

Use of Webcams and Crowdsourcing to Evaluate Physical Activity and Built Environment Change

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Funded by Washington University in St. Louis'
University Research Strategic Alliance

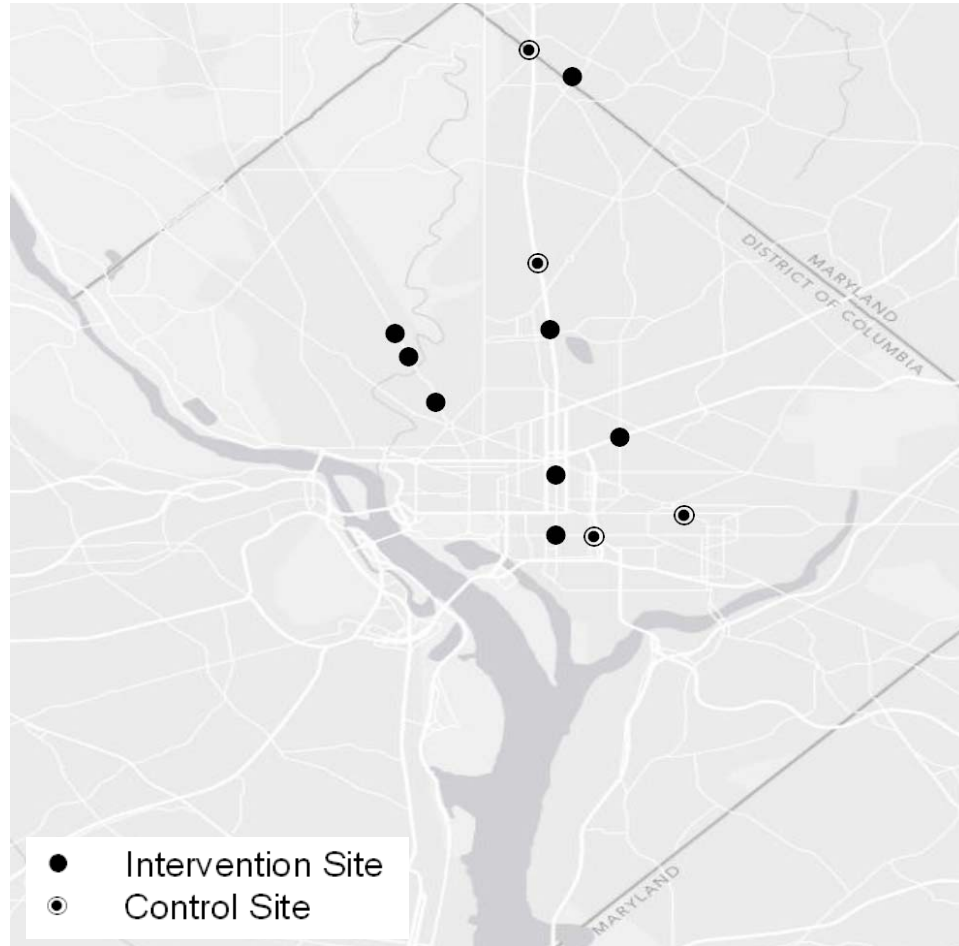
MMedia and
achines

computer science dept
washington university in st. louis



**PREVENTION
RESEARCH CENTER** in St. Louis
Promoting Healthy Communities

GEORGE WARREN
**BROWN
SCHOOL**
— of Social Work —



Objective:

Use innovative outdoor webcams and crowdsourcing methods to capture the prevalence of pedestrians and cyclists prior to and after BE changes

Active Living Research

Building Evidence to Prevent Childhood Obesity and Support Active Communities
www.activelivingresearch.org

RESEARCH BRIEF | *February 2013*



Counting Bicyclists and
Pedestrians to Inform
Transportation Planning

AMOS

Archive of Many Outdoor Scenes

<http://amosweb.cse.wustl.edu/>



2/15/13 7:31:39 AM

Fri Feb 15 2013 08:31:49 GMT-0600 (Central Standard Time)



Fri Sep 07 2012 11:58:00 GMT-0500 (Central Daylight Time)



Sat Feb 11 2012 10:58:38 GMT-0600 (Central Standard Time)

Compare to image from days ago [SHOW](#)

« Back

2012

Forward »



Day of Year ← Time of Day
<http://www.cerf.com/>

Image Information



Location: Cahokia, IL
 Temperature: 24 degrees (F)
 Sky conditions: Mostly Cloudy
 Weather data by: WEATHER CHANNEL

Camera Information

Name: St Louis Arch
 Date Added: Sep 28, 2011 at 14:08:48 UTC
 Last Captured: Feb 15, 2012 at 14:28:49 UTC
 Next Scheduled Capture Time: 9 minutes 20 seconds
 Active: ✓
 Tags: Buildings fountain hipp people trees water
 Dimensions: 800 X 480 pixels

★★★★★ (Current rating: 5.0)



2009

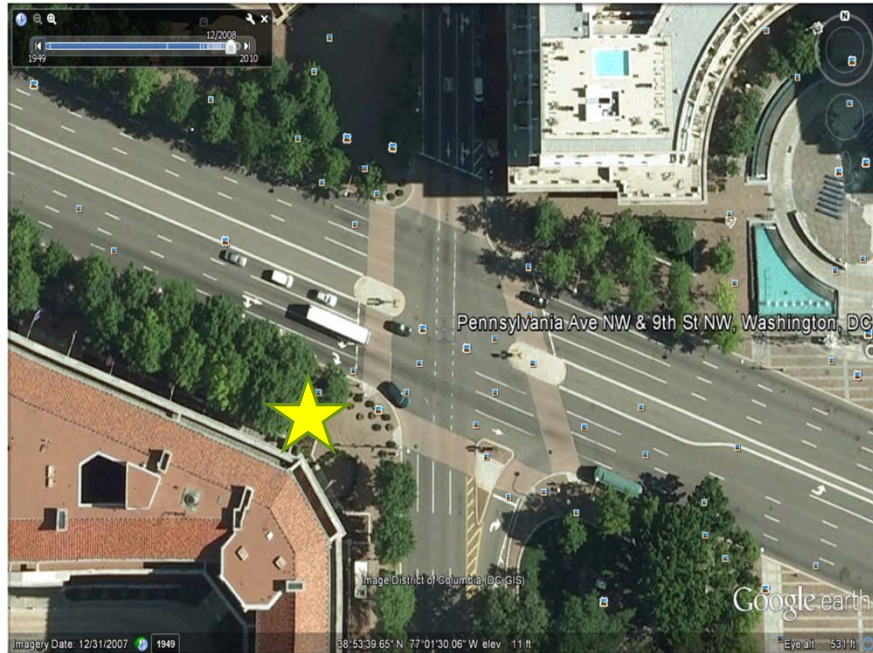
Pennsylvania Ave NW
& 9th St. NW
Washington, DC, USA

First work week of June
7:00am – 7:00pm
24 photos/day

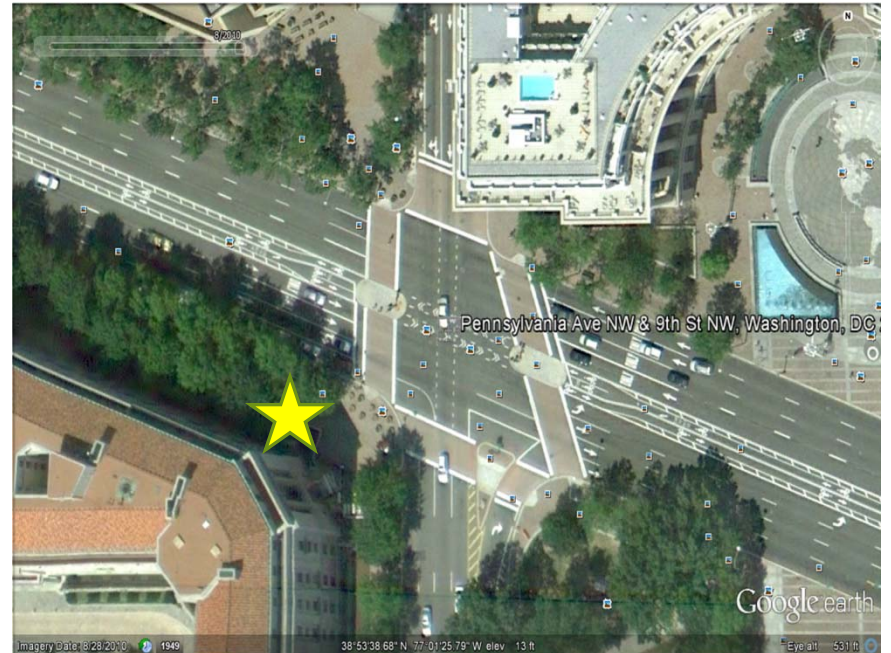


2010

2009



2010



Pennsylvania Ave NW and 9th St. NW
Washington, DC, USA

Crowdsourcing

Mechanical Turk is a marketplace for work.

We give businesses and developers access to an on-demand, scalable workforce. Workers select from thousands of tasks and work whenever it's convenient.

227,692 HITs available. [View them now.](#)

Make Money by working on HITs

HITs - *Human Intelligence Tasks* - are individual tasks that you work on. [Find HITs now.](#)

As a Mechanical Turk Worker you:

- Can work from home
- Choose your own work hours
- Get paid for doing good work



Get Results from Mechanical Turk Workers

Ask workers to complete HITs - *Human Intelligence Tasks* - and get results using Mechanical Turk. [Register Now](#)

As a Mechanical Turk Requester you:

- Have access to a global, on-demand, 24 x 7 workforce
- Get thousands of HITs completed in minutes
- Pay only when you're satisfied with the results



<https://www.mturk.com/>

Complete the following five steps to finish the HIT:

1. Find people

2. Find bikes

3. Find cars

4. Match scenes

5. Answer questions

STEP 1: Find all the people in this scene



Instructions:

- Left-click to place a dot.
- Right-click on a dot to remove it.
- Drag a dot to move it around.
- Place just one dot per person.
- Try to place dot at the center of
- **Do NOT label people who are ri**
- If there is no person, choose the the image

There is no person in this scene.

I am done with this step

Start over from step 1

Complete the following five steps to finish the HIT:

1. Find people

2. Find bikes

3. Find cars

4. Match scenes

5. Answer questions

STEP 1: Find all the people in this scene



Instructions:

- Left-click to place a dot.
- Right-click on a dot to remove it.
- Drag a dot to move it around.
- Place just one dot per person.
- Try to place dot at the center of person.
- If there is no person, choose the answer below the image

There is no person in this scene.

I am done with this step

Start over from step 1

262,138 35,168 21,169



Penn Ave & 9th - 2009



2010

Amazon Mechanical

Turks:

First work week of June

7:00am – 7:00pm

24 photos/day

5 workers per photo

\$US 0.01 per photo

1,200 data points for

US\$12.00



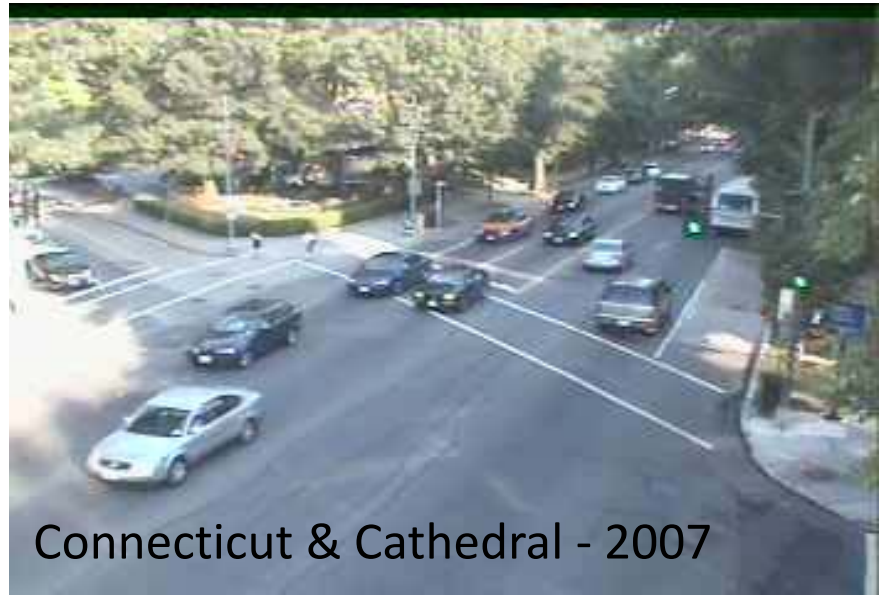
$\frac{3.57}{3.35}$



3.57***
(1.90, 6.71)



Connecticut & Calvert - 2007




Connecticut & Cathedral - 2007





2010




2010

 1.27
1.41

 3.03*
(1.59, 5.77)

 0.68
0.60

 1.81*
(1.03, 3.20)

Reliability

- Mturk Workers:
 - Pedestrians: 0.35 – 0.69
 - Cyclists: 0.16 – 0.49
- Trained Research Assistants:
 - Pedestrians: 0.86 – 0.91
 - Cyclists: 0.21 – 0.93



Validity

- Pedestrians:
 - 0.86
- Cyclists
 - 0.27



Future Directions and Conclusions

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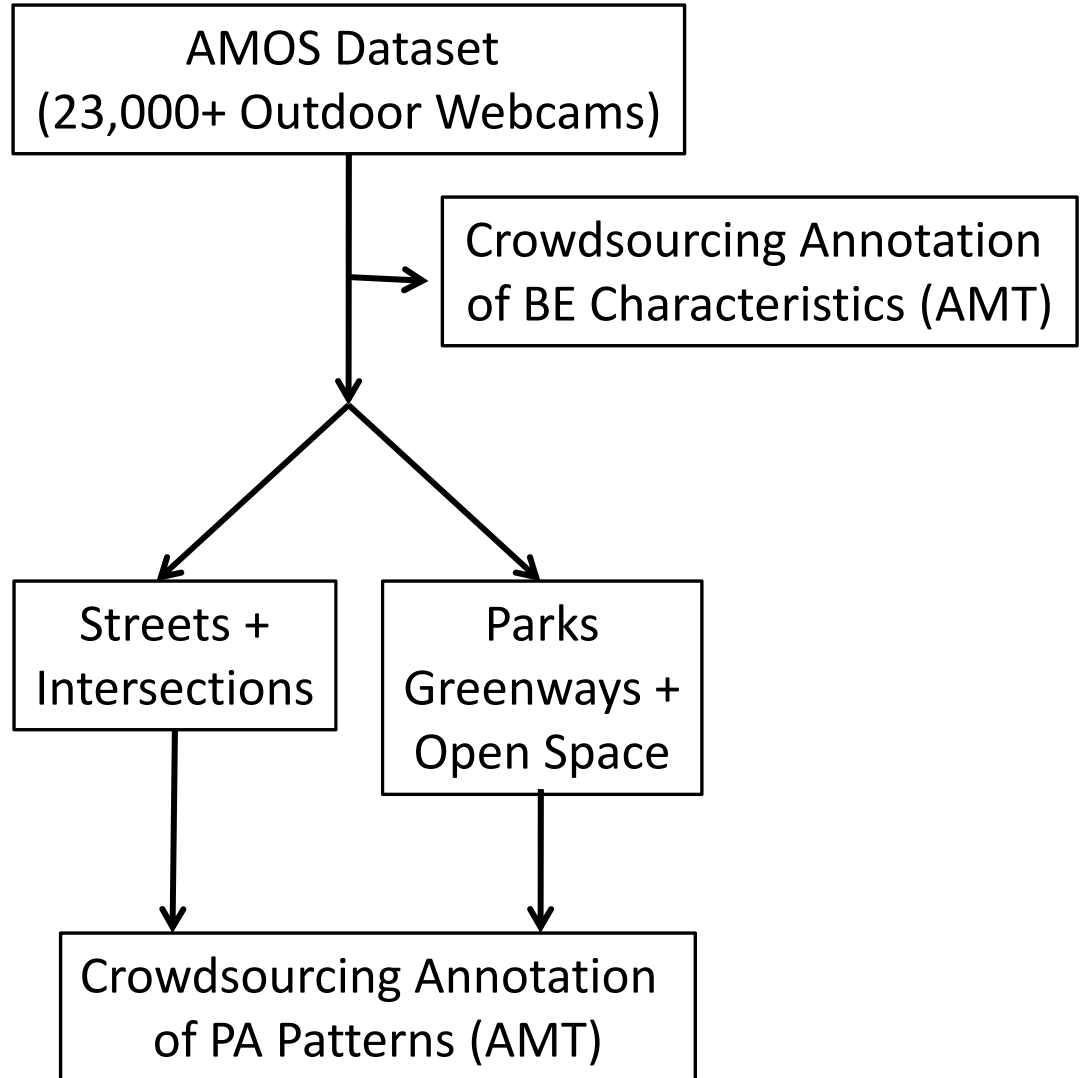
AMOS Dataset
(23,000+ Outdoor Webcams)

Crowdsourcing Annotation
of BE Characteristics (AMT)

Streets +
Intersections

Parks
Greenways +
Open Space

Crowdsourcing Annotation
of PA Patterns (AMT)



AMOS

347,891,268 images and counting

Thank you!

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<http://amosweb.cse.wustl.edu/>

<https://www.mturk.com/>

@drhipp

@rbpless