

Assignment 5: Accessibility

Background

A broad consensus in the field defines accessibility as the availability of opportunities (proximity, Figure 1) reachable in a specific amount of time (related to mobility, Figures 2 and 3, generated and shown for Assignment 4). Consequently, results for accessibility studies at San Jose MSA census tracts will be deeply related to both elements.

Not surprisingly, opportunities, defined as jobs (Figure 1), are concentrated around the downtown, with some minor participation of cities like Morgan Hill. Both transit (Figure 2) and road networks (Figure 3) also show concentration at Downtown San Jose, from which a narrow corridor runs up the valley, until it eventually vanishes in terms of hierarchy.

Conducted Study

The analysis used 30 minute cutoffs for driving and riding transit respectively, taking for the latter an average starting time at 4 p.m. on a weekday, and along a 2-hour window, intending to target evening peak hours' headways. The selected decay function was the logistic one. Reasons for this decision responded to its smoother curve (unlike step or linear), while it maintains an inflection point (unlike exponential). Also, given the relatively small number of tracts, the higher computational capacity it requires could

be handled in a decent time. Finally, the study was considered to have no alternative scenario: working from home reduces the number of weekly commutes, but as for accessibility, it is still important for potential workers to be able to get to their offices when needed. Their potential positions are fixed at some specific locations even if remoteness is becoming increasingly often an option.

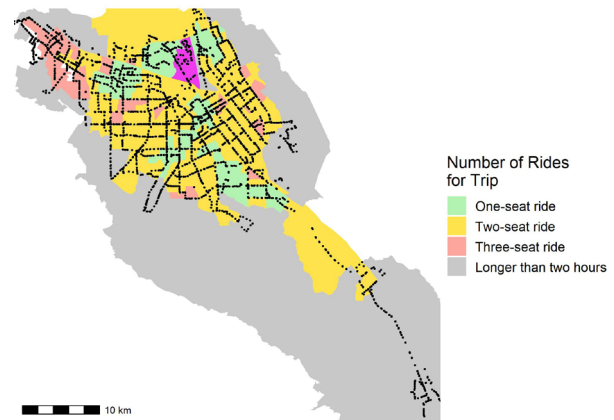


Figure 2 - VTA transit stops and number of rides for a trip to the tract with the highest number of jobs.

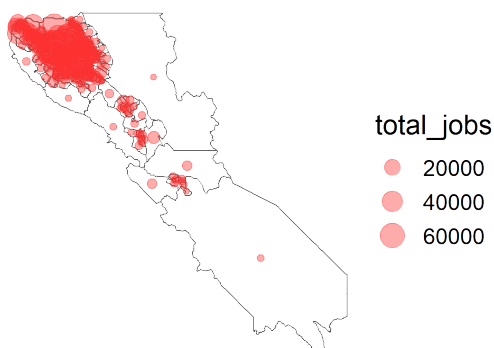


Figure 1 - Centroids of the census tracts showing the number of jobs they offer.

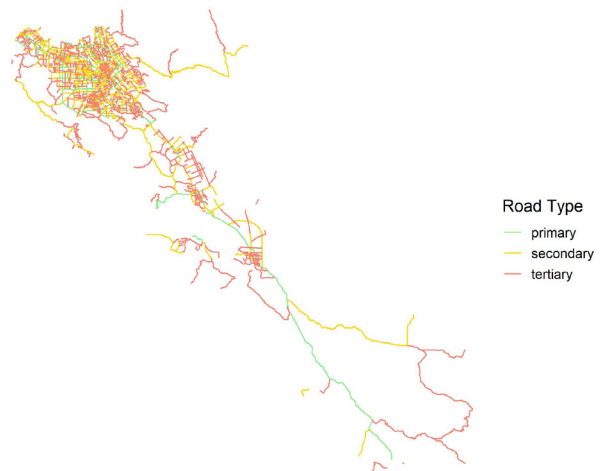


Figure 3 - Road network highlighting primary, secondary, and tertiary roads only, according to OSM.

Results

Results are summarized by Figures 4 and 5. As a general fact, having ratios below 10% for almost every tract and below 5% for a vast majority of them (Figure 4) suggests that transit is not nearly as appealing as driving is at this MSA, leading to expected car-oriented preferences (at least with regards to accessibility).

However, in relative terms, there were some counterintuitive findings. Tracts closer to downtown have worse ratios despite their much better transit supply. The effect that seems to prevail is that the further potential workers can travel, the more tracts they can *conquest*, and consequentially, the more job opportunities they can reach. Some peripheral census tracts, in turn, perform slightly better (or even *perfectly* in some cases) not because transit mobility is equally as good as that derived from driving, but instead because at them, any given commuter can only access the local (tract-level) jobs. This means that in 30 minutes, neither driving nor riding transit could take potential workers from their *hometown centroid* to another one. The southernmost census tract of the MSA is an example of this, with a ratio equal to 1.

An additional anomaly for the study was the case of the gray census tract to the northeast (see Figure 5), where the ratio turned out to be infinite. After double checking the outputs, this was not a $0/0$ indeterminate form (that although it still would have been a bug, it would have been at least uniform), but truly a division by zero, meaning that the transit rider could reach the jobs at his/her own tract, but drivers could not reach any. The hypothesis in this case is that the centroid probably lies somewhere completely detached from the road network, and while transit options include the ability of walking to stops, driving ones need trips to be feasible 100% on a car.

A final remark is that if these models could account for congestion, transit at central areas would be likely to perform relatively better when compared to driving.

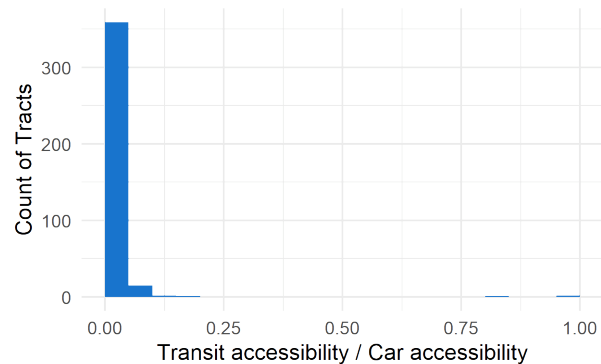


Figure 4 - Histogram showing the count of tracts according to their ratios between transit accessibility and car accessibility. The bins group 5 pp. intervals.

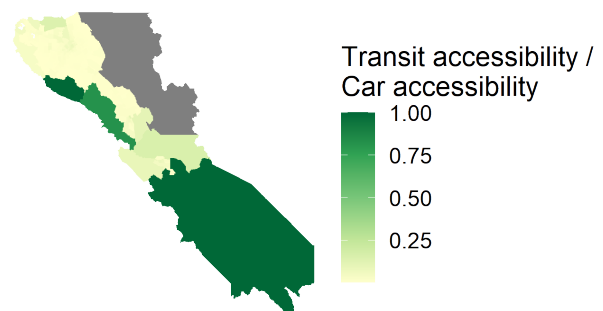


Figure 5 - Choropleth map showing the different ratios of transit accessibility to car accessibility. The southernmost tract counterintuitively shows a *perfect score* due to its remoteness.