



Assessment of Citizen's '**Affect**' from
Tweets in different Urban settings
Comparing ATLANTA and BOSTON

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What do we mean by “affect”?



The outward appearance of feeling and emotions

- Widely used in **psychology**

It can be expressed in :

- A tone
- A facial expression
- A textual expression
-

In this case we are assessing affect of **Twitter microblogs**

Why is assessment of 'affect' important in urban context?



- Cities are associated with **higher rates of most mental health problems**
- 40% higher risk of mood disorder,
- 20% more anxiety issues
(Peen et al., 2010)
- Urban Planners can encourage **designing urban spaces conducive to people's mental wellbeing**

Spaces that are favorable?

It has been studied that certain **urban spaces**, are responsible for **mental wellbeing** more than others.



Green Spaces

Roe, J. (2016)



Active places (accessible and public transportation friendly)

Gehl. (2017)



Pro- social places

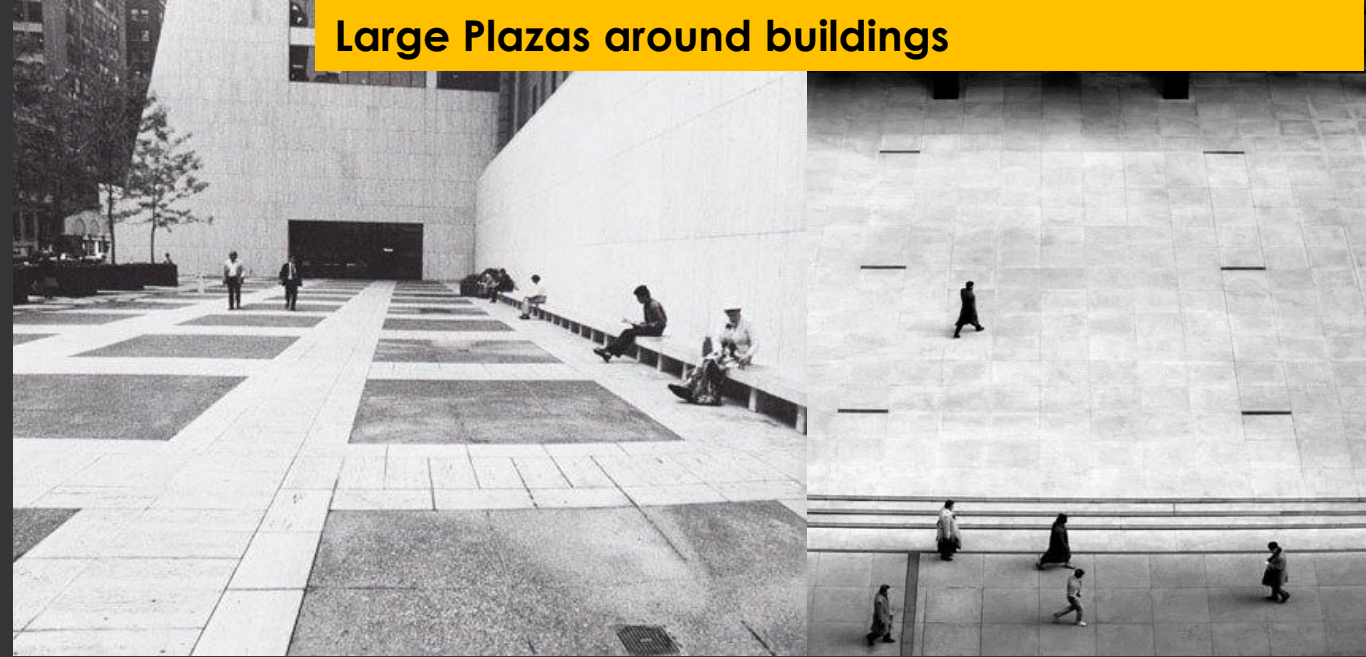
Corcoran R, Marshall G. (2016)

Urban Theory

Small spaces around vital urban Functions



Large Plazas around buildings



“for the foreseeable future the opportunities in the center city are going to be for **small spaces**.”
(p101, Whyte)

Kevin Lynch talks about the importance of **vitality**, the degree to which urban form supports **vital function**.

Visual Assessment and observation



Advantages:

High Accuracy

Challenges:

Expensive

Covers limited geographical areas

Unable to detect 'affect' of individuals

social media data (LBSN)



Advantages:

Covers extensive geographic areas

Cheaper

Allows 'affect' detection

Challenges:

Noise

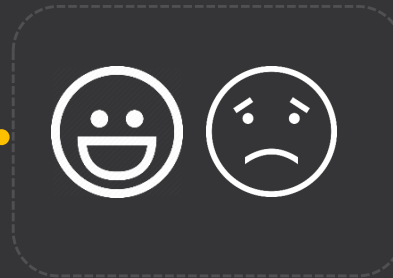
Inaccuracies and biases

Research Goals

Urban ACTIVITY



AFFECT



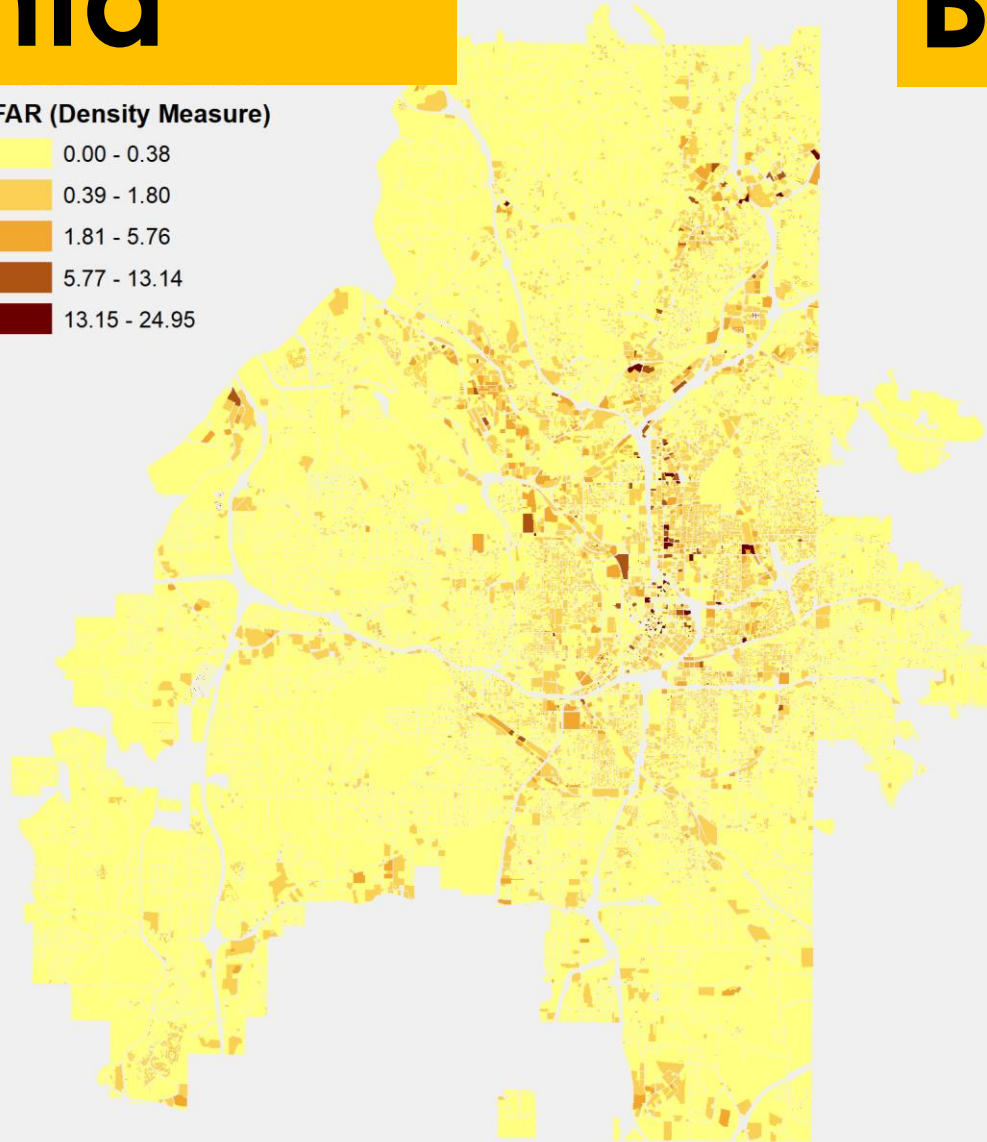
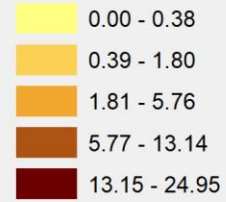
SPACE



- Predict ‘urban activity’ through linguistic analysis of Tweet text
- Understand “where” people express more “positive affect” while engaging in these urban activities

Atlanta

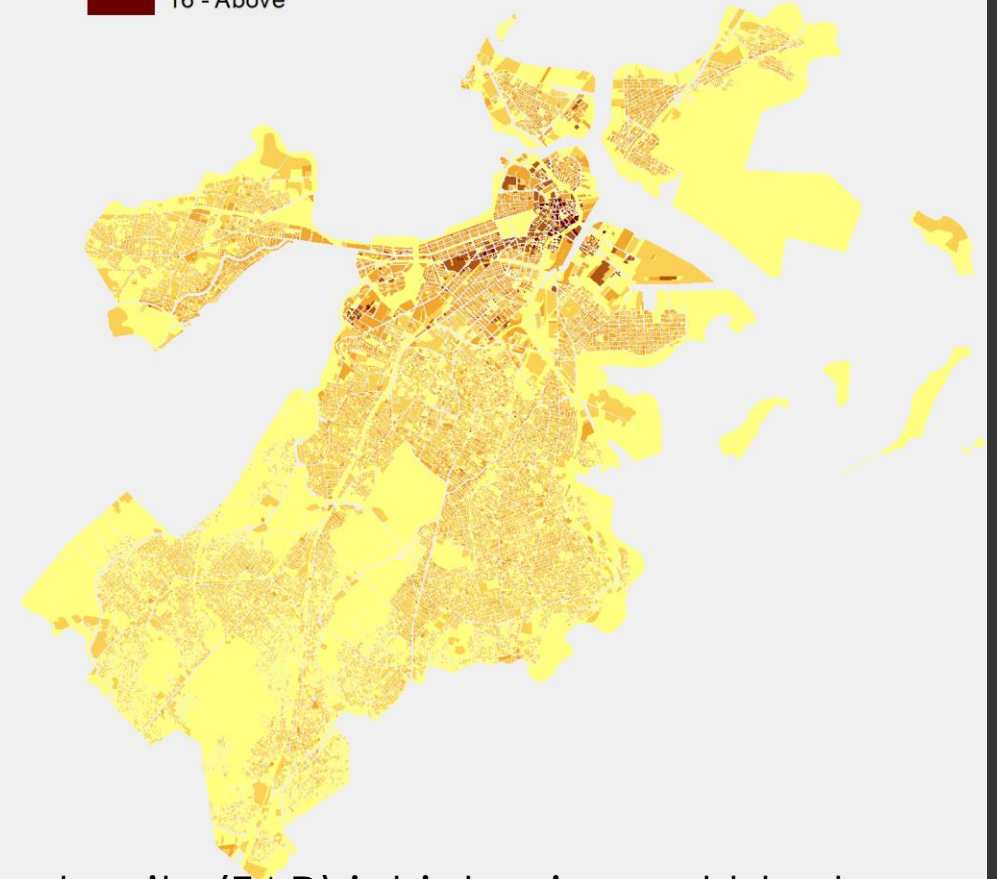
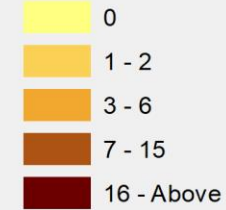
FAR (Density Measure)



Building Density (FAR) is high in the city center
Street Network Density : **317 nodes/Sq Miles**

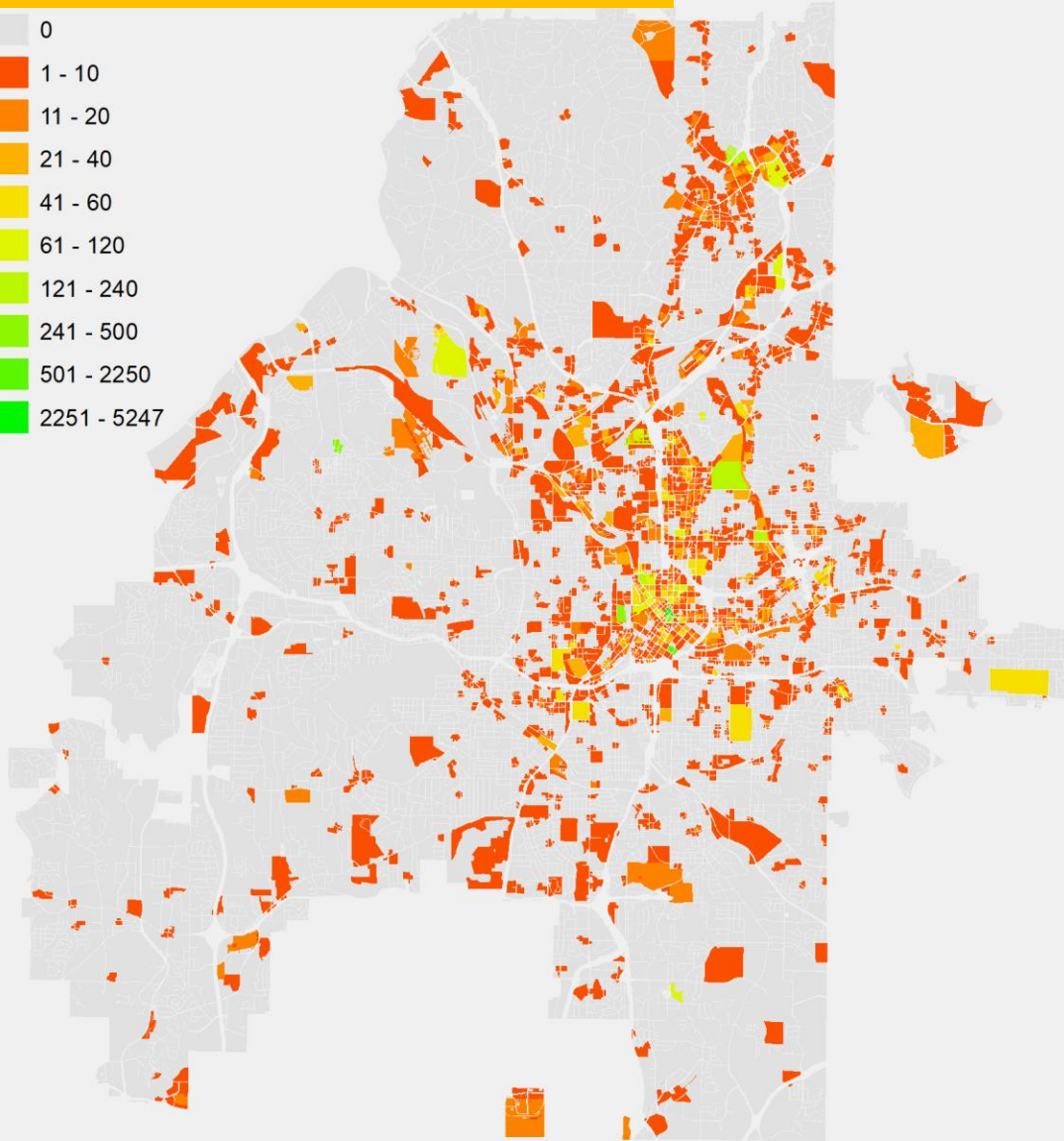
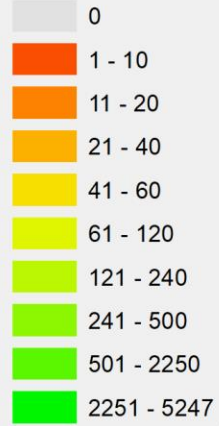
Boston

FAR



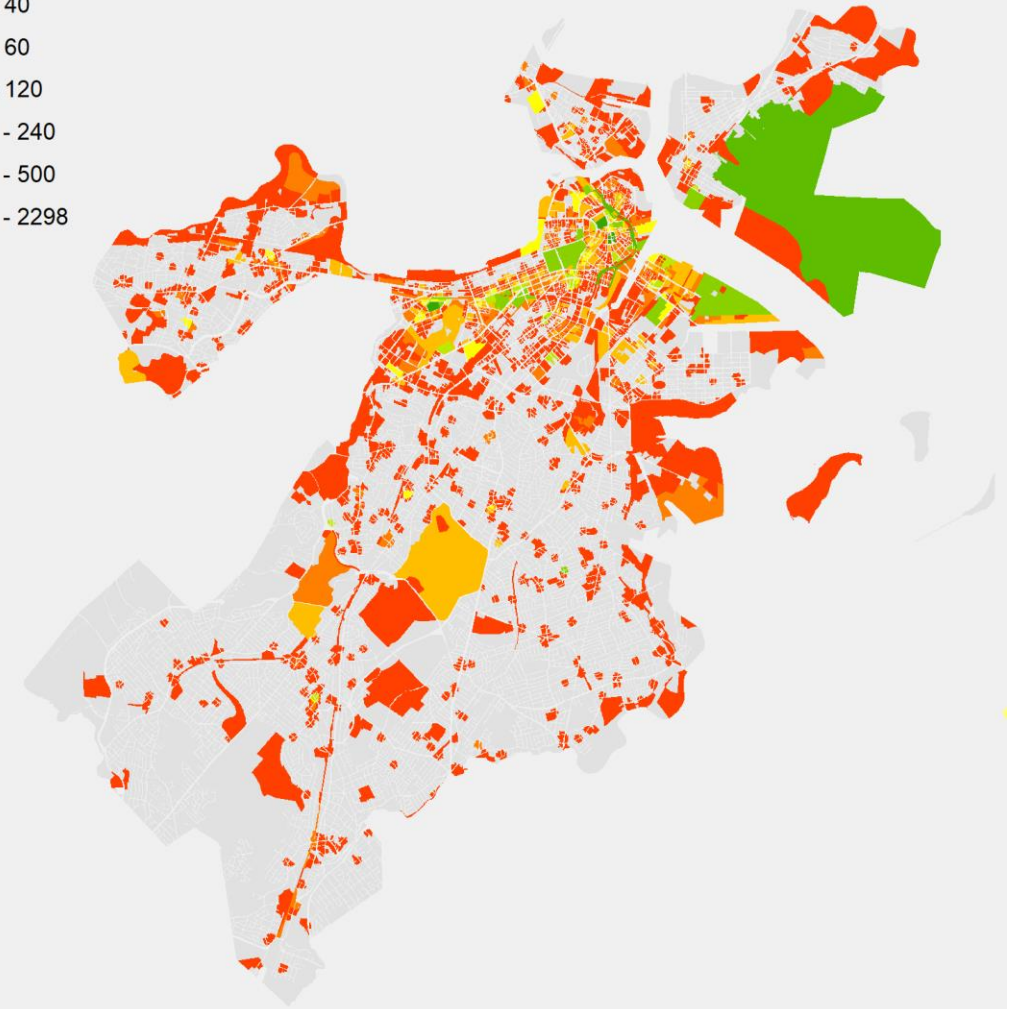
Building density (FAR) is higher in most blocks
Street Network Density : **552 nodes/Sq. miles**

Atlanta



~16,000 are in the (in 6 months) **City of Atlanta**
Tweet Density **121** per Sq. miles

Boston



~14,000 are in the **Boston city** (6 months)
Tweet Density **290** per Sq. miles

Hypothesis

H1. Urban blocks with **high street network density** and **building density (FAR)** produce **more activities**, and induce **more positive affect**.

H2. Certain **land use** categories encourage **more activities** that induce **positive affect**.

H3. **Boston** due to its inherently different urban characteristics than **Atlanta** will show **differences** in **activity pattern** and **affect** values.

Urban ACTIVITY



•Knowing activity indicated by a Tweet

- Entertainment
- Shopping
- Outdoor activity
- Home based
- Work based
- Mobility

AFFECT



•Assessing Affect of Tweets

- Positive
- Negative

SPACE



Getting the built environment Metrics

- Land use
- Network density
- Building density etc.



“If you have to be stuck in traffic a #rainbow is a great view”

29 likes
APRIL 26
Add a comment...
...



“Only in this city on a rainy day stuck in traffic lead to a great moment”

8 likes
APRIL 25

Coming through Atlanta tonight during rush hour was a challenge. Stop and go bumper to bumper traffic during rain was a challenge. The answer, but a Peachtree pass that lets one...

[instagram.com/p/BoNn2IOgUXF/](https://www.instagram.com/p/BoNn2IOgUXF/) ...

Boston is truly an intellectual powerhouse. A city of bustling nightlife and diverse cultures. Although traffic jam is common, the surrounding architecture...

[instagram.com/p/Bpl06o2Bc51u](https://www.instagram.com/p/Bpl06o2Bc51u) ...

10:19 AM - 20 Oct 2018 from Boston, MA

...

Atlanta

**Mobility-
Drive**

Boston



Boston is truly an intellectual powerhouse. A city of bustling nightlife and diverse cultures. Although traffic jam is common, the surrounding architecture will surely keep your eyes busy! #eastcoast #exploringboston

dzenirow Nice 😊



Boston is truly an intellectual powerhouse. A city of bustling nightlife and diverse cultures. Although traffic jam is common, the surrounding architecture...

[instagram.com/p/BpI06o2Bc51u](https://www.instagram.com/p/BpI06o2Bc51u) ...

10:19 AM - 20 Oct 2018 from Boston, MA

Mobility-
Drive

3

Boston



Only in this city on a rainy day stuck in traffic lead to a great moment #ShotOniPhone X



8 likes

APRIL 25



view Stuck in traffic with a pretty



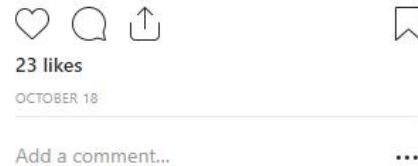
7 likes

OCTOBER 14

11AM start time!

Traffic got us jammed up in deez ATL Streets!!

“Nothing stops a hustle like traffic!!! We will be done at 11am today!!! ”



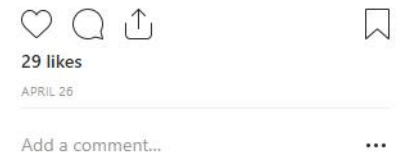
Coming through Atlanta tonight during rush hour was a challenge. Stop and go bumper to bumper traffic during rain was a challenge. The answer, but a Peachtree pass that lets one...

[instagram.com/p/BoNn2lOgUXF/](https://www.instagram.com/p/BoNn2lOgUXF/) ...

10:30 AM - 27 Sep 2018 from Atlanta, GA



“If you have to be stuck in traffic a #rainbow is a great view”



“just saw three accidents within a mile of each other. traffic is crazy”
Sat May 05 10:47:43 2018

Urban ACTIVITY



Predict 'Urban Activity'

STEP- 1

- **Data Cleaning**

~14,000 Tweets for
Greater Boston Area

~16,000 Tweets for
Metro Atlanta

STEP- 2

- **Hand labeling**

Hand labelled 'k'
tweets

Memos for 'k' tweets
Creating a Training
Dataset

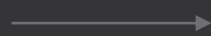
~1000 hand labeled
data points

STEP- 3

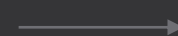
- **Clustering &
Spot checking**

• After iterative clustering
~4000 semi-automated
labeled data points are
generated

Clean Tweets



Labeled + Relevant
Tweets



Increasing labeled
Tweets

STEP- 4 •Model Building

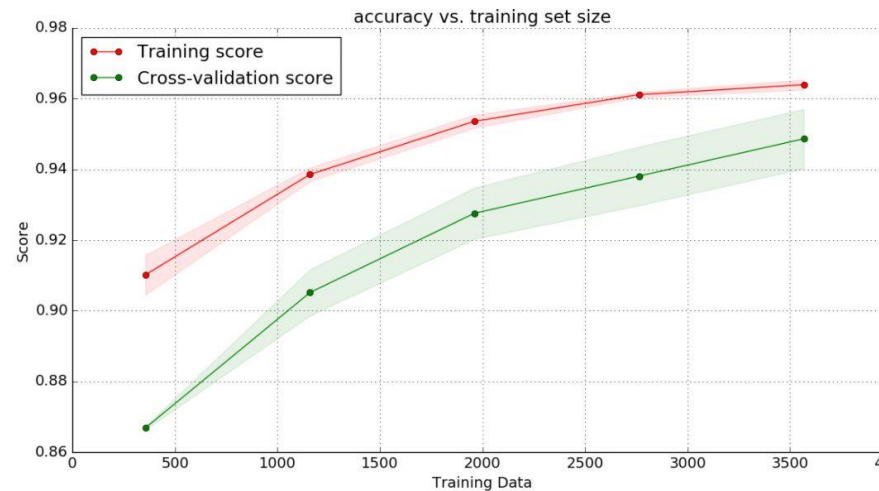
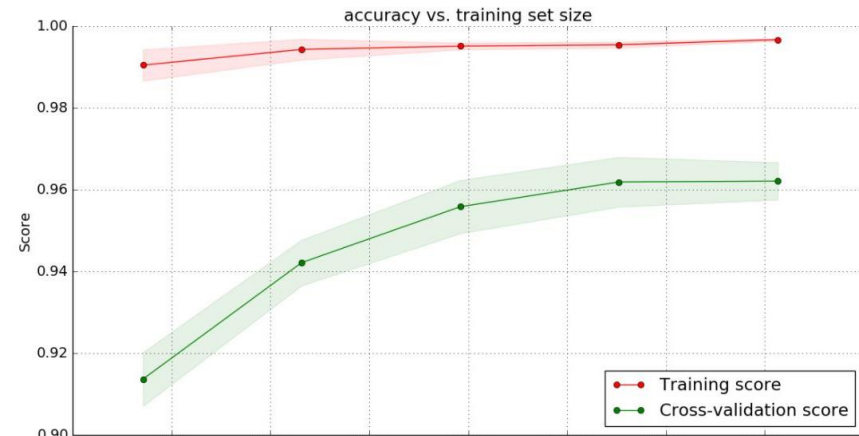
Random Forest Machine Learning Model for Tweet Classification

Atlanta
94.89 %

Activities	precision	recall	f1-score
educational	1.00	0.67	0.80
entertainment	0.93	1.00	0.96
home	1.00	0.80	0.89
mobility	1.00	0.62	0.77
recreation	1.00	0.75	0.86
shopping	1.00	0.50	0.67
work	1.00	1.00	1.00

Boston
93.63%

Activities	precision	recall	f1-score
educational	0.85	0.88	0.87
entertainment	0.99	0.99	0.99
home	1.00	0.78	0.88
mobility	1.00	0.91	0.95
recreation	1.00	0.93	0.97
shopping	1.00	0.82	0.90
work	0.94	1.00	0.97



For the entire dataset the accuracy is 72.14%

Urban ACTIVITY



Example Tweets :

Outdoor Activity

Enjoyed a beautiful afternoon [exploring](#) The [Freedom Trail](#).

Mobility

[@mbta](#) mechanical issues with [bus 676](#)? Was very slow so I bailed and took a different [route](#)

Shopping

Doing a little Sunday [shopping](#) [@whitebarnfarm](#) for sides for Burger night tomorrow

Entertainment

We just had a delicious [breakfast](#) at the [redarrowdiner](#) of [@foodnetwork](#)
[Dinners Drive-Ins](#)

AFFECT



Assessing 'Affect' of Each
Tweet

STEP- 5 Affect Assessment

Assessment based on the words in the tweets

- words that reflect **positive and negative affect are assessed**
 - Positive Affect – e.g. nice, love, wonderful, fun, sweet etc.
 - Negative Affect – e.g. nasty , bad , ugly , hurt etc.

From each tweet a score is generated that reflects the positive and negative affective measures.

USED – Modified dictionary of the the Linguistic Inquiry and Word count (LIWC 2015)
and, Vader python Library

AFFECT



Example Tweets :

Positive – Happy Tweet

Enjoyed a beautiful afternoon exploring The Freedom Trail. **+20.1**



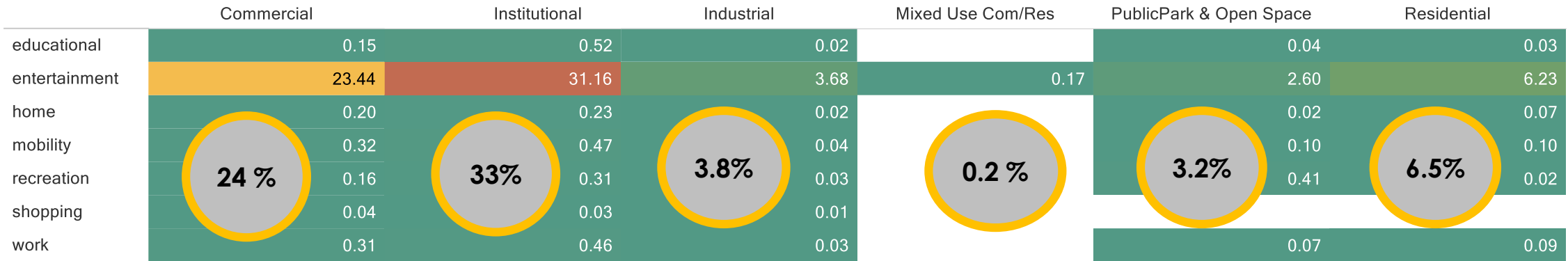
Negative – Angry Tweet

Very frustrating weekend in the first lap of the main. I hit a bike in the sand and was stuck **-25.0**

Negative – Anxious Tweet

I hate driving down here. He was fine. Ran out in front of me as I was starting to take a right turn. So no damage to my car. Or him. **-12.5**

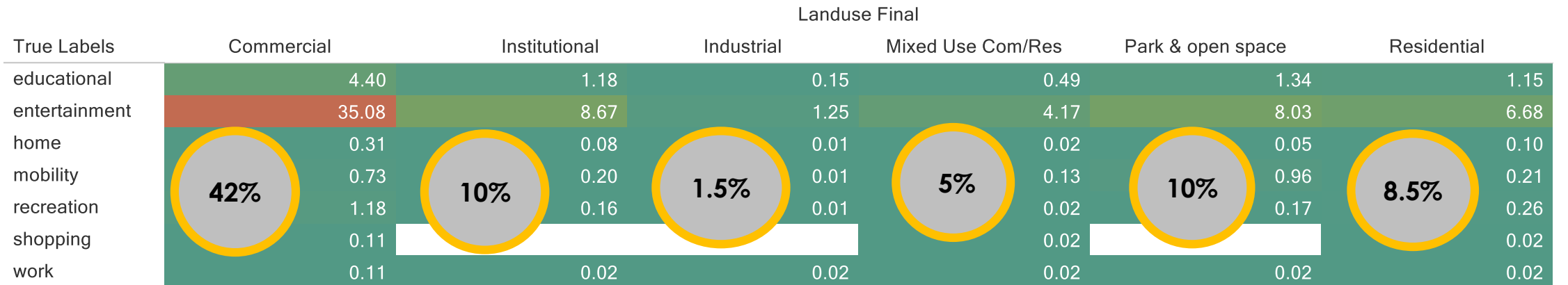
Activity & Landuse Distribution in Atlanta



SUM([Number of Records]*100/16679) broken down by LU Final vs. True Label. Color shows sum of Number of Records. The marks are labeled by SUM([Number of Records]*100/16679). The view is filtered on True Label and LU Final. The True Label filter excludes others and posting. The LU Final filter excludes No Landuse Info.

Number of Records
1 5,198

Atlanta

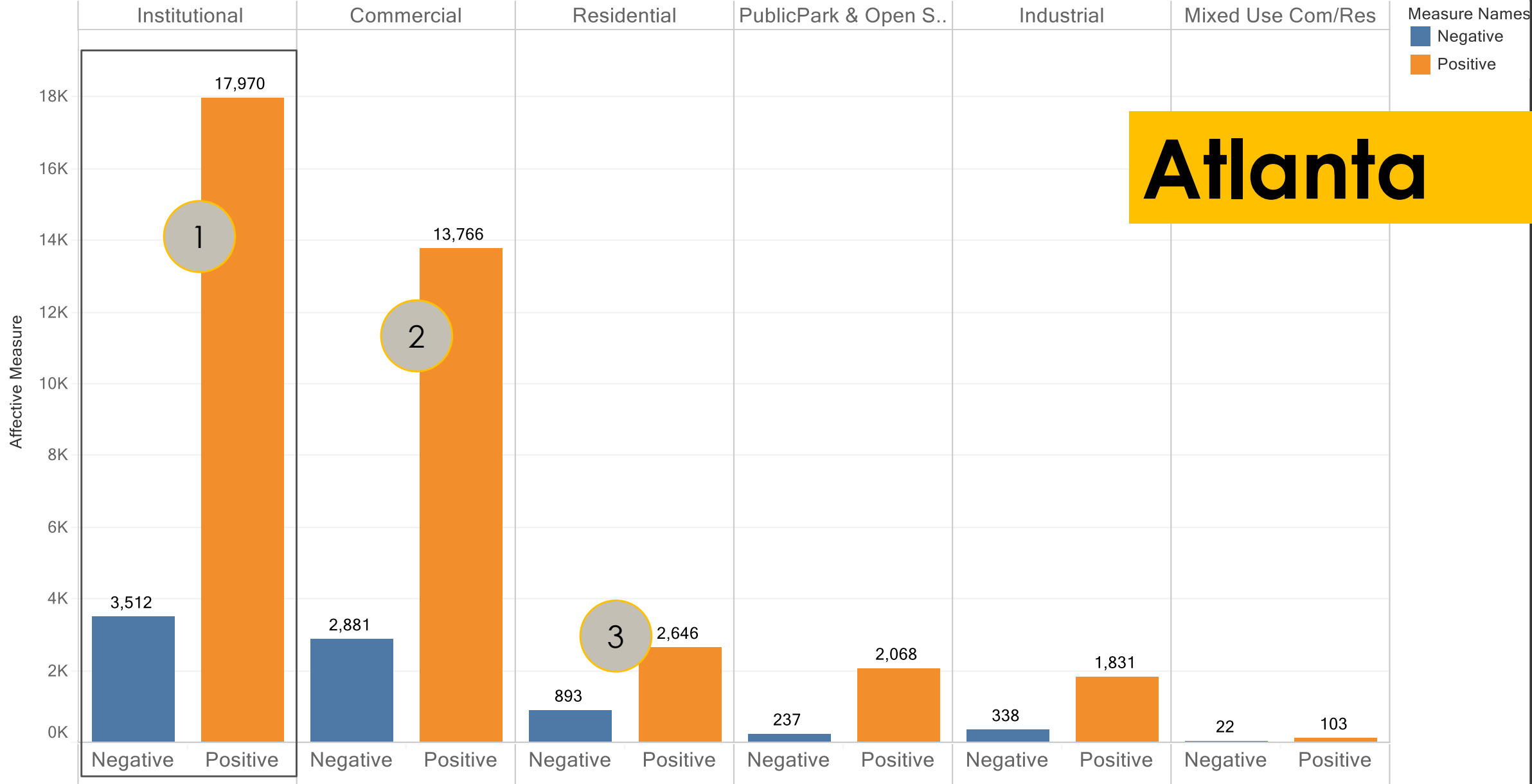


SUM([Number of Records]*100/13320) broken down by Landuse Final vs. True Labels. Color shows sum of Number of Records. The marks are labeled by SUM([Number of Records]*100/13320). The view is filtered on Landuse Final and True Labels. The Landuse Final filter excludes Null. The True Labels filter excludes others and posting.

Number of Records
1 4,673

Boston

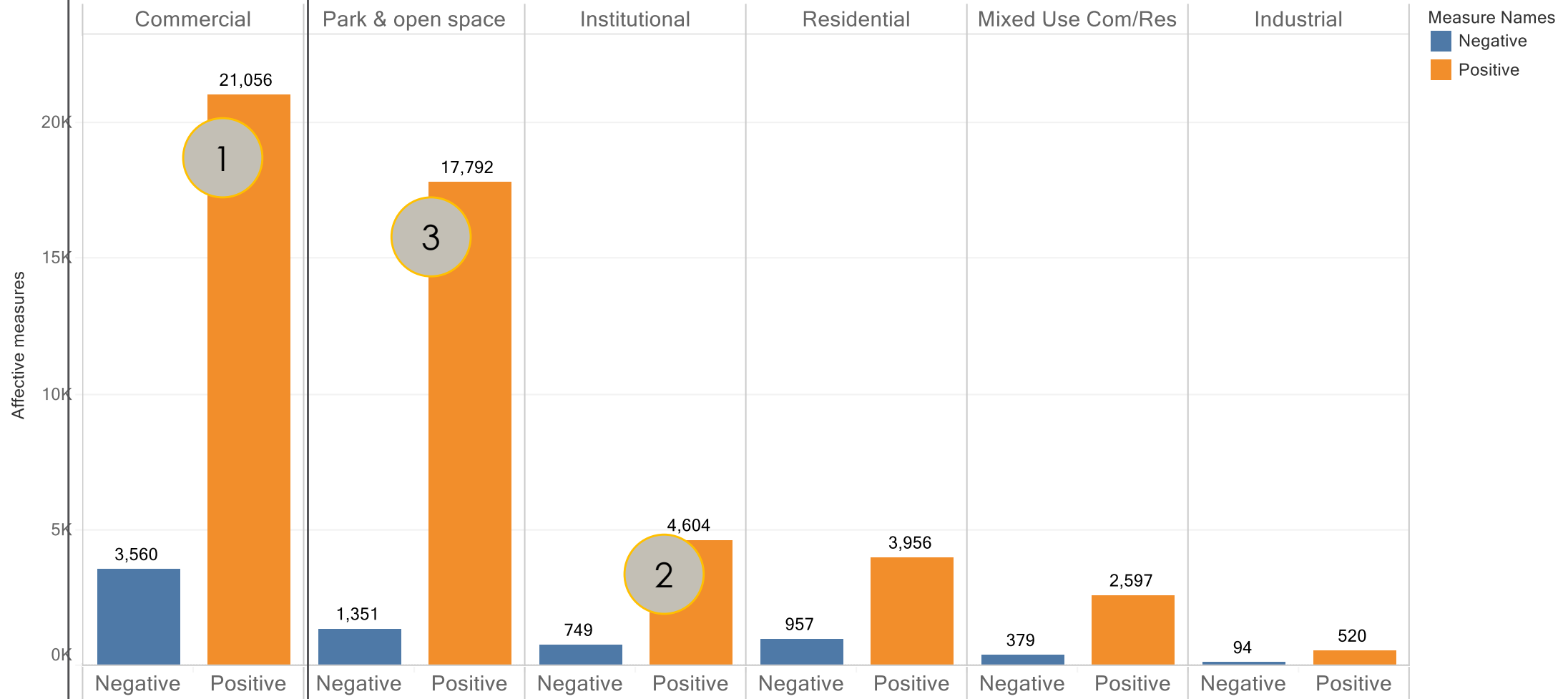
Positive and Negative Affect associated with Landuse ATL



Atlanta

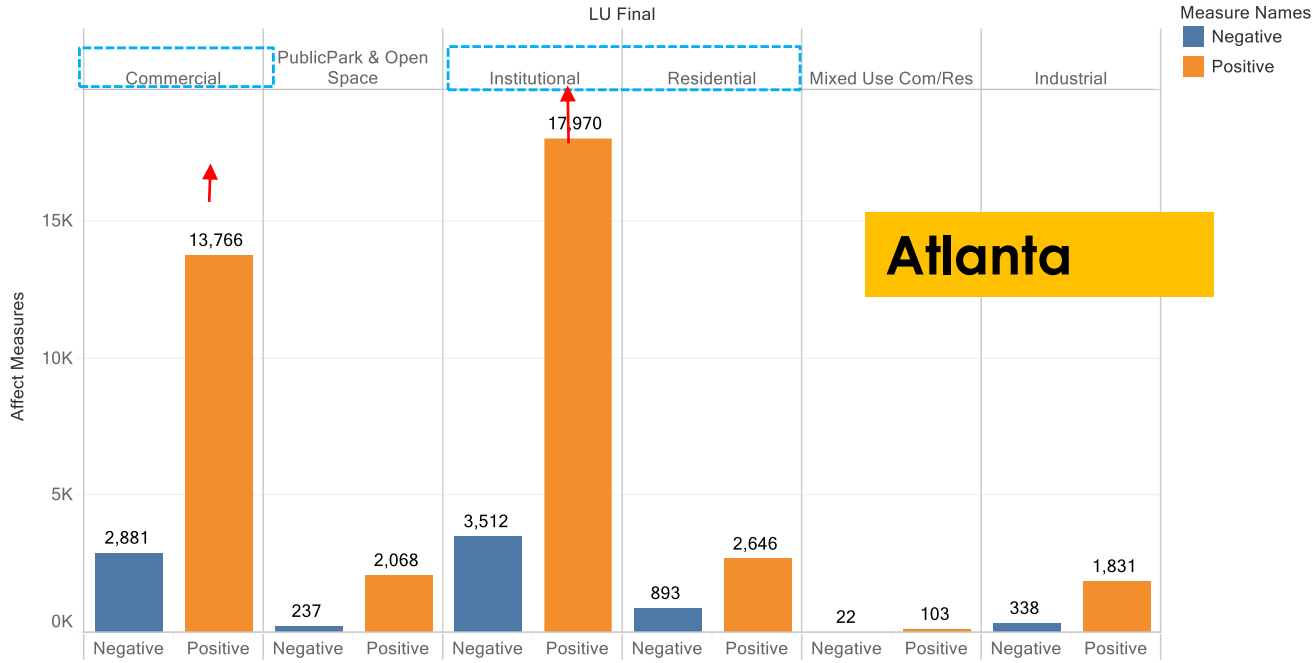
Boston

Positive and Negative Affect associated with Landuse BOS



Negative and Positive for each Landuse Final. Color shows details about Negative and Positive. The view is filtered on Landuse Final, which excludes Null.

Positive and Negative Affect associated with Landuse ATL



Boston in Comparison to Atlanta

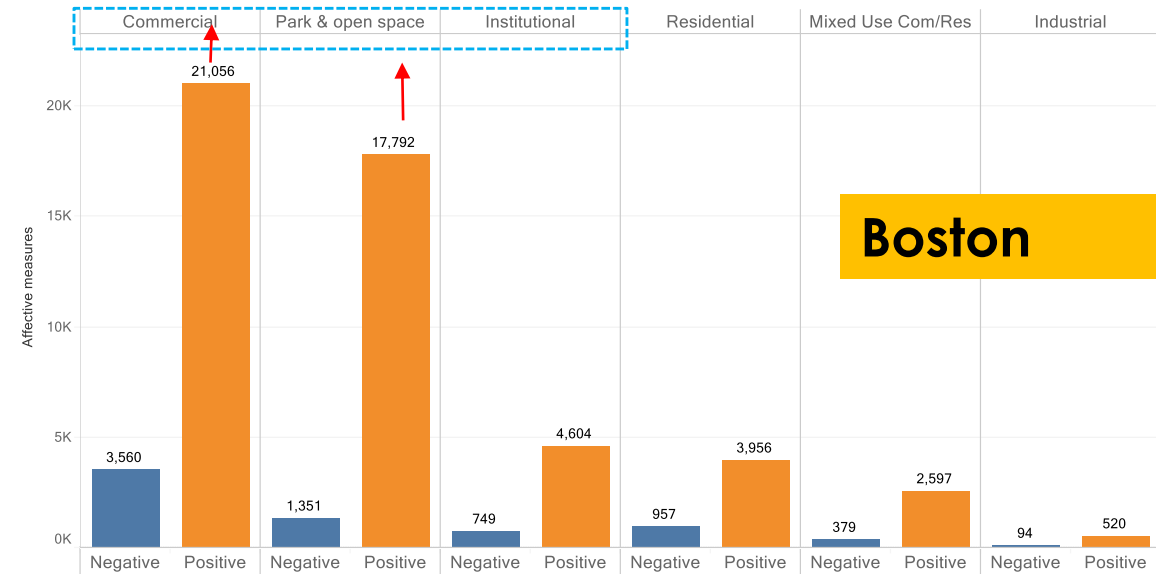
Higher Positive Affect in :

Commercial
Park and open spaces
Institutional

Higher positive Affect in :

Commercial
Institutional
Residential

Positive and Negative Affect associated with Landuse BOS

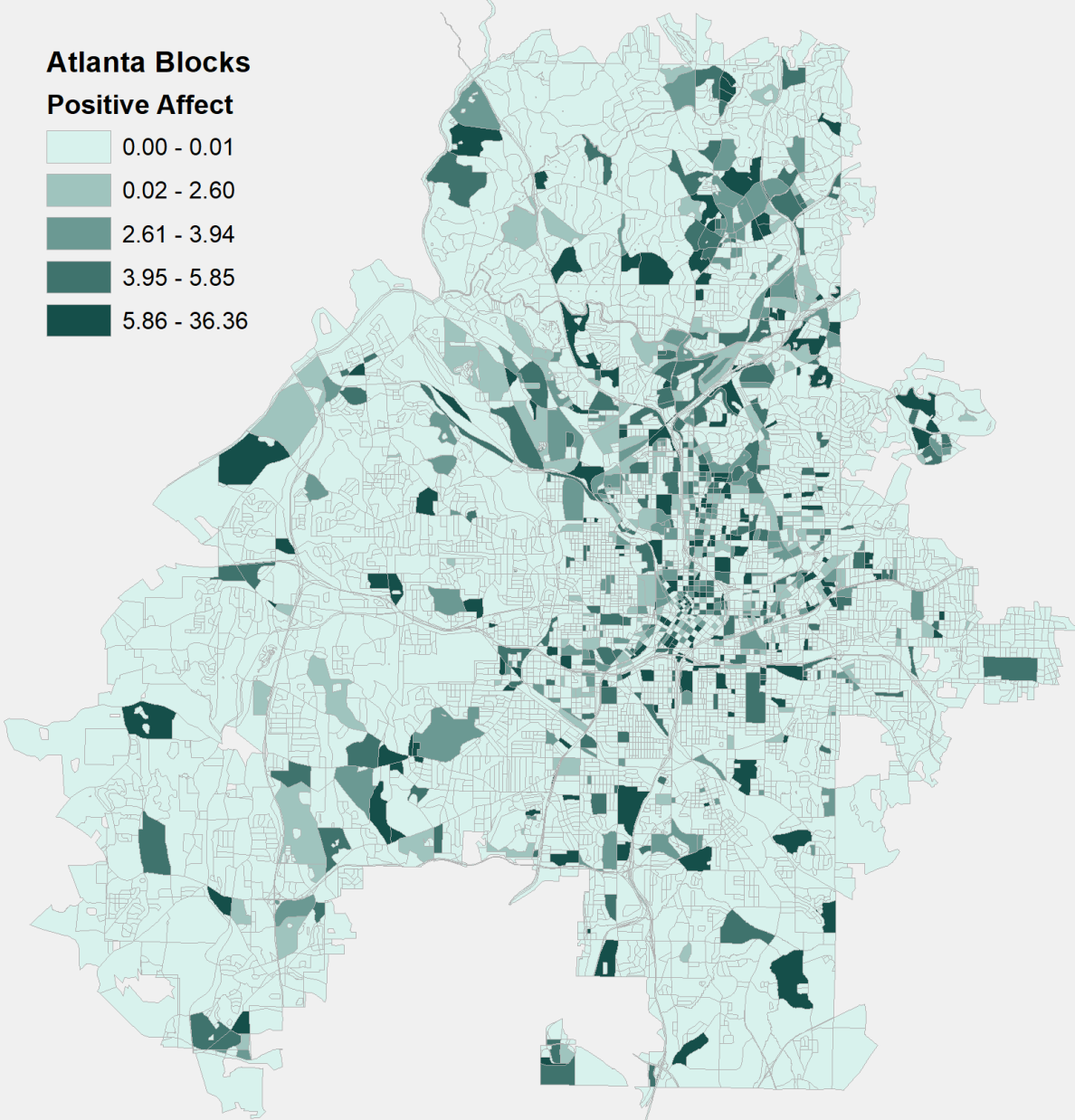
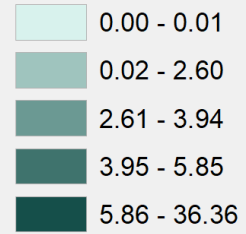


Negative and Positive for each Landuse Final. Color shows details about Negative and Positive. The view is filtered on Landuse Final, which excludes Null.

Atlanta

Atlanta Blocks

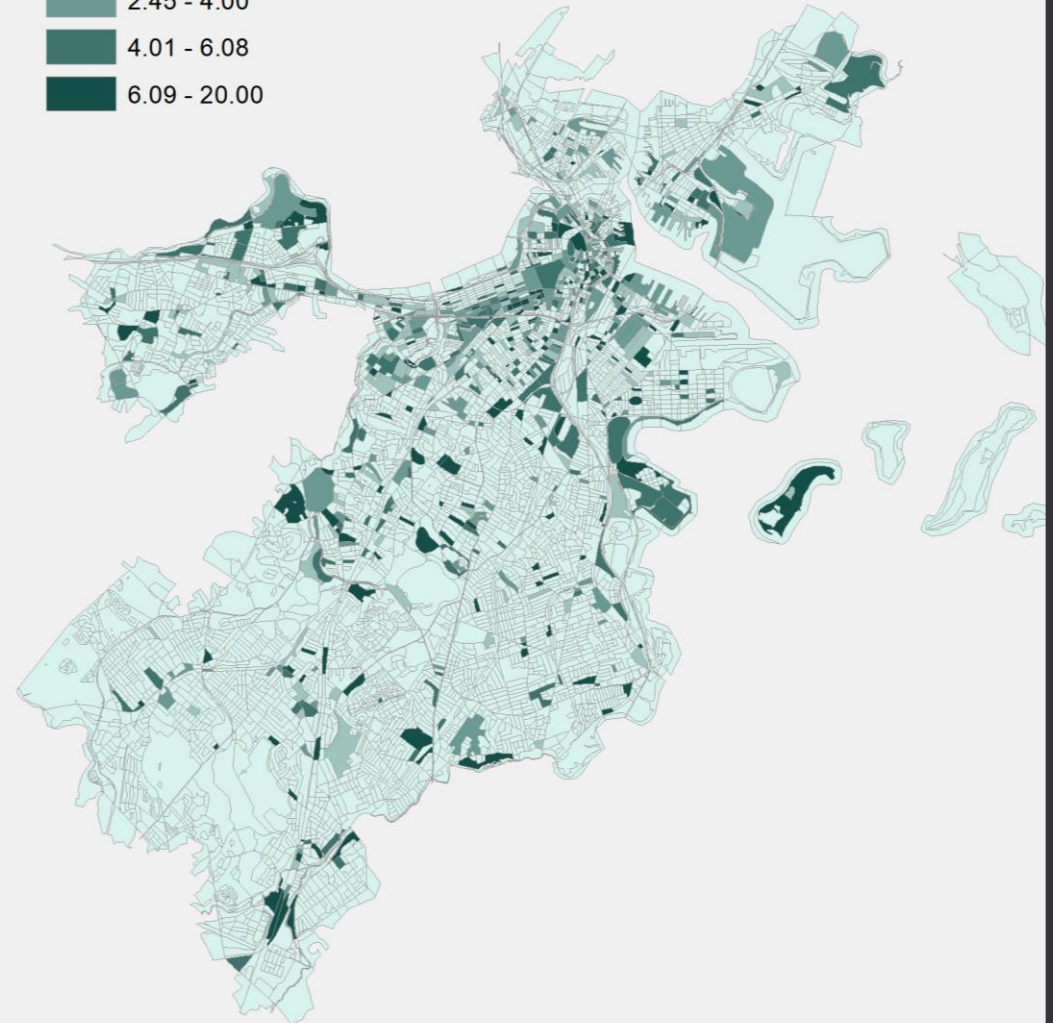
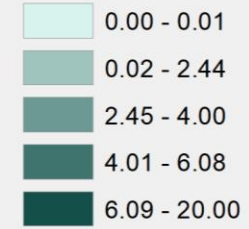
Positive Affect



Boston

BostonBlocks

Positive Affect



Findings

H1. Small blocks, high street network density and building density (FAR) produce **more activities**, and more induce **more positive affect**.

Urban Activities tend to originate in the areas with High Building Density (FAR)

- For **Both Atlanta** and **Boston**

In Boston - Positive affect is positively correlated with **Network density, FAR, % ground coverage**

In Atlanta - Positive affect not correlated with **Network density, FAR, % ground coverage**

Findings

H2. Certain Land Use categories produces more urban activities and associated with more positive affect

*Urban activities are higher in the, Park and Open Spaces – For both **Atlanta** and **Boston***

More '**positive affect**' is associated with certain Land use categories such as **commercial** , **institutional** , **park and open spaces**

Findings

H3. Boston City due to its inherent urban characteristics (mix of land use smaller blocks, accessibility) may induce more positive affect when compared to the City of Atlanta

- Spatial variables are better predictor of urban activities in **Boston**
- **Boston** shows more activities in **Commercial** land use , and **Atlanta** shows more activities in **Institutional** land use
- Boston shows highest '**positive affect**' associated with , **commercial, park and open spaces,** and **institutional** land use
- Atlanta shows highest **positive affect** in **Institutional , commercial,** and **residential** land use

Findings

H3. Boston City due to its inherent urban characteristics (mix of land use smaller blocks, accessibility) may induce more positive affect when compared to the City of Atlanta

Beyond the city center ,

- In **Atlanta** more urban activities and positive affect are situated in the **commercial malls**
- In **Boston** activities and positive affect beyond the city center is observed in **urban parks , river walks,** and **small commercial establishments** near transit stations.

Summary

- 'Affect' values in both cities primarily varies with land use types. Land use constituting prosocial places are usually associated with higher positive affect.
- Higher density encourage urban activities (such as entertainment , outdoor activity, mobility etc.)
- Higher density is not always associated with 'positive affect'