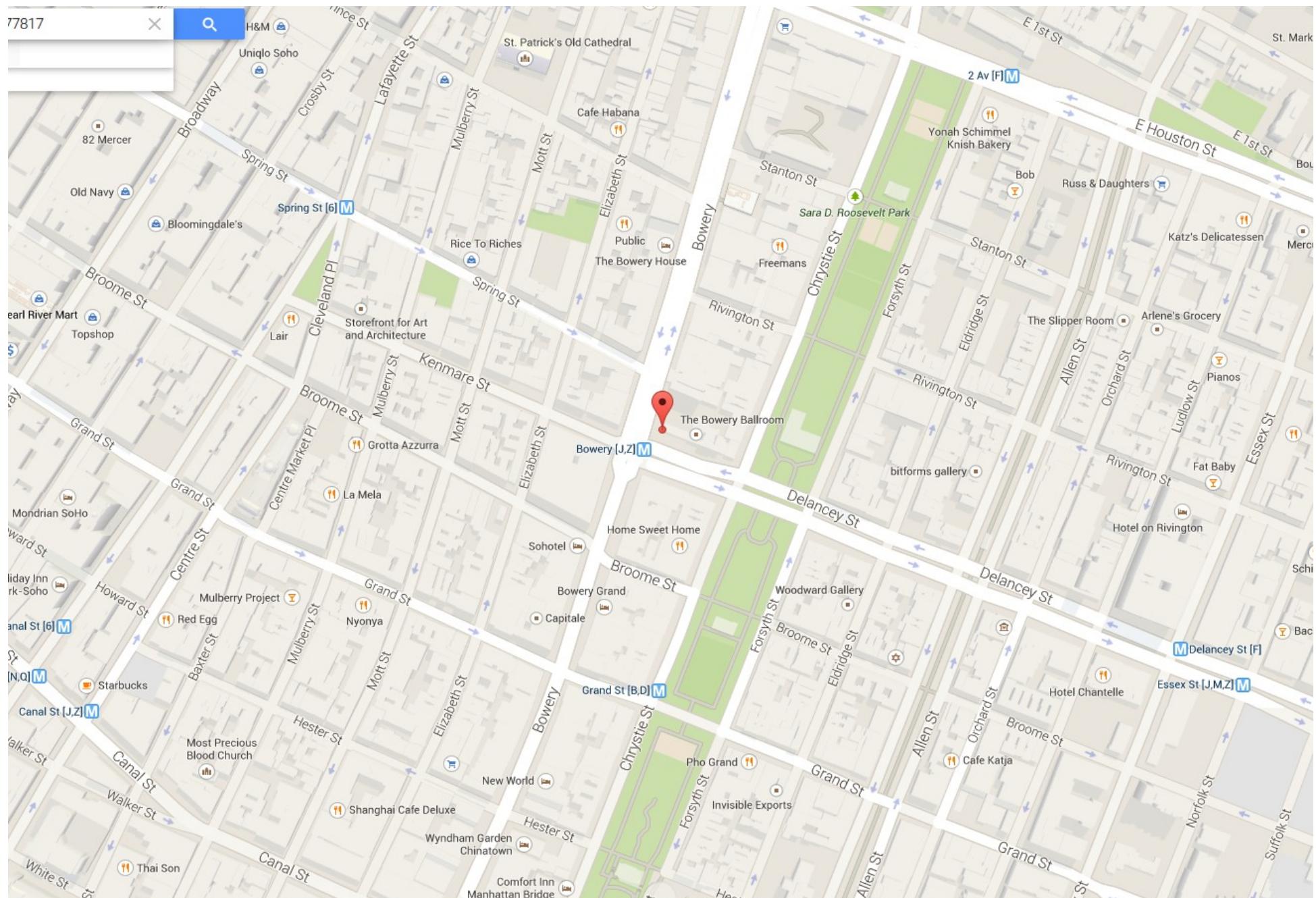
Most Dangerous Intersections in Lower Manhattan All Collisions



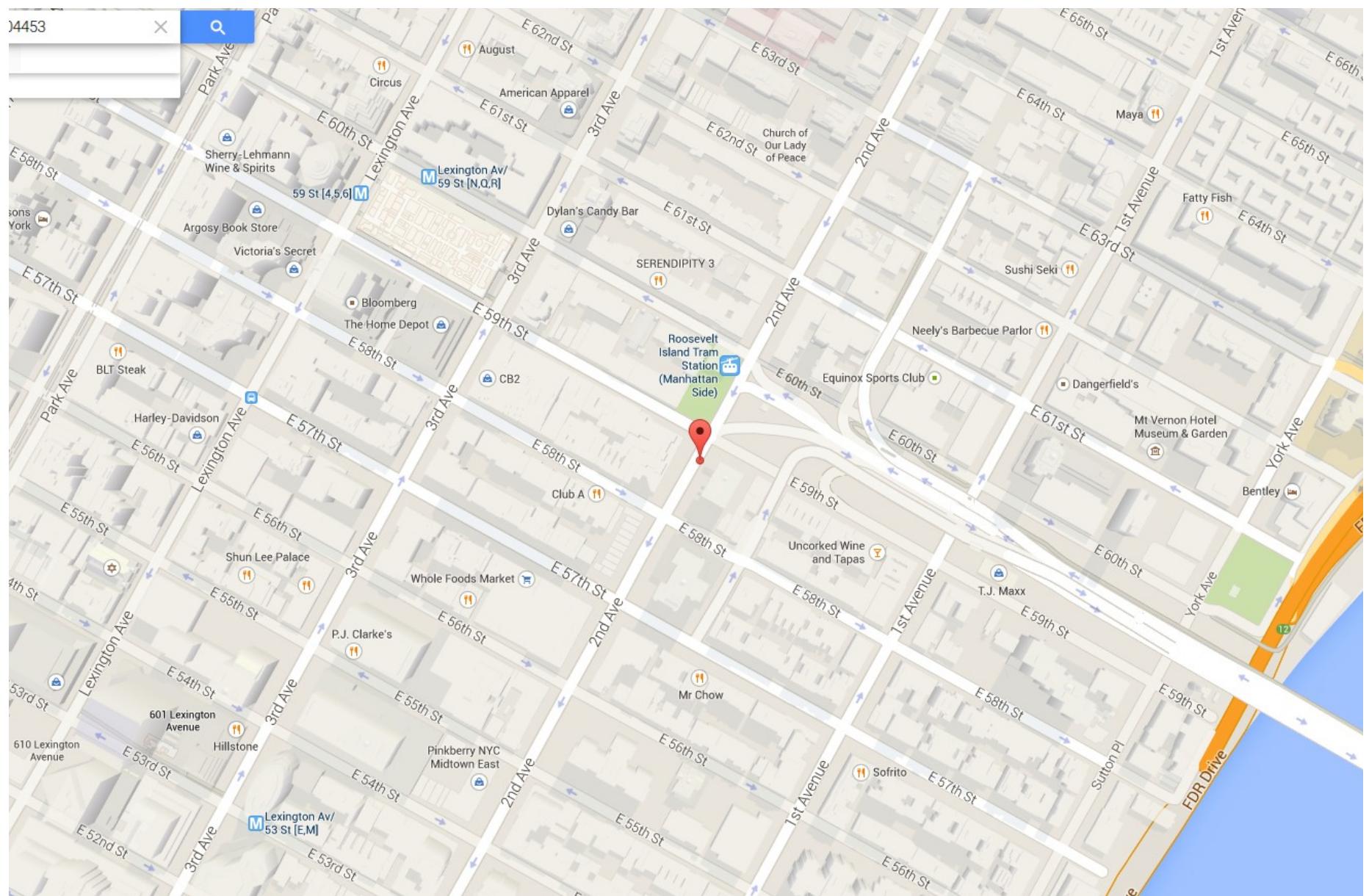
West 41st St and 9th Avenue (end of the Lincoln Tunnel)



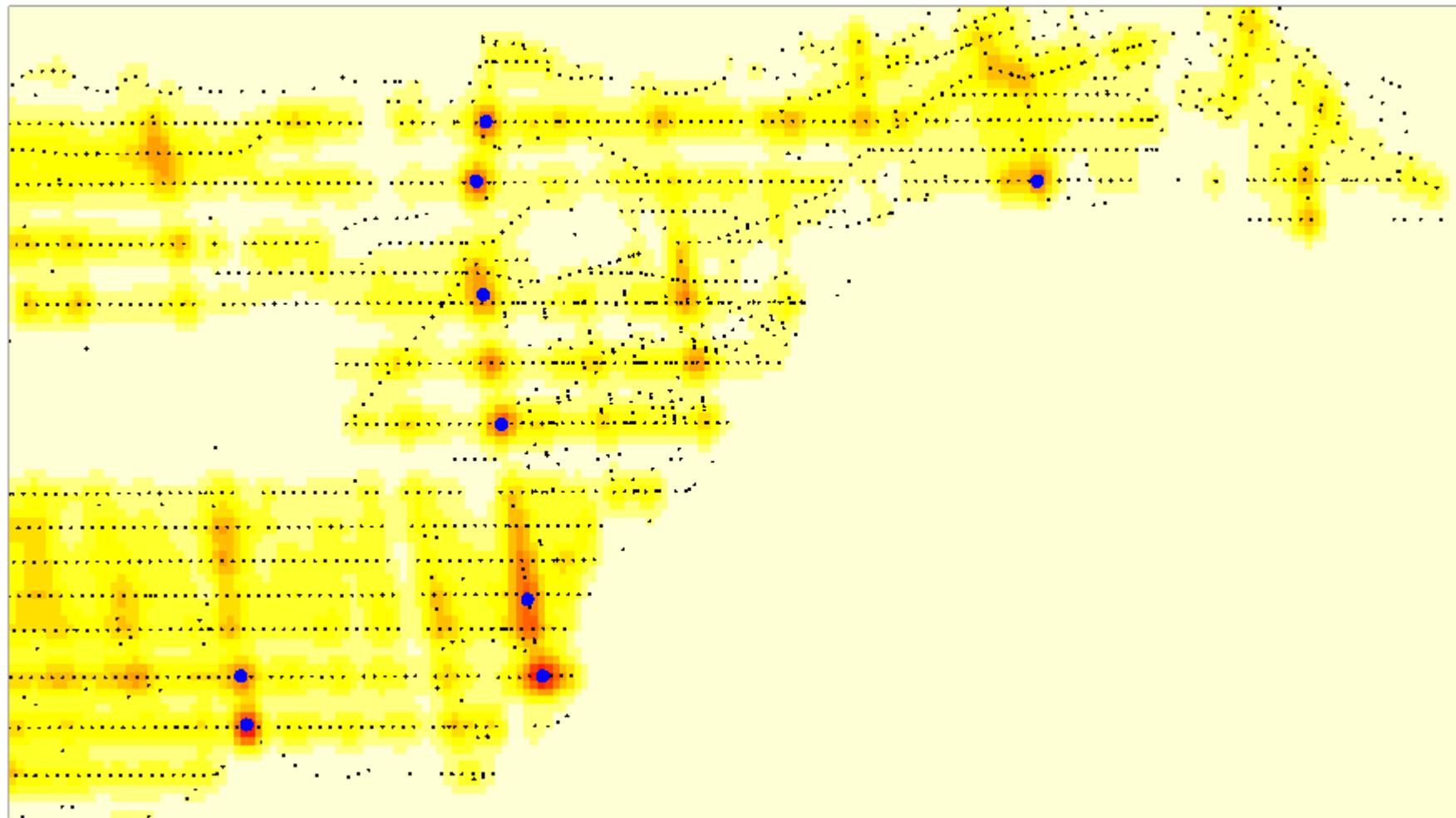
Delancey St and Bowery



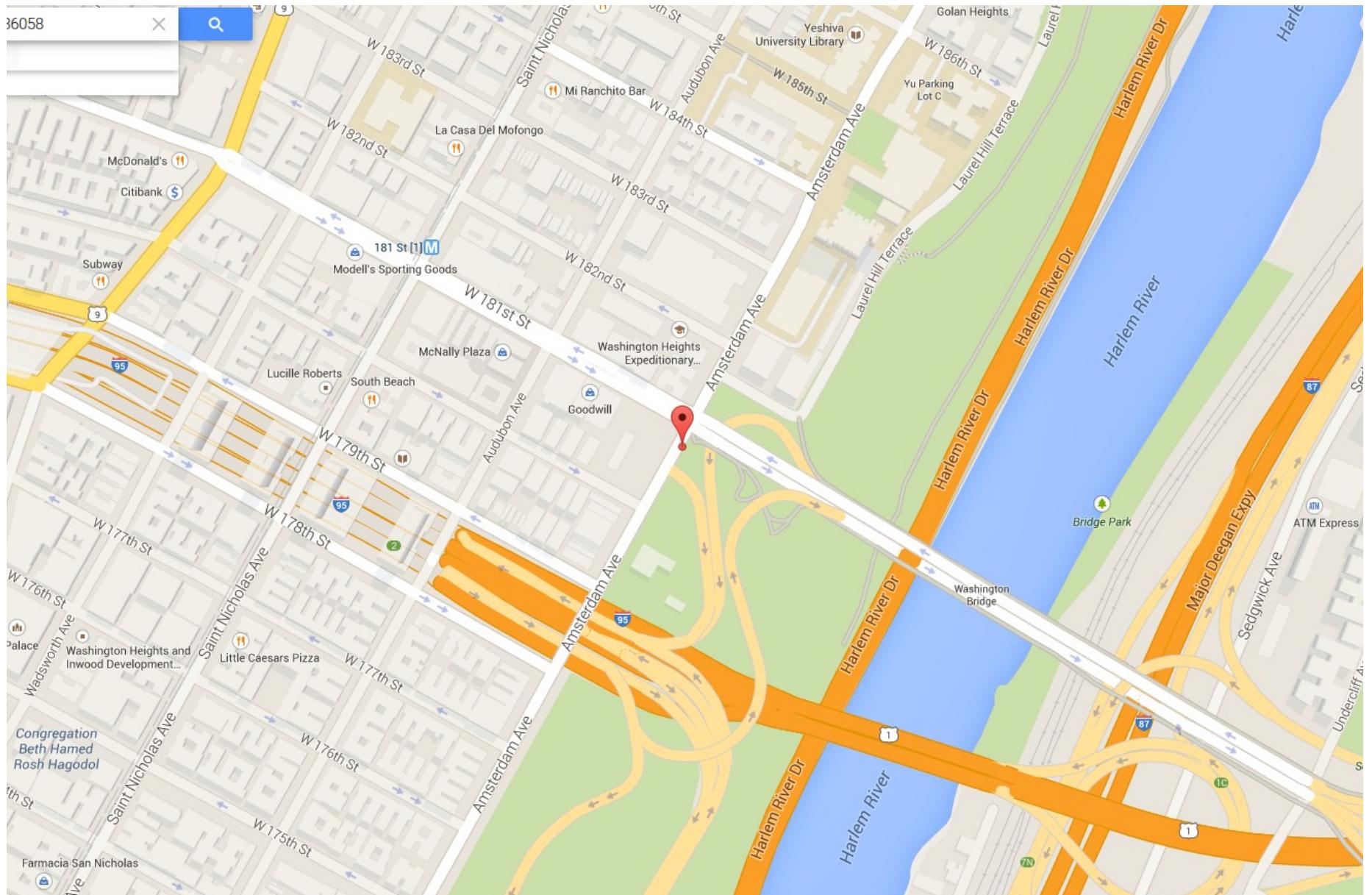
East 59th St and 2nd Avenue (End of the Queensboro Bridge)



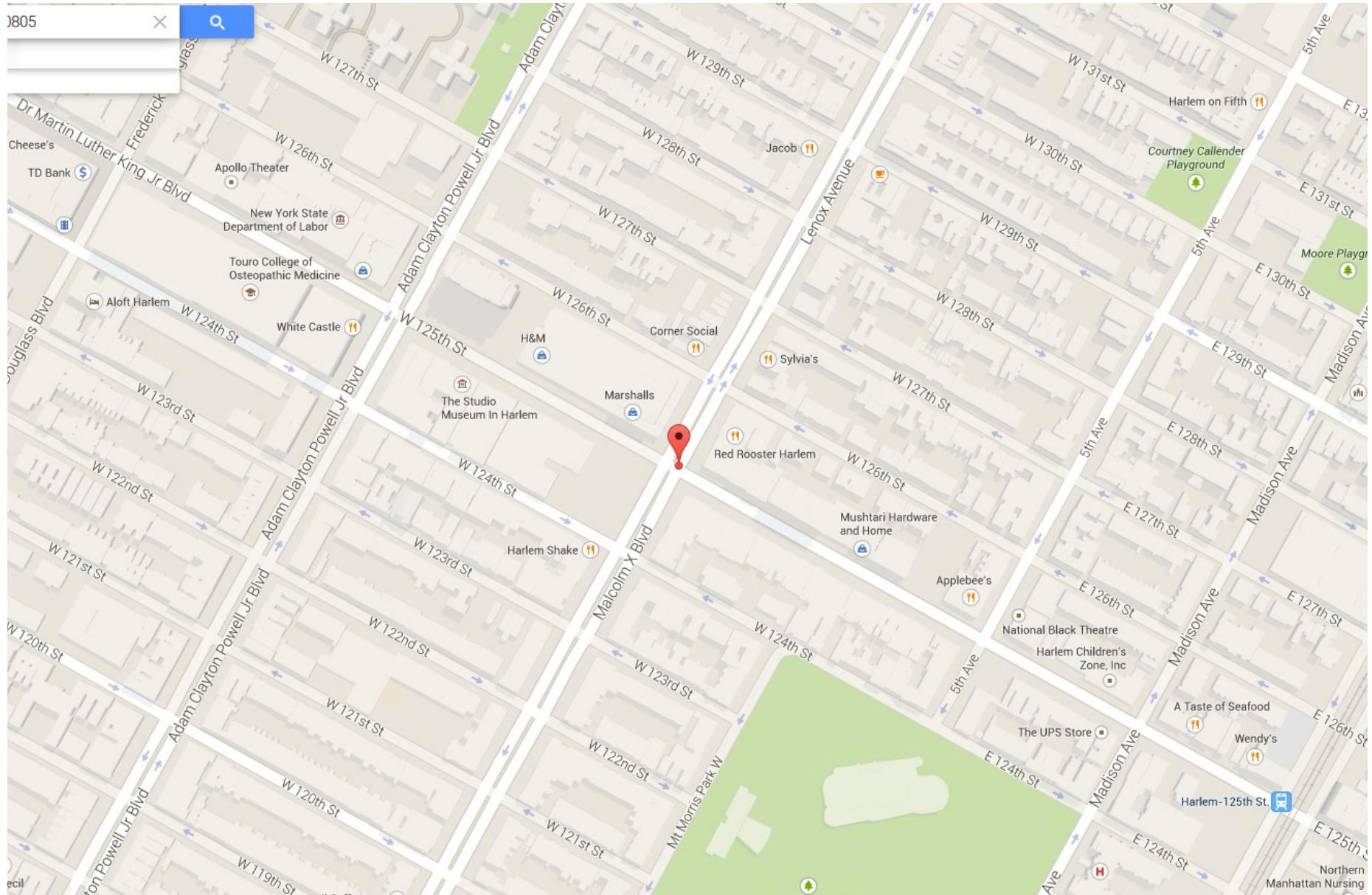
Most Dangerous Intersections in Upper Manhattan All Collisions



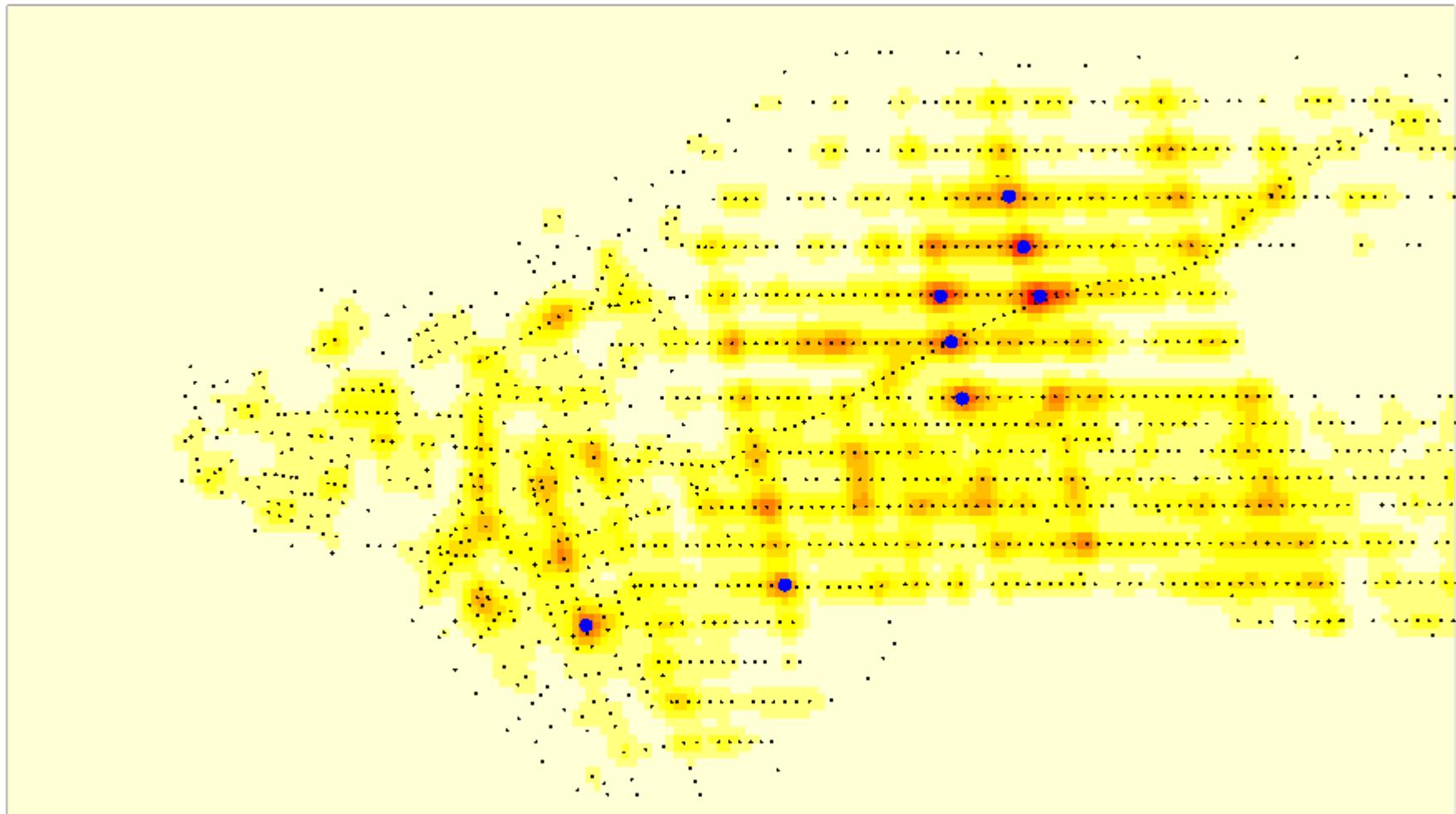
West 181st St and Amsterdam Avenue (End of the Washington Bridge)



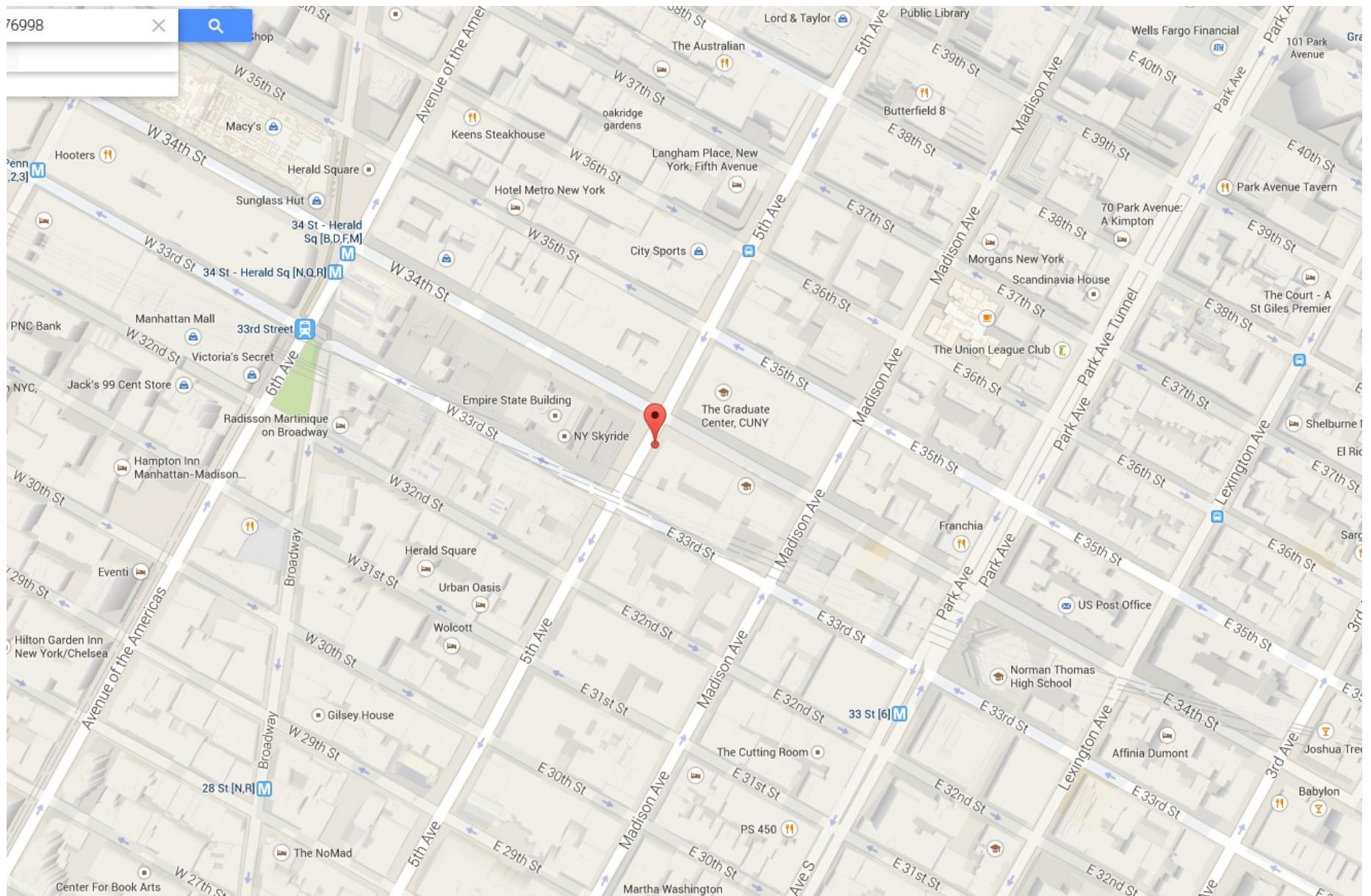
West 125th St and Malcolm X Blvd



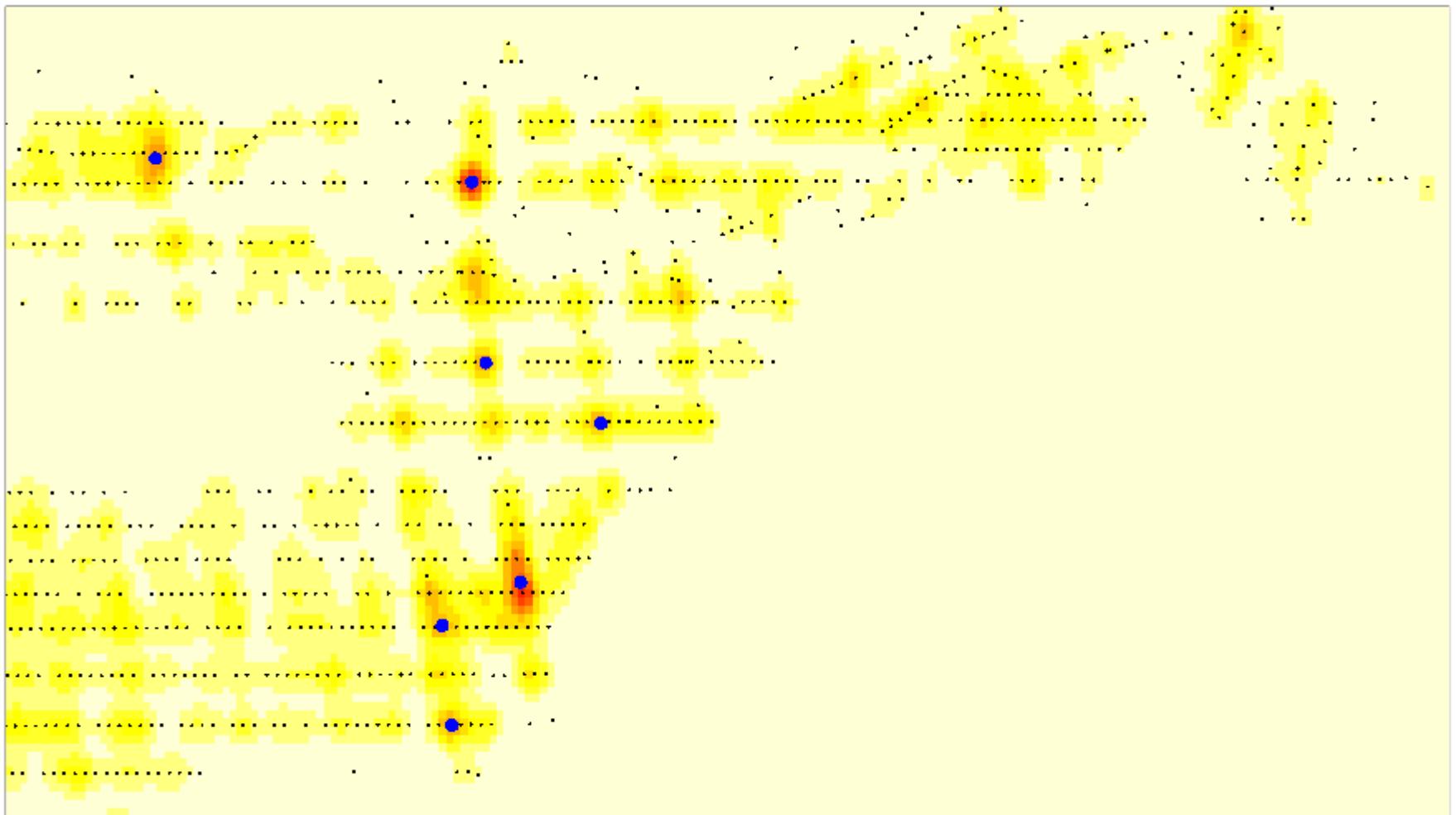
Most Dangerous Intersections in Lower Manhattan Pedestrian Injured or Killed



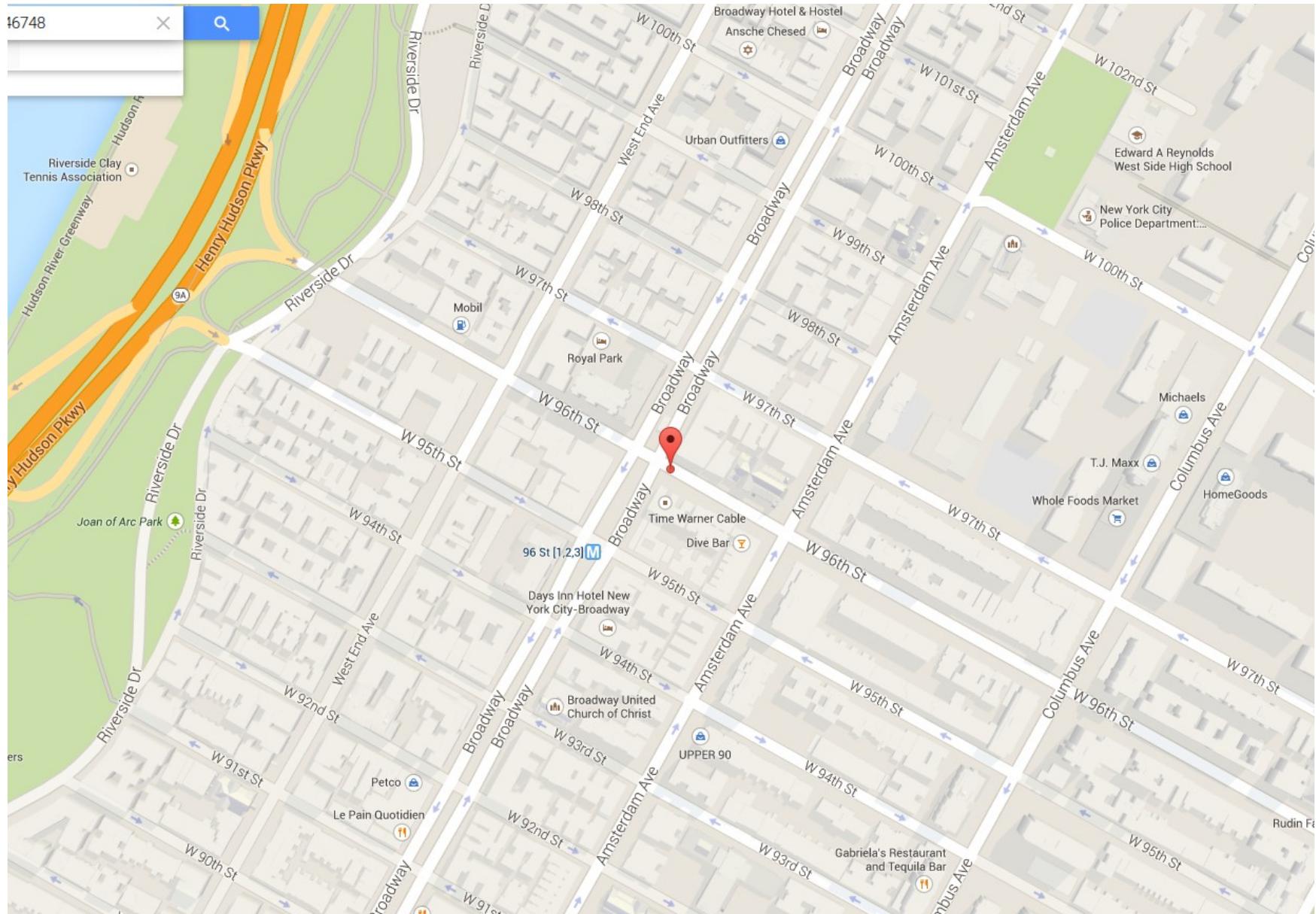
East 34th St and 5th Avenue (Empire State Building)



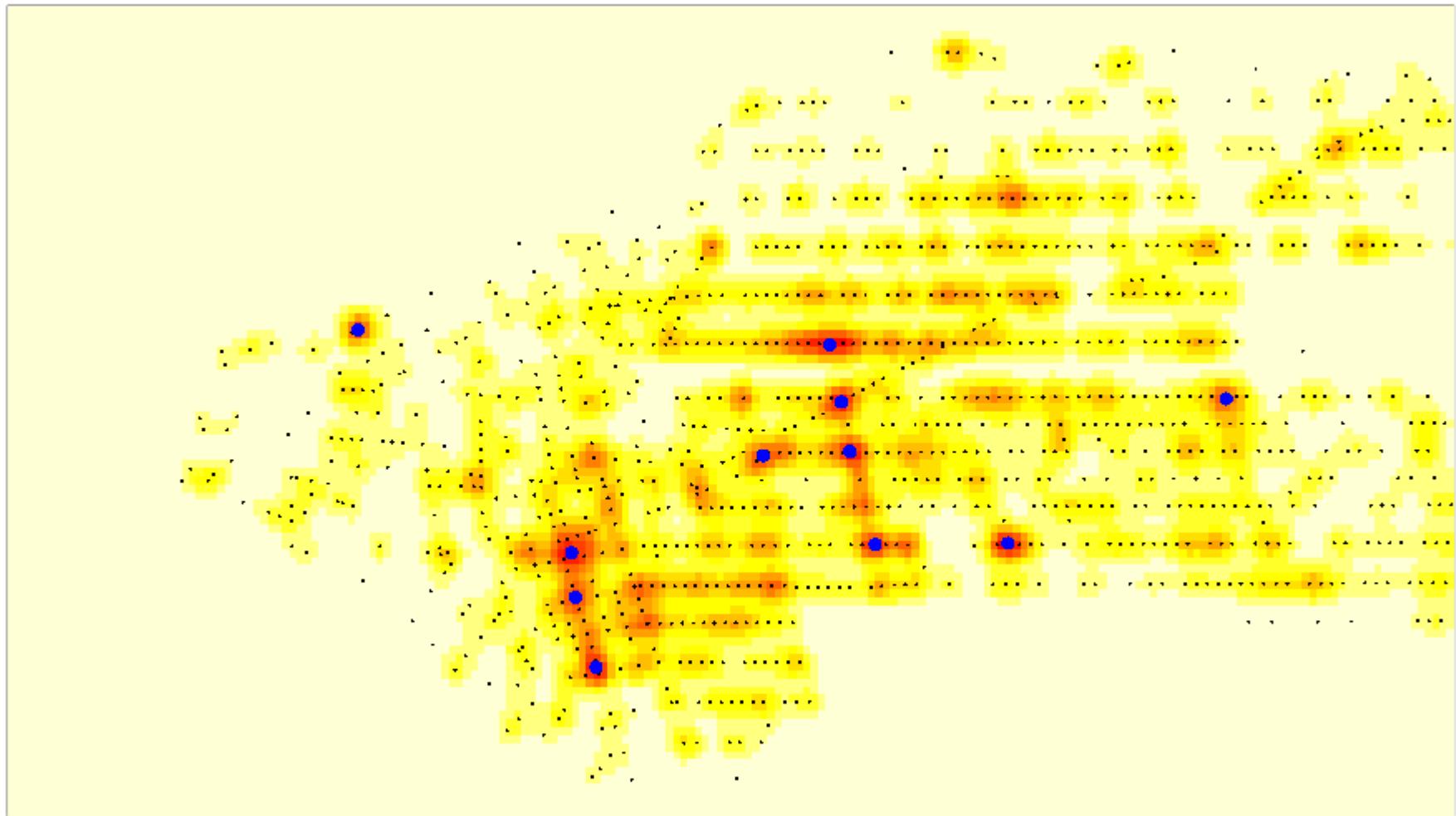
Most Dangerous Intersections in Upper Manhattan Pedestrian Injured or Killed



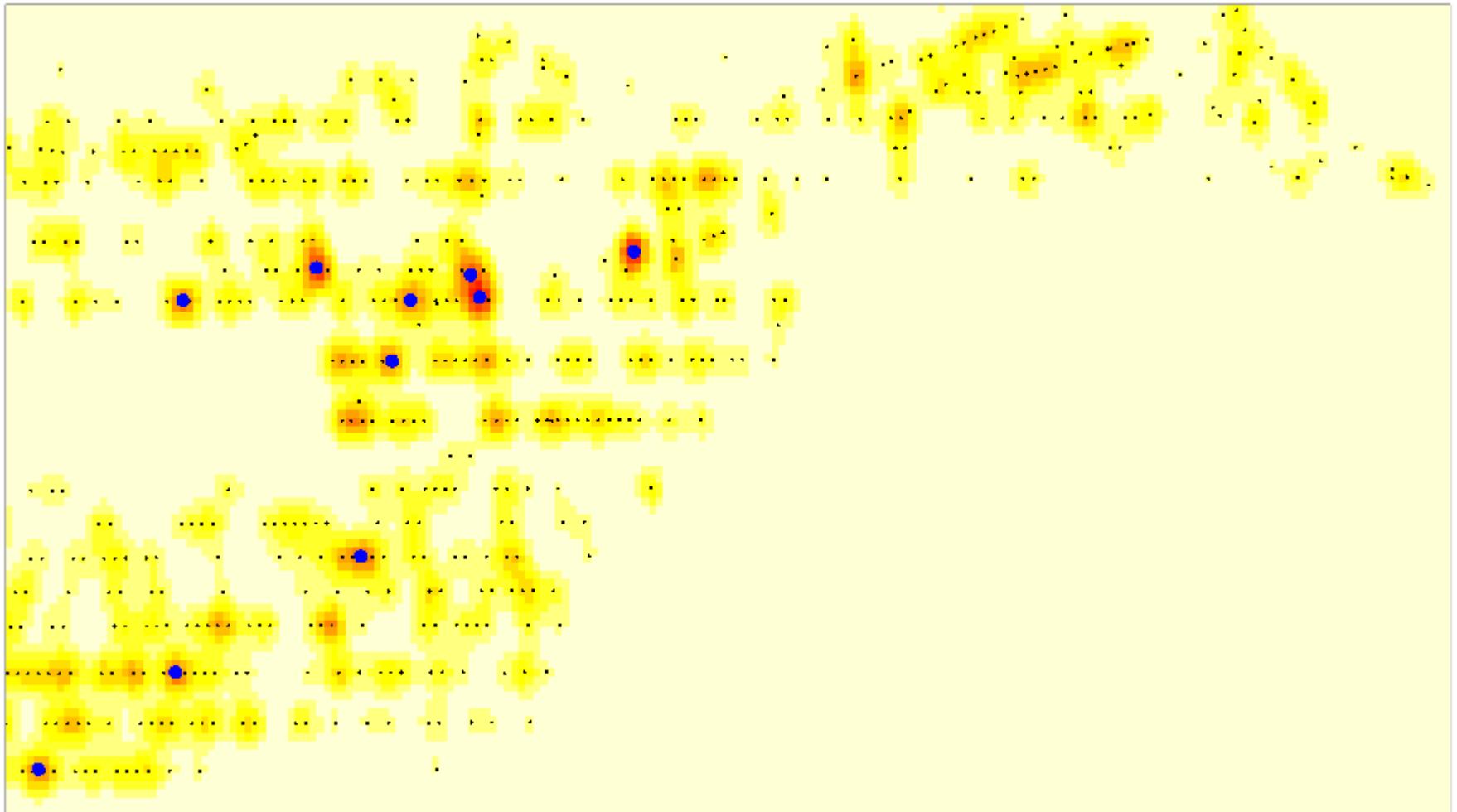
West 96th St and Broadway



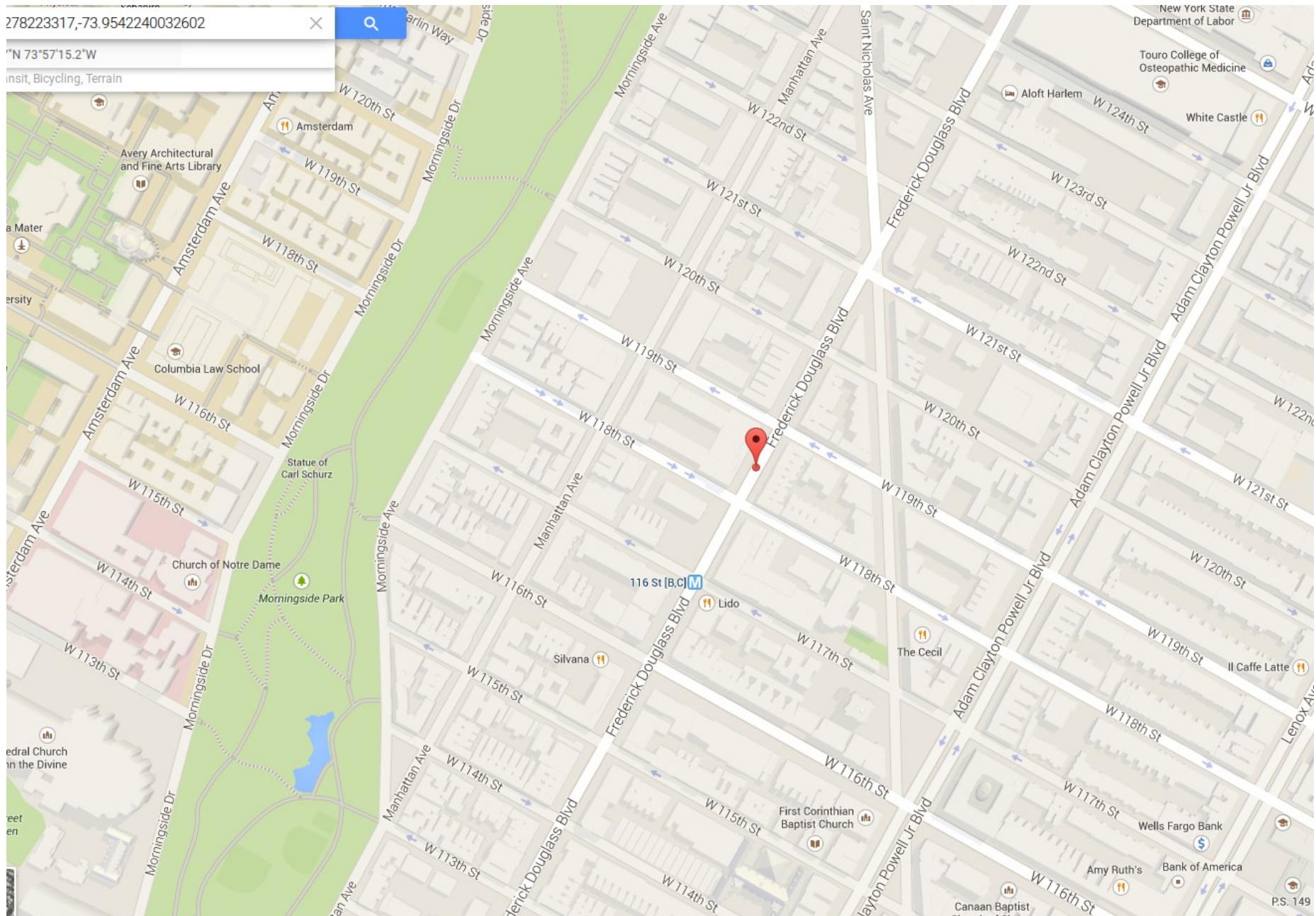
Most Dangerous Intersections in Lower Manhattan Cyclist Injured or Killed



Most Dangerous Intersections in Upper Manhattan Cyclist Injured or Killed



West 188th St at Frederick Douglass Blvd (Columbia University)



Next Steps and Further Investigation

- Compare collision rates relative to daily traffic volume
- Perform analysis on the neighborhood level
- Drill down:
 - Time of day (morning rush, afternoon rush, late night)
 - Over a period of time
 - Cause (failed to yield, alcohol)
 - Vehicle type (car, bus, taxi)

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