Does access to diverse urban facilities reduce stress amongst urbanites? An assessment, mining Twitter social media micro-blogs and Points of Interest (POI).

Florina Dutt & Subhrajit Guhathakurta, GEORGIA INSTITUTE OF TECHNOLOGY

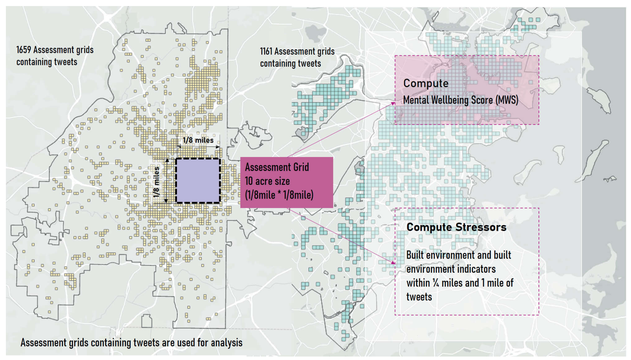
Contact Info : florina.design@gatech.edu

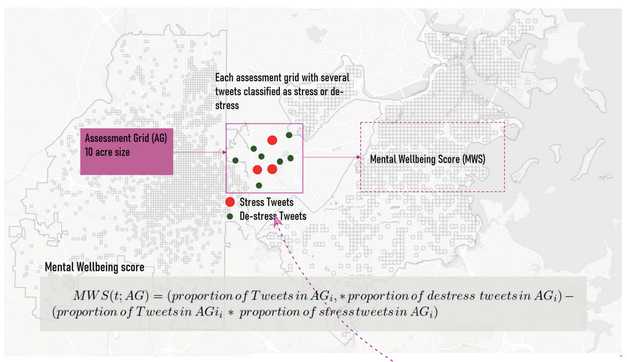
Theories in psychiatric geography claims that higher levels of stress and anxiety are associated with mixed land-uses (Halpern 1995). Higher accessibility and permeability of urban areas are identified as one of the risk factors for crime (Greenberg et al 1984). The assumption here is that diversity and accessibility invite potential offenders to urban areas. Another competing hypothesis that challenges Jane Jacobs's theory of street safety is that the perception of increased pedestrian traffic in residential neighborhoods leads to increased fear in residents who lack social integration (Hunter et al 1982) . Other findings suggest that large parklands or escape facilities in natural settings are key to good mental health for the urban population as they act as a buffer against high-density living (Rodin et al 1978, Chu et al. 1994). Over 200,000 geo-located tweets between May 2018, and 31st March 2020 is used to access wellbeing score of people in the city of Boston, and Atlanta.

Our results contest the claim 'higher levels of stress and anxiety are associated with mixed land-uses', advocating higher points of Interest (POI) diversity, accessibility, and high-density living for improving mental wellbeing of residents.

Conceptualizing Assessment Grids & Mental Wellbeing Score (MWS) Computation

Assessment Grids of 1/8th miles helped in optimizing the computation time for built environment for tweets.



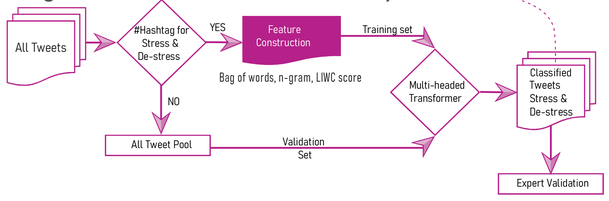


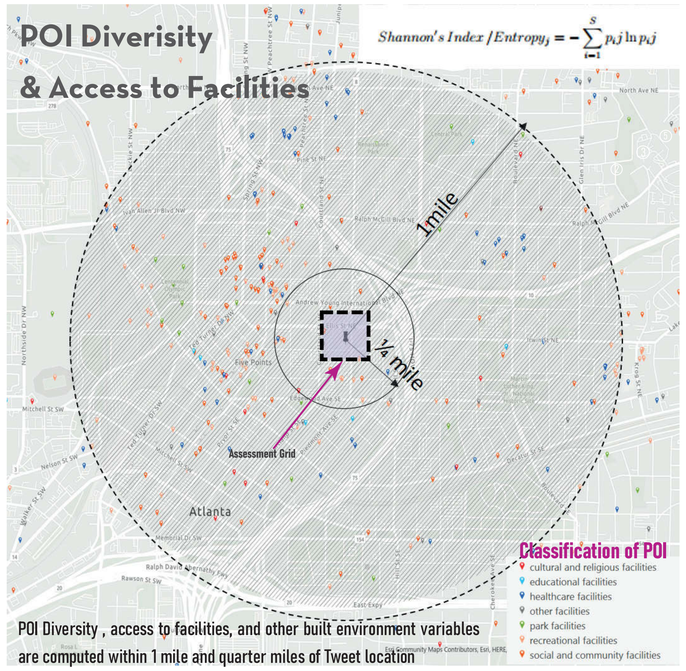
Stress Tweet

Last night was a GRIND! Got stuck in the infamous ATL traffic on the way to the station, couldn't make it.

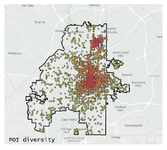
De-stress Tweet

There's no better reward for a long day exploring a city quite like a cannoli! #Boston #bostonfoodies #foodies. .





Variables		Data Source
Outcome Variable	Mental Wellbeing Score (MWS)	Twitter data
Explainatory Variables Access to Facilities		
	Land use mix	Tax assessor's (TA) data
	Point of interest diversity	Google places
	Parks , green spaces , trails	TA data and Google places
	Social and community facilities	Google places
	Recreational facilities	Google places
	Cultural and religious facilities	Google places
	Health care facilities	SafeGraph and Google places
	Public transportation stop	City's publicly available database



1. For both Atlanta and Boston, factor analysis results show POI diversity and access to diverse facilities within 1 mile of a tweet location have high positive loadings, on urbannes factor.

Factor Analysis

Variables	Atlanta 1mile			Boston 1mile		
	Urbanness	Fear of Crime and Poverty	Urban Rent Burden	Urbanness	Fear of Crime and Poverty	Urban Rent Burden
Land use diversity		-0.724	-0.445			
Point of interest (POI) diversity	0.906			0.981		
Access to parks and trails	0.942			0.909		
Access to social facilities	0.900			0.967		
Access to educational facilities	0.879			0.912		
Access to recreational facilities	0.854			0.970		
Access to historic districts and landmarks	0.847			0.956		
Access to cultural facilities	0.721			0.832		
Access to healthcare facilities	0.576	-0.611		0.918		
Street cross-sectional proportion	0.920			0.931		
Street intersection density	0.754		0.521	0.430	0.819	
Transit access	0.643		0.313	0.311		0.608
Street tree cover	-0.624		-0.626	-0.317		-0.675
Street lights	0.811		0.427	0.723		
Building density	0.589			0.874		
Building setback	-0.379		-0.449			-0.762
Buildings per 100 m of street segments			0.607	0.303		0.419
Street wall continuity	0.356		0.765	0.731		0.483
Deadends			0.688		0.776	
Average block size	-0.559		-0.724	-0.350		
Employment density	0.868			0.974		
Population	0.816		0.442	0.531	0.651	
% White		-0.948			-0.771	
% Black		0.935			0.705	
Poverty		0.922			0.866	
Rent burden		0.895	0.305		0.807	0.315
Eviction rate		0.749	0.305			0.379
Vacant properties along street		0.428			0.599	
Misdemeanor (rule violations, and thefts)	0.947			0.648	0.684	
Felony (homicides and robbery)		0.554			0.759	
Noise	0.742			0.645		
Variance	34.01%	18.15%	9.26%	39.90%	19.18%	15.95%
Cumulative variance	61.42%			64.54%		

2. The quantile regression model shows urbanness factor within 1 mile of the tweet location is significant for all the quartiles of mental wellbeing score (MWS).

Quantile Regression Model

$$MWS^{\tau} => \beta_0^{(\tau)} + \beta_1 Comfortable\ weather\ conditions^{(\tau)} + \beta_2 Urbanness^{(\tau)} + \beta_3 Fear\ of\ crime\ and\ poverty^{(\tau)} + \beta_4 Urban\ rent\ burden^{(\tau)}$$

	$\tau(0.25)$				$\tau(0.50)$				$\tau(0.75)$			
	(coeff)$_\tau$	(coeff)$_{raw}$	Std Er	P -value	(coeff)$_\tau$	(coeff)$_{raw}$	Std Er	P -value	(coeff)$_\tau$	(coeff)$_{raw}$	Std Er	P -value
Atlanta												
Intercept	866.683	2.269	0.010	***	1069.311	2.459	0.012	***	1396.479	2.706	0.016	***
Comfortable weather	4.248	0.042	0.001	***	5.475	0.0533	0.001	***	6.599	0.064	0.001	***
factors												
(1)Urbanness	5.61	0.055	0.009	***	12.975	0.122	0.012	***	11.717	0.111	0.016	***
(2)Fear of crime and poverty	-1.961	-0.020	0.008	**	-7.596	-0.079	0.011	***	-7.291	-0.076	0.015	***
(3)Urban rent burden	-1.499	-0.015	0.008	-	-2.498	-0.0253	0.011	**	-0.965	-0.010	0.015	-
Pseudo R- squared	0.2789				0.4474				0.5649			
No of assessment grids	1659				1659				1659			
Boston												
Intercept	597.756	1.9427	0.006	***	677.179	2.0505	0.007	***	747.144	2.1367	0.011	***
Comfortable weather	1.704	0.0169	0.001	***	2.491	0.0246	0.001	***	4.050	0.0397	0.001	***
factors												
(1)Urbanness	9.516	0.0909	0.006	***	17.610	0.1622	0.007	***	14.970	0.1395	0.011	***
(2)Fear of crime and poverty	-0.896	-0.009	0.006	-	-2.849	-0.0289	0.007	***	-4.123	-0.0421	0.011	***
(3)Urban rent burden	-0.050	-0.0005	0.006	-	0.280	0.0028	0.007	-	0.531	0.0053	0.011	-
Pseudo R- squared	0.2731				0.4423				0.5974			
No of assessment grids	1161				1161				1161			

[a](coeff)$_\tau$ is transformed coefficient and gives percentage %values, (coeff)$_{raw}$ is raw coefficient for $log(MWS)$,'Std Er' is standard error
[b]P-value * * * < 0.000; * * < 0.001; * < 0.05