

Conditions Assessment and Solution Finding of New Transit Services in the “Bay Town”

CIVENG 259 PUBLIC
TRANSPORTATION SYSTEMS:

MIHIR THAKAR

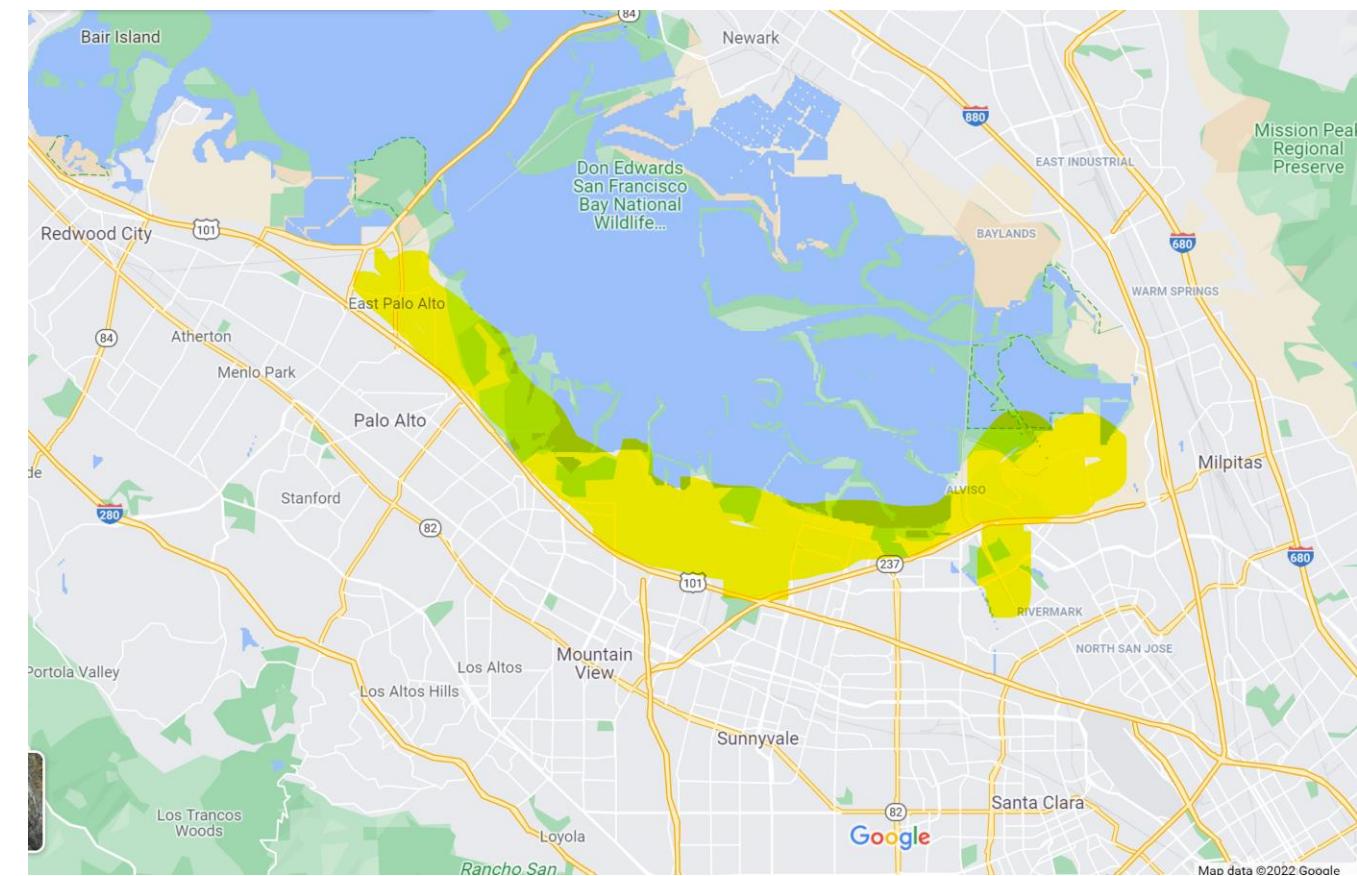


Context

- Startup Company: Swyft Cities
- Spun out of Google by Former Head of Transportation Planning: Jeral Poskey
- Pre-pandemic: Google-Centric transit system
- Sustainability and Real Estate initiative
- Pandemic scrapped Google Campus only plans
- Addressing the “Transit Desert” of the Bay Area (Highlighted area above 101 and surrounded by 85 and 880 on the right)



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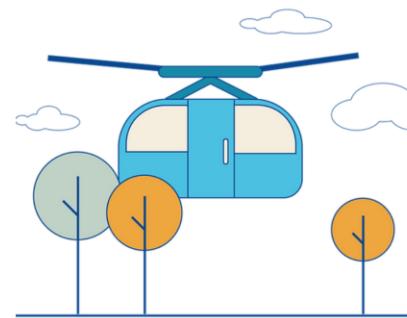


Swyft Cities Idea

- Reduce costs, and increase revenue for
 - Real Estate Developments
 - Airports
 - Universities
 - Tourism Destinations
- Reduce Parking
- Avoid Roadway congestion
- Connect residential housing developments and CBD's

- How?
- **Cable Car System**

- Sustainable
- Last/First Mile connector
- Uncongested Mobility



CLIMATE SOLUTION

Swyft Reduces 1Gt of Carbon Annually

Swyft is the most efficient, lowest embodied carbon transportation system and enables better land use for energy, water, and environment.



REAL ESTATE SOLUTION

Swyft Saves Money and Adds Value

Reducing parking and transportation costs saves money. Better access and activity generate higher rents. Increased density helps developers, cities and the environment.



COMMUNITY SOLUTION

Swyft Connects People to Places

A point-to-point network connects campuses and neighborhoods to add vitality, density, and sustainability to your community.

Cable Car Concept

- Ropeways feed networks with challenging topography
- Minimal Land Use
- 100% Electrically driven
- Lagos Nigeria Case Study
 - Government Buildings
 - Places of Worship
 - Offices
 - Retail

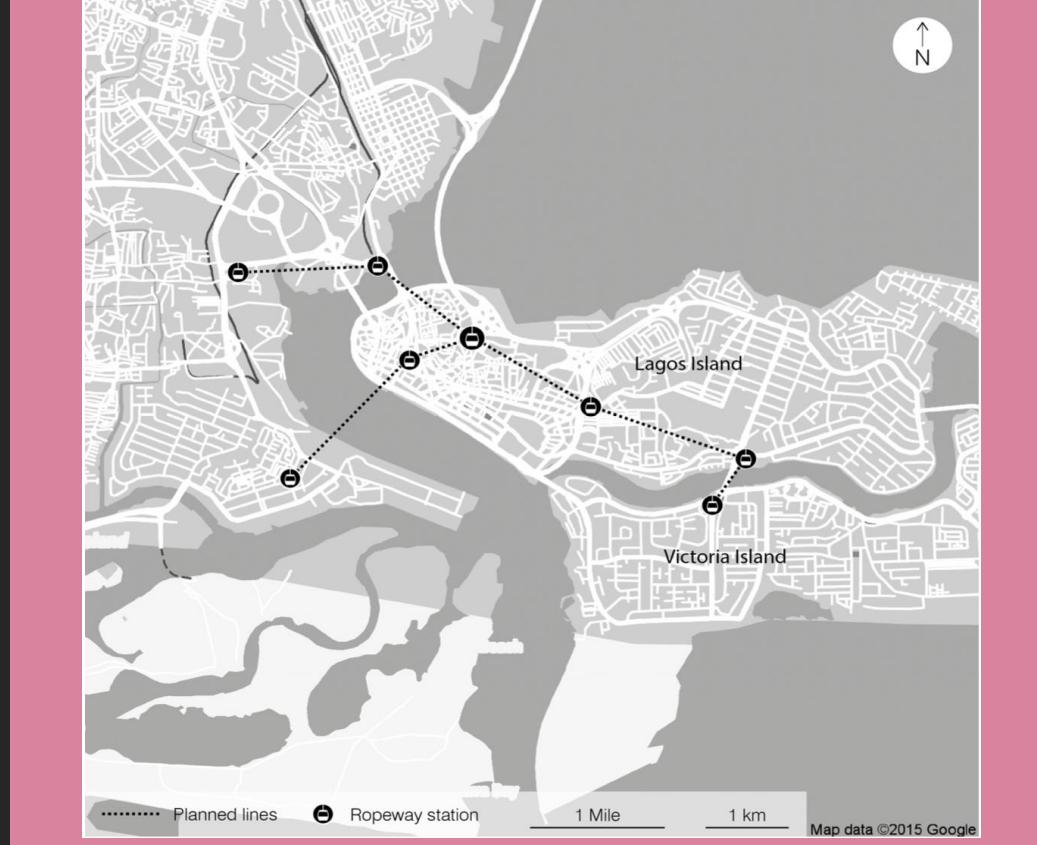


Table 3. Ropeway network in Lagos. Parameters

Approximate Length	13 000 m (8.07 miles)
Speed	8.0 m/s (17.89 miles/hour)
Capacity	16 500 pphpd
Cabins	196
Cabin Size	38 passengers

Cable Car Applications

- TransMiCable in Bogota, Colombia:
 - Publicly Funded
 - Subsidiary of TransMilenio BRT System
- Portland Aerial Tram (OHSU Tram)
 - Jointly Funded by City of Portland and OHSU
 - Connects Waterfront district and campus Health Center
- LA Aerial Rapid Transit Proposal:
 - Privately Funded
 - Between Union Station and Dodgers stadium

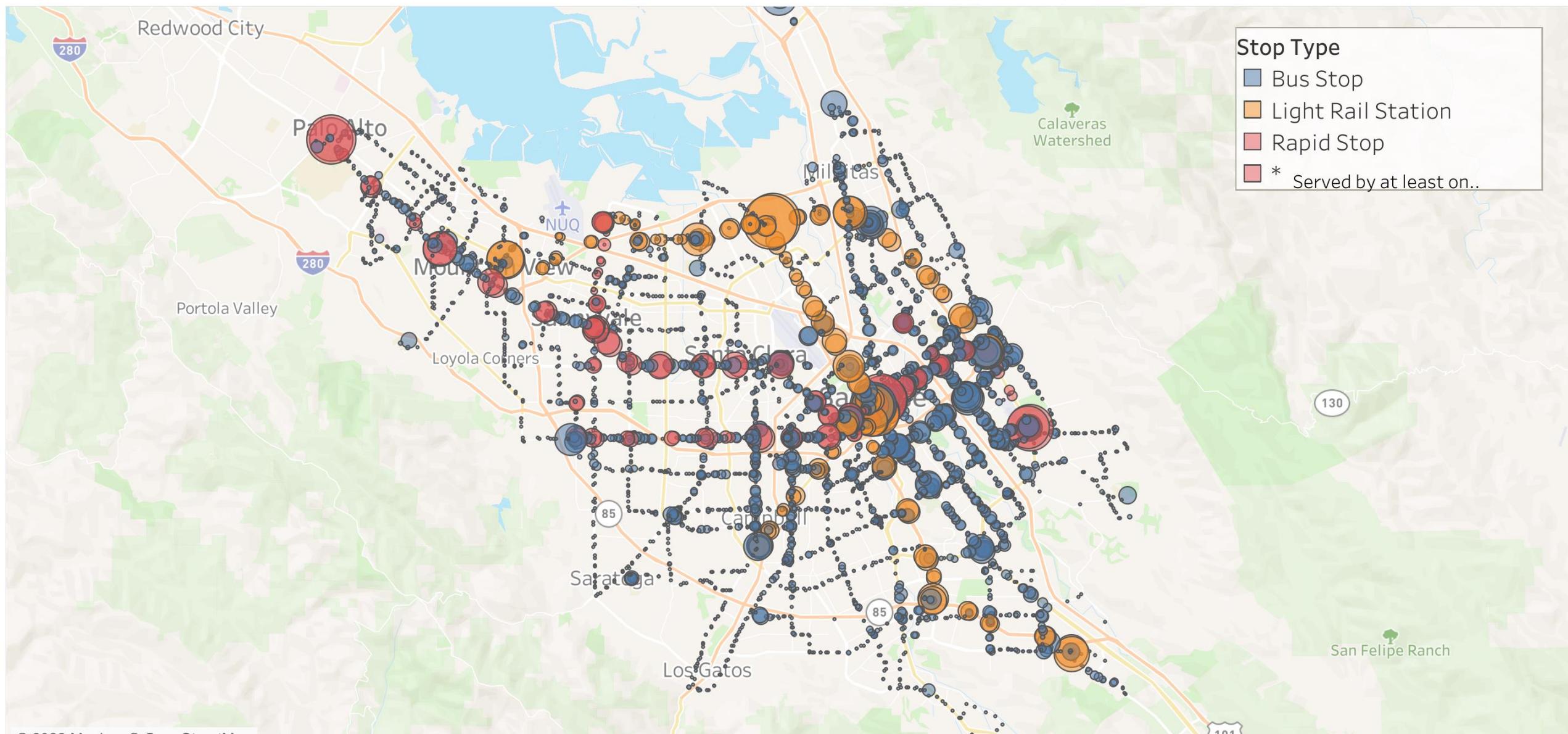


First steps

Data Collection

- Transitland GTFS API
- VTA: Valley Transit Authority
 - Primary Transit Agency that covers the Silicon Valley: Santa Clara, Sunnyvale, Cupertino, Mountain View, and San Jose
 - Most recent update on 3/8/2022

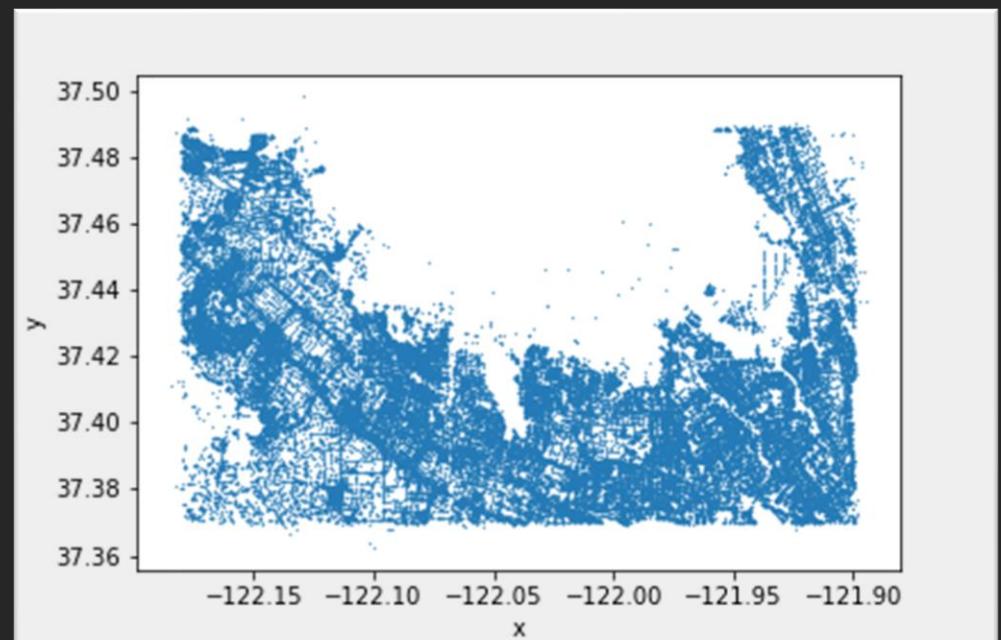
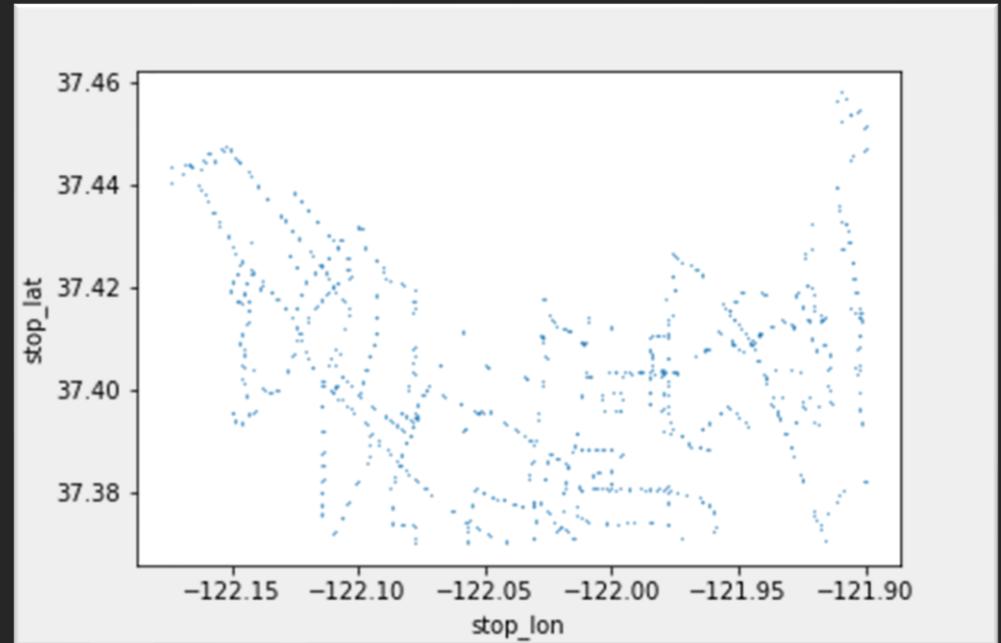
VTA Average Daily Ridership by Stop/Station

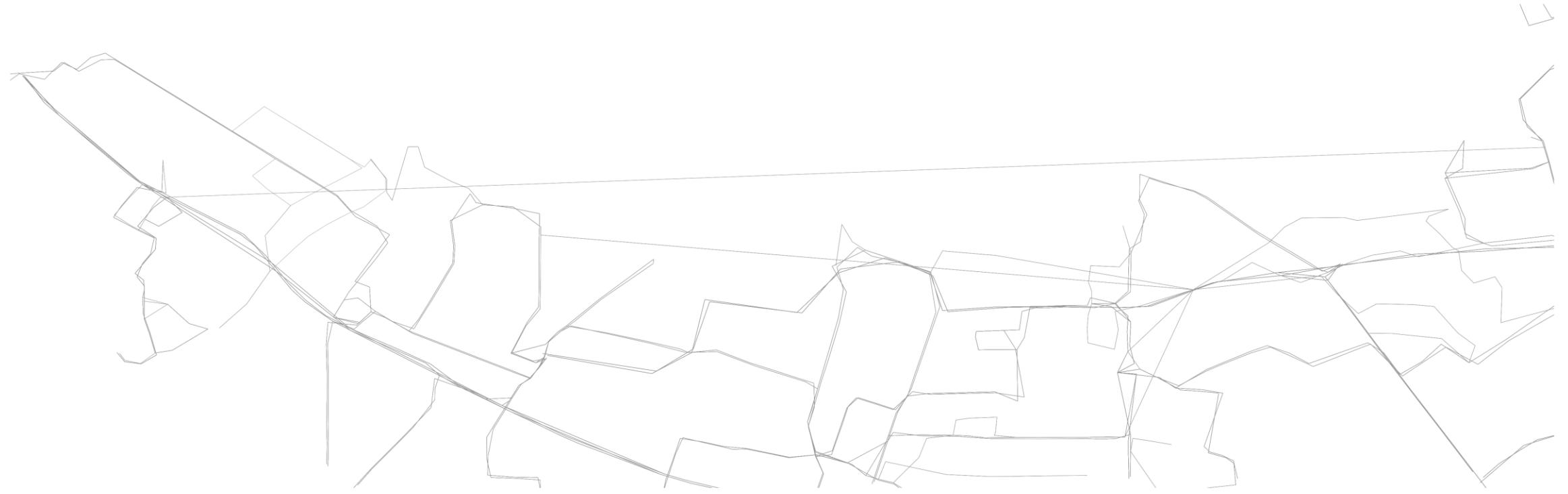


Urban Access

Initial Parameters

- Bounding Box for Transit Desert (Northern parts of Palo Alto, Mountain View, Sunnyvale, Santa Clara, San Jose, and Milpitas) surrounded by Highway 101, 85, and 880.
- Tech Campuses range from Facebook in top left down to LinkedIn to Cisco in the right
- Bus Stop Network
- Pedestrian Network





Transit Network in
Bounding Box



Pedestrian Network in
Bounding Box

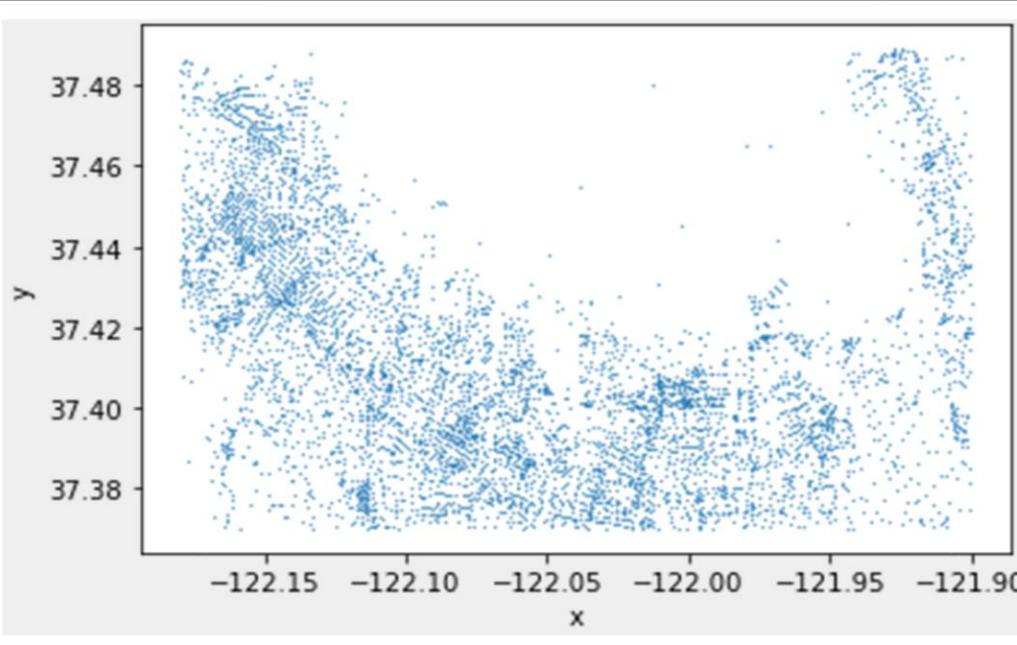


Transit-Pedestrian Network in Bounding Box

NOTE*

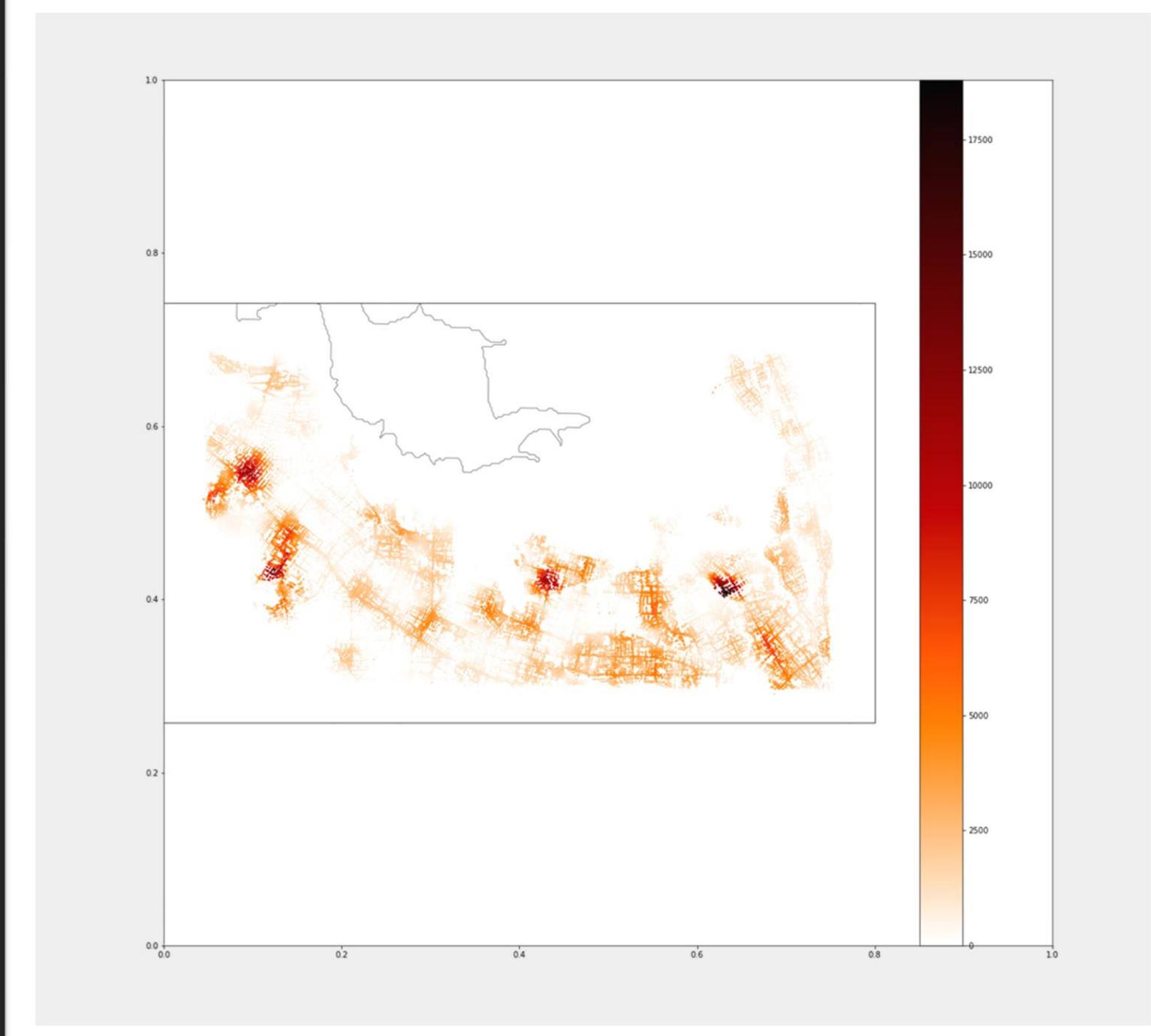
VTA'S MAJOR BUS ARTERIAL
ROUTES (IN DARKER RED)
AND TRANSFER LOCATIONS
WITH THE UNDERLYING
PEDESTRIAN NETWORK.

Census Block Groups Visualized

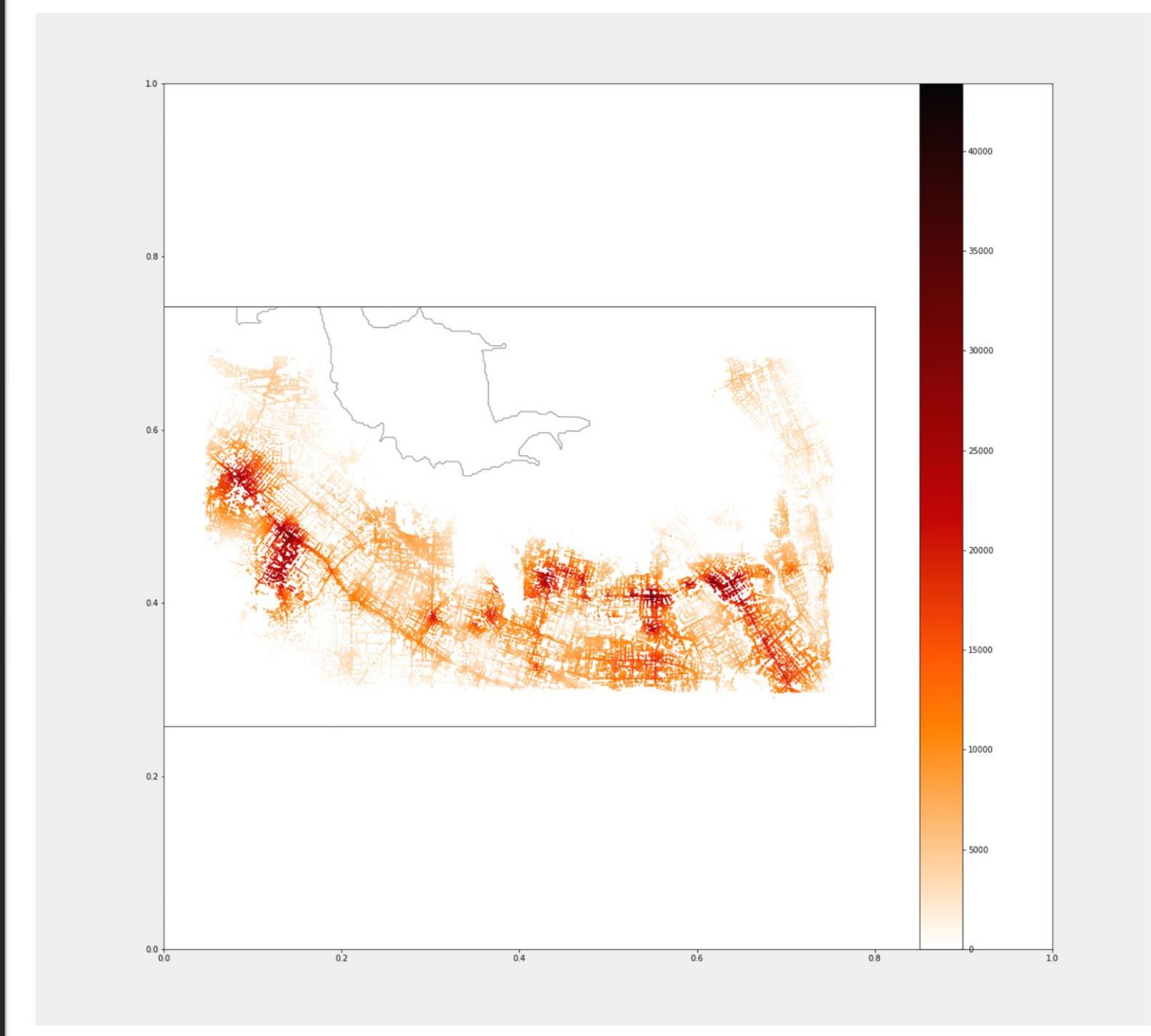


	x	y	res_rents	res_values	square_meters_land	households	persons	workers	children	cars	income	jobs
060014415031030	-122.012501	37.479924	1930.0	604100.000000		16017465	0.0	0.0	0.0	0.0	0.0	0.0
060014415031127	-121.930455	37.488208	1930.0	604100.000000		33680	0.0	0.0	0.0	0.0	0.0	77.0
060014415031128	-121.929625	37.487240	1930.0	604100.000000		46825	0.0	0.0	0.0	0.0	0.0	202.0
060014415031129	-121.927641	37.482614	1930.0	604100.000000		192190	0.0	0.0	0.0	0.0	0.0	668.0
060014415031130	-121.928148	37.485618	1930.0	604100.000000		41233	0.0	0.0	0.0	0.0	0.0	29.0
...
060855130003003	-122.153485	37.427282	1238.0	623776.812093		2359	0.0	0.0	0.0	0.0	0.0	0.0
060855130003004	-122.151520	37.425527	1238.0	623776.812093		11200	0.0	0.0	0.0	0.0	0.0	30.0
060855130003005	-122.152818	37.423857	1238.0	623776.812093		15073	0.0	0.0	0.0	0.0	0.0	0.0
060855130003006	-122.154190	37.422212	1238.0	623776.812093		7596	0.0	0.0	0.0	0.0	0.0	0.0
060855130003007	-122.149405	37.427682	1238.0	623776.812093		582	0.0	0.0	0.0	0.0	0.0	0.0

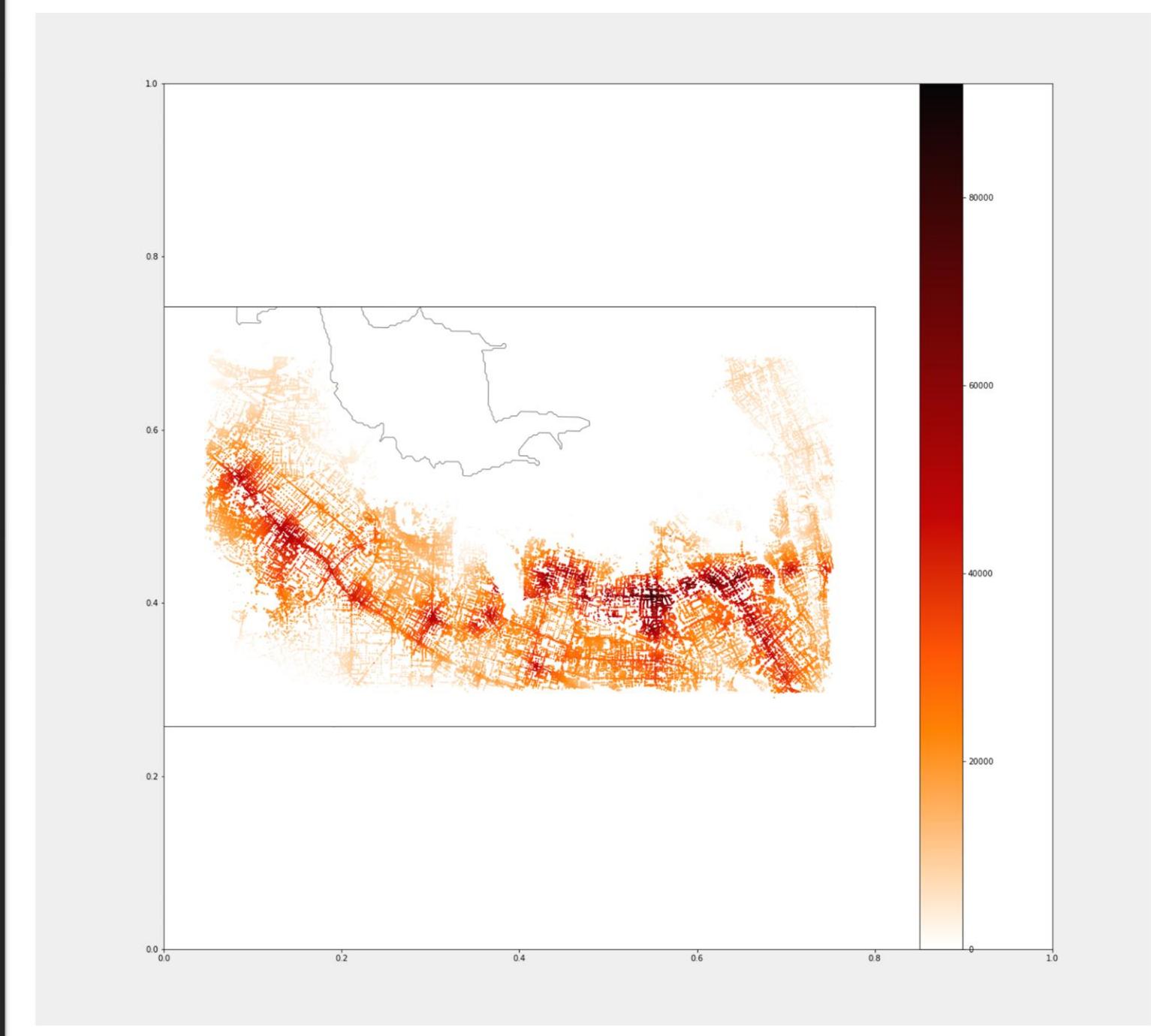
Job Accessibility by Transit-Pedestrian
Network: **15 minutes**



Job Accessibility by Transit-Pedestrian
Network: **30 minutes**



Job Accessibility by Transit-Pedestrian
Network: **45 minutes**



	id	x	y	unique_agency_id	route_type	stop_id	stop_name	parent_station	stop_code	wheelchair_boarding	
	id_int										
1	327_vta	-122.168376	37.444098	vta	3.0	327	El Camino and Stanford Shopping Center	NaN	60327.0	1.0	
2	328_vta	-122.165763	37.443750	vta	3.0	328	Palo Alto Transit Center (Bay 10)	PS_PATC	60328.0	1.0	
3	329_vta	-122.162394	37.439113	vta	3.0	329	El Camino & Palm	NaN	60329.0	1.0	
4	330_vta	-122.159821	37.436861	vta	3.0	330	El Camino & Galvez	NaN	60330.0	1.0	
5	331_vta	-122.157257	37.434625	vta	3.0	331	El Camino & Sam McDonald	NaN	60331.0	1.0	

Model Development

OLS Regression Results

Dep. Variable:	WeeklyRidership	R-squared:	0.301			
Model:	OLS	Adj. R-squared:	0.085			
Method:	Least Squares	F-statistic:	1.396			
Date:	Mon, 25 Apr 2022	Prob (F-statistic):	0.244			
Time:	21:09:03	Log-Likelihood:	-233.05			
No. Observations:	35	AIC:	484.1			
Df Residuals:	26	BIC:	498.1			
Df Model:	8					
Covariance Type:	nonrobust					
	coef	std err	t	P> t	[0.025	0.975]
Intercept	634.0111	205.806	3.081	0.005	210.971	1057.051
ResRentValues	-0.2784	0.140	-1.987	0.058	-0.566	0.010
ResHomeValues	-7.117e-05	0.000	-0.428	0.672	-0.000	0.000
LandArea	0.0067	0.004	1.751	0.092	-0.001	0.014
households	4.8915	10.219	0.479	0.636	-16.114	25.897
workers	-6.6628	7.018	-0.949	0.351	-21.088	7.763
cars	-29.5001	98.807	-0.299	0.768	-232.600	173.600
income	0.0006	0.001	0.396	0.695	-0.002	0.004
jobs	-0.1510	0.198	-0.761	0.454	-0.559	0.257
Omnibus:	23.966	Durbin-Watson:	2.295			
Prob(Omnibus):	0.000	Jarque-Bera (JB):	43.226			
Skew:	1.690	Prob(JB):	4.11e-10			
Kurtosis:	7.268	Cond. No.	4.05e+06			

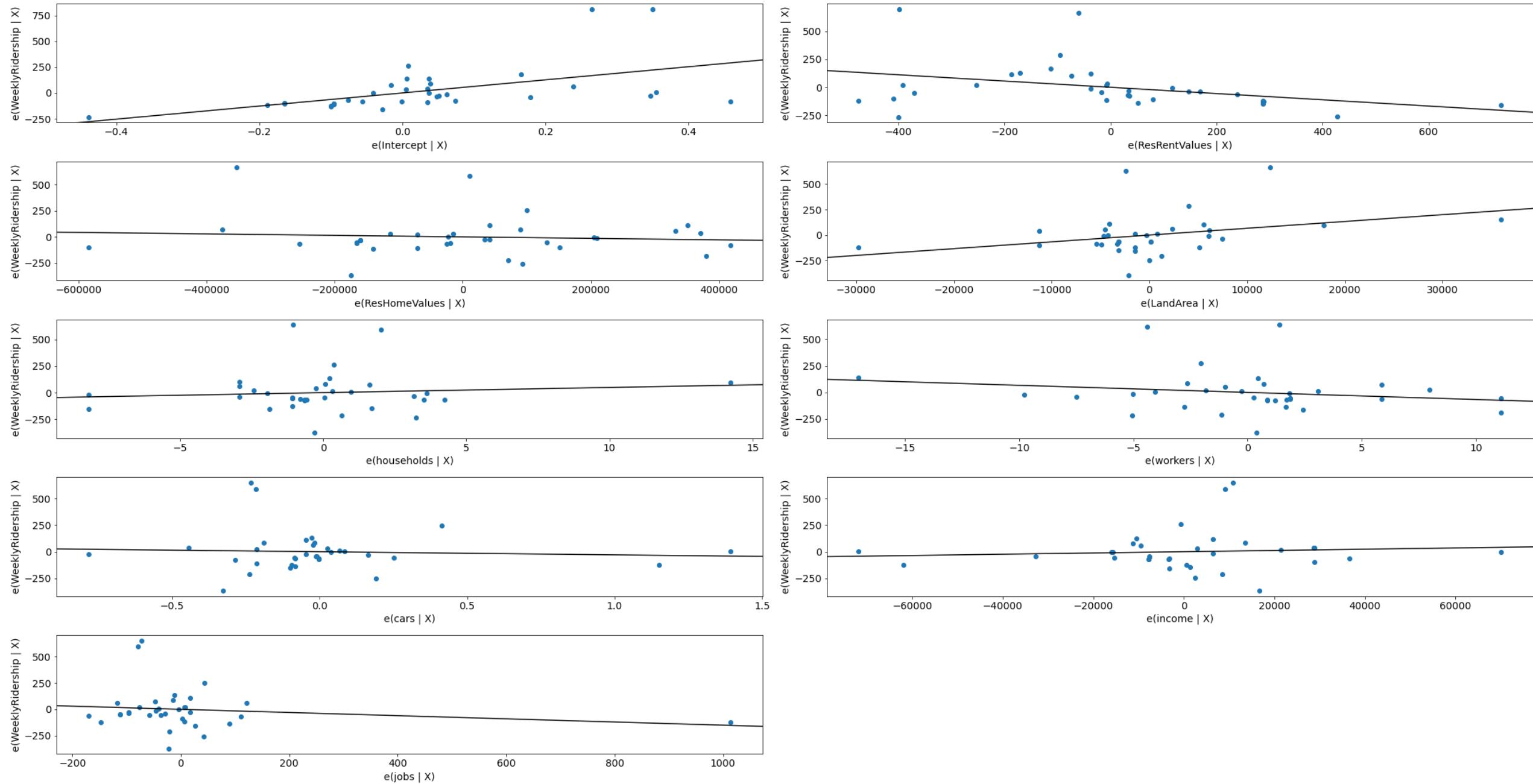
Notes:

- [1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
- [2] The condition number is large, 4.05e+06. This might indicate that there are strong multicollinearity or other numerical problems.

Weekly Ridership Models

Least Squares
Model

Partial Regression Plot



Generalized Linear Model Regression Results

Dep. Variable:	WeeklyRidership	No. Observations:	35			
Model:	GLM	Df Residuals:	26			
Model Family:	NegativeBinomial	Df Model:	8			
Link Function:	Log	Scale:	1.0000			
Method:	IRLS	Log-Likelihood:	-177.82			
Date:	Mon, 25 Apr 2022	Deviance:	58.137			
Time:	21:10:13	Pearson chi2:	44.1			
No. Iterations:	22	Pseudo R-squ. (CS):	0.7547			
Covariance Type:	nonrobust					
	coef	std err	z	P> z	[0.025	0.975]
-----	-----	-----	-----	-----	-----	-----
Intercept	11.2243	0.964	11.649	0.000	9.336	13.113
ResRentValues	-0.0049	0.001	-7.437	0.000	-0.006	-0.004
ResHomeValues	1.98e-06	7.8e-07	2.538	0.011	4.51e-07	3.51e-06
LandArea	4.658e-05	1.76e-05	2.647	0.008	1.21e-05	8.11e-05
households	-0.0880	0.058	-1.514	0.130	-0.202	0.026
workers	0.0271	0.038	0.721	0.471	-0.047	0.101
cars	0.1067	0.484	0.220	0.826	-0.843	1.056
income	-4.225e-08	7.24e-06	-0.006	0.995	-1.42e-05	1.42e-05
jobs	-0.0009	0.001	-0.976	0.329	-0.003	0.001

Weekly Ridership Models

Negative
Binomial Model

Generalized Linear Model Regression Results

Dep. Variable:	WeeklyRidership	No. Observations:	35			
Model:	GLM	Df Residuals:	26			
Model Family:	Poisson	Df Model:	8			
Link Function:	Log	Scale:	1.0000			
Method:	IRLS	Log-Likelihood:	-2576.4			
Date:	Mon, 25 Apr 2022	Deviance:	4977.9			
Time:	21:09:38	Pearson chi2:	6.07e+03			
No. Iterations:	7	Pseudo R-squ. (CS):	1.000			
Covariance Type:	nonrobust					
	coef	std err	z	P> z	[0.025	0.975]
-----	-----	-----	-----	-----	-----	-----
Intercept	7.8426	0.076	103.669	0.000	7.694	7.991
ResRentValues	-0.0019	6.59e-05	-29.391	0.000	-0.002	-0.002
ResHomeValues	-2.696e-07	8.02e-08	-3.361	0.001	-4.27e-07	-1.12e-07
LandArea	5.272e-05	1.62e-06	32.578	0.000	4.95e-05	5.59e-05
households	-0.0145	0.008	-1.807	0.071	-0.030	0.001
workers	-0.0166	0.005	-3.560	0.000	-0.026	-0.007
cars	-0.0541	0.050	-1.083	0.279	-0.152	0.044
income	1.312e-08	8.1e-07	0.016	0.987	-1.57e-06	1.6e-06
jobs	-0.0045	0.001	-8.055	0.000	-0.006	-0.003

Weekly Ridership Models

Poisson Model

Next Steps & Recommendations

Obtain Swyft Cities parameters for their own Cable Propelled Transport:

- Cabin Size
- Speed
- Link Length
- Primary Sources of Funding

Hybrid Work Model:

- Recent Phenomenon that tech workers actually living further away, and more willing to drive longer distances 2-3 days/week

Future Work (past Job Accessibility):

- Office
- Retail
- Industrial
- Housing
- Largest Employer Data

A dark, blurred background showing a group of people clapping their hands.

Thank you for
listening!
