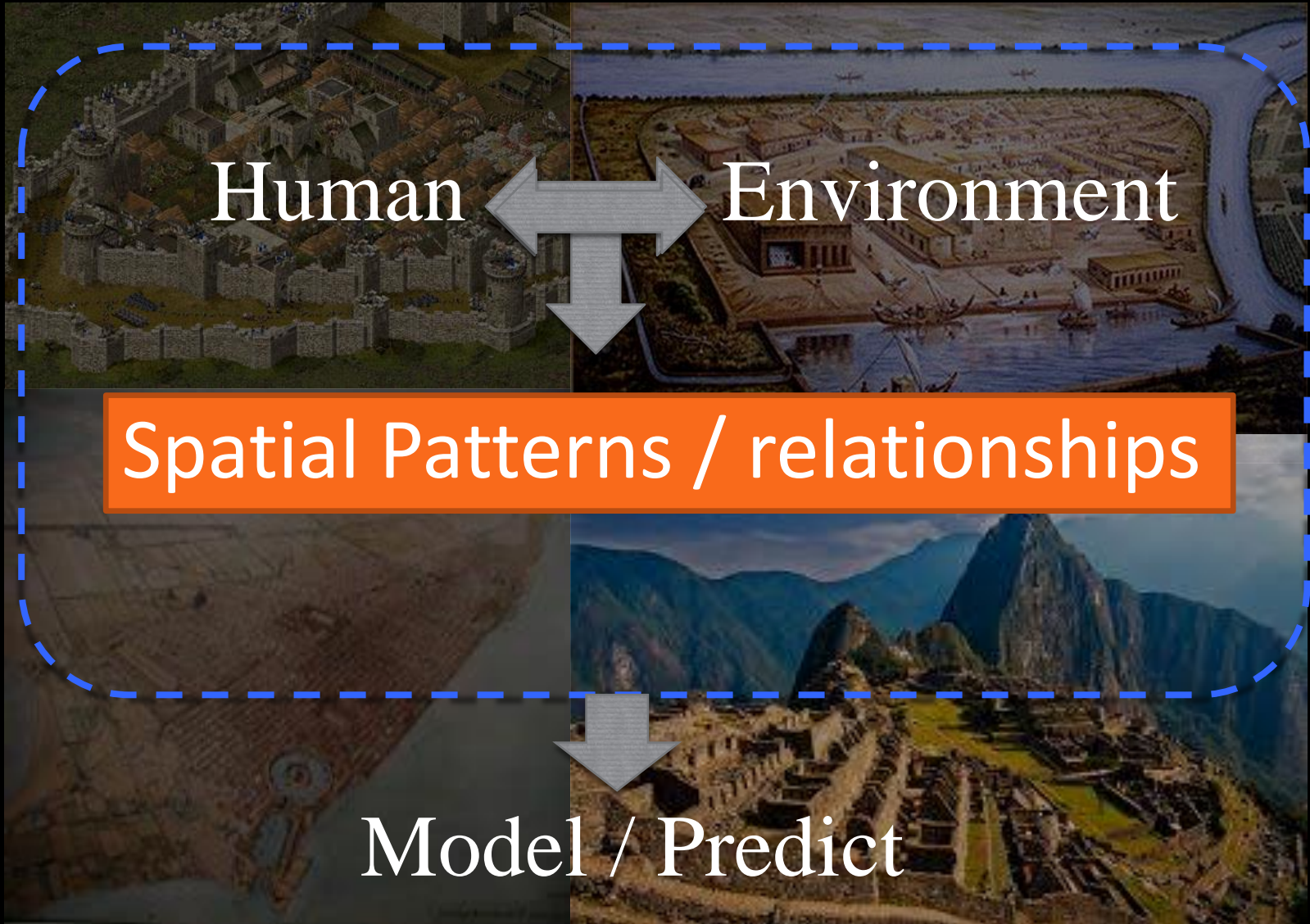


# Leveraging GeoSpatial Technologies in Planning for Sustainable Urban Futures

*Center for Geographic  
Information Systems*

**Subhro Guhathakurta, Director**  
**Professor, School of City and Regional Planning**





# Big Data Can Guess Who You Are Based on Your Zip Code

Software company Esri's database files Americans into one of 67 consumer groups.

ADRIENNE LAFRANCE | OCT 14 2014, 10:50 AM ET



Steve Cadman/Flickr



# ZIP Lookup

What Your Zip Code Says About You.

Tapestry Income Age Population Density

For ZIP Code

## Top Tapestry™ Segments

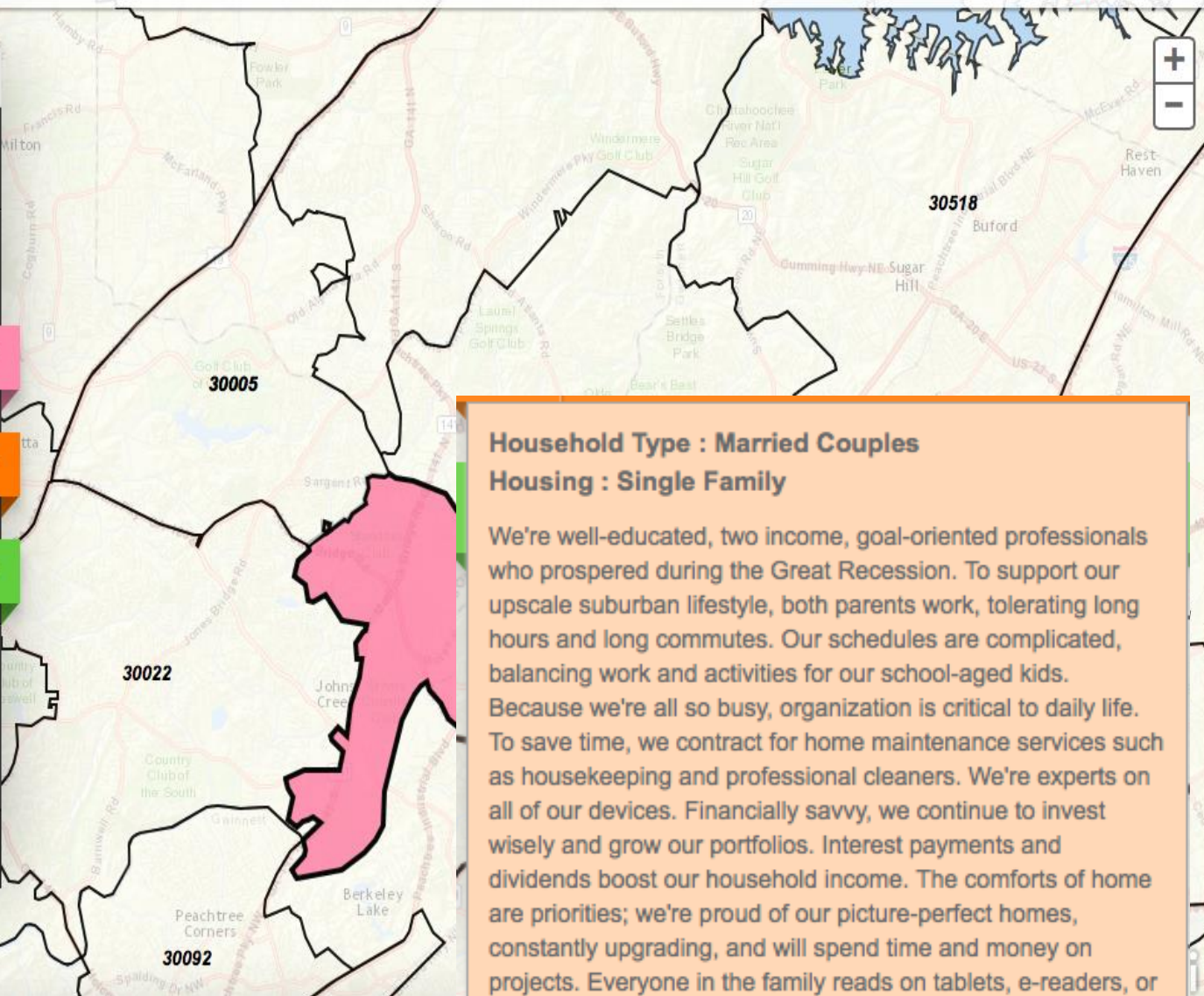
31% Soccer Moms

27% Professional Pride

26% Enterprising Professionals

Want to know more? Esri's Tapestry™ Lifestyle Segmentation classifies the US population into 67 market segments and provides comprehensive lifestyle details.

[More about Tapestry](#) [Contact Us](#)



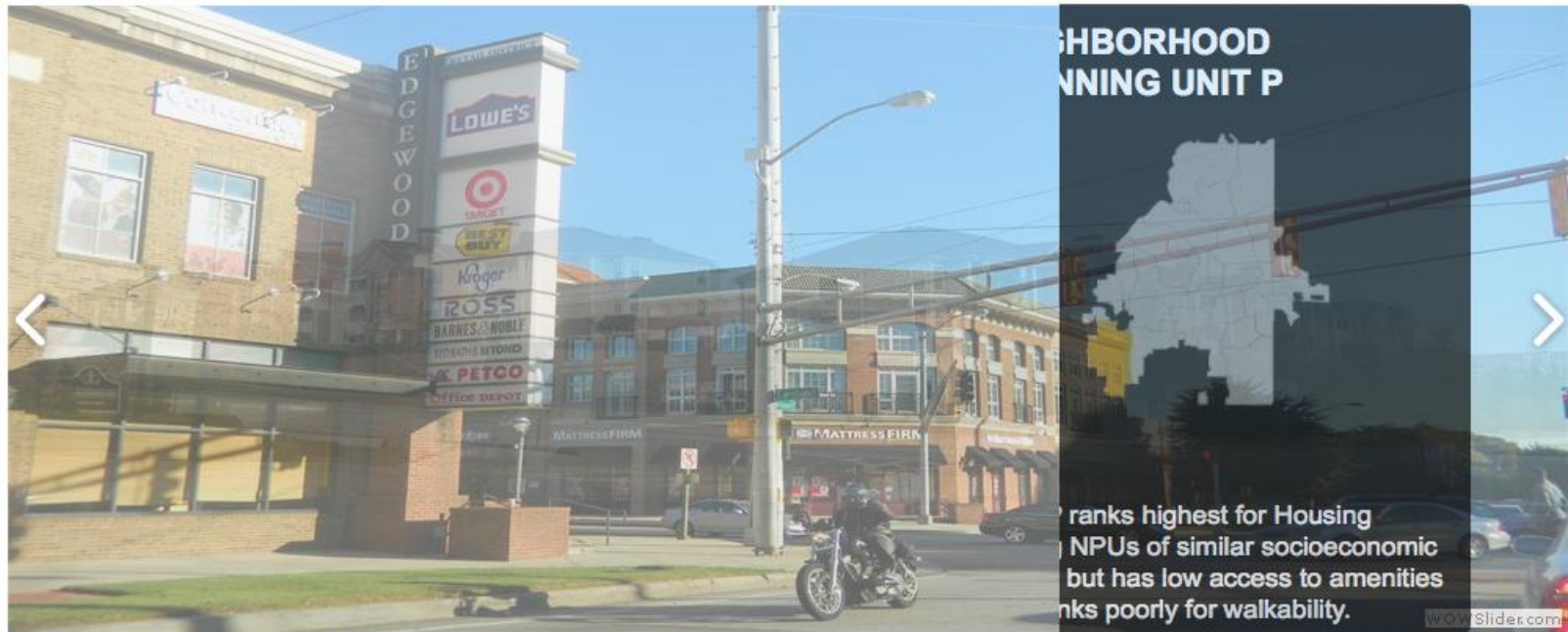
**Household Type : Married Couples**  
**Housing : Single Family**

We're well-educated, two income, goal-oriented professionals who prospered during the Great Recession. To support our upscale suburban lifestyle, both parents work, tolerating long hours and long commutes. Our schedules are complicated, balancing work and activities for our school-aged kids. Because we're all so busy, organization is critical to daily life. To save time, we contract for home maintenance services such as housekeeping and professional cleaners. We're experts on all of our devices. Financially savvy, we continue to invest wisely and grow our portfolios. Interest payments and dividends boost our household income. The comforts of home are priorities; we're proud of our picture-perfect homes, constantly upgrading, and will spend time and money on projects. Everyone in the family reads on tablets, e-readers, or smartphones, but prefer hard copies of epicurean, home, or sports magazines.



# Atlanta's Neighborhood Quality of Life & Health Project

- Home
- About ▾
- Find Your Neighborhood
- Interactive Map
- Data & Methods ▾
- Improve Your Neighborhood ▾



Interested in learning about quality of life and health in your Atlanta neighborhood?

Find out more with our interactive Map!

[Explore Rankings](#)

Which neighborhood planning unit do you live, work or play in?

How are Atlanta's neighborhoods organized?

[Discover Atlanta's Neighborhoods!](#)

Keep up with NQoLHI

Stay informed by entering your email address in the box below.

[Subscribe](#)

**Tweets**

**NQoLHI** **Neighborhood Indices** @NQoLH 29 Jul  
East Baton Rouge #Food #Access Policy Commission offers ideas for improving food choices in food deserts:  
[theadvocate.com/home/9819780-1...](http://theadvocate.com/home/9819780-1...)  
#NQoLH

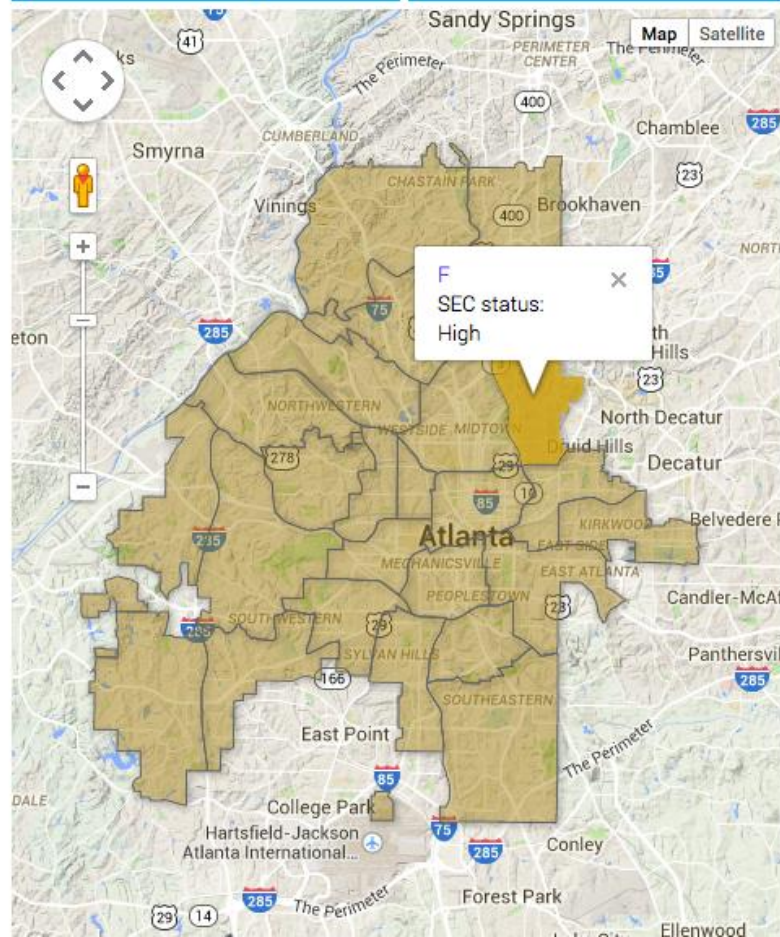
# Atlanta's Neighborhood Quality of Life & Health Project

Home About ▾ Find Your Neighborhood Interactive Map Data & Methods ▾ Improve Your Neighborhood ▾

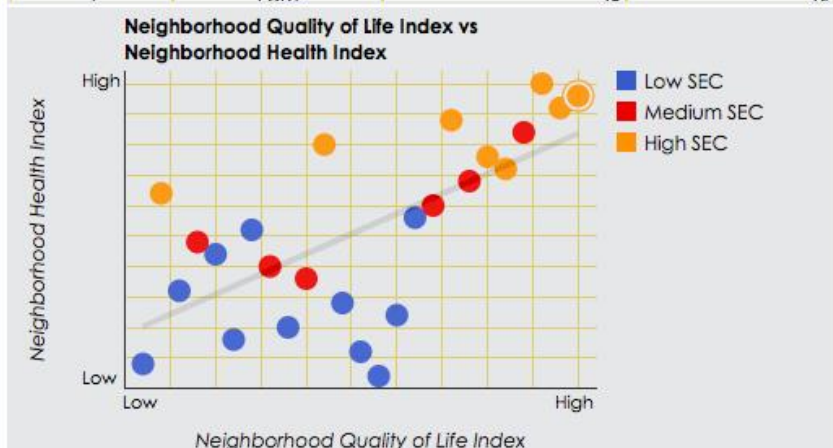
Enter an address, neighborhood or point of interest in the search bar below.

**Explore Atlanta's Neighborhoods**  
Make a selection in the boxes to the right or enter a location in the search box to the left to get started.

(Rankings/Measures)	SEC	NPU's
NQOL Index VS. NH Index	All	All
> Neighborhood Quality of Life Index	Low	A
>> Amenities	Medium	B
>>> Parks & Recreation Access	High	C
>>>> Retail Access		D



Neighborhood Planning Unit	Socioeconomic Conditions Category	Neighborhood Quality of Life Index Ranking	Neighborhood Health Index Ranking
A	High	15	6
B	High	2	3
C	High	6	7
D	High	5	8
E	High	3	1
F	High	1	2
G	Low	12	25
H	Low	23	18
I	Medium	18	16
J	Low	25	24



CLEAR ALL/ DOWNLOAD DOWNLOAD

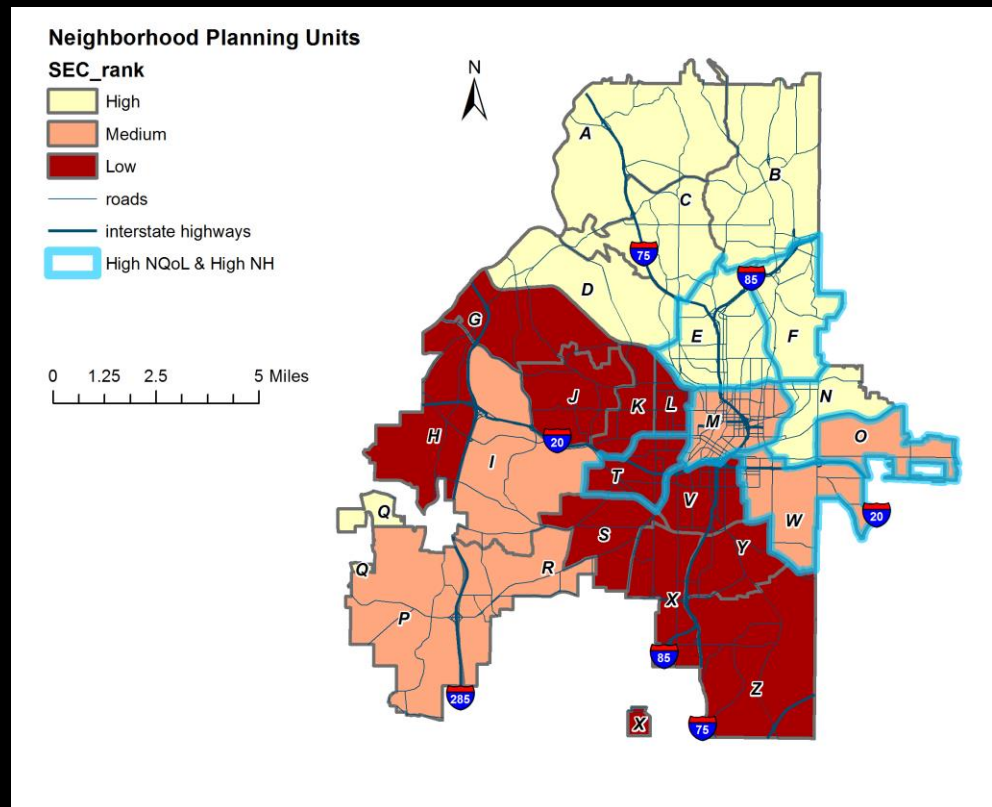


# Comparing Neighborhoods with high Quality of Life & health

Overlap matrix

SEC	High QoL	High Health	Overlap
High	B, F, E	F, E, N	F, E
Med	M, O, W	M, O, W	M, O, W
Low	T, S, G	V, T, Y	T

NPUs with high NH & NQoL

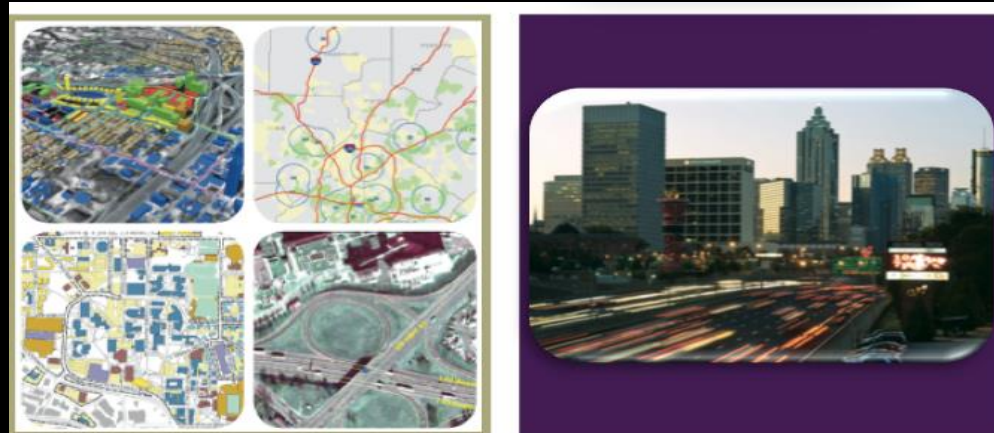


# Findings

- SES Status is not always predictive of areas with high quality of life and health parameters
- The central city neighborhoods seem to offer comprehensive amenities to achieve better QoL and health outcomes



# Walk this Way: A New App to Find the Optimal Walking Route in the City of Atlanta



# Walkability Factors



- Despite growing research on walkability, knowledge about paths and corridors that are conducive for walking is still largely unavailable
- Various travel surveys document that walkability factors and their impacts vary from person to person
- The built environment influences walking behavior



# Walk Score

## 751 Robert E Lee Parkway

Lenox, Atlanta, 30326

[Bigger Map](#)

Walk Score  
**62**

### Somewhat Walkable

Some errands can be accomplished on foot.

Transit Score  
**59**

### Good Transit

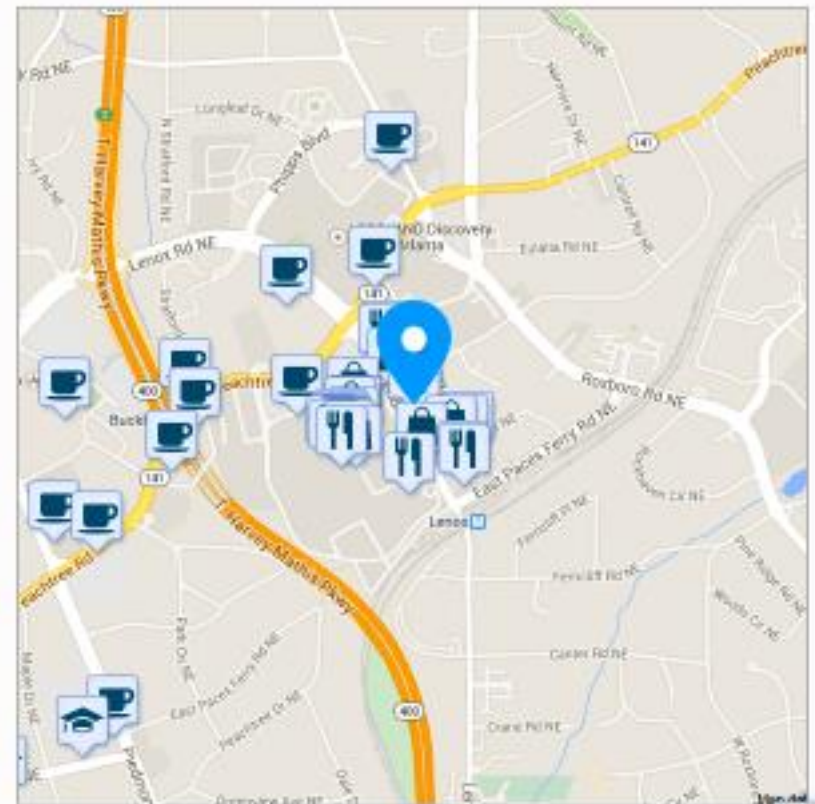
Many nearby public transportation options.

Bike Score  
**55**

### Bikeable

Mostly flat, some bike lanes.

[Score Details](#)





Address Search

425 5th avenue

Map Layers

Adjust Priorities Explore Amenities



Restaurants	
BUTTERFILED 8	0.02mi
BERGER'S ON THE GO	0.03mi
LORD & TAYLOR	0.04mi
LORD & TAYLOR	0.04mi
ASIAN FOOD CULTURE, INC	0.04mi
EVERGREEN ON 38	0.05mi
MONDELLO	0.07mi
BLAGGARDS	0.07mi
WASHOKU CAFE	0.08mi
CAFE BONJOUR	0.08mi
Coffee Shops	
STARBUCKS COFFEE	0.20mi
STARBUCKS COFFEE	0.22mi
COSI DOWNTOWN	0.27mi
STARBUCKS COFFEE	0.32mi
JOE: THE ART OF COFFEE	0.34mi
STARBUCKS COFFEE	0.36mi
STARBUCKS COFFEE	0.37mi
JIMMY'S COFFEE SHOP	0.39mi
Cosi	0.41mi
MIKE'S COFFEE SHOP	0.45mi
MTA Subway Stops	
42nd St-5th Ave-6th Ave	0.24mi
42nd St-5th Ave-6th Ave	0.34mi
Grand Central	0.38mi
34th St-6th Ave	0.40mi
33rd St-Park Ave	0.42mi
Times Square-42nd St	0.54mi



Open in Google Earth

A Fancier version of Walkscore Available for New York City and Philadelphia



# But when you want to know how to get from one point to another in a city by walking, what options do you have??

bing rosen centre orlando

Directions My places Nearby

A 9840 International Dr, Orlando, FL 32819

B 9101 International Dr, Orlando, FL 32819

add destination show options

Clear Go

Caution: This route is not shown on sidewalks or pedestrian paths.

0.7 mi, 14 min walking

A 9840 International Dr, Orlando, FL 32819

Depart International Dr toward Convention Way

0.7 mi  
Arrive at 9101 International Dr, Orlando, FL 32819  
If you reach Samoan Ct, you've gone too far

B 9101 International Dr, Orlando, FL 32819

Report a problem

Send to: Email, Mobile

These directions are subject to the Microsoft® Service

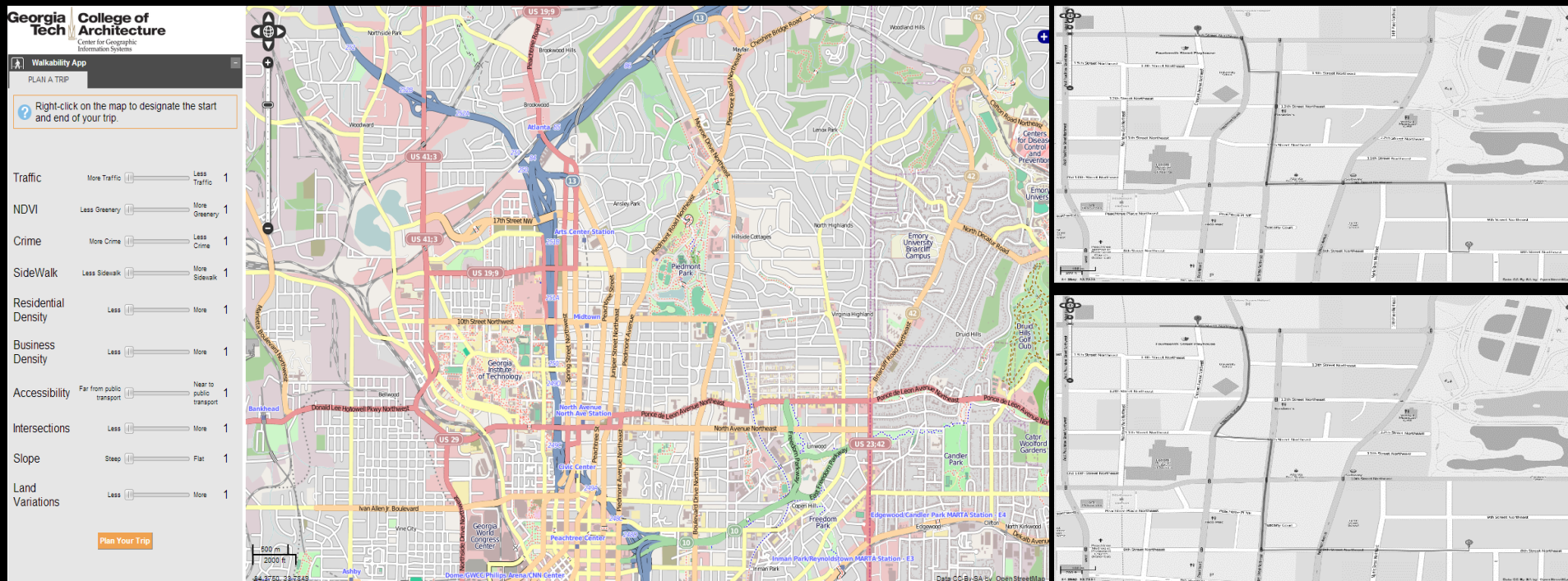
500 feet 200 m

© 2013 Nokia © 2013 Microsoft Corporation

*We wanted to develop a better option*

# What is **Walk this Way?**

- A **more comprehensive** evaluation system for walkability
- **User selection** mechanism
- **Optimal route** identification for walkers





# Walkability Attributes

Walkability attributes were chosen based on extensive literature, that fall into below categories:

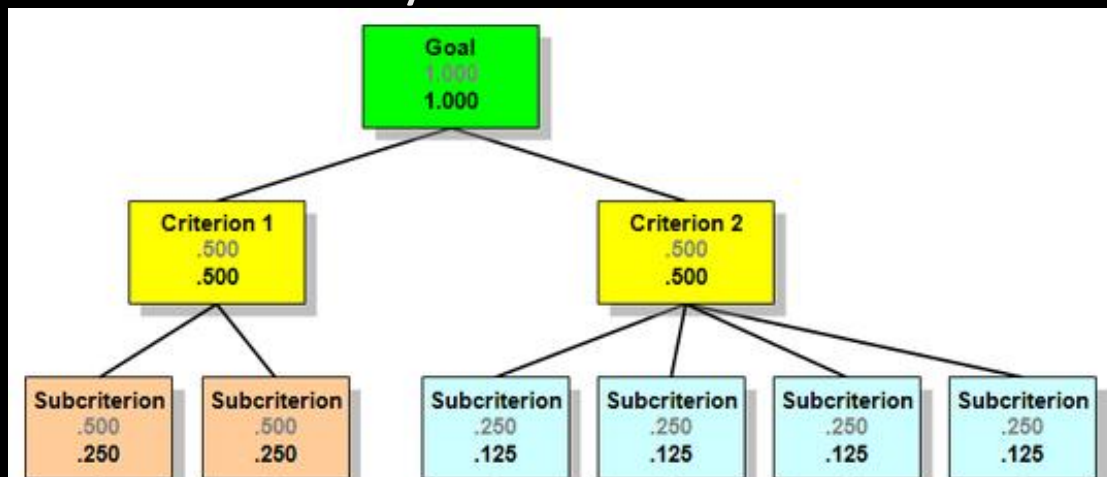
- 1) residential density;
- 2) business density;
- 3) land use mix diversity;
- 4) accessibility;
- 5) street connectivity;
- 6) crime safety;
- 7) traffic safety;
- 8) physical barriers;
- 9) aesthetics; and
- 10) pedestrian infrastructure.

# How does Walk this Way **work**?

- Walkability score calculation
  - ❖ Attribute quantification
    - 32 variables under 10 categories
  - ❖ Weight estimation
    - Analytical Hierarchy Process (AHP)
  - ❖ Composite score calculation
    - Walkability algorithm

# How does Walk this Way **work**?

- ❖ Weight estimation--AHP
  - ❑ A pairwise importance comparison between variables
  - ❑ Normalize each matrix element by the sum of elements in each column, calculate the sum for each row and then normalize the sum of the rows for the weights for each variable
  - ❑ Calculate the consistency ratio of the selection to validate its consistency



A simple  
AHP  
hierarchy

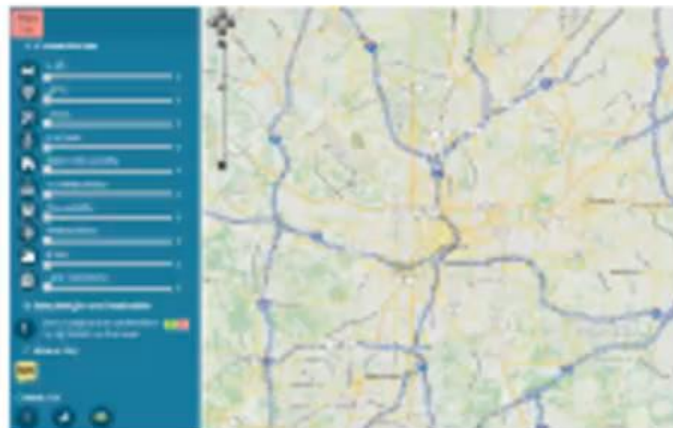


## Composite walk score calculation

$$WS_j = D_j \cdot \sum_{i=1}^n (V_i W_i)$$

Where  $WS_j$  is the walkability score of the street segment  $j$ ,  $D_j$  is the length of the street segment  $j$ ,  $n$  is the number of the attributes of walkability and  $V_i$  and  $W_i$  are the value and the weight for the attribute  $i$ , respectively.

# Applications



## Walkability

*(Preferred browsers: Firefox & Chrome)*



# The Extensions of Walk This Way

## App for Location Intelligence and Geospatial Navigation (ALIGN!)

### *Objective:*

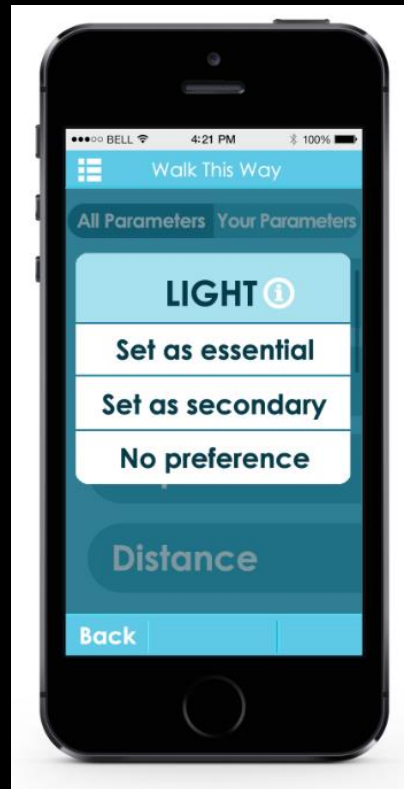
Develop and evaluate the feasibility of a mobile app (ALIGN) to inform outdoor route planning by people aging with ambulatory disabilities who are experiencing comorbid functional losses.



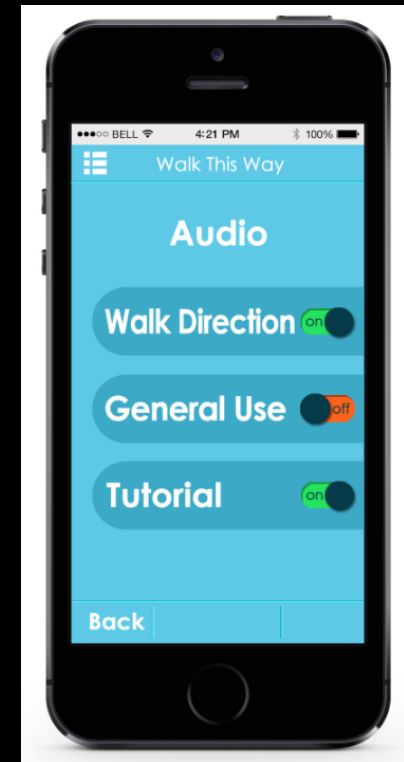
Included  
Feedback on  
Route Conditions



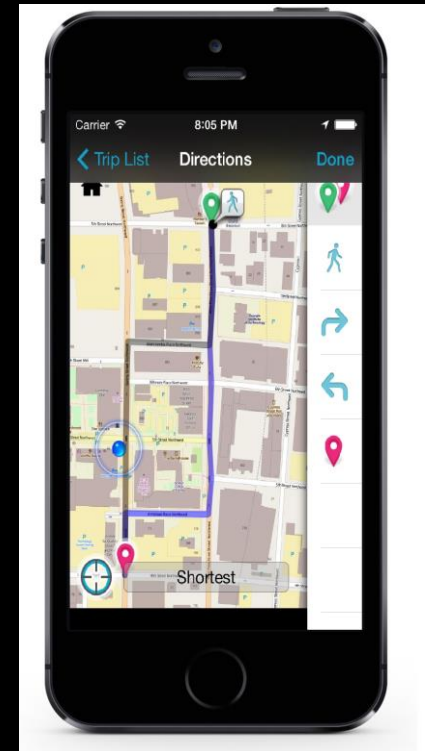
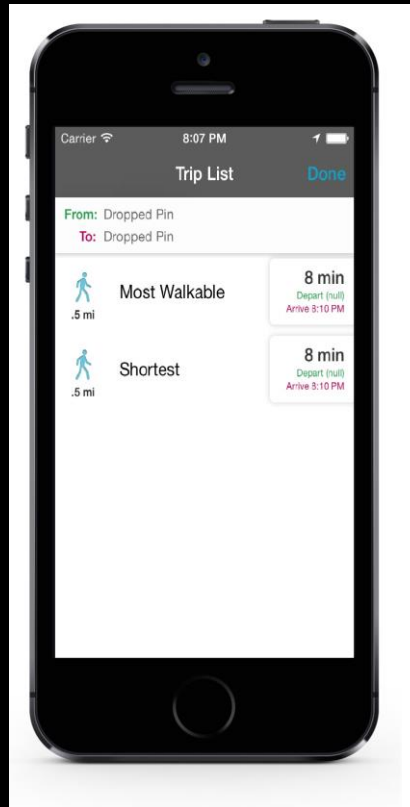
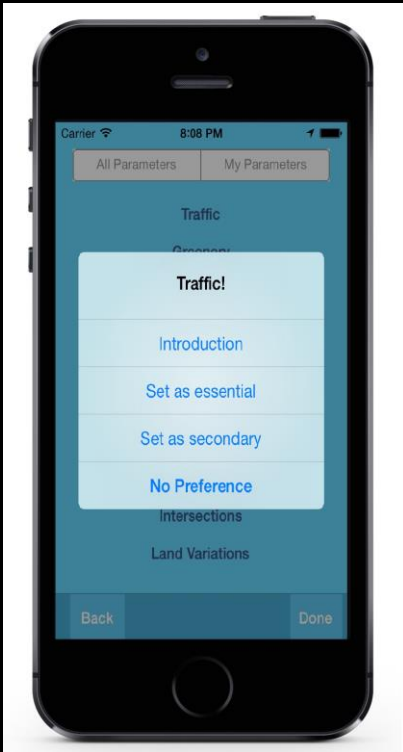
A Simpler Rating  
System (essential  
and secondary)



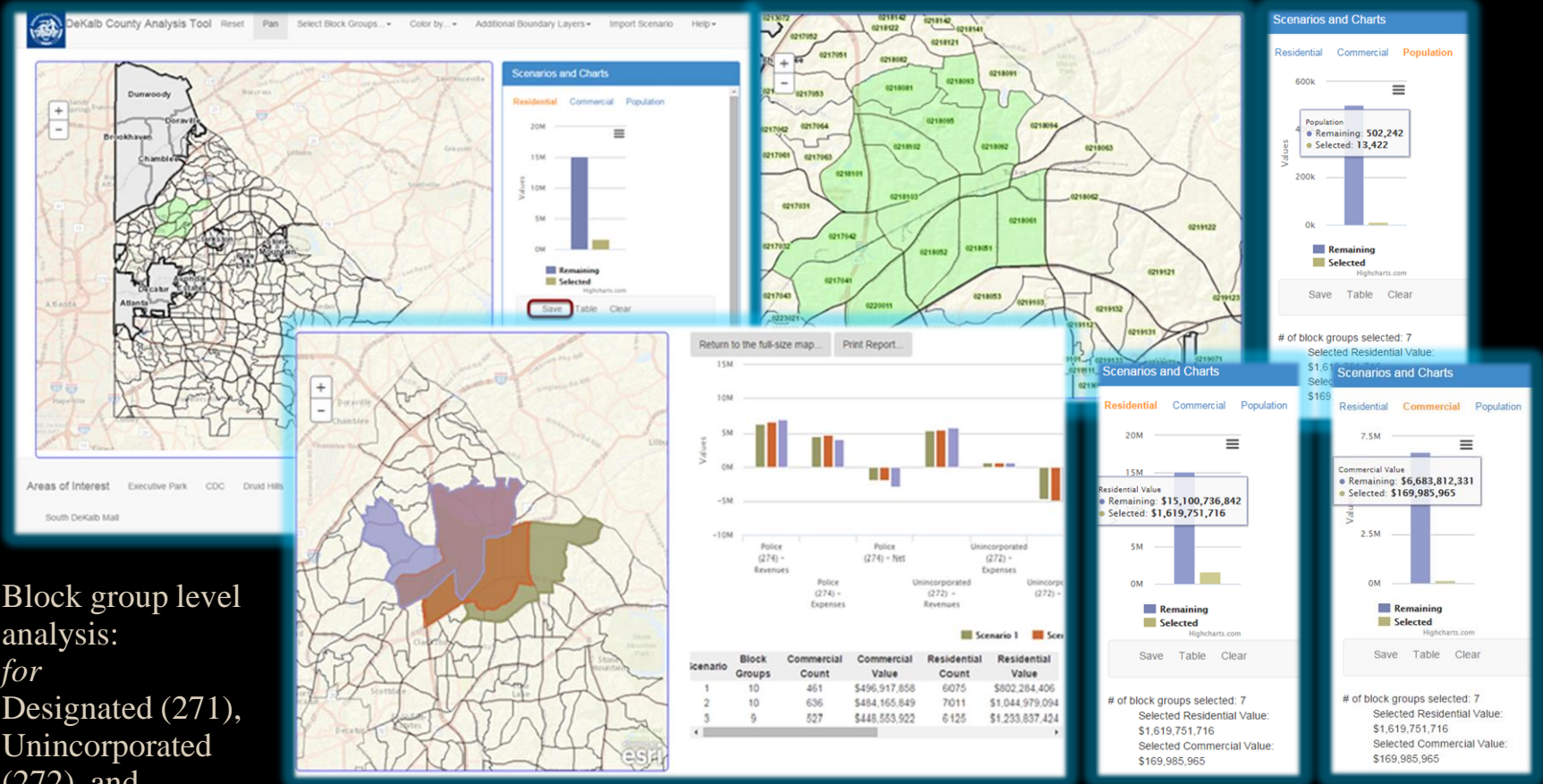
Included Audio  
Feedback



# User Interface Design



# Fiscal Analysis of Municipal Annexation



Block group level analysis:  
for Designated (271), Unincorporated (272), and Police (274) Funds



# Sustainability - Urban Forestry Management

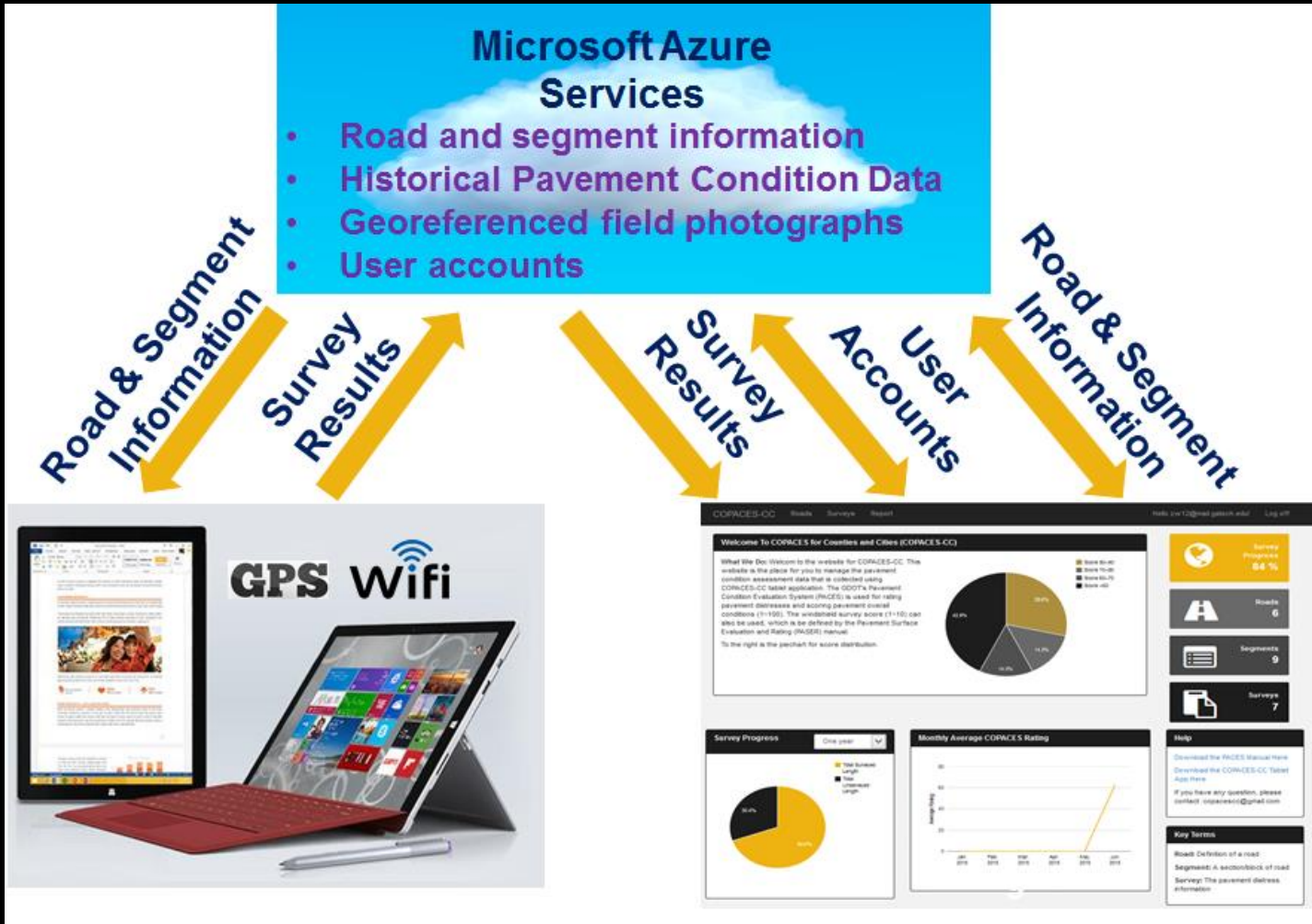


# Pavement Management for Georgia's Local Governments (1)

- There are 159 counties and more than 700 cities in Georgia
- Current Local Maintenance & Improvement Grant (LMIG) program requires governments in Georgia to evaluate the condition of their roadway pavements to determine and prioritize roadway treatments that will produce the highest return on investment
- We developed a Computerized Pavement Condition Evaluation System for Counties and Cities (COPACES-CC)



# Pavement Management for Georgia's Local Governments (2)



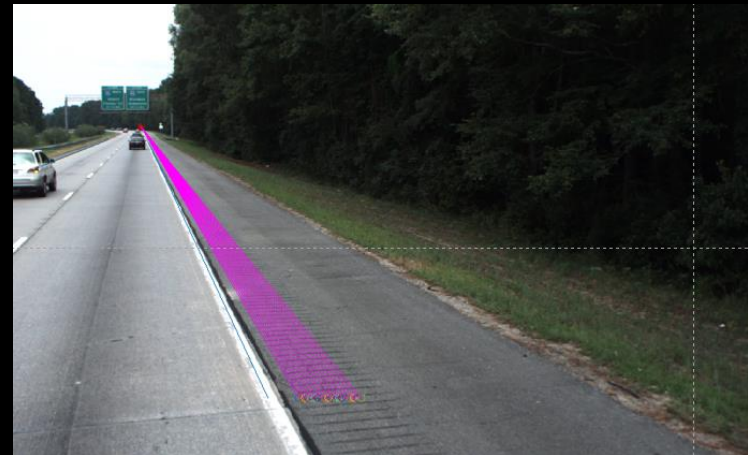


# Roadway Asset Inventory Using Videolog Images and Computer Vision (1)



- Videolog images have been widely used for roadway asset (signs, guardrails, rumble strips, etc.) inventory in State Departments of Transportation (DOTs)
- Georgia DOT has spent more than \$4 million and collected videolog images on 52,000 lane miles
- Visual inspection is very time consuming and labor intensive
- We are developing algorithms and applications to automate the data extraction process

# Roadway Asset Inventory Using Videolog Images and Computer Vision (2)





# ATLANTA TREE CANOPY STUDY

## SAPORTAREPORT

Valued voices share insights about Atlanta and beyond

Home Respected Voices Latest Reports About Us Photo Picks Thought Leaders Topics

MARIA DAVID ELEANOR TOM SABA JAMIL MAYNARD LANCE GUESTS

### DAVID PENDERED

#### Atlanta to invest nearly \$1 million in tree planting, programs about urban forest

September 28, 2015, 4:42 pm / 6 Comments

Share this:

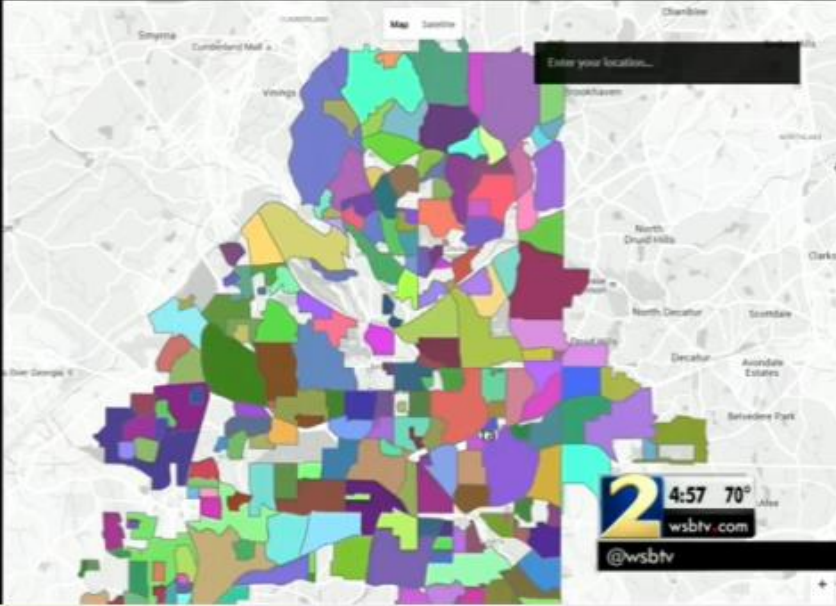
Facebook 1K+ LinkedIn 29 Reddit Tumblr Google+ Twitter 53 Email More

By David Pendered  
Trees Atlanta is slated to plant about 4,000 trees throughout Atlanta and provide various programs to teach people about the importance of trees, according to legislation pending before the Atlanta City Council.

CGIS 2015  
**TREE CANOPY**  
Atlanta

- Overall 100%
- Atlanta Neighborhoods 98%
- Central Neighborhoods 99%
- MTA 100%
- Parks 100%
- Corporates 100%
- Sub/Manufacture 100%
- Low Density/High Density 100%
- Waterfront Capacity 100%

**TREES ATLANTA**



's ongoing effort to maintain its t of the entire city, making country. But the canopy varies ; conducted on behalf of the velopment.

est canopy, at 71 percent. The n area spanning downtown nd Sweet Auburn, according to l released by the Atlanta Tree ppointed by the mayor and

ber and all trees are to be tend each tree for two years, ho's to pay for the replacement ends on the circumstances of the

trees in areas where the tree tudy completed in 2008.

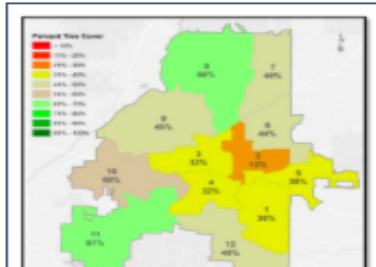
rided among Atlanta's 15 council bers is be asked to submit a trees, and is to receive 40 trees. rge posts, is to receive 40 trees at nclmembers.

t types of trees are to be selected, lanted at the appropriate time of ioner Amy Phuong is to be ertain locations for trees.

mmon size and provides a tree of half-inch to one inch, according



Atlanta intends to plant about 4,000 trees over the next 18 months to enhance the city's tree canopy, which is accessible to pedestrians who stroll along the Canopy Walk at the Atlanta Botanical Garden. Credit: 1460daysofgeorgia.wordpress.com



00:55 PAUSE share get code MENU



# City Grid

Divided the city into 6-acre  
(500 square feet) grid cells

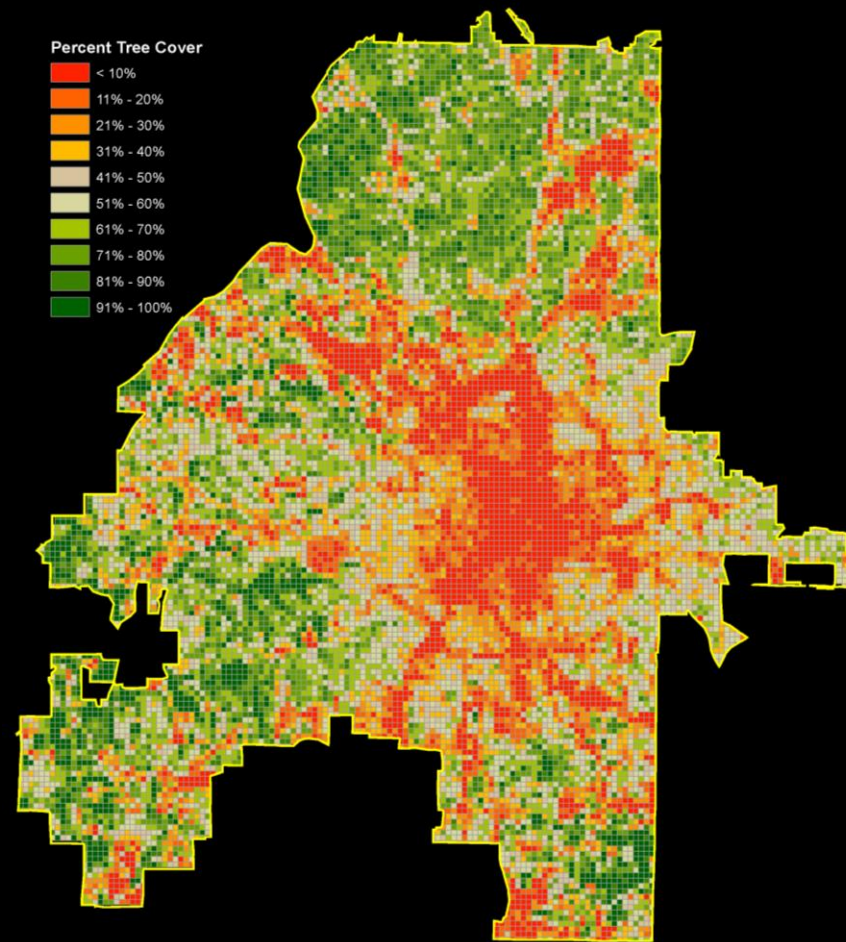


Aggregated tree cover across  
the city by grid cell

Calculated cover percentages  
for each cell

Cover percentages displayed in  
increments of ten

Grid helps convey the  
distribution of tree cover across  
the city



# How do we compare?

18 cities with recent UTC studies

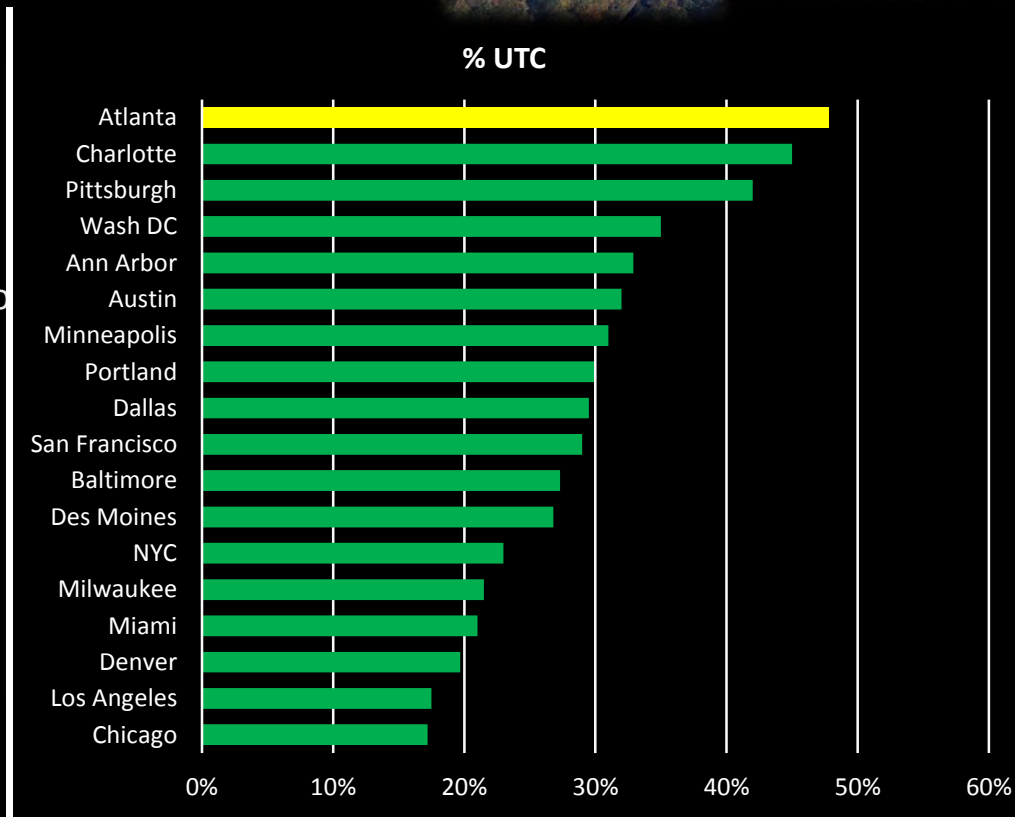


Highest tree cover in cities with:

- Naturally forested regions (East Coast)
- Large parklands (Minneapolis, Washington DC)
- Large single-family lots in city limits (Charlotte)

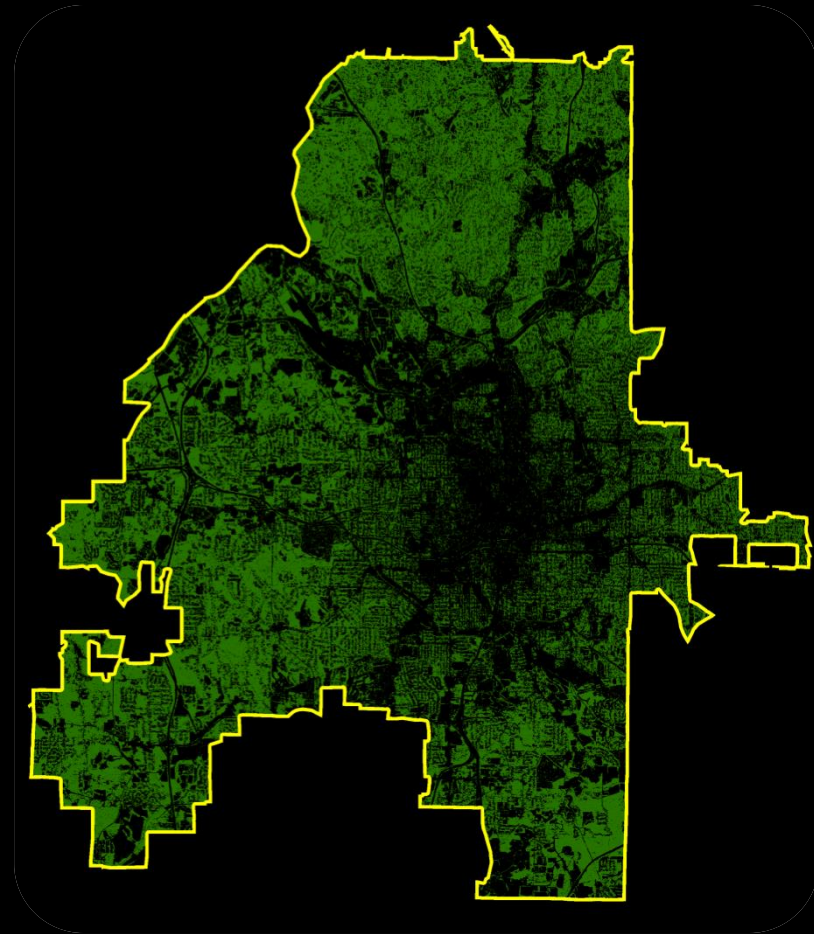
Should compare Atlanta against cities of similar:

- Geography
- Size
- Density



# Next Steps

In Progress - Follow-up study  
using 2014 WorldView2  
Satellite Imagery





Trees-mapping



Walk this way!



QoL and Health!



SPLOST Data Portal



Coastal Planning



GT Campus Sustainability



## RESEARCH THRUST III:

Web-based mapping, analysis, and routing applications



# THANK YOU

Visit us at [www.cgis.gatech.edu](http://www.cgis.gatech.edu)  
Follow us on Twitter and Facebook

Georgia Tech Home Map Directory Offices



Georgia Tech Center for Geographic Information Systems  
College of Architecture

Home About Portfolio Current Projects Interactive Maps Education Labs News And Events MS-GIST PROGRAM >

SEARCH

GT Home >

## Mapping Gorilla Movements in Rwanda

SEE HOW THEY MOVE >

Using a GIS-Based Fiscal Model to Analyze Municipal Incorporations



Pavement Maintenance Strategies

Managing Pavement Assets



Walk this Way! App

