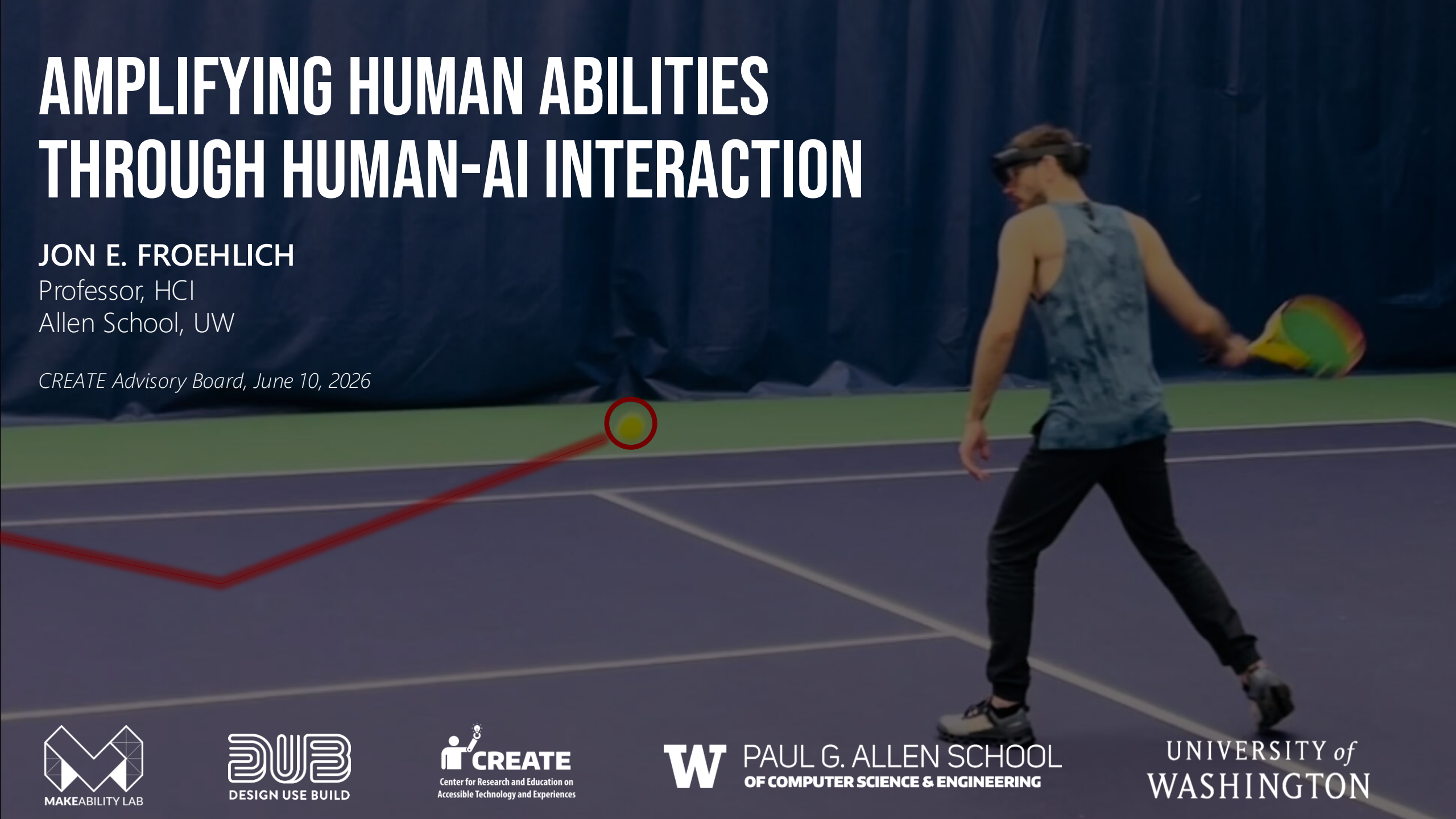
AMPLIFYING HUMAN ABILITIES THROUGH HUMAN-AI INTERACTION

JON E. FROEHLICH
Professor, HCI
Allen School, UW

CREATE Advisory Board, June 10, 2026



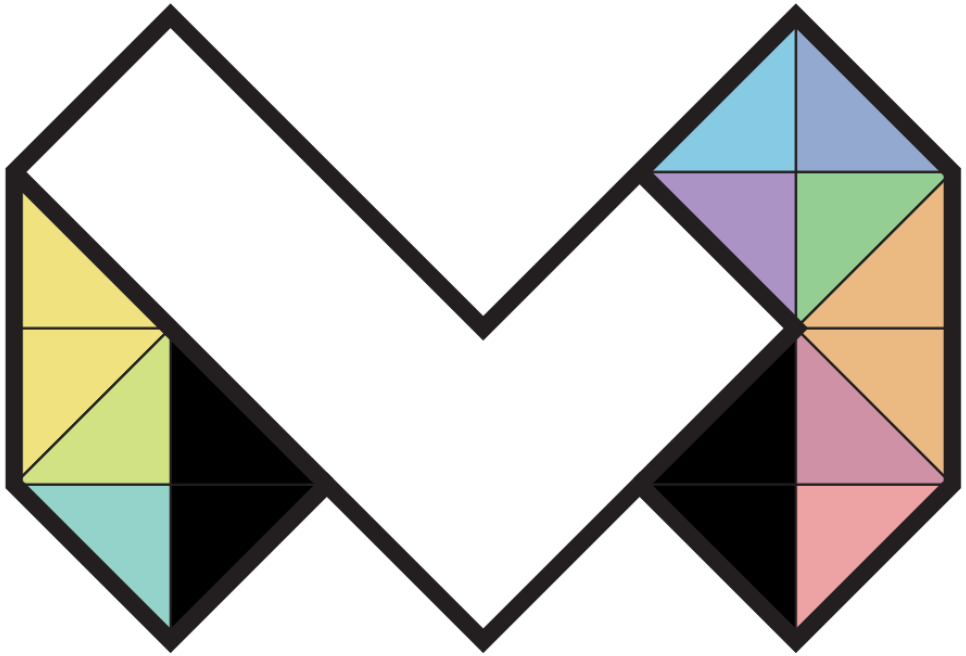
MAKEABILITY LAB

DESIGN USE BUILD

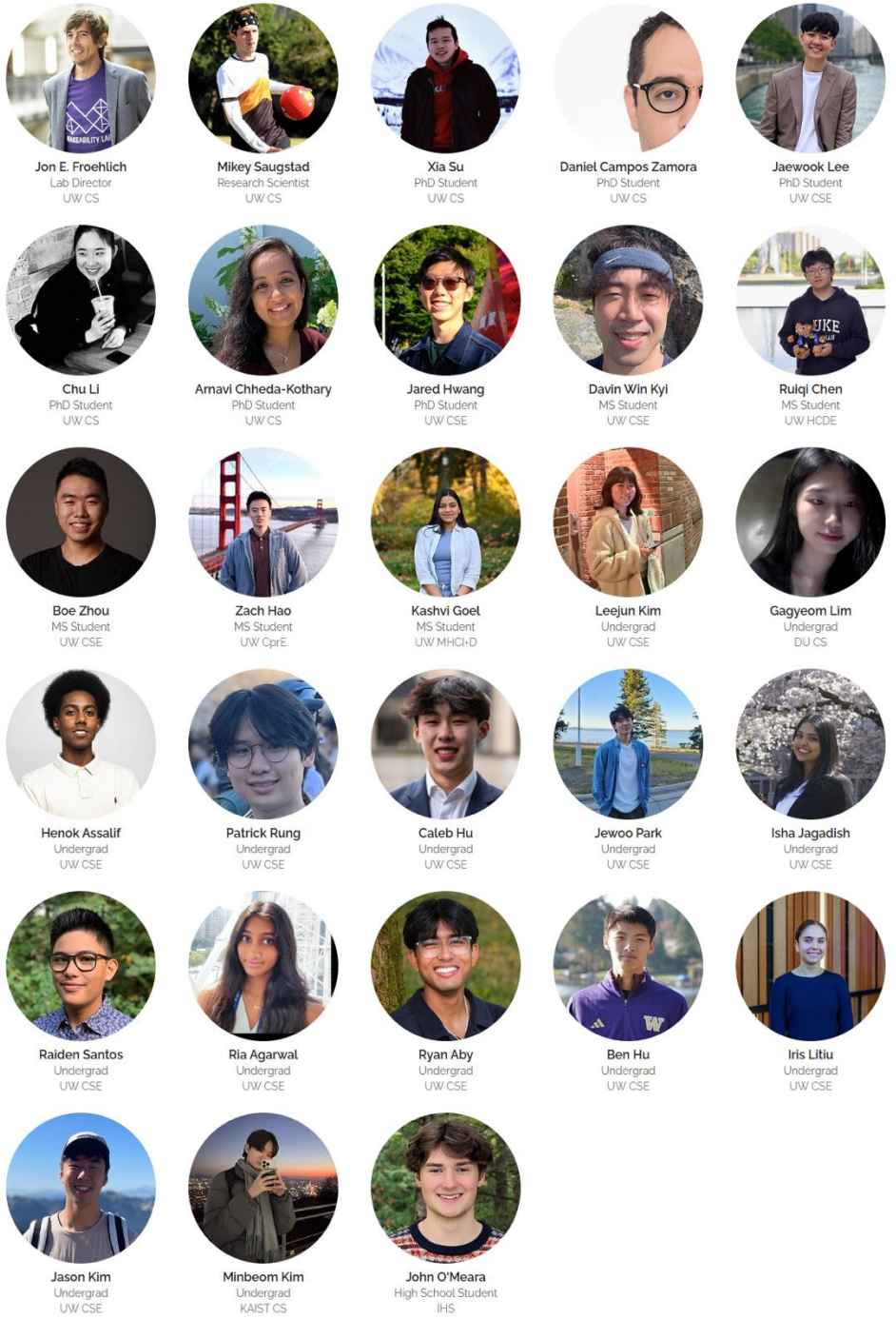
CREATE
Center for Research and Education on Accessible Technology and Experiences

PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY of WASHINGTON



Makeability Lab



Jon E. Froehlich
Lab Director
UW CS

Mikey Saugstad
Research Scientist
UW CS

Xia Su
PhD Student
UW CS

Daniel Campos Zamora
PhD Student
UW CS

Jaewook Lee
PhD Student
UW CSE

Chu Li
PhD Student
UW CS

Arnavi Chheda-Kothary
PhD Student
UW CS

Jared Hwang
PhD Student
UW CSE

Davin Win Kyi
MS Student
UW CSE

Ruiqi Chen
MS Student
UW HCDE

Boe Zhou
MS Student
UW CSE

Zach Hao
MS Student
UW CprE

Kashvi Goel
MS Student
UW MHCI+D

Leejun Kim
Undergrad
UW CSE

Gagyeom Lim
Undergrad
DU CS

Henok Assalif
Undergrad
UW CSE

Patrick Rung
Undergrad
UW CSE

Caleb Hu
Undergrad
UW CSE

Jewoo Park
Undergrad
UW CSE

Isha Jagadish
Undergrad
UW CSE

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Ria Agarwal
Undergrad
UW CSE

Ryan Aby
Undergrad
UW CSE

Ben Hu
Undergrad
UW CSE

Iris Litiu
Undergrad
UW CSE

Jason Kim
Undergrad
UW CSE

Minbeom Kim
Undergrad
KAIST CS

John O'Meara
High School Student
IHS

Augmented Reality

SonoCraftAR
2025 – Present

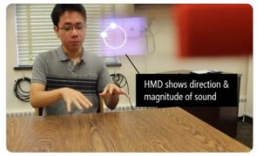
SonifyAR: Context-Aware Sound Gener...
2023 – Present

CookAR
2023 – Present

RASSAR
2022 – 2024

GazePointAR
2022 – 2024

AR Captioning
2016 – 2022



GlassEar
2014

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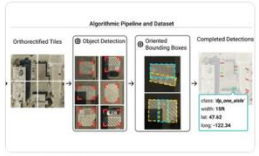

AccessParkCV
2023 – Present

RampNet
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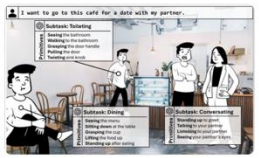

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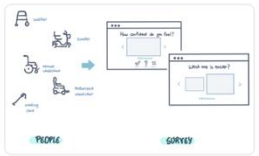
Project Sidewalk
2012 – Present



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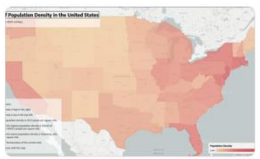

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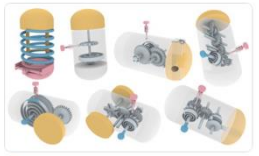
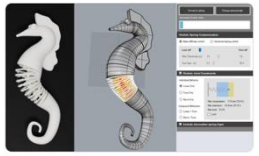


Kinergy
2020 – 2022



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SqueezaPulse
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ReWear
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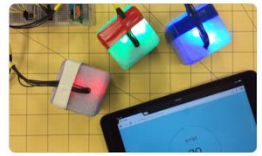
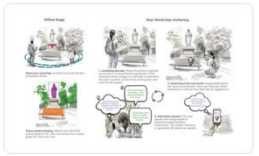
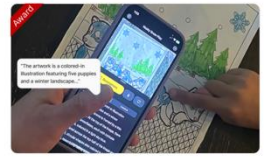


Pixel
2014 – 2015



ImaginatAR
2024 – Present

DepthScape
2024 – Present



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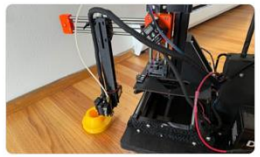

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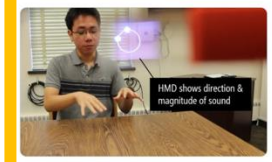

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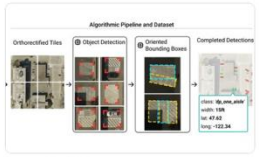

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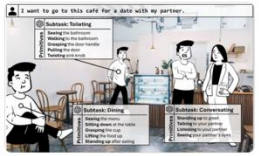

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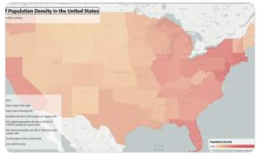

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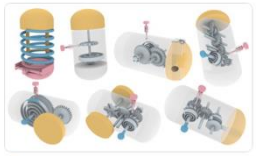

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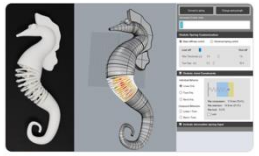

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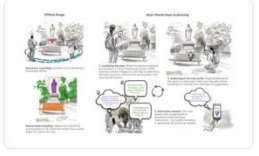

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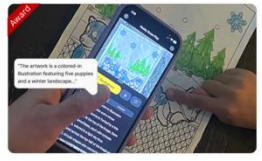

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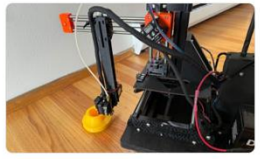
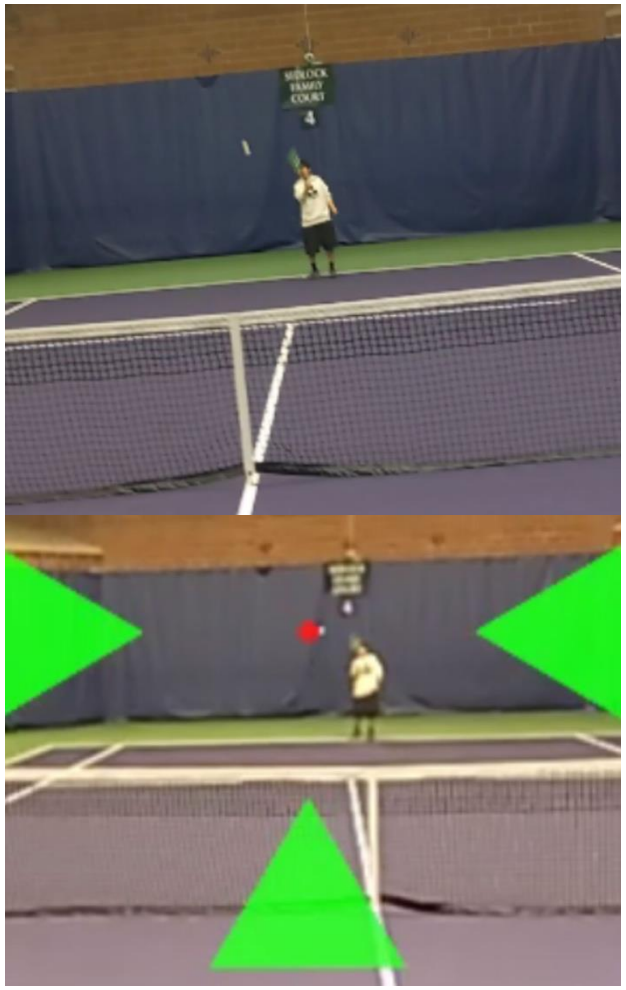


MobiPrint
2022 – Present

MAKEABILITY LAB

AR LOW-VISION SPORTS



ARSports

UIST'23 Demo; IDEATExR'24 Best Paper;

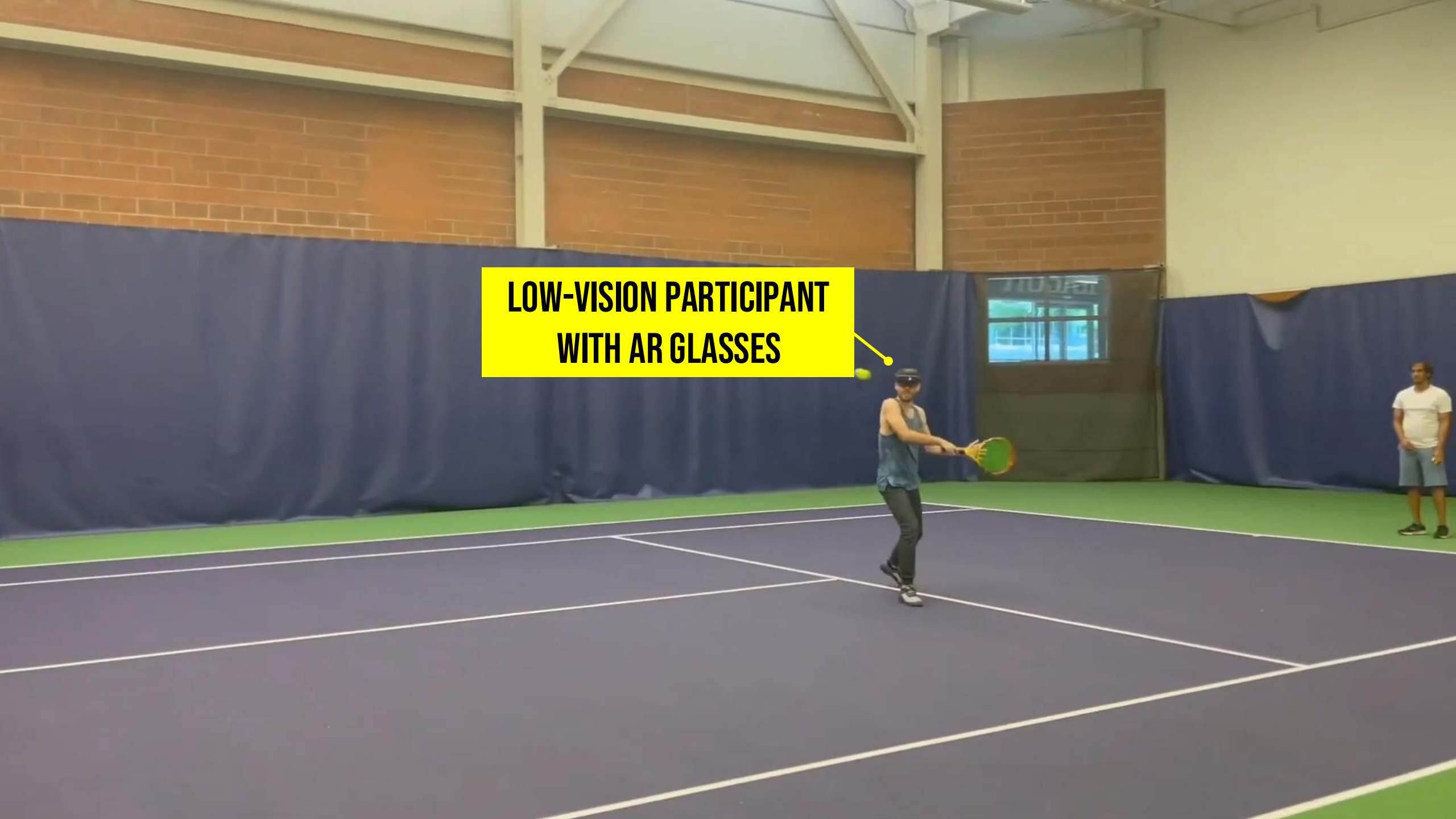
Jaewook Lee
PhD Student
UW CSE

Yapeng Tian
Professor
UT Dallas

Yuhang Zhao
Professor
UW Madison

How can we...

use real-time computer vision & visual augmentations to **support people with low-vision** in **playing sports**?


LOW-VISION PARTICIPANT
WITH AR GLASSES


HUSKIES
COURT 4
GUEST
EDLOCK
FAMILY
COURT
4


31.459 FPS
Rackets: 38.2
Person: 80.1
Net: 96.8

MAKEABILITY LAB

SOUND AWARENESS

ARSound

CHI'20; ASSETS'20; IMWUT'21; CACM'22; CHI'22;

Dhruv Jain
Graduated PhD
(Now UMich Prof)

Emma McDonnell
Graduated PhD
(Now Postdoc)

Steven Goodman
Graduated PhD
(Now Startup)

Leah Findlater
HCDE Professor
UW

How can we...

support **sound awareness for DHH people** through real-time sound processing?

MAKEABILITY LAB

SOUNDWATCH: REAL-TIME SOUND REC FOR DHH

Jain, D., Ngo, H., Patel, P., Goodman, S., Findlater, L., Froehlich, J. E. SoundWatch: Smartwatch-based Deep Learning Approaches to Support Sound Awareness for Deaf and Hard of Hearing Users. ASSETS'20; CACM'22


SoundWatch • Now
Knocking
(Loud, 77 dB)
Snooze 10 mins
Open

SoundWatch

Accessibility Lab, University of Michigan

4.1★
28 reviews

2K+
Downloads

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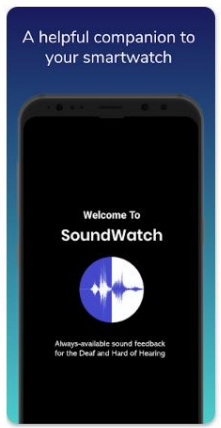

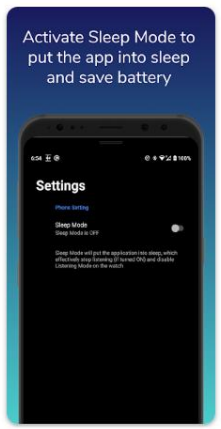

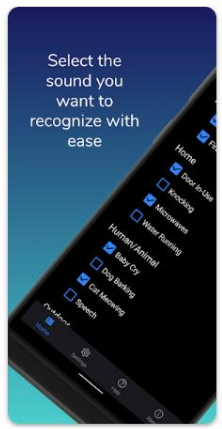

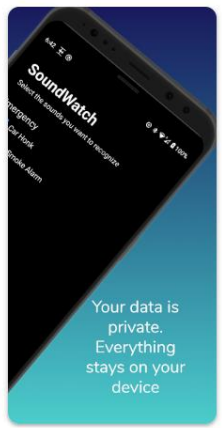

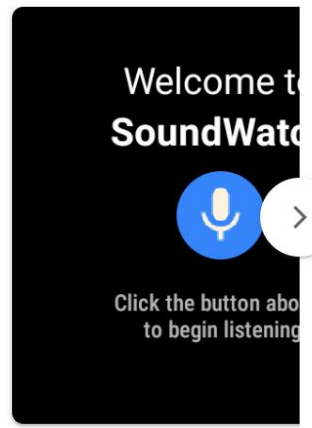

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App support

About this app

DISCLAIMER: SoundWatch is a research prototype maintained by a team of student researchers at the University of Washington, and not a finished product. We try our best, but due to the volume of the emails we receive, we may not be able to respond to every query on time. But, every feedback matters, so please continue to share your experience and any improvement suggestions, so we can eventually get to these messages and improve SoundWatch.
Note: A Google Wear OS smartwatch is required for this app. Some options you can use include: Ticwatch Pro 3, Fossil watches, and Moto 360. Samsung watches are not compatible since they use a different OS, called Tizen, which has less support for third party...

Google Play Games Apps Movies & TV Books Kids

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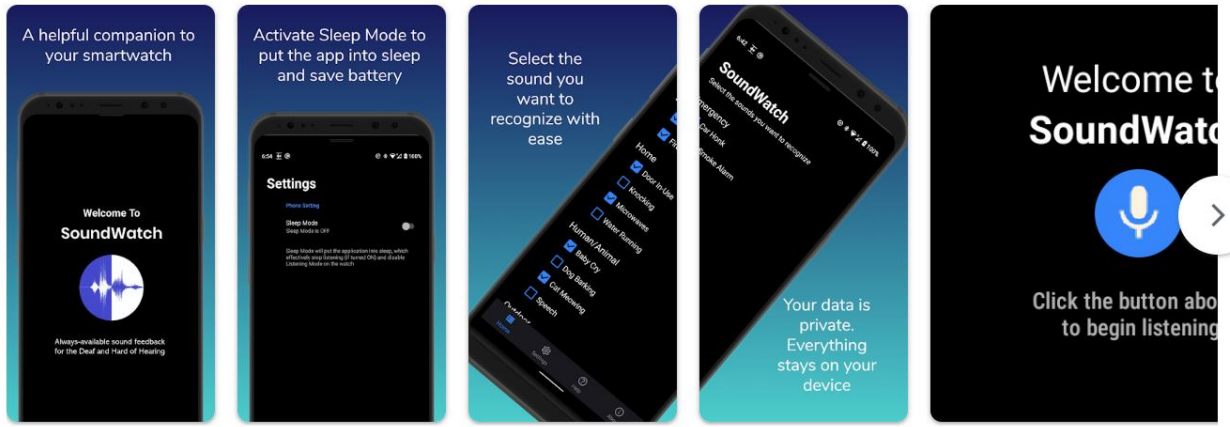

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Dhruv Jain
Assistant Prof, UMich

SIGCHI Dissertation Award

PhD Dissertation
"Sound Sensing and Feedback Techniques for Deaf and Hard of Hearing People,"


Sound Sensing and Feedback Techniques for Deaf and Hard of Hearing People

Dhruv Jain

A dissertation submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

University of Washington
2022

Reading Committee:
Jon E. Froehlich, Chair
Leah Findlater, Chair
Richard Ladner

Program Authorized to Offer Degree:
Computer Science and Engineering

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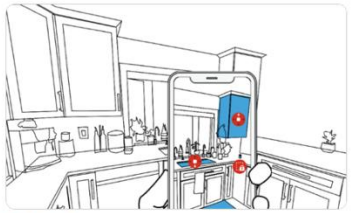

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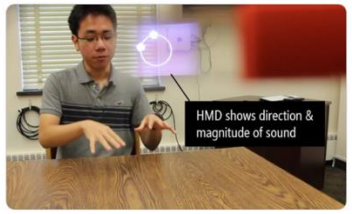

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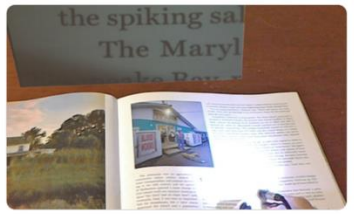

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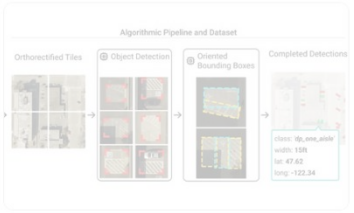

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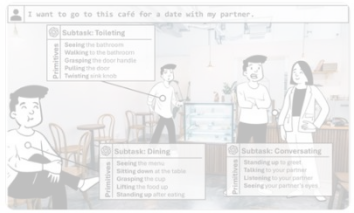

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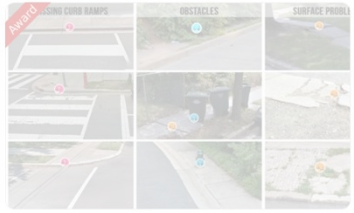

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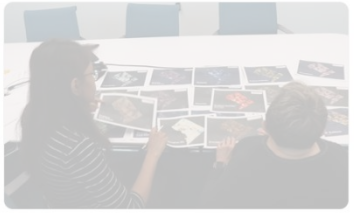

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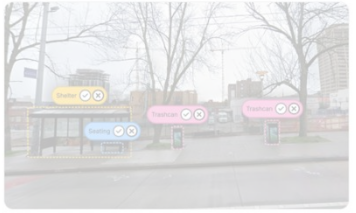

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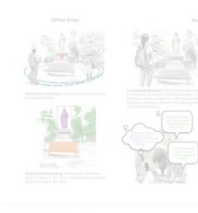

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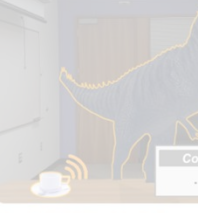

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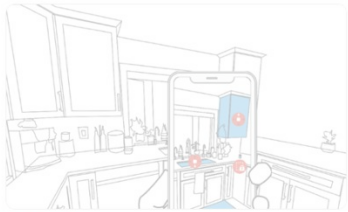
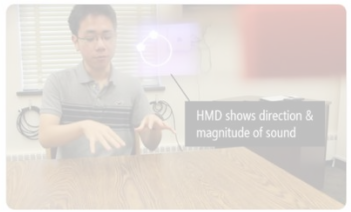
CookAR
2023 – Present



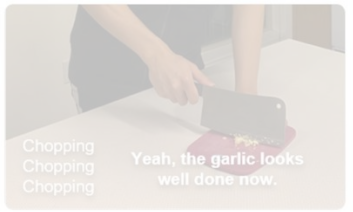
RASSAR
2022 – 2024

GazePointAR
2022 – 2024

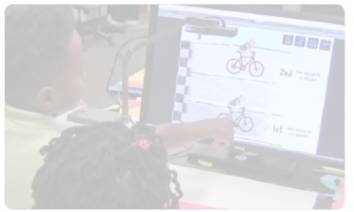
AR Captioning
2016 – 2022



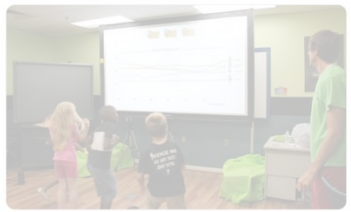
GlassEar
2014



HoloSound
2020



PrototypAR
2017 – 2019



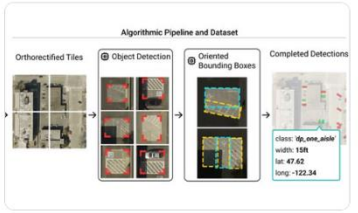
SharedPhys
2014 – 2017

ARMath
2018 – 2020

AR Magnification
2016 – 2018

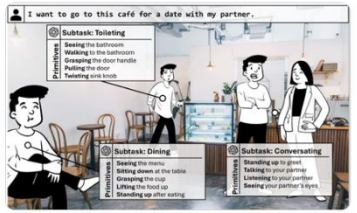
GeoAI

StreetReaderAI
2024 – Present



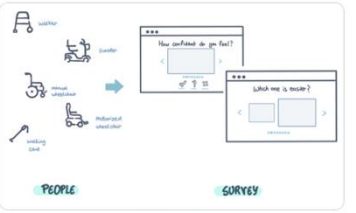
AccessParkCV
2023 – Present

RampNet
2025 – Present



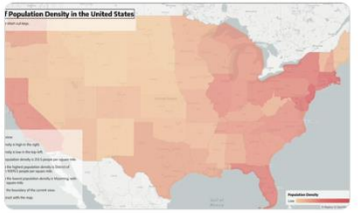
Accessibility Scout
2024 – Present

Project Sidewalk
2012 – Present



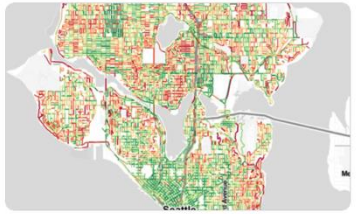
Accessibility for Whom?
2024 – Present

Deep Learning for Sidewalk Assessment
2016 – Present



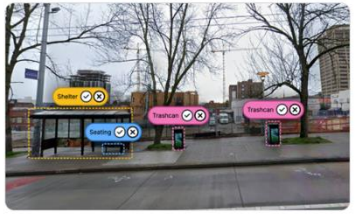
AltGeoViz
2024 – Present

Project Sidewalk + Community Science
2021 – Present



Sidewalk Equity
2022 – Present

Multi-Stakeholder Interviews to Examin...
2015 – Present

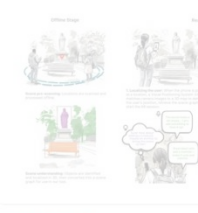


BusStopCV
2023 – Present

Crea

Kinergy
2020 – 2022

SqueezaPulse
2015 – 2016



ImaginatAR
2024 – Present

SonifyAR: Context-Awar
2023 – Present

How can **we design Human-AI** workflows to analyze the **built environment** & support **personalized navigation**?

TRY IT!

PROJECT SIDEWALK

http://projectsidewalk.org

Mikey Saugstad
Research Engineer

Chu Li
PhD Student

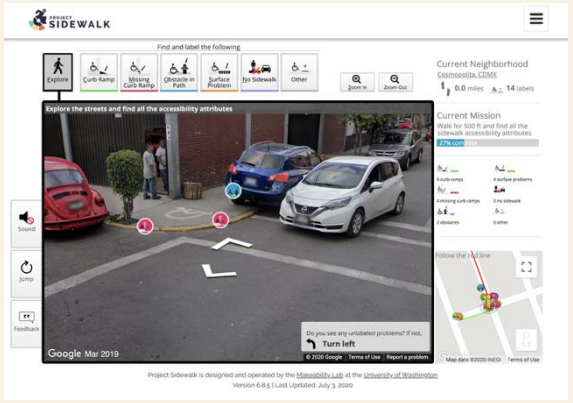
Kotaro Hara
PhD Alum
Now Prof at SMU

Manaswi Saha
PhD Alum
Now at Accenture Labs

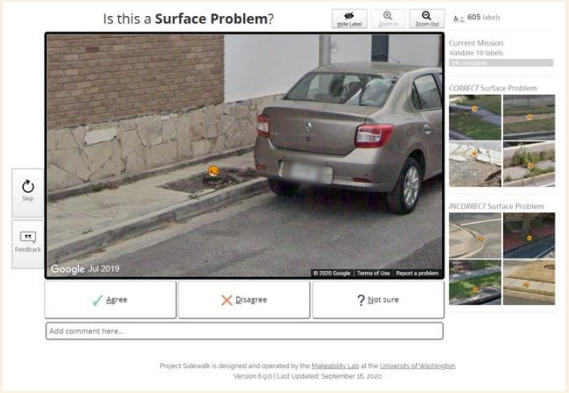
ONLINE MAP IMAGERY

+

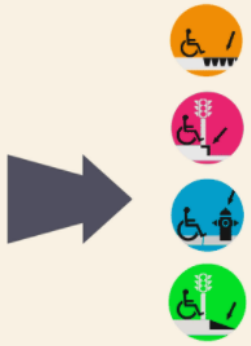
REMOTE CROWDSOURCING INTERFACES



Labeling missions



Validation missions



HUMAN LABELS

MACHINE LEARNING

PROJECT SIDEWALK
HTTP://PROJECTSIDEWALK.IO

OUTCOMES

MACHINE LEARNING

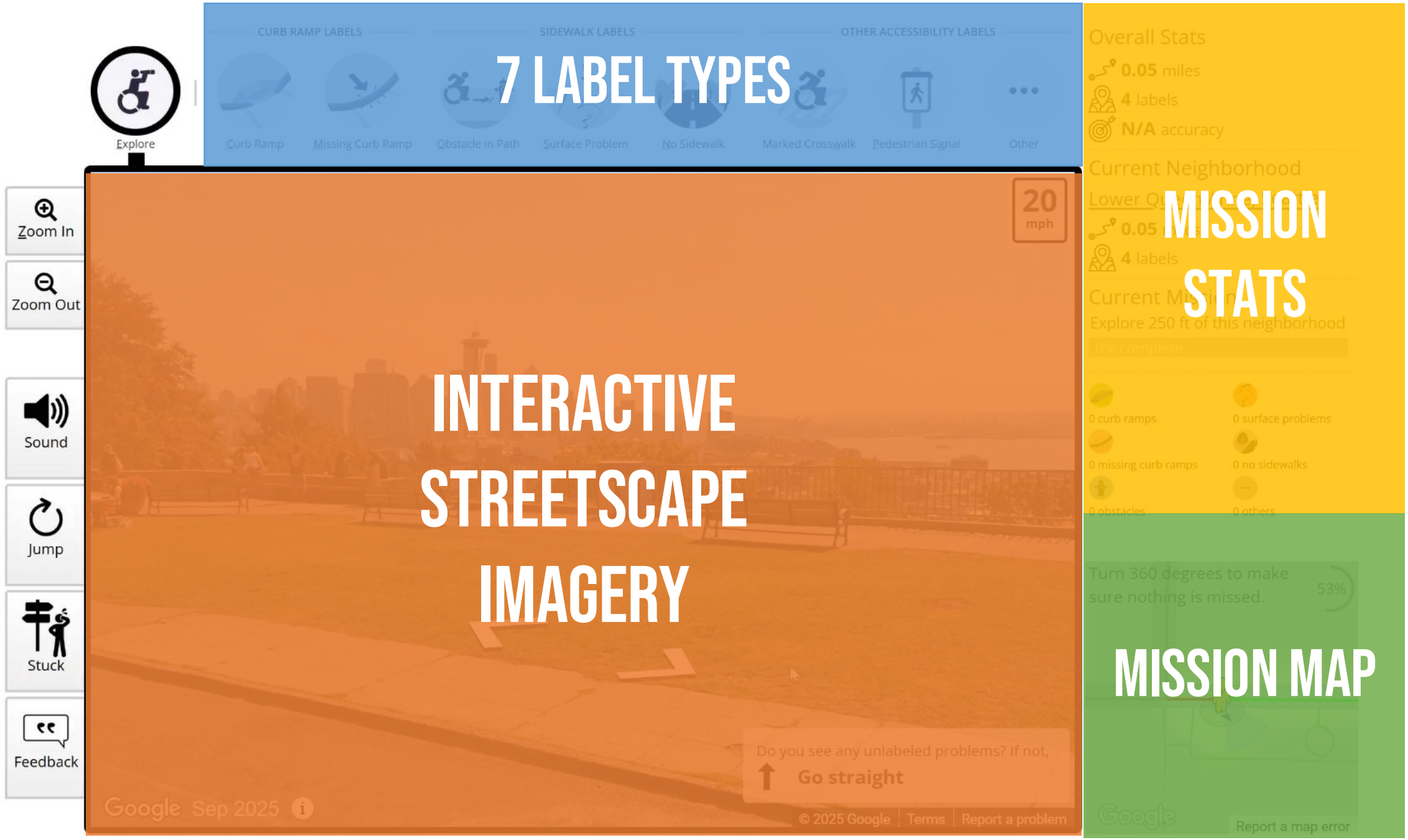
Improved urban planning

Interactive visualization tools

New Urban Analytics

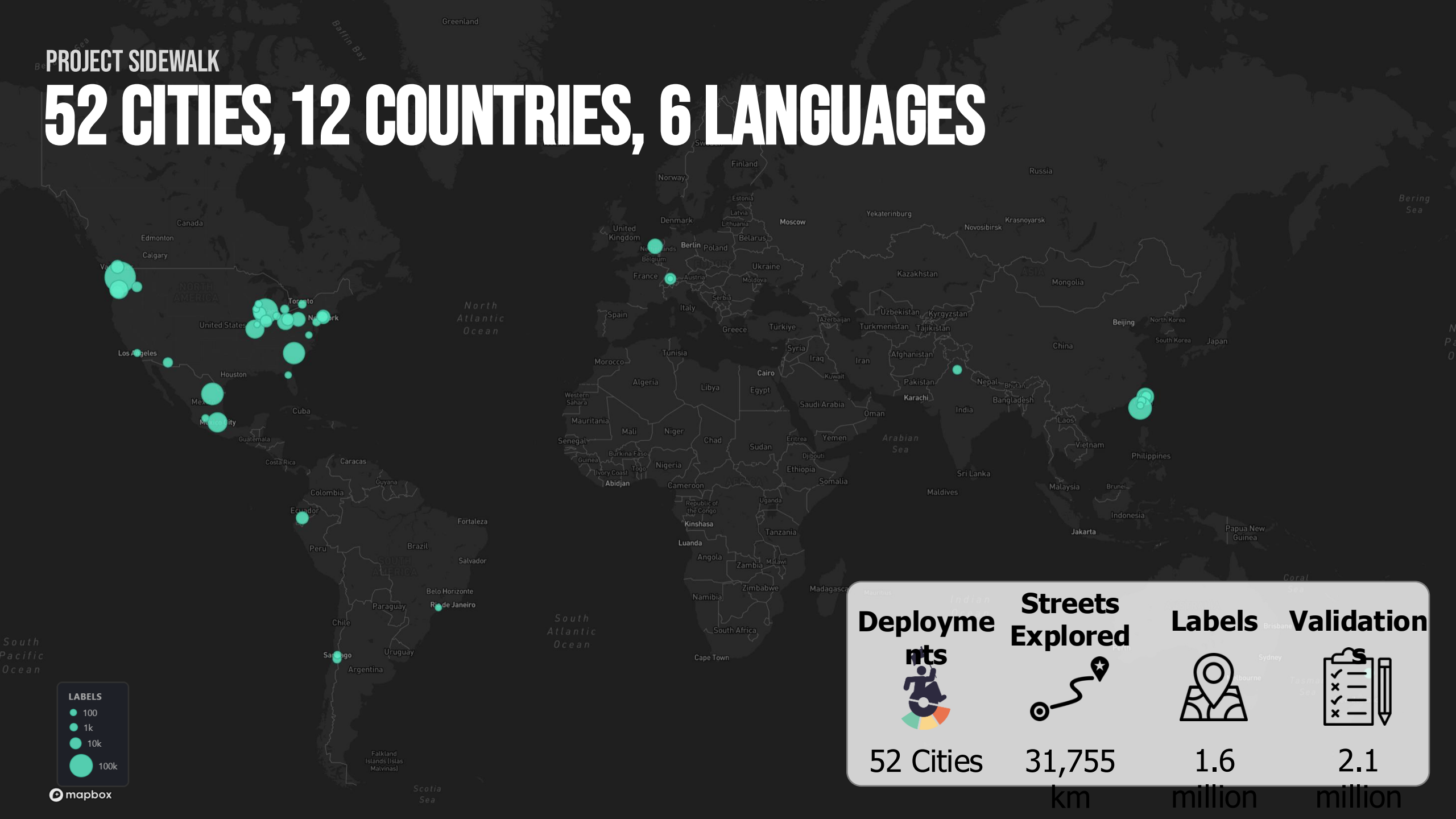
Improved government transparency

PROJECT SIDEWALK
HTTP://PROJECTSIDEWALK.IO


7 LABEL TYPES
CURB RAMP LABELS
SIDEWALK LABELS
OTHER ACCESSIBILITY LABELS
Curb Ramp
Missing Curb Ramp
Obstacle in Path
Surface Problem
No Sidewalk
Marked Crosswalk
Pedestrian Signal
Other
Explore
Zoom In
Zoom Out
Sound
Jump
Stuck
Feedback
INTERACTIVE STREETSCAPE IMAGERY
20 mph
Do you see any unlabeled problems? If not,
Go straight
Google Sep 2025
© 2025 Google
Terms
Report a problem
MISSION STATS
Overall Stats
0.05 miles
4 labels
N/A accuracy
Current Neighborhood
0.05
4 labels
Explore 250 ft of this neighborhood
0 curb ramps
0 surface problems
0 missing curb ramps
0 no sidewalks
0 obstacles
0 others
MISSION MAP
Turn 360 degrees to make sure nothing is missed.
53%
Google
Report a map error

PROJECT SIDEWALK

52 CITIES, 12 COUNTRIES, 6 LANGUAGES



Deployments	Streets Explored	Labels	Validations
52 Cities	31,755 km	1.6 million	2.1 million

路緣坡道標籤 | 人行道標籤 | 其他可及性標籤

探索E | 路緣斜坡C | 無路緣斜坡M | 障礙物O | 鋪面問題S | 無實體人行道N | 有標記的行人穿越道W | 行人號誌P | 其他

放大Z

縮小

音效

跳過

卡住

回饋

整體統計數據

0.11 公里

50 標記

74.5% 精準度

目前所在的鄰里

水錦里, 基隆市

0.03 公里

0 標記

目前的任務

探索75 公尺並找到所有人行道可及性選項

9% 完成

0 路緣斜坡

0 鋪面問題

0 缺路緣斜坡

0 無實體人行道

0 有障礙物

0 其他

旋轉 360 度以確保沒有遺漏任何內容。

30%

TROTTOIR OPRIT LABELS | TROTTOIR LABELS | ANDERE TOEGANKELIJKHEIDSLABELS

Ontdek | Trottoir Oprit (C) | Ontbrekende Trottoir Oprit | Obstakel in het Pad | Oppervlakteprobleem (S) | Geen Trottoir | Gemarkeerde oversteekplaats (W) | Verkeerslicht (P) | Anders

Zoom In

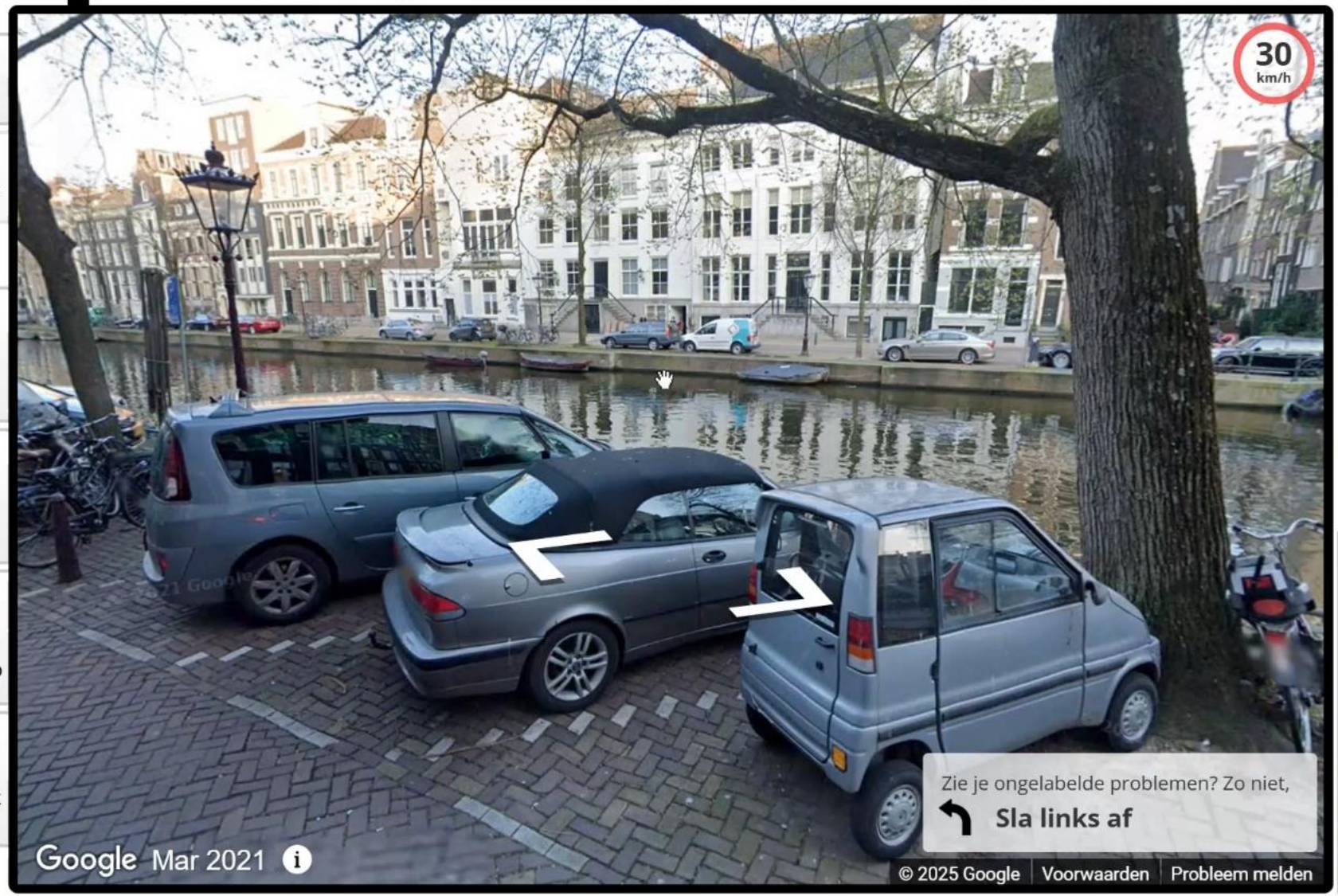
Zoom Uit

Geluid

Spring

Vastgelopen

Feedback



Algemene statistieken

3,06 kilometer

526 labels

74,4% nauwkeurigheid

Huidige Wijk

Leliegracht e.o., Amsterdam

0,95 kilometer

235 labels

Huidige Missie

Zoek 150 m voor deze wijk

0% voltooid

0 stoep oprit

0 oppervlakte problemen

0 ontbrekende stoep opritten

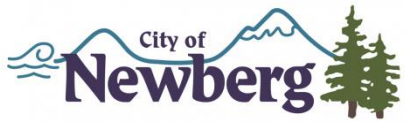
0 geen trottoirs

0 obstakels

0 anders

Oradell Girl Scouts

Hackensack Meridian School of Medicine



UW Disability & D/deaf Cultural Center

National Multiple Sclerosis Society
Bergen Multiple Sclerosis Community Council

Teaneck High School

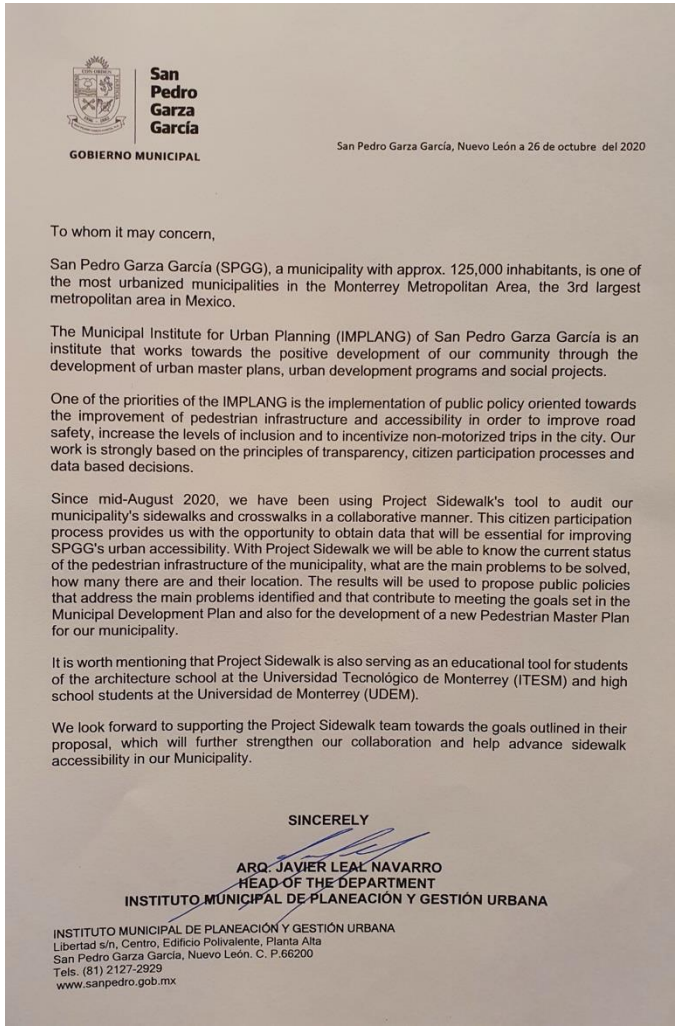
People Nudge

Denny International Middle School


SAN PEDRO,
LigaPeatonal.org
Local University
Local Community

PROJECT SIDEWALK MEXICO

SAN PEDRO, MX



San Pedro Garza García
GOBIERNO MUNICIPAL

San Pedro Garza García, Nuevo León a 26 de octubre del 2020

To whom it may concern,

San Pedro Garza García (SPGG), a municipality with approx. 125,000 inhabitants, is one of the most urbanized municipalities in the Monterrey Metropolitan Area, the 3rd largest metropolitan area in Mexico.

The Municipal Institute for Urban Planning (IMPLANG) of San Pedro Garza García is an institute that works towards the positive development of our community through the development of urban master plans, urban development programs and social projects.

One of the priorities of the IMPLANG is the implementation of public policy oriented towards the improvement of pedestrian infrastructure and accessibility in order to improve road safety, increase the levels of inclusion and to incentivize non-motorized trips in the city. Our work is strongly based on the principles of transparency, citizen participation processes and data based decisions.

Since mid-August 2020, we have been using Project Sidewalk's tool to audit our municipality's sidewalks and crosswalks in a collaborative manner. This citizen participation process provides us with the opportunity to obtain data that will be essential for improving SPGG's urban accessibility. With Project Sidewalk we will be able to know the current status of the pedestrian infrastructure of the municipality, what are the main problems to be solved, how many there are and their location. The results will be used to propose public policies that address the main problems identified and that contribute to meeting the goals set in the Municipal Development Plan and also for the development of a new Pedestrian Master Plan for our municipality.

It is worth mentioning that Project Sidewalk is also serving as an educational tool for students of the architecture school at the Universidad Tecnológico de Monterrey (ITESM) and high school students at the Universidad de Monterrey (UDEM).

We look forward to supporting the Project Sidewalk team towards the goals outlined in their proposal, which will further strengthen our collaboration and help advance sidewalk accessibility in our Municipality.

SINCERELY

ARQ. JAVIER LEAL NAVARRO
HEAD OF THE DEPARTMENT
INSTITUTO MUNICIPAL DE PLANEACIÓN Y GESTIÓN URBANA

INSTITUTO MUNICIPAL DE PLANEACIÓN Y GESTIÓN URBANA
Libertad s/n, Centro, Edificio Polivalente, Planta Alta
San Pedro Garza García, Nuevo León. C. P.66200
Tels. (81) 2127-2929
www.sanpedro.gob.mx

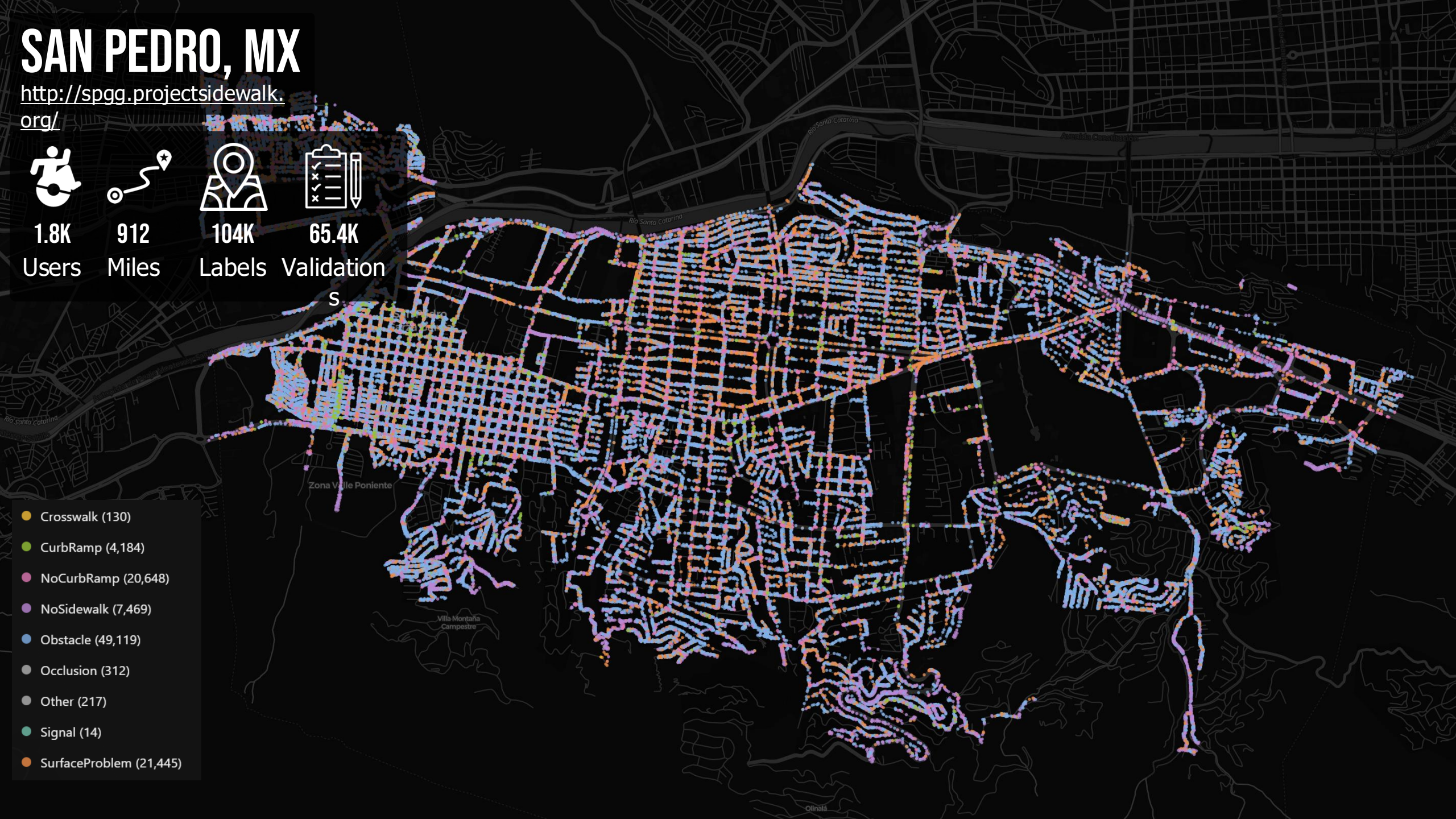
Project Sidewalk provides us with data that is **essential to improving San Pedro's urban accessibility**. With Project Sidewalk, we **know the main problems** to be solved, how many problems there are, and their location... The results will be used to inform a **new Pedestrian Master Plan** for our municipality.

San Pedro Garza García
GOBIERNO MUNICIPAL

SAN PEDRO, MX

http://spgg.projectsidewalk.org/

1.8K	912	104K	65.4K
Users	Miles	Labels	Validations



SAN PEDRO, MX

http://spgg.projectsidewalk.org/

1.8K	912	104K	65.4K
Users	Miles	Labels	Validations

ONU HABITAT
POR UN MEJOR FUTURO URBANO

ENFOQUE ACTIVISTA

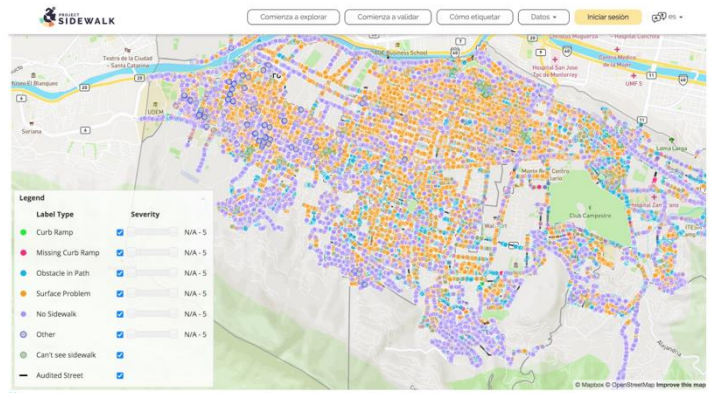
E

EvaluANDO: del activismo peatonal a la colaboración comunitaria para el registro de obstáculos en las banquetas

Escrito por
Claudina de Gyves y Ana Rodríguez

Ubicación
San Pedro Garza García, México

Palabras clave
activismo peatonal, movilidad sostenible, infraestructura peatonal, participación remota

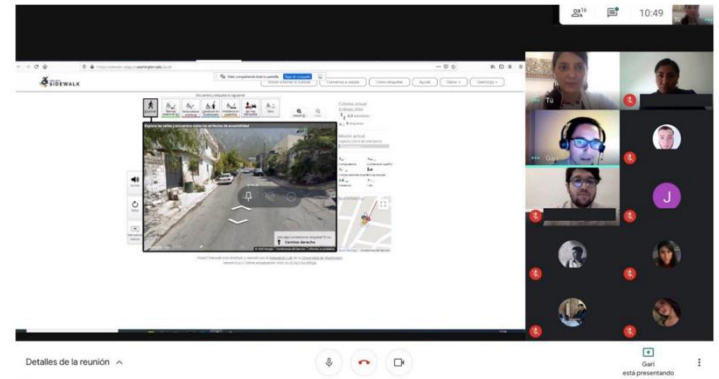


>>
Fotografía 2. Mapa de etiquetas en Project Sidewalk
Fuente: Liga Peatonal (2021).

La vinculación fue posible gracias a que ya había un historial de activismo peatonal en la metrópoli y el acercamiento no fue solo con la Liga Peatonal como ONG, sino de la mano de Makeability Lab, un actor técnico-académico que mostró disposición a contextualizar su plataforma a las necesidades de las calles mexicanas. Aunado a este proceso, la situación por la COVID-19 detonó una serie de intervenciones en el espacio público por parte del municipio de San Pedro Garza García, enfocadas en promover la movilidad sostenible, destacando las ciclovías emergentes y la aceleración de otros proyectos en el espacio público que estaban en puerta. Todo esto generó un escenario adecuado para la colaboración de EvaluANDO SPGG, en la que todos los actores involucrados estaban conscientes de la importancia de contar con información precisa sobre las condiciones de las calles en el municipio.

Recientemente, en mayo de 2021, tras 9 meses de trabajo y con la participación de 1099 personas se lograron cubrir los 570.2 km de vialidades que tiene el municipio de SPGG y se generaron 105 117 etiquetas (Makeability Lab, 2021) en un ejercicio inédito a nivel nacional de participación ciudadana para ubicar los obstáculos de movilidad peatonal.

El caso de EvaluANDO SPGG destaca no solo por haber completado el mapeo del municipio y ser resultado de una colaboración multisectorial entre gobierno local, sociedad civil y academia, sino porque los resultados son ahora insumos valiosos del municipio para la creación de nuevos planes y proyectos. Los planes en proceso de elaboración, tanto de movilidad activa como de seguridad vial, con los resultados de EvaluANDO, ayudarán a identificar estrategias aterrizadas a la realidad y fomentar una mayor participación ciudadana, al involucrar a la población desde su diagnóstico y permitir la descarga de los datos generados en formato editable.

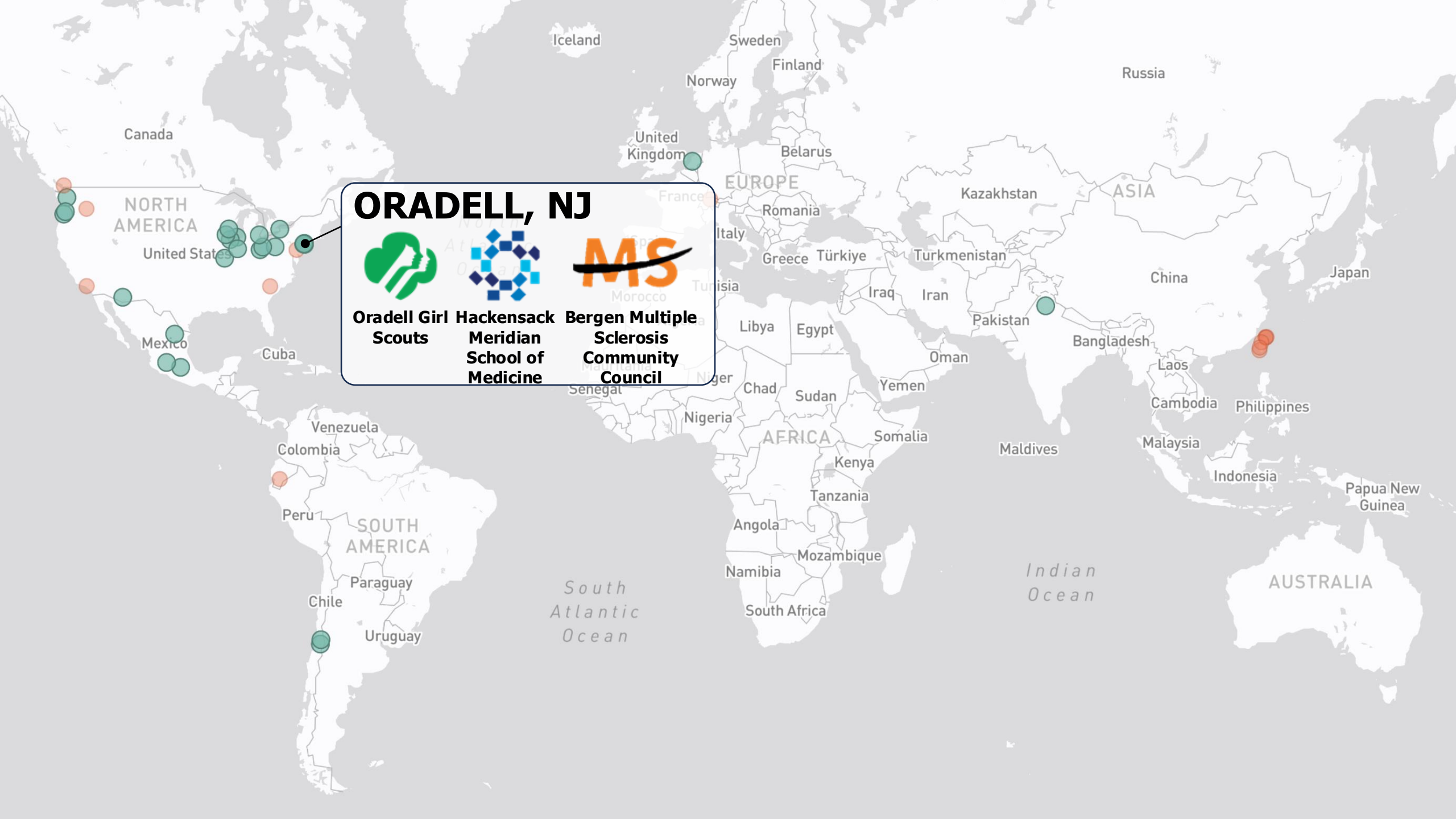


>>
Fotografía 4. Mapatón San Pedro Garza García
Fuente: Liga Peatonal (2020).

En el proceso de levantamiento de información, Liga Peatonal trató de complementar el trabajo asincrónico e individual con cuatro eventos donde varias personas se conectaban de manera simultánea a probar la herramienta y resolver dudas sobre su funcionamiento. Se convocó a dos sesiones dirigidas a las personas ciudadanas del municipio, con el nombre de Mapatones, y otras dos orientadas a estudiantes universitarios, en formato de talleres en los que se les introducía al tema de movilidad peatonal y donde se generaron propuestas para atender los problemas principales.

Si bien este proceso ha permitido el involucramiento de adolescentes y jóvenes en el análisis crítico de su entorno urbano, todavía presenta oportunidades de mejora en la inclusión de personas que no tienen acceso a dispositivos de internet. Ante esta situación, sería conveniente explorar el ejercicio analógico del mapeo en sitio con herramientas impresas y más con el fin de fortalecer la convivencia vecinal y promover la organización, que con la precisión del levantamiento. En estos escenarios de atención a la población en condición de vulnerabilidad, tal vez destaquen otros elementos a mapear no tan relacionados con ser un obstáculo en las banquetas, sino ya más encaminados a una ausencia de infraestructura como la misma pavimentación de las calles, las banquetas o la falta de conectividad con otros sectores.

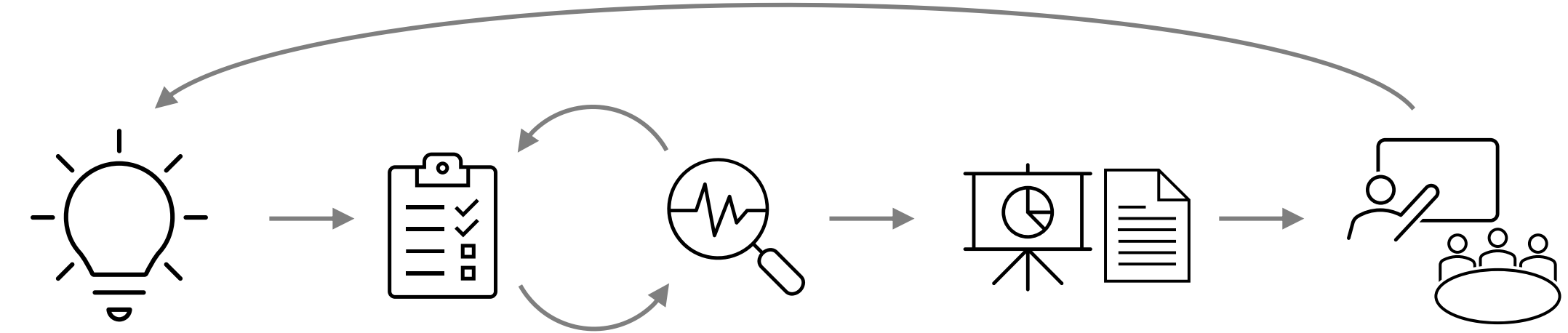
Además, en las reflexiones en torno al uso de la herramienta y las necesidades para el diagnóstico urbano incluyente, se identificó como área de oportunidad un mapeo con perspectiva de género, que pudiera incluir no solamente obstáculos en los trayectos identificados, sino también situaciones y elementos propios de la infraestructura que provocan una sensación de inseguridad, pero que no representan como tal un obstáculo, como sí lo hacen los muros ciegos, la falta de luminarias, los recovecos o terrenos baldíos.


ORADELL, NJ
Oradell Girl Scouts
Hackensack Meridian School of Medicine
Bergen Multiple Sclerosis Community Council
Iceland
Sweden
Finland
Norway
Russia
Canada
United Kingdom
Belarus
EUROPE
NORTH AMERICA
United States
France
Romania
Kazakhstan
ASIA
Italy
Greece
Türkiye
Turkmenistan
China
Japan
Iraq
Iran
Pakistan
Libya
Egypt
Bangladesh
Mexico
Cuba
Oman
Laos
Yemen
Chad
Sudan
Cambodia
Philippines
Nigeria
Venezuela
Colombia
AFRICA
Somalia
Malaysia
Maldives
Kenya
Indonesia
Tanzania
Papua New Guinea
Peru
SOUTH AMERICA
Angola
Mozambique
Namibia
Paraguay
Chile
South Africa
AUSTRALIA
Uruguay
South Atlantic Ocean
Indian Ocean


We're going to have the Girl Scouts
do their presentation
Dianne Camelo Didio
Mayor
OPTV
MC Regular Meeting
Jan 31, 2023

PROJECT SIDEWALK

SERVICE LEARNING



Need finding & Problem Definition

Data Collection

Data Analysis

Report Generation

Communit y Advocacy

Before Project Sidewalk**, I never realized how important curb ramps** are for people with disabilities…

- GIRL SCOUT (GS4)

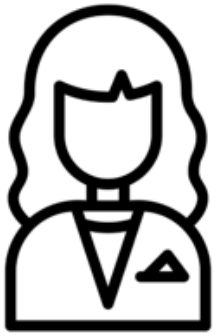
Post-study interview

Li, C., *et al*. "I never realized sidewalks were a big deal": A Case Study of a Community-Driven Sidewalk Audit Using Project Sidewalk. CHI 2024

Now when they walk down the street and see something [inaccessible], they quickly notice and say **“This is wrong!”**

- PARENT

Post-study interview

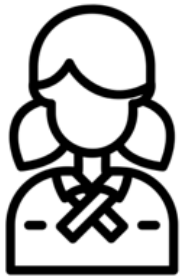


Li, C., *et al*. “I never realized sidewalks were a big deal”: A Case Study of a Community-Driven Sidewalk Audit Using Project Sidewalk. CHI 2024

“This experience gave me a new perspective that I can use **to help change the world**.”

- GIRL SCOUT (GS7)

Post-study interview



Access Score Analysis

Curb Ramps

1

Missing Curb Ramps

0.7

Obstacles

1

1

Surface Problems

1

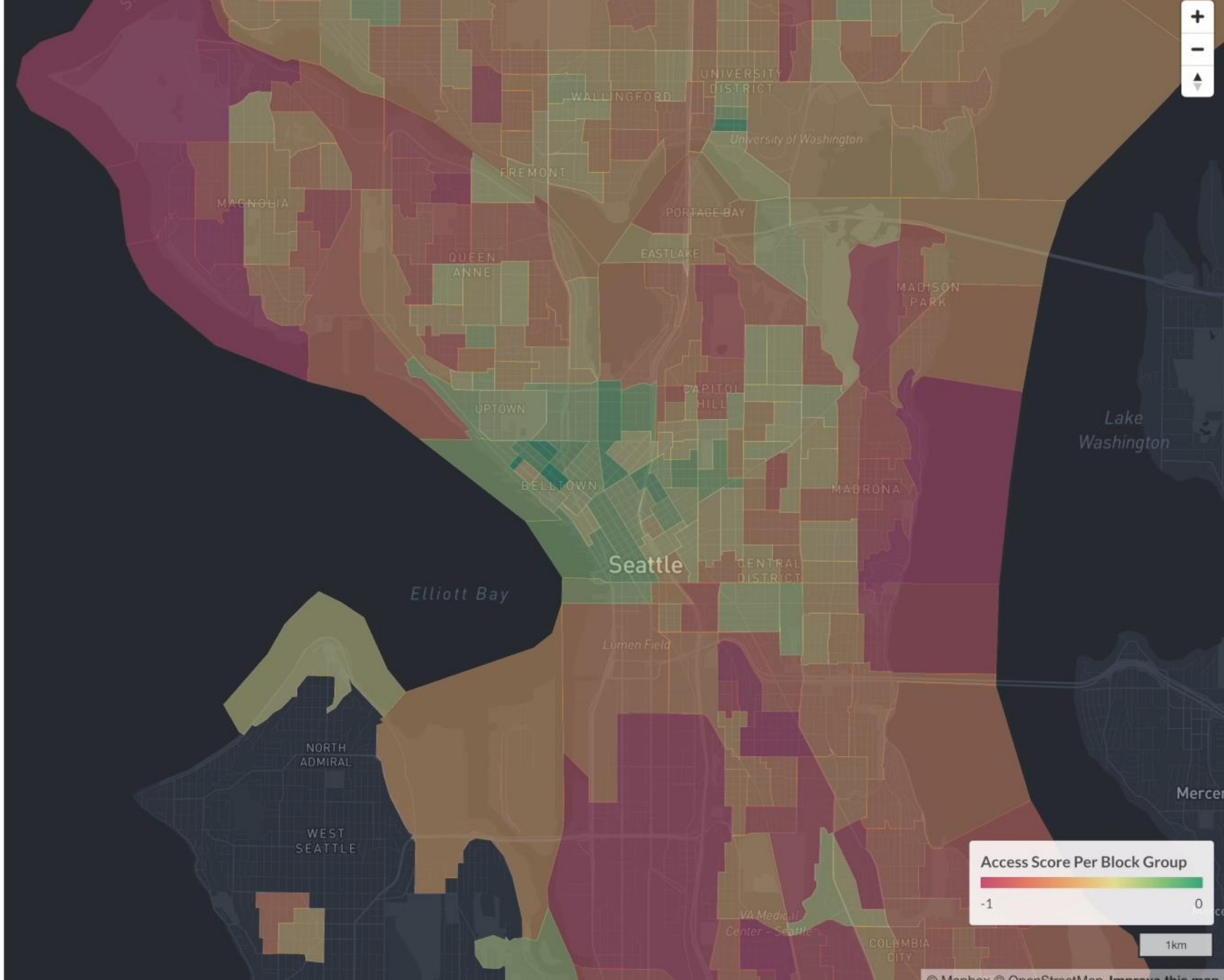
Missing Sidewalks

1

Select geographical unit

Census Block Group

COMPUTE ACCESS SCORE



Deep Learning for Automatically Detecting Sidewalk Accessibility Problems Using Streetscape Imagery

Galen Weld[1], Esther Jang[1], Anthony Li[2], A
[1]Paul G. Allen School of Computer Science a
[2]Department of Computer Science
[gweld, infrared, aileenz, khei

ABSTRACT
Recent work has applied machine learning methods to
matically find and/or assess pedestrian infrastructure in o
map imagery (*e.g.*, satellite photos, streetscape panora
While promising, these methods have been limited by t
terrelated issues: small training sets and the choice of m
learning model. In this paper, aided by the recently re
Project Sidewalk dataset of 300,000+ image-based si
accessibility labels, we present the first examination
learning to automatically assess sidewalks in Googl
View (GSV) panoramas. Specifically, we investigate
plication areas: automatically *labeling* sidewalk accessibility is
and automatically *labeling* and use a residual neural
both tasks, we introduce and use a residual neural
(ResNet) modified to support both image and non-in
textual) features (*e.g.*, geography). We present an a
performance, the effect of our non-image features a
set size, and cross-city generalizability. Our res
icantly improve on prior automated methods an
cases, meet or exceed human labeling performanc

Author Keywords
Neural networks, accessibility, sidewalks, compu

ACM Classification Keywords
I.2.10. Artificial Intelligence: Vision and Scen
ing; I.2.6. Artificial Intelligence: Learning

INTRODUCTION
Sidewalks should benefit all of us. They
environmentally-friendly conduit for moving
people with disabilities, sidewalks can have
pact on independence [47], quality of life
physical activity [17]. While mapping tools
Apple Maps have begun offering pedestrian
they do not incorporate sidewalk routes or in
walk accessibility [23], which limits their
portionately affects people with disabilitie
is data: Where does it come from? How is
Traditionally, sidewalk audits—which gat
ence and quality of sidewalks—are perf

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Towards Global-Scale Crowd+AI Techniques to Map and Assess Sidewalks for People with Disabilities

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Andres Sevtsuk[5], Claudio T. Silva[2], Jon E. Froehlich[3]
University, [2] NYU, [3] University of Washington, [4] University of Illinois at Chicago, [5] MIT

Abstract
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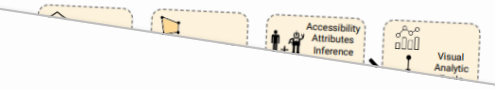

Scaling Crowd+AI Sidewalk Accessibility Assessments: Initial Experiments Examining Label Quality and Cross-city Training on Performance

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JON E. FROEHLICH, Allen School of C

Increasingly, crowds plus machine learning tech
ronments; however, open questions remain abou
effect of crowdsourced data in automatically cla
investigate the effect of validated data—which ha
larger but noisier aggregate dataset. In Experime
as effective training data for another. Together,
semi-automatic sidewalk assessment and help i

ACM Reference Format:
Michael Duan, Shosuke Kiami, Logan Milandi
Scaling Crowd+AI Sidewalk Accessibility Ass
Performance. In . ACM, New York, NY, USA, 7

1 INTRODUCTION
Despite broad policy measures and an i
sidewalks remain largely inaccessible. T
location and their condition, which funda
features in tools like Apple or Google M
administered by local governments; ho
emerging work has explored alternative
both [8, 11].
While vision-based solutions are mor
ized streetscape datasets like *CityScapes*
autonomous navigation. However, the
while automatic walkability [1] and
imagery, these experiments used expe
and size (*e.g.*, to only single neighborh

Manuscript submitted to ACM

RampNet: A Two-Stage Pipeline for Bootstrapping Curb Ramp Detection in Streetscape Images from Open Government Metadata

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https://github.com/ProjectSidewalk/RampNet

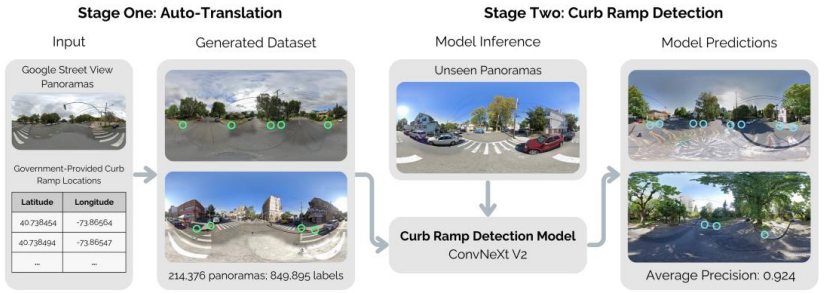

Figure 1. We introduce RampNet, a custom two-stage pipeline for bootstrapping curb ramp detection models in streetscape images from open government data. In Stage 1, we auto-generate a labeled streetview curb ramp dataset by translating government-provided curb ramp location data (*i.e.*, <lat, long> lists) into pixel labels on Google Street View panoramas. Stage 2 then uses this generated dataset to train a detection model that predicts curb ramp points in unseen panoramas.

Abstract

Curb ramps are critical for urban accessibility, but robustly

generated dataset, achieving state-of-the-art performance. To evaluate both stages of our pipeline, we compare to manually labeled panoramas. Our generated dataset achieves

Towards Fine-Grained Sidewalk Accessibility Assessment with Deep Learning: Initial Benchmarks and an Open Dataset

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models can classify sidewalk accessibility conditions from pre-cropped 640x640 *is too steep, too narrow, or missing a tactile indicator* or if a sidewalk panel is *ne.* The grid above showcases all 33 conditions we attempt to infer.

(uplifts), narrow, uneven/slanted, pole, and *sign.* We present two experiments: first, a comparison between two
puter vision models, Meta's

Accessibility Scout: Personal Envi

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Figure 1: Accessibility Scout is an LLM-based perso a person's accessibility preferences to *identify* and Accessibility Scout converts plain text descriptions o LLM-interpretable user models. (Right) User models Images can be sourced from anywhere, including Ye

Abstract

Assessing the accessibility of unfamiliar built environmen cal for people with disabilities. However, manual assessm formed by users or their personal health professionals, are and unscalable, while automatic machine learning meth neglect an individual user's unique needs. Recent advance Language Models (LLMs) enable novel approaches to thi balancing personalization with scalability to enable mor and context-aware assessments of accessibility. We pres sibility Scout, an LLM-based accessibility scanning sy identifies accessibility concerns from photos of built env

StreetReaderAI: Making Street View Accessibl Context-Aware Multimodal AI

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Figure 1: We introduce StreetReaderAI, an accessible streetscape mapping prototype that use navigation controls for blind and low-vision users. (a) Users can search for and select locations or (c) chat with a multimodal AI agent about the scene and local geography while virtually

Abstract

Interactive streetscape mapping tools such as Google Street View (GSV) and Meta Mapillary enable users to virtually navigate and experience real-world environments via immersive 360° imagery but remain fundamentally inaccessible to blind users. We introduce *StreetReaderAI*, the first-ever accessible street view tool, which combines context-aware, multimodal AI, accessible navigation controls, and conversational speech. With StreetReaderAI, blind users can virtually examine destinations, engage in open-world exploration, and virtually tour any of the over 220 billion GSV images across 100+ countries. We iteratively designed StreetReaderAI with a mixed-visual ability team and performed an evaluation with eleven blind users. Our findings demonstrate the value of an accessible street view in supporting POI investigations and remote route planning. We close by enumerating key guidelines for future work.

CCS Concepts

• **Human-centered compu tion (HCI); Accessibility**

Keywords

Accessible maps, Multimod

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1 Introduction

Interactive, digital maps the world, from route pl tual tourism. Though h recent work has signific

[1]Some streetscape figures ha

"Does the cafe entrance look accessible? Where is the Towards Geospatial AI Agents for Visual Inquir

Jon E. Froehlich[1,2] Jared Hwang[1] Zeyu Wang[1] John S. O'Meara[1] Xi
Yang Zhang[3] Alex Fiannaca[4] Philip Nelson[2] Shaun
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Figure 1. We introduce our vision for *Geo-Visual Agents*—multimodal AI agents capable of unc visual-spatial inquiries about the world by analyzing large-scale repositories of geospatial imag sources. For example, *StreetReaderAI* [14] (above) makes street view accessible to blind users information, and dynamic street view images into an MLLM, accessed via an AI chat interface an

Abstract

Interactive digital maps have revolutionized how people travel and learn about the world; however, they rely on pre-existing structured data in GIS databases (e.g., road networks, POI indices), limiting their ability to address geo-visual questions related to what the world looks like. We introduce our vision for Geo-Visual Agents—multimodal AI agents capable of understanding and responding to nuanced visual-spatial inquiries about the world by analyzing large-scale repositories of geospatial images, including streetscapes (e.g., Google Street View), place-based photos (e.g., TripAdvisor, Yelp), and aerial imagery (e.g., satellite photos) combined with traditional GIS data sources. We define our vision, describe sensing and interaction approaches, provide three exemplars, and enumerate key challenges and opportunities for future work.

1. Introduction

Over the last two de vasive internet conn have transformed hu *situ* navigation.. De systems are confine data, leaving a vast r within street-level, untapped and inac *geo-visual question* questions about a l a wheelchair user *library on 35th?"* *the door to the ca*

In this works *Geo-Visual Agent* derstanding and

CapNav: Benchmarking Vision Language Models on Capability-conditioned Indoor Navigation

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Figure 1. We introduce Capability-Conditioned Navigation (***CapNav***), a benchmark designed to evaluate how well VLMs can navigate complex indoor spaces given an agent's specific physical and operational capabilities. CapNav inputs (1) a tour video of an indoor space, (2) nodes of its navigation graph, (3) an agent's mobility profile, and (4) a navigation task, and evaluates VLM outputs in task feasibility, path validity, route traversability, and reasoning validity.

Abstract

*Vision-Language Models (VLMs) have shown remarkable progress in Vision-Language Navigation (VLN), offering new possibilities for navigation decision-making that could benefit both robotic platforms and human users. However, real-world navigation is inherently conditioned by the agent's mobility constraints. For example, a sweeping robot cannot traverse stairs, while a quadruped can. We introduce Capability-Conditioned Navigation (**CapNav**), a benchmark designed to evaluate how well VLMs can navigate complex indoor spaces given an agent's specific physical and operational capabilities. CapNav defines five representative human and robot agents, each described with*

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StreetReaderAI: Towards making street view accessible via context-aware multimodal AI

October 29, 2025 ·

Jon E. Froehlich, Visiting Faculty Researcher, and Shaun Kane, Research Scientist, Google Research

We introduce StreetReaderAI, a new accessible street view prototype using context-aware, real-time AI and accessible navigation controls.

QUICK LINKS

Paper

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Interactive streetscape tools, available today in every major mapping service, have revolutionized how people virtually navigate and explore the world — from previewing routes and inspecting destinations to remotely visiting world-class tourist locations. But to date, screen readers have not been able to interpret street view imagery, and alt text is unavailable. We now have an opportunity to redefine this immersive streetscape experience to be inclusive for all with multimodal AI and image understanding. This could eventually allow a service like Google Street View, which has over 220 billion images spanning 110+ countries and territories, to be more accessible to people in the blind and low-vision community, offering an immersive visual experience and opening up new possibilities for exploration.

In "StreetReaderAI: Making Street View Accessible Using Context-Aware Multimodal AI", presented at UIST'25, we introduce StreetReaderAI, a proof-of-concept accessible street view prototype that uses context-aware, real-time AI and accessible navigation controls. StreetReaderAI was designed iteratively by a team of blind and sighted accessibility researchers, drawing on previous work in accessible first-person gaming and navigation tools, such as Shades of Doom, BlindSquare, and SoundScape. Key capabilities include:

- Real-time AI-generated descriptions of nearby roads, intersections, and places.
- Dynamic conversation with a multimodal AI agent about scenes and local geography.
- Accessible panning and movement between panoramic images using voice commands or keyboard shortcuts.

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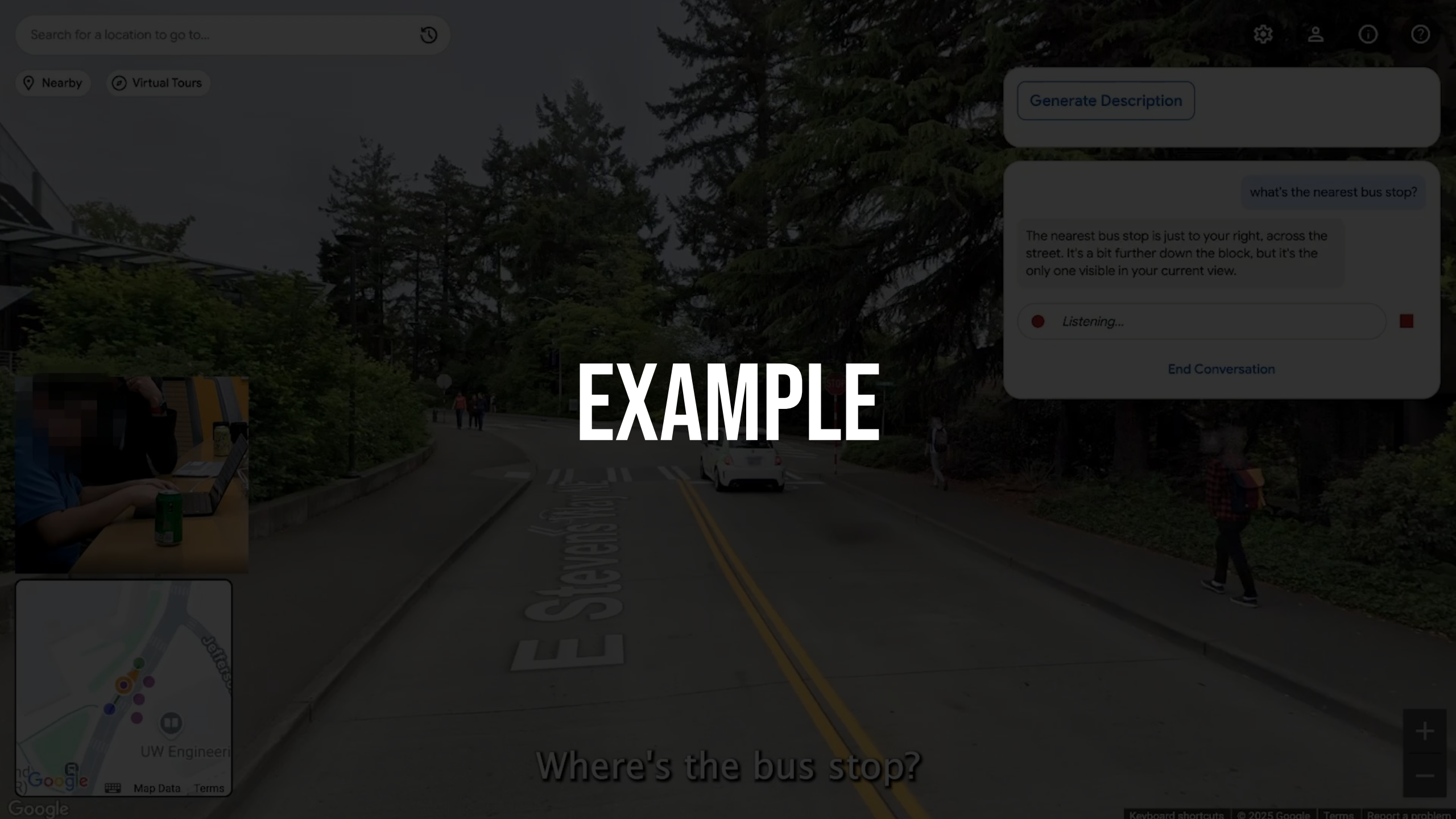
Source: https://research.google/blog/streetreaderai-towards-making-street-view-accessible-via-context-aware-multimodal-ai


Search for a location to go to...
Nearby
Virtual Tours
Generate Description
what's the nearest bus stop?
The nearest bus stop is just to your right, across the street. It's a bit further down the block, but it's the only one visible in your current view.
Listening...
End Conversation
EXAMPLE
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Map Data
Terms
Where's the bus stop?
Google
Keyboard shortcuts
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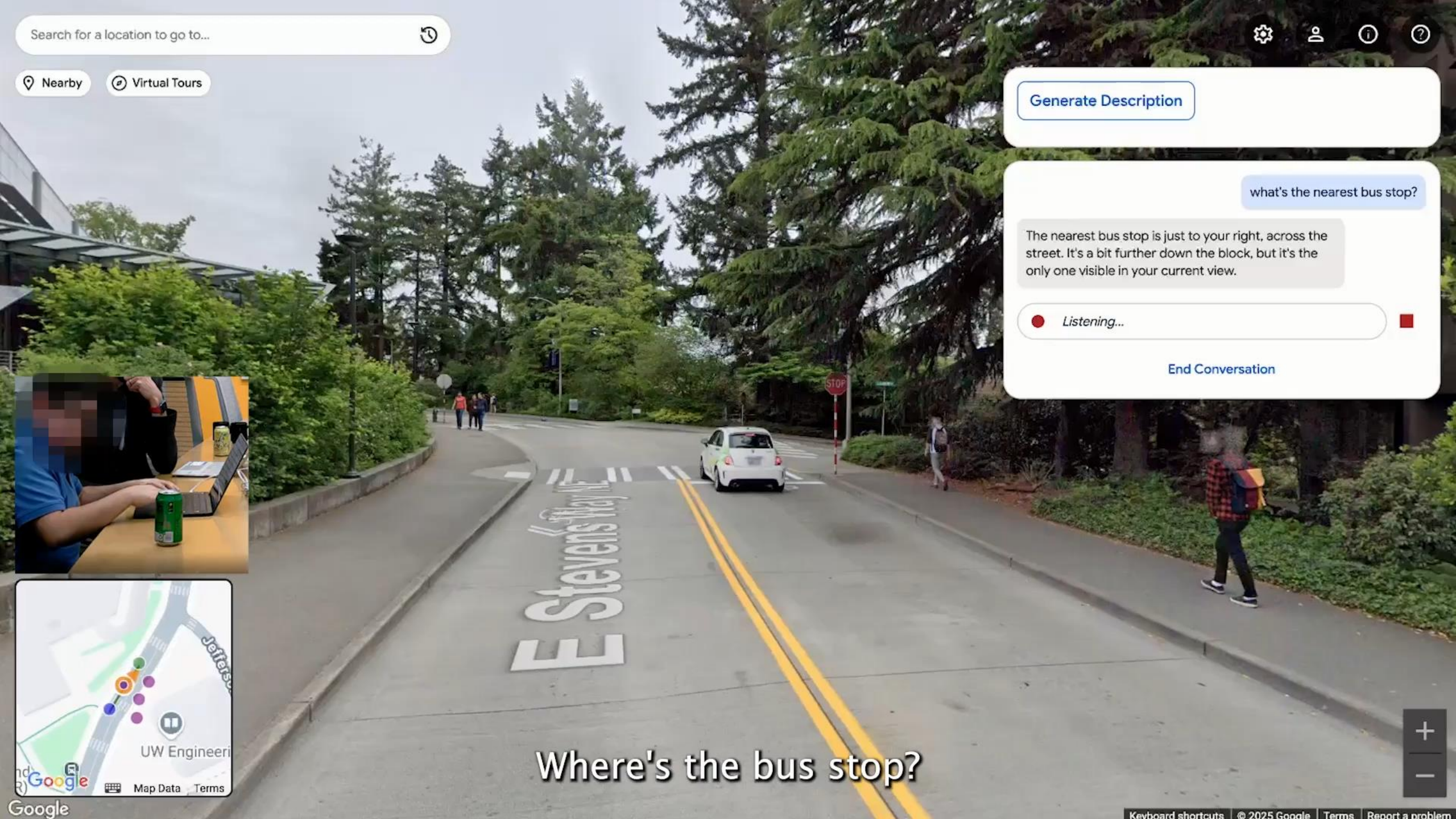
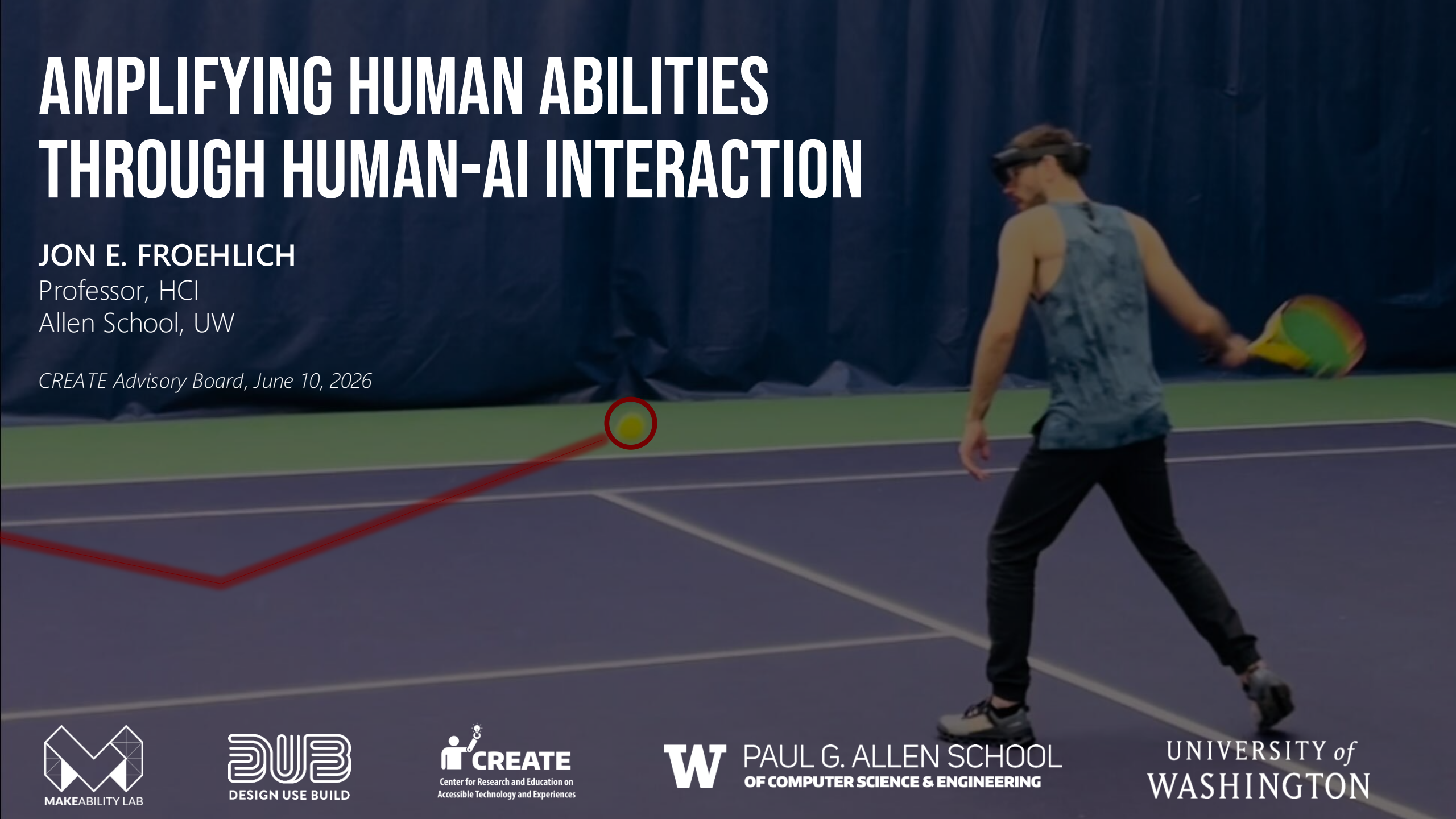
Terms
Report a problem


Search for a location to go to...
Nearby
Virtual Tours
Generate Description
what's the nearest bus stop?
The nearest bus stop is just to your right, across the street. It's a bit further down the block, but it's the only one visible in your current view.
Listening...
End Conversation
E Stevens Way NE
STOP
UW Engineeri
Google
Map Data
Terms
Where's the bus stop?
Keyboard shortcuts
© 2025 Google
Terms
Report a problem

AMPLIFYING HUMAN ABILITIES THROUGH HUMAN-AI INTERACTION

JON E. FROEHLICH
Professor, HCI
Allen School, UW

CREATE Advisory Board, June 10, 2026



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