

Surveilling Surveillance:

Estimating the Prevalence of Surveillance Cameras with Street View Data

Hao Sheng, Keniel Yao, Sharad Goel
Stanford University Computational Policy Lab

Summary

- The use of video surveillance in public spaces has attracted considerable attention in recent years. However, it has been difficult to systematically measure the prevalence and placement of cameras.
- We present a novel approach for estimating the spatial distribution of surveillance cameras nationwide: Applying computer vision algorithms to large-scale street view image data.
- We find that cameras are concentrated in commercial, industrial, and mixed land-use zones, and in neighborhoods with a higher shares of non-white residents -- a pattern that persists even after adjusting for land use.

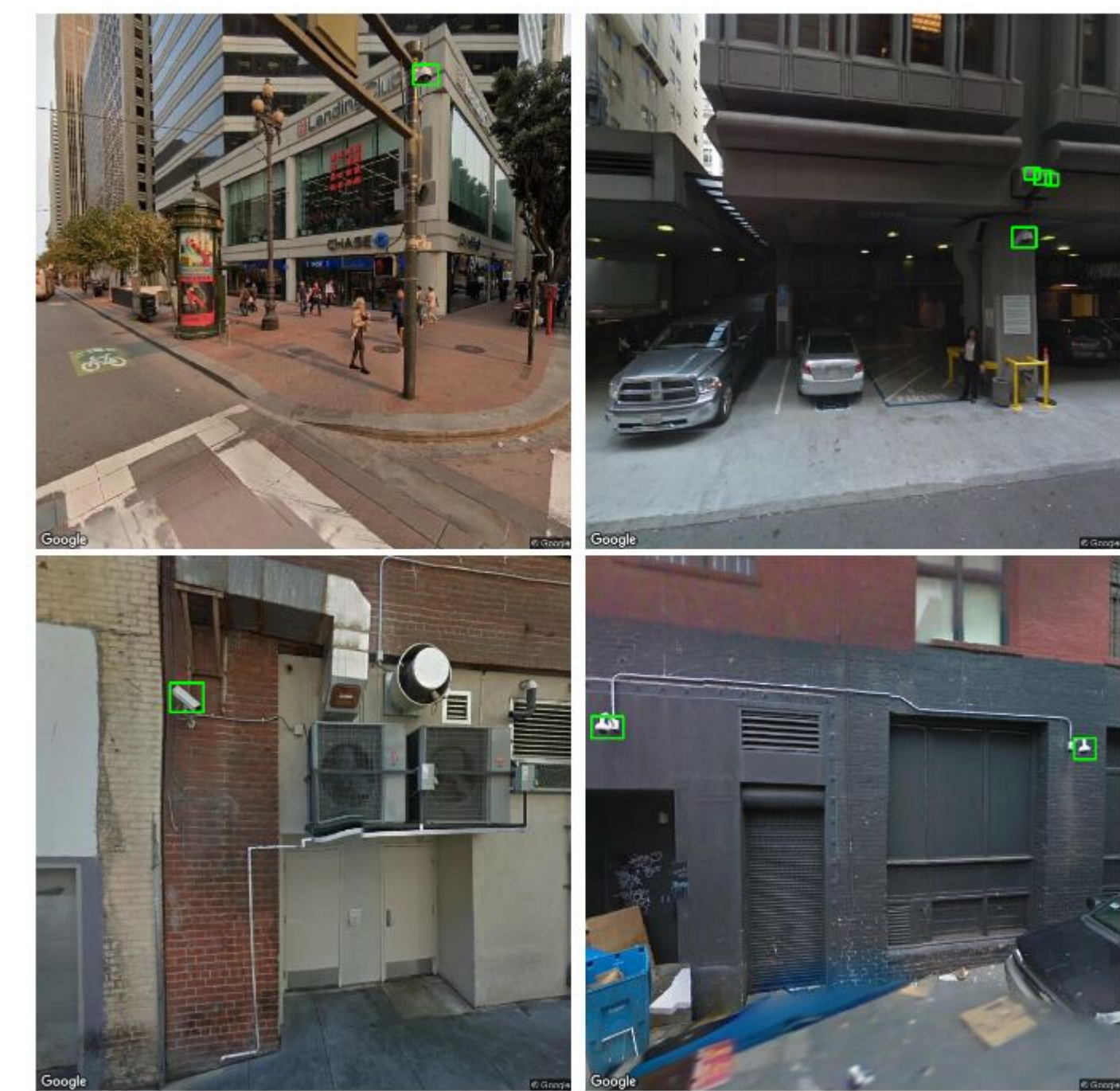


Figure 1. Examples of surveillance cameras in San Francisco. Upper left: Dome camera mounted on a traffic pole. Upper right: Dome camera mounted on the wall of a parking structure. Lower left: A wall mounted directed camera. Lower right: Two wall-mounted dome cameras.

Workflow

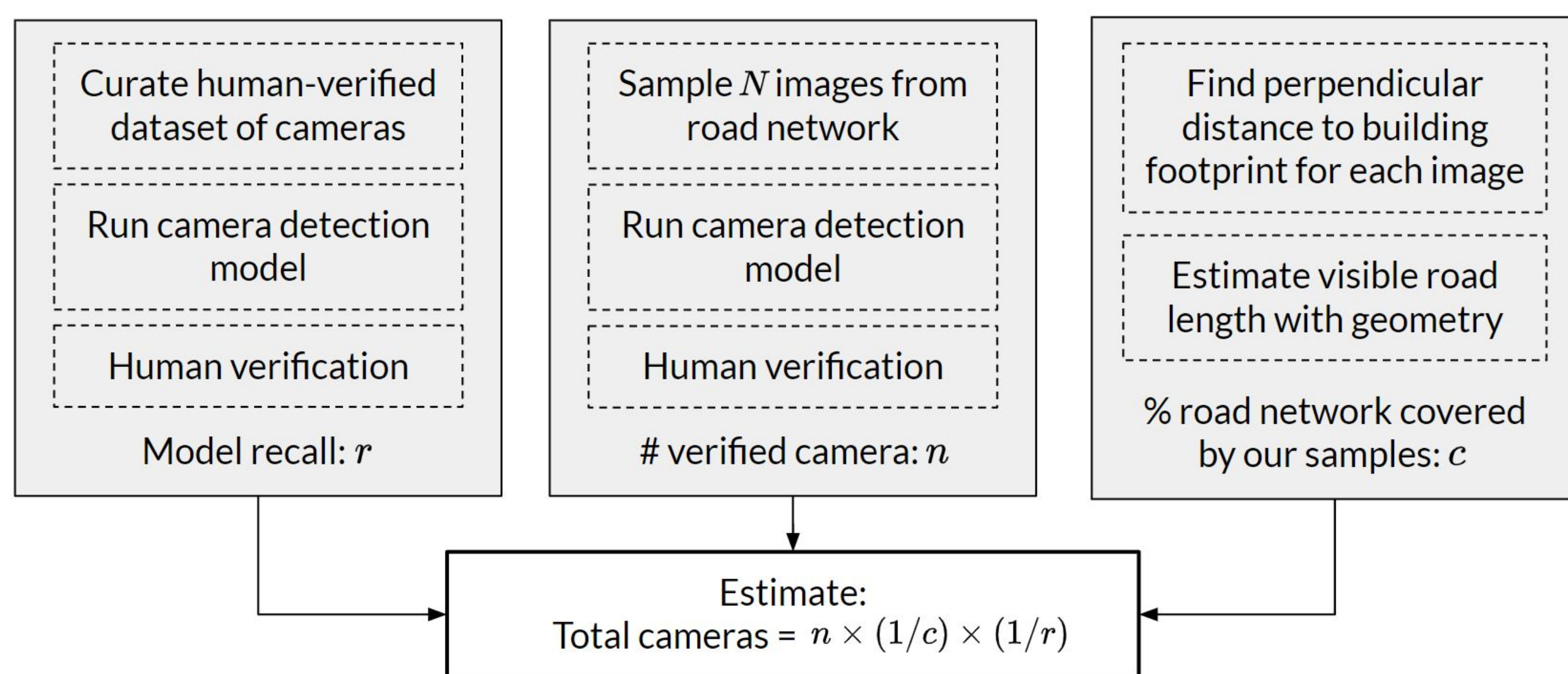


Figure 2. Camera estimation workflow.

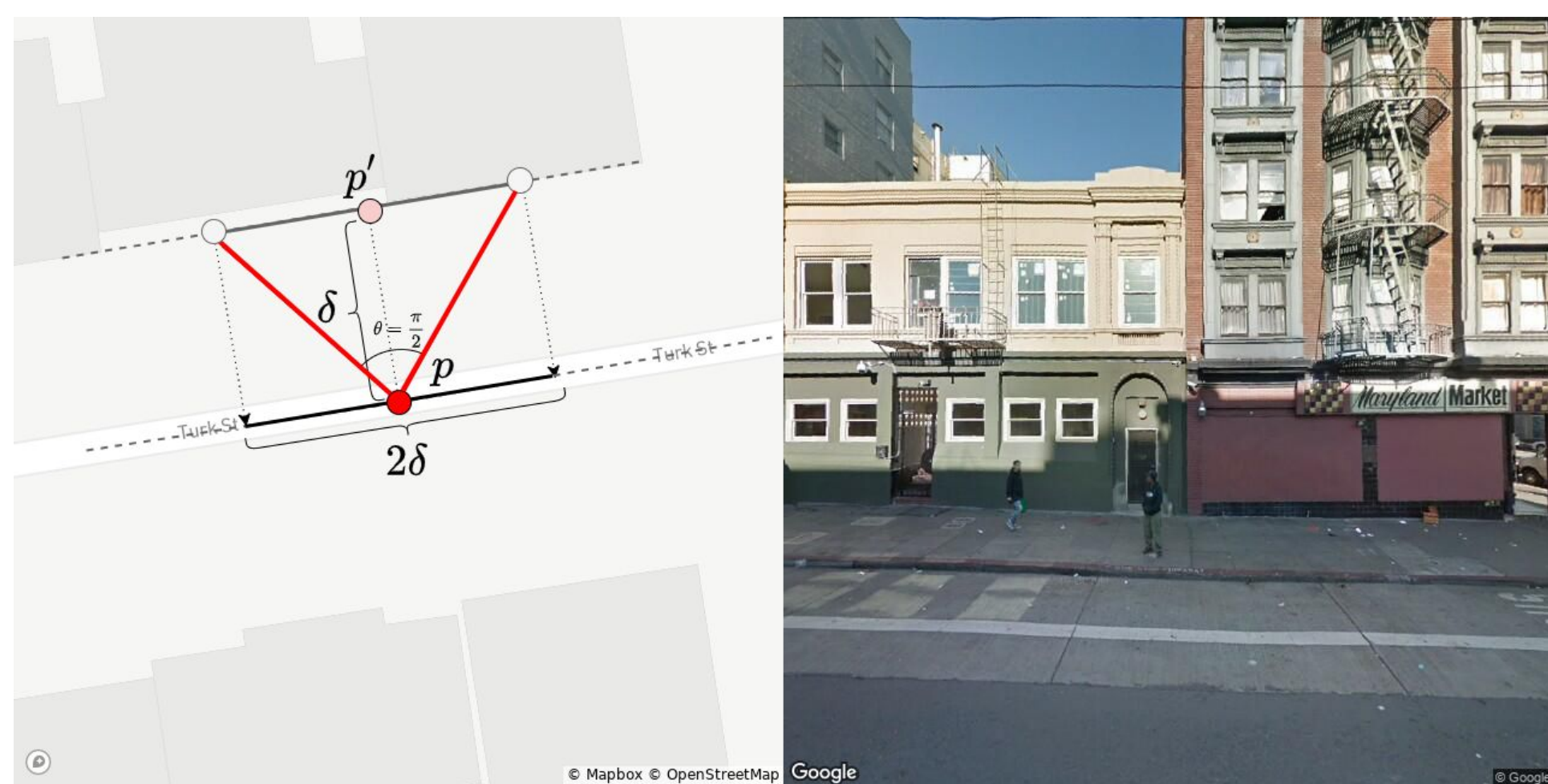


Figure 3: Illustration of how we estimate the road segment coverage for one image.

Camera Placement

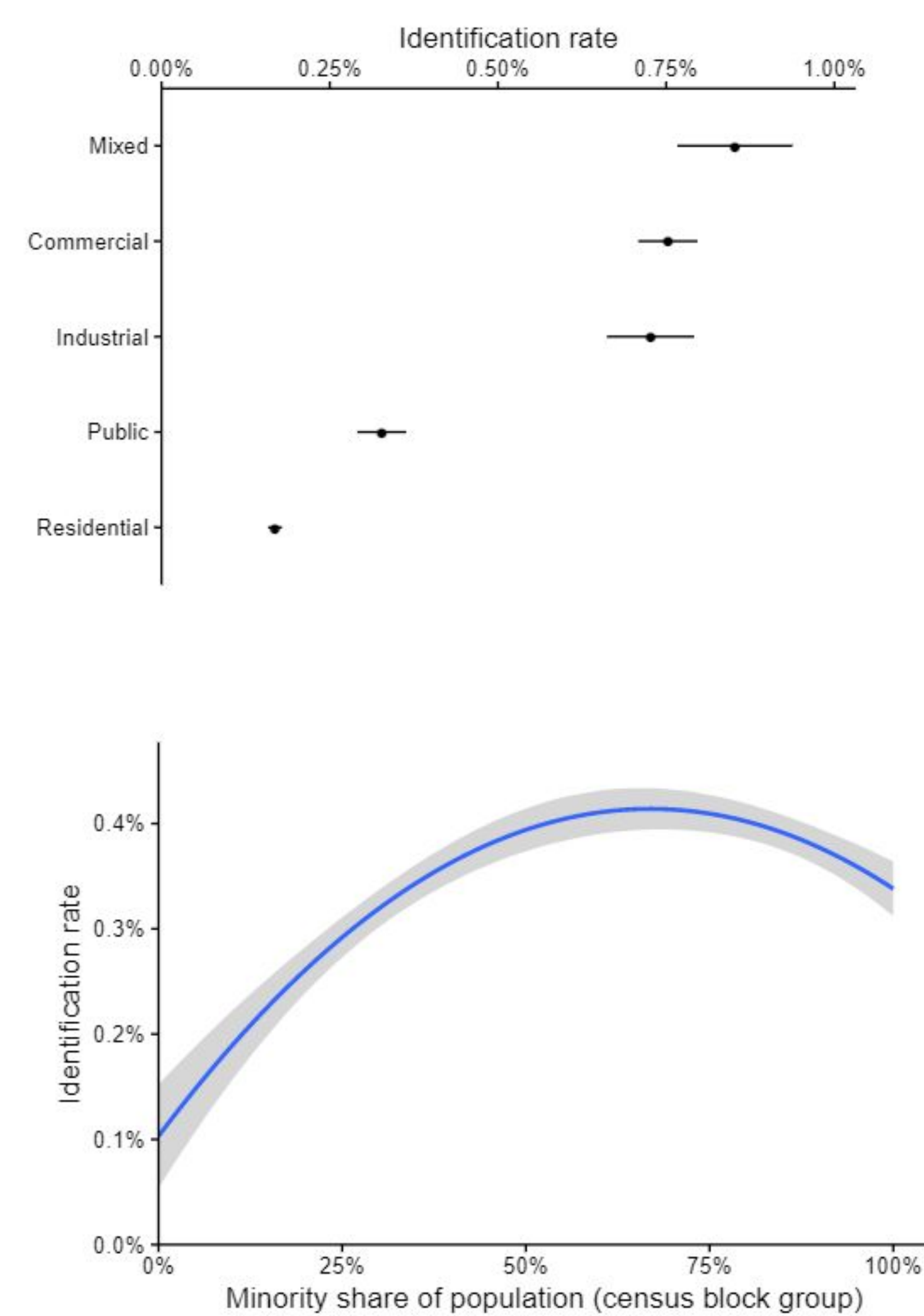


Figure 6: The relationship between camera identification rate (cameras per image) and zoning (upper) / minority share of population (lower), aggregated across 10 large U.S. cities for the period 2016-2020.

Camera Prevalence

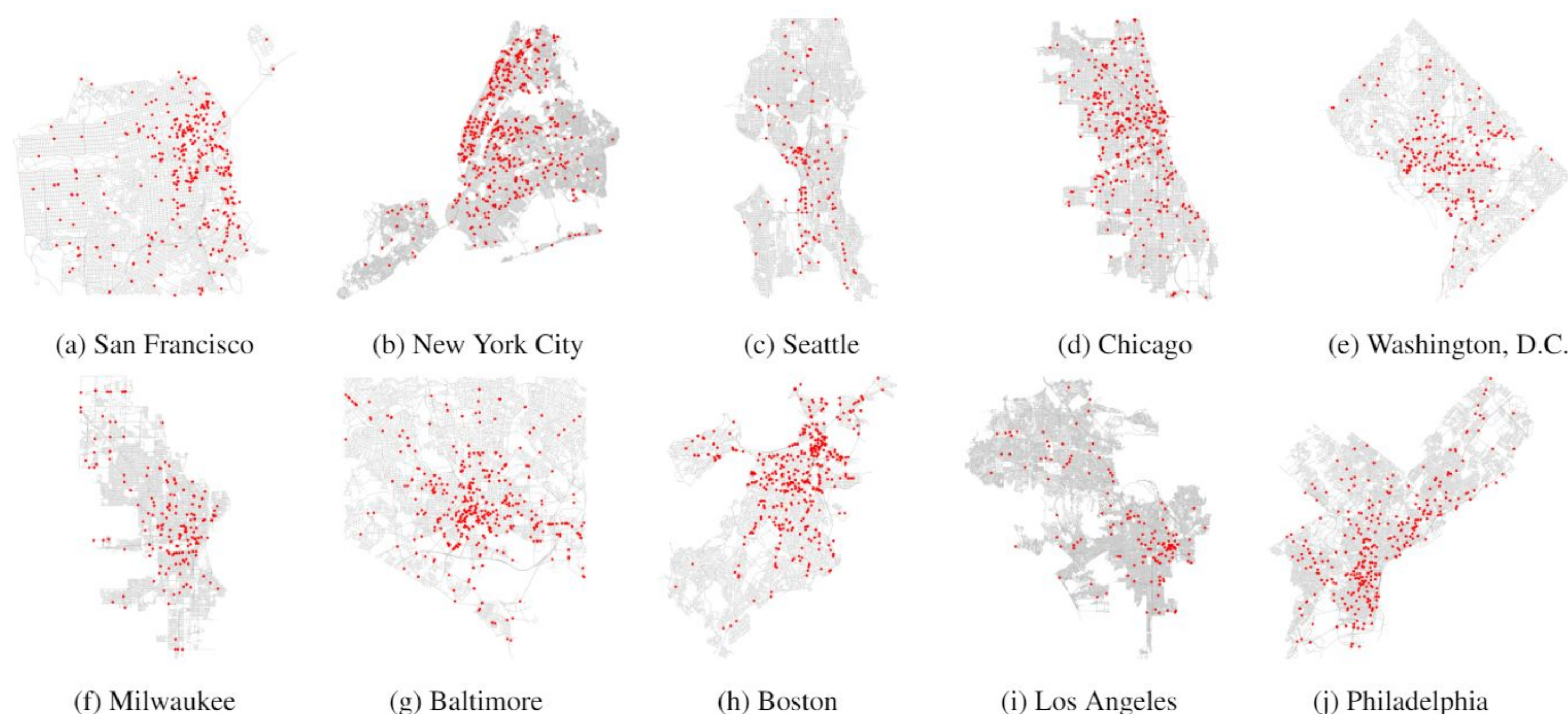


Figure 4: Locations of verified cameras in 10 large U.S. cities for the period 2016-2020. Densely clustered areas of points indicate regions with high camera density in each city. Camera density varies widely between neighborhoods. Note: Scale varies between cities.

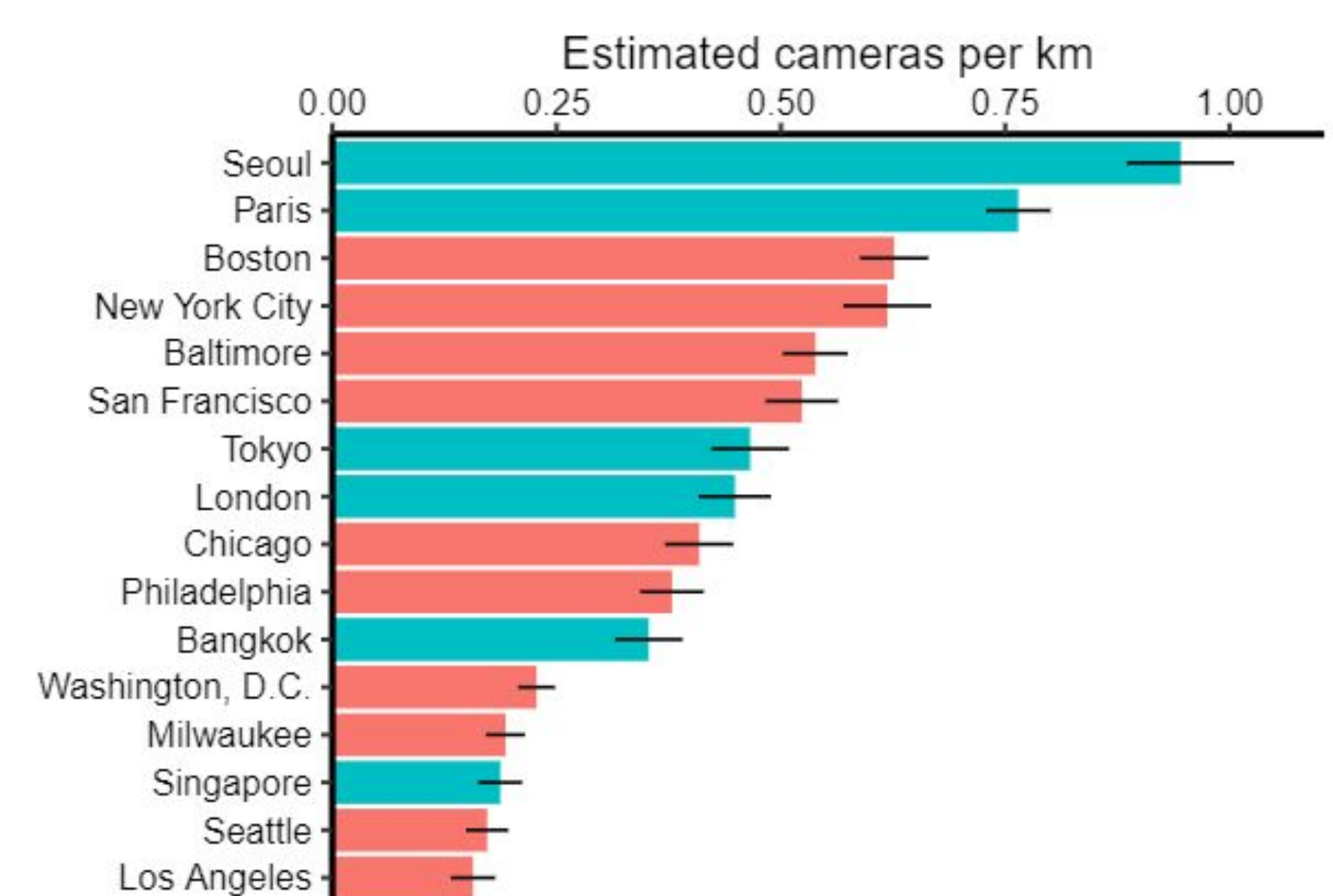


Figure 5: Estimated camera density (cameras per km) for 10 large U.S. cities and 6 other major cities for the period 2016-2020.