At the Intersection of Disability Justice, Pedestrian Safety, and Health

TRB workshop 2024
Standing Committee on Accessible Transportation and Mobility
Thank you to our team:
Valerie Novack, Xiaojun Qi, Camille Tirschner
Welcome!

1. Introduction: Why disability justice, pedestrian safety and health?
2. Section 1: Integrating accessibility planning with health planning, safety planning, environmental planning
3. Break
4. Section 2: Interactive tools for planning accessibility
HUMAN LABELING

Grab five post-its

Find a person

Why are you here?

Who do you know that can’t drive or doesn’t have reliable access to a car?

Write down response in 2-5 words

Stick it on shirt

Repeat until you’re out of stickers
LIVE DEMO!
HUMAN LABELING

Grab five post-its

Find a person

Why are you here?

Who do you know that can’t drive or doesn’t have reliable access to a car?

Write down response in 2-5 words

Stick it on shirt

Repeat until you’re out of stickers
PRESENTING LABELS

Need two volunteers

Present each other’s stories based on their labels

(An inductive analysis technique!)

Repeat 3x...
By the way, who’s here?
INTRODUCTION

Disability Justice

- Exclusion
- Inaccessibility
- Discrimination
- Alternative path
- Stairs
- Barriers
- Uneven sidewalks
- Missing Curb ramps
- Signage
- No audible signal
- Separate entrance
Lawsuits/settlement agreements 2000-2004

Project Civic Access 2000-2004 (37)

Private Lawsuits 2000-2004 (1)
Lawsuits/settlement agreements 2000-2014
Lawsuits/settlement agreements 2000-2023
INTRODUCTION

Disability Justice
INTRODUCTION - 3

Disability Justice

Pedestrian Safety

Public Health
Federal/National Policy and Initiatives: A Catalyst to Address Sidewalk Accessibility

Judy L. Shanley, Ph.D.
Asst. Vice President, Education & Youth Transition
National Director, Transportation & Mobility
Co-Chair, AME50 Committee on Accessibility and Mobility
Federal Policy Catalysts

- Federal Highway Administration (FHWA) recent dear colleague letter
  - Overview of the funding sources that can help implement ADA Transition Plans
  - Updated website will provide direct links to state DOT ADA Transition Plans and the inventory of structural barriers
- Federal Transit Administration
  - Coordinating Council on Access and Mobility (CCAM) Strategic Plan. Goal 2: Promote Safer and Accessible pedestrian networks – such as Complete Streets and Vision Zero.
- Discretionary grant programs
  - All Stations Accessibility Program (ASAP)
  - Innovative Coordinated Access and Mobility Grant Program
There are also Community Programs that Focus on Sidewalk Accessibility

• **Vision Zero** is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all.

• **Complete Streets** are streets for everyone. Complete Streets is an approach to planning, designing, building, operating, and maintaining streets that enables safe access for all people who need to use them, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities.

• **Healthy Aging.** Aging in place refers to the phenomena of older adults remaining in their homes and communities as they age, rather than relocating or moving into an institutional setting. The U.S. Centers for Disease Control and Prevention defines aging in place as:

  “the ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level.”
More Community Programs

- **Safe Routes to School (SRTS)** is an approach that promotes walking and bicycling to school through sidewalk, road, and pathway improvements, enforcement, tools, safety education, and incentives to encourage walking and bicycling to school.

- **America Walks** advances safe, equitable, accessible, and enjoyable places to walk and move by giving people and communities the resources to effectively advocate for change. Programs create walkable communities and work to increase the visibility and demand for public places that allow all people to move and walk in ways that are safe and make the most sense for them.

There are likely many more community programs that encourage accessible pathways!
Ways to Learn about Sidewalk Challenges

- People walking around and looking for sidewalk conditions – this is called a sidewalk audit
- Drones or cameras that fly over sidewalks and record information
- Web Tools like Project Sidewalk which enable people to remotely evaluate sidewalks (this is called crowdsourcing)
Judy Shanley
  - jshanley@easterseals.com
Scenario #1

Imagine you are working with a city to plan for improved pedestrian infrastructure and a senior staff member tells you - “No thanks, we do not want to know where there are sidewalk problems as we do not want to be liable”

Discuss how you would respond? Who would you involve?
Section 1: Integrating accessibility planning with health planning, safety planning, environmental planning
The Link Between Non-driving, Safety, and Health

Anna Zivarts
A Third of Us Can’t Drive

- 31 out of every 100 residents in the US lack a driver license (USDOT, 2020).
- Washington State: 30% of the population are nondrivers (JTC, 2023)
- Wisconsin DOT 31% of the population are nondrivers (2021).
Who Are Nondrivers?

- **Disabled People:** 19% of adult nondrivers in WA State can’t drive because of a disability (JTC, 2023)
- **Low-Income People:** Close to 15% of the WA population has an annual household income of less than $25,000. In contrast, more than 40% of nondriver survey respondents have a household income of less than $28,000 (JTC, 2023)
- **Seniors:** 18% of people older than 65 don't drive, 35% of women over 75 (AARP, 2022)
- **Youth:** In 2020, 25% of 16 year olds had driver’s licenses compared to 43% in 1997; 80% of 20-25 year olds have licenses, compared to 90% in 1997 (FHWA, 2021)
- **Black, Indigenous and Immigrant Communities:** (National Equity Atlas)
Survey respondents: reported negative impacts to their travel behavior and access to life opportunities

- Over 70% of surveyed nondrivers had travel plans negatively impacted at least one time in the past 30 days.
- This negative impact is defined as at least once a week or more often:
  - 23% of surveyed nondrivers will skip going somewhere because of transportation
  - 22% will be late when not driving
  - 34% percent worry about being able to get somewhere
  - 39% worry about inconveniencing friends and family
Emotional Burden of Asking for Rides

"Whenever I call or text somebody asking for a ride I start to wonder, are they going to get back to me or not? Should I call a second person? There are times I would rather walk, even several miles, than deal with the anxiety of finding a ride."

- Amanda, Everett

"It is beyond frustrating having to depend on others for transportation. It really affects me to the point where it's easier to just isolate myself in my room so I don't feel like a burden."

- Jaime, Pasco
On-Demand Rides Aren’t the Solution

“In the Blind community, not all Blind people have good jobs. Students and others are struggling financially, and Uber is expensive.”

- Amandeep, Everett

“People talk all the time about getting rides [from ride-hailing companies], but people in chairs can’t do that.”

- Jessica, Kent

“We don't even have Lyft or Uber here. All we have is one taxi, which doesn't run on Sundays, it only runs on certain hours on Saturdays.”

- Leah, Port Townsend
Housing and Land Use Matter

“[Housing] can be a struggle to figure out — can I walk to a grocery store if I need to, or is there a bus that can take me without having to transfer five times?”

- Chris, Vancouver

"More affordability means moving further out. Moving further out means more limited transportation.”

- Vaughn, Spokane
“An inch represents a foot if you're in a wheelchair. If you go over a bump, it's like you're going over a whole foot of a bump when you're walking regularly. When you're trying to go three blocks down the street on your side of the street, sometimes you have to go a nine-block radius to get to where you're going.” - Erin, Seattle

“One of the bigger barriers is that sidewalks are atrocious in many places. Sometimes they are completely nonexistent. And we’re in the part of the year where there’s a great deal of ice.” - Aileen, Yakima

Pedestrian Connectivity Is the Root of Access
Inclusive, accessible design can contribute to culture of sustainability

Brent Chamberlain
Sustainability

Infrastructure costs, maintenance, taxation

(micro) climate, habitat, food/agri, resource use

Jobs, accessibility, community inclusion, health

Disability
Justice

Pedestrian
Safety

Public
Health
Economic and Infrastructure

Initial costs

Maintenance

Taxes and land value
Suburban Homes
Rural Home
Apartments and Condos
Commercial Districts
Social Inclusion and Well-being

Jobs access
Transportation accessibility
Community inclusion
Health
Ageing Process and Transportation

Exploration and play
Ageing Process and Transportation

Independence, healthy habits
Ageing Process and Transportation

Healthy lifestyle & exercise, significant environmental impacts
Ageing Process and Transportation

Health maintenance, time flexibility
Ageing Process and Transportation

Health maintenance, time flexibility
Pedestrian Problems
Inclusive Design & Benefits for All
Environmental Impacts

Habitat

Food and Agriculture

Resource use
Landuse Change
Inclusive Design = Sustainability

Inclusive Design = Higher *Initial* Costs = Lower or Smarter Land Development = Improved Sustainability
Community planning for participation and employment outcomes

Keith Christensen
Community Planning
  ◦ Social - Participation
  ◦ Economic - Employment
  ◦ Environmental - Access (Housing & Transportation)
Step 1 - Participation
Step 2 - Identify

- Demands of the environment
  - Physical
  - Psychological
  - Social

- A person’s abilities
  - Physical
  - Psychological
  - Social
● Process
  ○ Participation in planning process.
  ○ Established lived experience outcomes goal.
  ○ Identify unnecessary demands
  ○ Identify mitigation strategies
  ○ Identify reduction strategies
  ○ Prioritize strategies
Scenario #2

Imagine that the city manager tells you that “There is no time or funding for disability inclusive city planning.”

What are existing or upcoming planning efforts that can be linked to planning for disability inclusive cities?

What challenges might there be to linking planning initiatives?
Break
Section 2: Interactive tools for planning accessibility
Artificial Intelligence Community Contributions to Map and Assess Transit Accessibility

Jon Froehlich
AI + COMMUNITY

MAPPING AND ASSESSING TRANSIT ACCESSIBILITY AT SCALE

Jon E. Froehlich, Computer Science, UW
Yochai Eisenberg, Disability & Human Development, UIC
Delphine Labbé, Disability & Human Development, UIC
Joy Hammel, Disability & Human Development, UIC
Judy Shanley, Assistant Vice President, Easterseals
Brent Chamberlain, Landscape Architecture & Planning, Utah State
Valerie Novack, Disability Rights Advocate / Policy Researcher

Presented at TRB’s Workshop on “At the Intersection of Disability Justice, Pedestrian Safety, and Health”, Jan 7, 2024
Public transit & sidewalks are critical infrastructure.
INDEPENDENCE,
QUALITY OF LIFE,
PHYSICAL ACTIVITY

Thapar et al., 2004; Nuernberger, 2008
PHYSICAL OBSTACLES
Sidewalk that unexpectedly ends.
IN ACCESSIBLE BUS STOP
THE PROBLEM IS NOT JUST A LACK OF ACCESSIBLE INFRASTRUCTURE.

A LACK OF DATA.
The National Council on Disability notes that there is **no comprehensive information** on “the degree to which sidewalks are accessible” in cities.

*National Council on Disability, 2007*

The impact of the Americans with Disabilities Act: Assessing the progress toward achieving the goals of the ADA
BACKGROUND

STUDY OF OPEN DATA ON SIDEWALKS

178 US CITIES

54% OPEN STREET DATA
20% SIDEWALKS
10% CURB RAMPS
<5% BASIC ACCESSIBILITY INFO

Are communities in the United States planning for pedestrians with disabilities? Findings from a systematic evaluation of local government barrier removal plans

Yoshai Eisenberg, Amy Heider, Rob Gould, Robin Jones


STUDY OF ADA TRANSITION PLANS

13% w/ADA transition plans
1.7% Met minimum requirements

Local Governments

401
We are pursuing a **two-fold solution**
To develop new data collection methods that combine crowdsourcing + AI
To create new urban accessibility analytics not previously possible

Access Score_{\text{beta}}

Use the sliders below to adjust the significance of each accessibility feature.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curb Ramp</td>
<td>52</td>
</tr>
<tr>
<td>No Curb Ramp</td>
<td>100</td>
</tr>
<tr>
<td>Obstacle</td>
<td>50</td>
</tr>
<tr>
<td>Surface Problem</td>
<td>48</td>
</tr>
</tbody>
</table>
SCALABLE TECHNIQUES TO MAP & ASSESS TRANSIT INFRASTRUCTURE THROUGHOUT THE WORLD
Online map imagery + Remote crowdsourcing interfaces + Machine learning

Labeling missions

Validation missions

Human labels

Project Sidewalk
http://projectsidewalk.io
MACHINE LEARNING

OUTCOMES

New Urban Analytics

Interactive visualization tools

Improved urban planning

New Urban Analytics

Improved government transparency
REMOTE CROWDSOURCING

LABELING MEXICO CITY FROM GERMANY!

Source: Edgar Martínez, Liga Peatonal
How to Use
PROJECT SIDEWALK
PROJECT SIDEWALK

TWO DATA COLLECTION MISSIONS

1 FIND, LABEL, & ASSESS SIDEWALKS

2 VALIDATING & CORRECTING LABELS
In this Street View image, we have drawn an arrow to a curb ramp. Let's label it. Click the flashing "Curb Ramp" button above.
Explore 250 ft in Central Oradell

Your mission is to explore 250 ft in Central Oradell and find all the accessibility features that affect mobility impaired travelers!
Explore the streets and find all the accessibility attributes.
Click Surface Problem
Explore the streets and find all the accessibility attributes:

- Passable:
  - 1: Not passable
  - 2
  - 3
  - 4
  - 5
- Description (optional)
- Add Tags:
  - pole
  - tree
  - vegetation
  - trash/recycling can
  - parked car
  - sign
  - garage entrance
  - stairs
  - street vendor
  - height difference
  - narrow
  - litter/garbage
  - parked scooter/motorcycle
- Temporary (e.g., construction)

Example Obstacle Tags:
- Tree
- Fire hydrant
- Parked car
- Pole
- Garbage/recycling can
- Stairs
- Vegetation
- Height difference

Google Jan 2010
PROJECT SIDEWALK

TWO DATA COLLECTION MISSIONS

1. FIND, LABEL, & ASSESS SIDEWALKS
2. VALIDATING & CORRECTING LABELS
Is this an **Obstacle**?

![Image of a street scene with a bicycle and a car on the road.]

Options:
- **Agree**
- **Disagree**
- **Not sure**

Add comment here...
This is a driveway, not a curb ramp
Is this a Missing Curb Ramp?
Is this a Missing Curb Ramp?

- Agree
- Disagree
- Not sure
Is this a **Missing Curb Ramp?**

Correct Examples

Incorrect Examples

Add comment here...
This is a residential walkway. It is not intended to be a street crossing.
Is this a **Surface Problem**?

**NOT ON THE PEDESTRIAN PATHWAY**
Is this a **Surface Problem?**

![Image of a surface problem]

**Correct Examples**

**Incorrect Examples**

---

**Agree**

**Disagree**

**Not sure**

Add comment here...
Is this an **Obstacle**?

**POLE IS NOT AN OBSTACLE HERE**
Sidewalks often have buffer zones.
Only mark barriers in the pedestrian path.
We also try to make Project Sidewalk **fun** and **educational**
Your missions: 140
Distance: 2.03 mi
Labels: 568
Validations: 1249
Accuracy: 90.7%

Achievements

Missions
Congratulations, you've earned all mission badges!

Labels
Great job! 432 more labels until your next achievement.

Distance
Thanks for helping! 2.97 more miles until your next achievement.

Validations
Amazing work! 3751 more validations until your next achievement.
### Overall Leaderboard

Leaders are calculated based on their labels, missions, distance, and accuracy.

<table>
<thead>
<tr>
<th>#</th>
<th>Username</th>
<th>Labels</th>
<th>Missions</th>
<th>Distance</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>mariana.velasco</td>
<td>2894</td>
<td>150</td>
<td>9.6 miles</td>
<td>85.3%</td>
</tr>
<tr>
<td>2</td>
<td>maria</td>
<td>1918</td>
<td>51</td>
<td>9.0 miles</td>
<td>89.1%</td>
</tr>
<tr>
<td>3</td>
<td>abarragan99</td>
<td>1895</td>
<td>81</td>
<td>2.7 miles</td>
<td>86.5%</td>
</tr>
<tr>
<td>4</td>
<td>marian.trevino</td>
<td>1543</td>
<td>66</td>
<td>9.4 miles</td>
<td>82.2%</td>
</tr>
<tr>
<td>5</td>
<td>dordaz</td>
<td>1483</td>
<td>46</td>
<td>3.5 miles</td>
<td>84.2%</td>
</tr>
<tr>
<td>6</td>
<td>Gerardo R</td>
<td>1274</td>
<td>86</td>
<td>5.4 miles</td>
<td>87.6%</td>
</tr>
<tr>
<td>7</td>
<td>mariagarza</td>
<td>1205</td>
<td>62</td>
<td>9.4 miles</td>
<td>87.2%</td>
</tr>
<tr>
<td>8</td>
<td>ana.alvarezc</td>
<td>1053</td>
<td>63</td>
<td>9.8 miles</td>
<td>84.8%</td>
</tr>
<tr>
<td>9</td>
<td>Gari01234</td>
<td>848</td>
<td>62</td>
<td>4.6 miles</td>
<td>89.1%</td>
</tr>
<tr>
<td>10</td>
<td>Luis Gonzalez</td>
<td>812</td>
<td>59</td>
<td>9.7 miles</td>
<td>94.1%</td>
</tr>
</tbody>
</table>

Want to make it into the Top 10? [Start exploring!](#)
PROJECT SIDEWALK

DEPLOYMENTS AND PARTNERSHIPS
20 CITIES, 10K MILES, 1.5M DATA POINTS

13K USERS
913K LABELS
609K VALIDATIONS
What can we do with all this data?

Enable new urban analytics
Triage and fix high-priority problem areas
Inform and evaluate policy
Track government progress
Train machine learning algorithms
...

"What can we do with all this data?"

"Enable new urban analytics
Triage and fix high-priority problem areas
Inform and evaluate policy
Track government progress
Train machine learning algorithms
..."
LET'S TRY IT!
Let's start with validations

Let's create a path for everyone

Start Exploring Chicago

We are also in: Columbus, OH, Teaneck, NJ, Newberg, OR, Amsterdam, Netherlands
Let's start with validations

Let's create a path
YOUR MISSION

Validate 10 Crosswalk Labels

CORRECT EXAMPLE

Crosswalk

A crosswalk is a legally defined space to cross a road.

Crosswalks are often indicated by parallel dashed lines.

Start mission
JON SWITCHES TO LIVE DEMO MODE
WHAT CAN WE DO WITH ALL THIS DATA?

Enable new urban analytics
Triage and fix high-priority problem areas
Inform and evaluate policy
Train machine learning algorithms
...

What can we do with all this data?
PILOT DEPLOYMENT IN 2017

Audit the streets and find all the accessibility attributes

Current Neighborhood
Monumental Core, D.C.
Distance: 0.1 miles

Current Mission
Audit 1000ft of this neighborhood

Washington DC
WASHINGTON DC

1,400 USERS
260,388 LABELS
92% ACCURACY
AGGREGATE PROBLEM DENSITY HEATMAP
Anacostia
Lower socio-economic area
92% Black, 5% Non-Hispanic White, 3% Other
Georgetown
Highly affluent, historic area
82% White, 8.7% Asian, 6.2% Black,

Anacostia
Lower socio-economic area
92% Black, 5% Non-Hispanic White, 3% Other
This is the potential of data-driven urban accessibility analytics using Project Sidewalk data.
All our code + data is 100% open source

https://github.com/ProjectSidewalk

http://projectsidewalk.io/api
A city is only as accessible as its sidewalks. This map shows DC’s are often blocked.

When Washingtonians like myself look for new apartments, we pay close attention to the walk score of a neighborhood. Any score upwards of 90 on a hundred point scale marks an area as a “walker’s paradise,” meaning major needs such as grocery stores and transit are within walking distance. However, what is not factored into the walkability score is the actual condition of the sidewalks.
These efforts are **making a difference**. 
Transforming **policy**. 
Informing **urban design**. 
Creating better, more **equitable transit networks**.
Newberg, OR

http://newberg.projectsidewalk.org
NEWBERG, OR
http://newberg.projectsidewalk.org

235
USERS

17,400
LABELS

12,500
VALIDATIONS

Missing Sidewalks
Missing Curb Ramps
Surface Problems
Obstacles
Curb Ramps
Newberg, OR using data to support new accessibility policies

Missing Sidewalks
Missing Curb Ramps
Surface Problems
Obstacles

City of Newberg
January 30 at 9:29 AM

Congratulations and THANK YOU to the citizens of Newberg for putting in the work to map 100% of Newberg through Project Sidewalk. That's over 107 miles covered with 264 local users who contributed to the data.

This information will be used to identify areas in Newberg that need sidewalks, need sidewalk repairs, and need to be updated to become more accessible. Through your efforts, Newberg can become a safer, more accessible community.

Looking to help? Verifications are still needed for the collected data. Click the link below to learn more.
Oradell Girl Scouts
National Multiple Sclerosis Society
Bergen Multiple Sclerosis Community Council
Hackensack Meridian School of Medicine

Oradell, NJ
ORADELL DEPLOYMENT

SIDEWALK DATA

- Curb Ramps
- Missing Curb Ramps
- Obstacle
- Surface Problems
- Missing Sidewalk
- Occlusion
- Crosswalk
- Signal
- Other

Bar chart showing data distribution:
- Curb Ramps: 733
- Missing Curb Ramps: 381
- Obstacle: 161
- Surface Problems: 1542
- Missing Sidewalk: 2458
- Occlusion: 124
- Crosswalk: 231
- Signal: 2
- Other: 6

Legend:
- Green: Curb Ramps
- Pink: Missing Curb Ramps
- Blue: Obstacle
- Orange: Surface Problems
- Purple: Missing Sidewalk
- Gray: Occlusion
- Yellow: Crosswalk
- Light Green: Signal
- Other: Gray

Scale:
- 500 m
- 2000 ft

Map with various colored markers indicating different types of sidewalk data issues.
## ORADELL DEPLOYMENT

### TAG ANALYSIS

<table>
<thead>
<tr>
<th>Surface Problem Tags</th>
<th>Count</th>
<th>% of Surface Tags</th>
<th>Avg Severity (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>height difference</td>
<td>1455</td>
<td>29.0%</td>
<td>1.96 (0.99)</td>
</tr>
<tr>
<td>cracks</td>
<td>1256</td>
<td>25.0%</td>
<td>1.71 (0.79)</td>
</tr>
<tr>
<td>uneven/slanted</td>
<td>1031</td>
<td>21.0%</td>
<td>2.34 (1.02)</td>
</tr>
<tr>
<td>grass</td>
<td>547</td>
<td>11.0%</td>
<td>1.46 (0.63)</td>
</tr>
<tr>
<td>very broken</td>
<td>235</td>
<td>5.0%</td>
<td>2.44 (1.04)</td>
</tr>
<tr>
<td>bumpy</td>
<td>177</td>
<td>4.0%</td>
<td>2.25 (0.92)</td>
</tr>
<tr>
<td>n/a</td>
<td>90</td>
<td>2.0%</td>
<td>2.00 (1.02)</td>
</tr>
<tr>
<td>narrow sidewalk</td>
<td>88</td>
<td>2.0%</td>
<td>2.59 (0.93)</td>
</tr>
<tr>
<td>brick/cobblestone</td>
<td>74</td>
<td>1.0%</td>
<td>1.95 (0.72)</td>
</tr>
<tr>
<td>sand/gravel</td>
<td>47</td>
<td>1.0%</td>
<td>2.26 (0.94)</td>
</tr>
<tr>
<td>construction</td>
<td>2</td>
<td>0.0%</td>
<td>4.00 (n/a)</td>
</tr>
<tr>
<td>street has no sidewalks</td>
<td>1</td>
<td>0.0%</td>
<td>3.00 (n/a)</td>
</tr>
</tbody>
</table>

**Surface Problem**

![Image of a street with a highlighted height difference issue]

- **Severity**: 😞 😞 😞 😞
- **Tags**: height difference, uneven/slanted
- **Temporary**: No
- **Description**: No description
HIGH SEVERITY (≥ 4) SURFACE PROBLEMS
Creemos un camino para todas las personas

CÓMO PUEDES AYUDAR

Explora virtualmente las calles de la ciudad para encontrar lugares con problemas de accesibilidad.
Project Sidewalk provides us with data that is essential to improving San Pedro’s urban accessibility. With Project Sidewalk, we know the main problems to be solved, how many problems there are, and their location... The results will be used to inform a new Pedestrian Master Plan for our municipality.
CURB RAMPS
SEVERITY RATING 5
http://sidewalkgallery.io/

Narrow + obstacle
Steep
Not enough landing space
Points into traffic
Narrow
No friction/tactile strip
Not level with street
Steep + obstacle
Steep
Poor design
NEW CURB RAMP IS NOT ACCESSIBLE. CAN ONLY BE ENTERED FROM ONE DIRECTION.
Where does AI come in?
DEPLOYMENTS

20 CITIES, 10K MILES, 1.5M DATA POINTS

13K USERS
913K LABELS
609K VALIDATIONS
Online map imagery + Remote crowdsourcing interfaces = Human labels → Machine learning

Labeling missions

Validation missions

Human labels
HOW CAN WE USE AI TO IMPROVE DATA QUALITY & INCREASE ASSESSMENT SPEED?

ONLINE MAP + REMOTE CROWDSOURCING

Validation missions

MACHINE LEARNING

HUMAN LABELS
YOLOv8 Trained on Mapillary and Project Sidewalk Data
YOUR MISSION

Validate 65 Obstacle in Path Labels

CORRECT EXAMPLE

Obstacle in Path

Obstacles are barriers that impede pedestrian pathways for people using wheelchairs, walkers, or other mobility aids.

Not all fire hydrants, poles, and signs are obstacles—only those that clearly obstruct pedestrian paths.

Correct label
Mark Agree

Start mission
Overarching Research Questions

How can we use AI to infer when humans are making mistakes and intervene?

How to design those interventions?
Overarching Research Question

With advances in AI, how can we completely reconfigure the labeling flow in Crowd+AI streetscape labeling?

BusStopCV: A Real-time AI Assistant for Labeling Bus Stop Accessibility Features in Streetscape Imagery

Minchu Kulkarni1,2, Chu Li1, Zhihan Zhang1, Michael Saugstad2, Brent Chamberlain2, Jaye Ahn1,2, Katrina Ma1, Yochai Eisenberg4, Valerio Novack2, Jon E. Froehlich1

1Allen School of Computer Science, University of Washington
2MICS-D Program
3Human-Centered Design and Engineering, University of Washington
4Disability and Human Development, University of Illinois Chicago
5Landscape Architecture & Environmental Planning, Utah State University

ABSTRACT
Public transportation provides vital connectivity to people with disabilities, facilitating access to work, education, and health services. While modern navigation applications provide a suite of information about transit systems—including real-time updates about bus or train arrivals—they lack data about the accessibility of the transit stops themselves. Bus stop features such as shelters, benches, and handrails are critical, but few cities provide this information. In this paper, we introduce BusStopCV, a Human-AI with prototype for scalable collecting data on bus stop features using real-time computer vision and human labeling. We describe BusStopCV’s design, custom training with the YOLOV3 model, and an evaluation of 100 randomly selected bus stops in Seattle, WA. Our findings demonstrate the potential of BusStopCV and highlight opportunities for future work.

KEYWORDS
urbans accessibility, bus stops, accessible transit systems, computer vision, crowdsourcing
BusStopCV: A real-time AI assistant for labeling bus stop accessibility features in streetscape imagery

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Thank you!
What are some potential tensions with relying on AI for data collection and/or validation?

How could we address those tensions?

Should AI be used to assess transit infrastructure?

What would be necessary to make it deployable in your organization or city?
Discussion #3

What are some **potential tensions** with relying on AI for data collection and/or validation?

How could we **address** those tensions?

**Should AI be used** to assess transit infrastructure?

What would be **necessary to make it deployable** in your organization or city?
Visualization tools for community planner

Minoo Abrishami
Inclusive planning

Sustainability

Equity

Visualization

different scales

Scoring mechanism

Accessibility issues

Elements of sidewalks

AI-generated data
## Developing metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Direct of impact on Sidewalk Score</th>
<th>Assigning weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street speed limit beside the sidewalks</td>
<td>Increasing this degrades the Sidewalk Score</td>
<td>0.5</td>
</tr>
<tr>
<td>Number of crosswalks for each sidewalk</td>
<td>Increasing this improves the Sidewalk Score</td>
<td>0.65</td>
</tr>
<tr>
<td>Number of signs for each sidewalk</td>
<td>Increasing this improves Sidewalk Score</td>
<td>0.76</td>
</tr>
<tr>
<td>Number of curb ramps for each sidewalk</td>
<td>Increasing this improves the Sidewalk Score</td>
<td>0.87</td>
</tr>
<tr>
<td>Number of stairways in each sidewalk</td>
<td>Increasing this degrades the Sidewalk Score</td>
<td>0.45</td>
</tr>
<tr>
<td>Sidewalk Width</td>
<td>Increasing this improves the Sidewalk Score</td>
<td>0.54</td>
</tr>
<tr>
<td>Obstacles, obstructed pathways, temporary barriers, or temporary barriers</td>
<td>Increasing this degrades the Sidewalk Score</td>
<td>0.61</td>
</tr>
<tr>
<td>Connections with public transit</td>
<td>Increasing this improves the Sidewalk Score</td>
<td>0.47</td>
</tr>
</tbody>
</table>
Maps of system-wide transportation accessibility provide a spatial view of issues.

Scorecard and metrics give an overview of status and progress.

AI automatically identifies accessible infrastructure from Google Street view.
Discussion #4

- How could visualizations be used to prioritize infrastructure improvements?
- What visualizations would be most useful for convincing policymakers?
- What kinds of metrics or analytics would be most useful for your efforts?
Action Planning Activity

Action planning to incorporate new tools locally

- When walk out what will you do
- How can you tie these efforts to linking existing and upcoming planning efforts for health, safety and environment
Thank you!