

# Creating a New Neighborhood Score



Keeshan Patel  
Human-AI Interaction

# Background



(Burrell)



Factors are derived from potentially biased scores



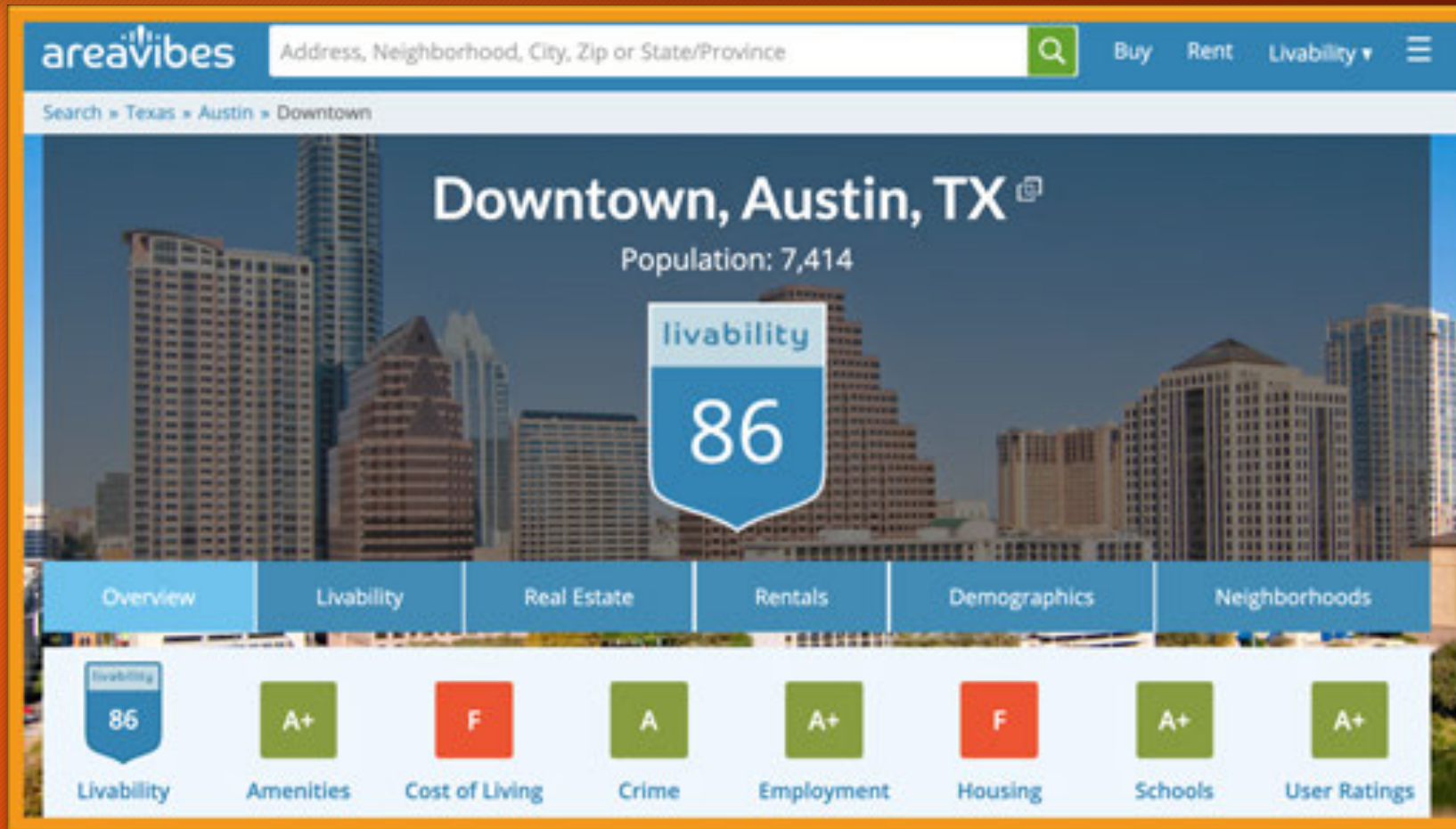
Final Neighborhood scores are decided in a black boxed manner  
They play a huge role in human perception and enforce biases

# Problem Definition



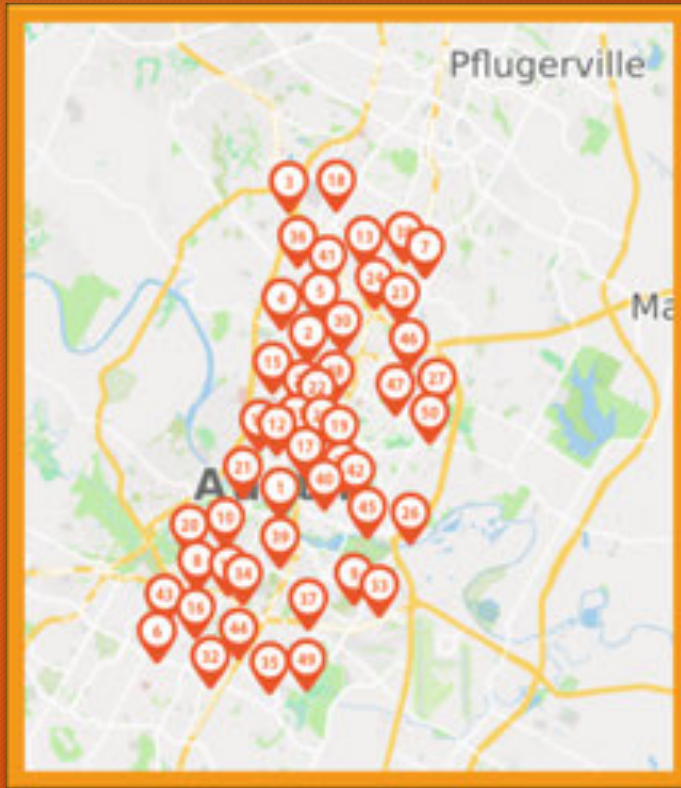
**Analyze neighborhood scores used on apartment hunting websites to see if they are inherently bias, why they are bias, and to create a new algorithm to alleviate the bias**

# AreaVibes



Example of Areavibes Score Breakdown and Factors

# Analysis Area - 50 Austin Neighborhoods



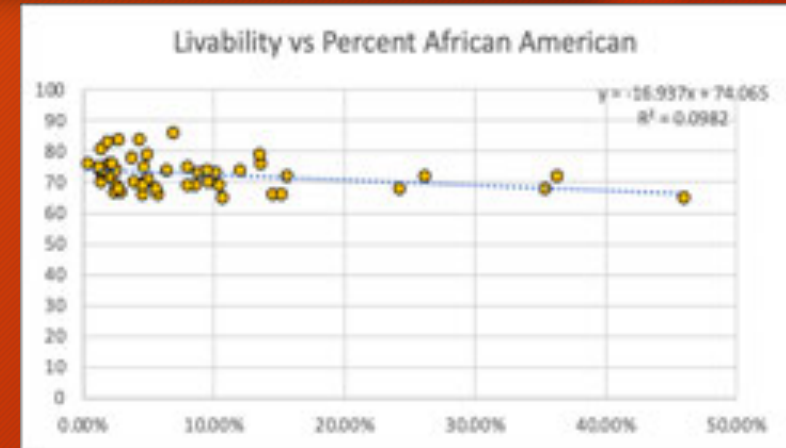
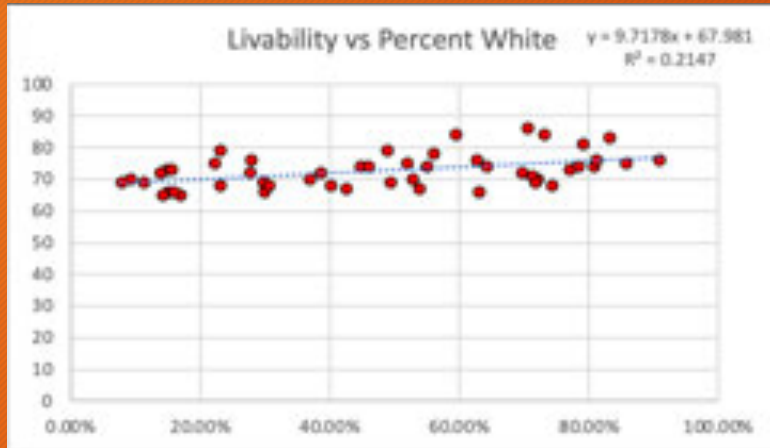
Map

ALLANDALE	NORTH LAMAR
BARTON HILLS	NORTH LOOP
BRENTWOOD	NORTH SHOAL CREEK
CENTRAL EAST AUSTIN	NORTH UNIVERSITY
CHESTNUT	OLD WEST AUSTIN
CORONADO HILLS	PARKER LANE
	PECAN SPRINGS
CRESTVIEW	SPRINGDALE
DAWSON	PLEASANT VALLEY
DOWNTOWN	ROSEDALE
EAST CONGRESS	ROSEWOOD
FRANKLIN PARK	SOUTH LAMAR
GALINDO	SOUTH MANCHACA
GARRISON PARK	SOUTH RIVER CITY
GATEWAY	SWEET BRIAR
GEORGIAN ACRES	TRIANGLE STATE
GOVALLE	UNIVERSITY HILLS
HANCOCK	UNIVERSITY OF TEXAS
HERITAGE HILLS	UPPER BOGGY CREEK
HIGHLAND	WEST GATE
HYDE PARK	WEST UNIVERSITY
JOHNSTON TERRACE	WINDSOR HILLS
MCKINNEY	WINDSOR PARK
MONTOPOLIS	WINDSOR ROAD
NORTH AUSTIN	WOOTEN
NORTH BURNETT	ZILKER

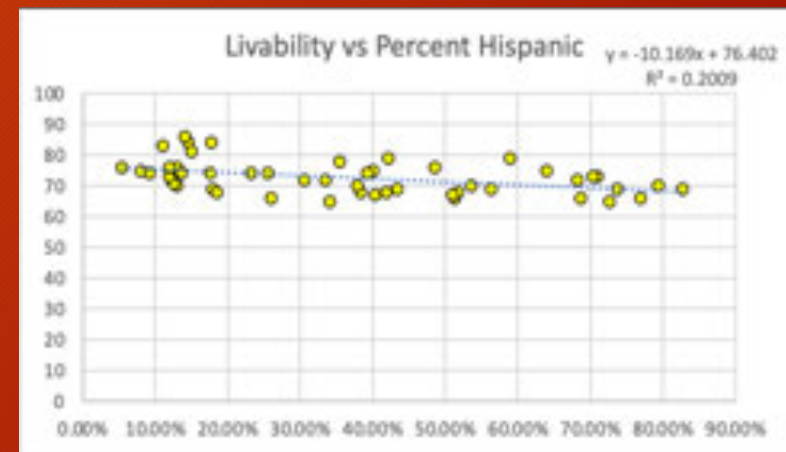
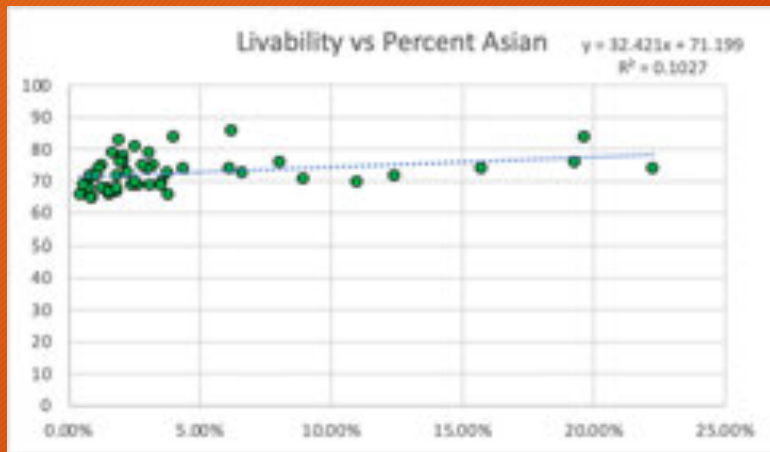
List of Neighborhoods

Will use these 50 Austin Neighborhoods for this Study

# Algorithm Analysis - Correlations



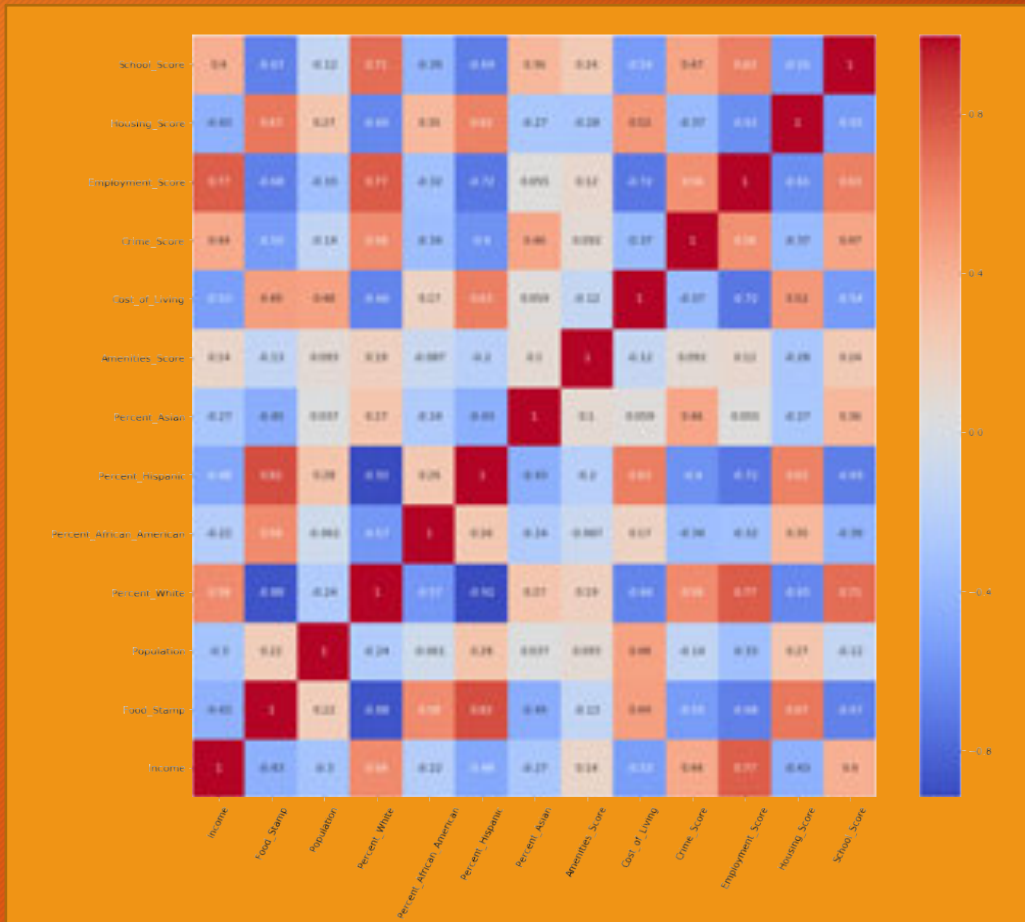
VS



Positive Trend for largely White and Asian Neighborhoods

Negative Trend for largely African American and Hispanic Neighborhoods

# Algorithm Analysis - Correlation Matrix



Correlation Matrix between Areavibes Factors, Demographics, other stats

- Percent White
  - 0.77 - Employment
  - 0.71 - School
  - 0.65 - Crime Score
  - -0.65 - Housing
  - -0.66 - Cost of Living
- Percent Hispanic
  - -0.72 - Employment
  - -0.69 - School
  - -0.60 - Crime Score
  - 0.62 - Housing
  - 0.63 - Cost of Living
- Percent African American & Asian
  - No strong correlations

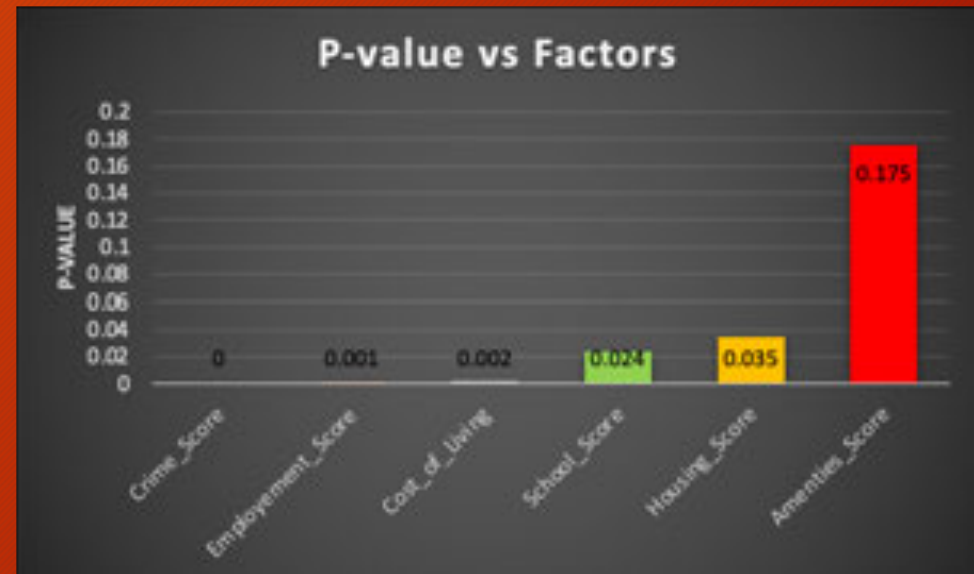
About equal positive and negative trends for White and Hispanic, but opposite livability trends

# Algorithm Analysis - Regression



## OLS Regression Results

Dep. Variable:		Livability		R-squared:		0.655	
Model:		OLS		Adj. R-squared:		0.607	
Method:		Least Squares		F-statistic:		13.63	
Date:		Wed, 18 Nov 2020		Prob (F-statistic):		1.34e-08	
Time:		20:11:18		Log-Likelihood:		-126.49	
No. Observations:		50		AIC:		267.0	
Df Residuals:		43		BIC:		280.4	
Df Model:		6					
Covariance Type:		nonrobust					
	coef	std err	t	P> t	[0.025	0.975]	
const	72.6000	0.463	156.767	0.000	71.666	73.534	
Amenities_Score	0.6761	0.490	1.380	0.175	-0.312	1.664	
Cost_of_Living	2.2667	0.686	3.302	0.002	0.882	3.651	
Crime_Score	2.3904	0.571	4.188	0.000	1.239	3.541	
Employment_Score	2.9439	0.824	3.573	0.001	1.282	4.605	
Housing_Score	1.3679	0.627	2.182	0.035	0.103	2.632	
School_Score	1.4999	0.642	2.337	0.024	0.205	2.794	
Omnibus:	0.915	Durbin-Watson:	2.029				
Prob(Omnibus):	0.633	Jarque-Bera (JB):	0.282				
Skew:	0.036	Prob(JB):	0.868				
Kurtosis:	3.361	Cond. No.	3.78				



Less important factors

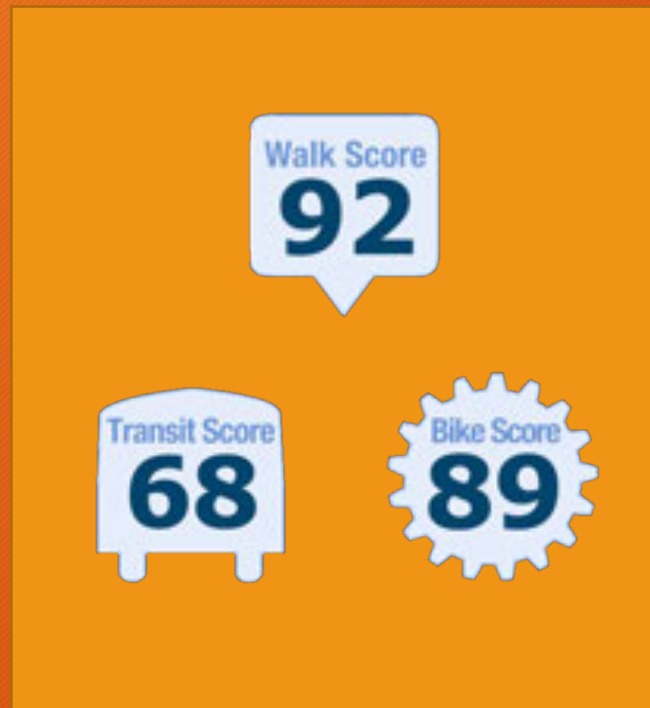
Higher score for factor = better neighborhood (high crime score = low crime)



# New Metrics in Algorithm (from interviews)



(Guzman)



WalkScore



Diversity Score



Age Preference

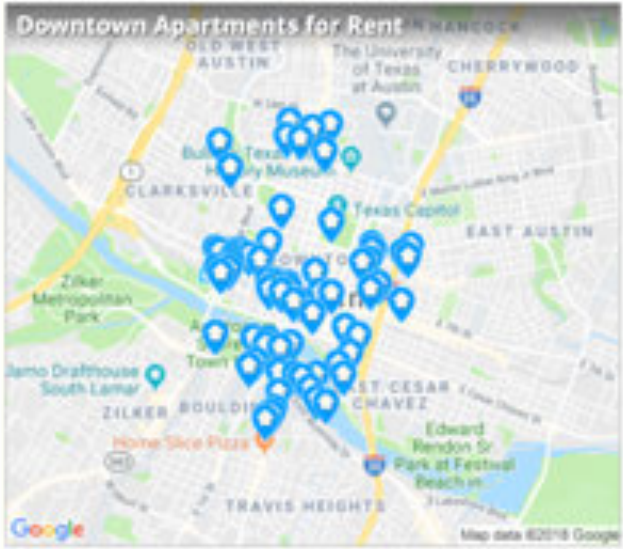
# WalkScore



Walk Score® Get Scores Find Apartments My Favorites Add to Your Site Log in ▾

Type an address, neighborhood or city  Go [Share](#)

## Living in Downtown Austin



**Downtown Apartments for Rent**

Map showing Downtown Austin with numerous apartment listings marked by blue pins. The map includes labels for neighborhoods like Old West Austin, University of Texas at Austin, East Austin, and Travis Heights, as well as landmarks like the Texas Capitol and Zilker Metropolitan Park.

**Walk Score 92** **Transit Score 68** **Bike Score 89**

Downtown is the most walkable neighborhood in Austin with 7,412 residents.

Downtown has good public transportation and is very bikeable.

Nearby neighborhoods: [University of Texas-Austin](#), [East Cesar Chavez](#), [Central East Austin](#), [Old West Austin](#), [Old Enfield](#), [West University](#) and [Bouldin Creek](#).

[Nearby Apartments](#)

[View Austin apartments for rent](#) | [View Austin homes for sale](#)

Walk, Transit, Bike Scores were retrieved for 50 Austin neighborhoods

# Diversity Score



(Mitchell) (Steel)

$$\text{DiversityScore} = 100 * \left( 1 - \sqrt{\frac{\sum_{i=0}^n (d_i - d_t)^2}{n - 1}} \right)$$

$n$  = number of ethnicities

$d_i$  = percentage of demographic  $i$

$d_t$  = percentage of demographics' ground truth



$d_t$



$d_i$

Equation for Diversity Score (Pseudo-Standard Deviation)

Closer a neighborhood is to the 'Ideal' Percentage, the higher the score

# Age Preference



(Mitchell)

$$z_i = \frac{x_i - \mu}{\sigma}$$

$$\text{AgeScore} = \frac{\text{Percentile}(z_i) * 100}{2} + 50$$

$x_i$  = percentage of age group in neighborhood

$\mu$  = mean of percentages of age group  
of neighborhoods of city

$\sigma$  = standard deviation of percentages of  
age group of neighborhoods of city

$z_i$  = z score of neighborhood



	% of 20 - 24	Z Score	Age Score
1	40%	Z: 1.22	94
2	30%	Z: 0	75
3	20%	Z: -1.22	56

Equation for Age Score (Z-score for Age Ranges)

Example of Age Preference Score for 3 Neighborhoods

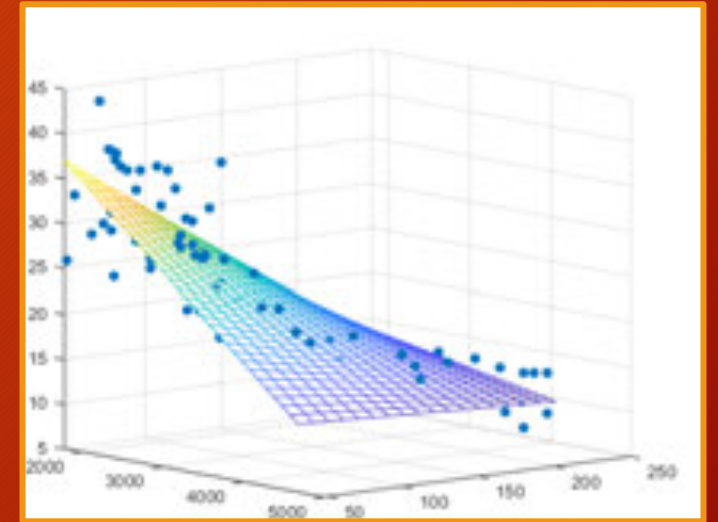
# Model Creation - Regression

A screenshot of a data table with multiple columns and rows, representing ground truth data. The text is small and difficult to read, but it appears to be a list of values for various features.

Ground Truth

A screenshot of a user input form titled "Austin Neighborhood Finder". It contains a list of neighborhood names, each followed by a radio button and a progress bar, indicating the user's selection of neighborhoods.

User Input



Multiple  
Linear Models

Demo

# Future Work



- Develop a better-looking UI
- Investigate better methods to obtain absolute truth for racially biased factors (such as crime score)
- Validate model and idea of diversity score with user tests

# Related Works



- Areavibes. (n.d.). Find the best places to live. Retrieved December 07, 2020, from <https://www.areavibes.com/>
- Burrell, J., & Resor, E. (n.d.). More Than A Number: How Users Interpret Neighborhood 'Scores'. Retrieved December 07, 2020, from <https://www.ischool.berkeley.edu/news/2020/more-number-how-users-interpret-neighborhood-scores>
- Get your Walk Score. (n.d.). Retrieved December 07, 2020, from <https://www.walkscore.com/>
- Guzman, S., & Douglas, A. (2015, December). Livability for All. Retrieved December, 2020, from <https://www.n4a.org/Files/For%20Newsletter/Planning%20Magazine%20Dec%202015%20Issue.pdf>
- Mitchell, Margaret, et al. “Diversity and Inclusion Metrics in Subset Selection.” *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society*, Association for Computing Machinery, 2020, pp. 117-123. *ACM Digital Library*, doi:10.1145/3375627.3375832.
- Steel, D., Fazelpour, S., Gillette, K. *et al.* Multiple diversity concepts and their ethical-epistemic implications. *Euro Jnl Phil Sci* 8, 761-780 (2018). <https://doi.org/10.1007/s13194-018-0209-5>



Thank you Professor Lee and Akef  
Questions?

