# *The Future of Urban Accessibility: The Role of AI*

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Jon E. Froehlich
Allen School of Computer Science
University of Washington, USA
jonf@cs.uw.edu

Chu Li
Allen School of Computer Science
University of Washington, USA
chuchuli@cs.uw.edu

Maryam Hosseini
City and Regional Planning
UC Berkeley, USA
maryamh@berkeley.edu

Fabio Miranda
Department of Computer Science
University of Illinois Chicago, USA
fabiom@uic.edu

Andres Sevtsuk
City Form Lab, Massachusetts
Institute of Technology, USA
asevtsuk@mit.edu

Yochai Eisenberg
Disability and Human Development
University of Illinois at Chicago, USA
yeisen2@uic.edu

## Abstract

We have entered a new era of computing—one where AI permeates every aspect of society from education to healthcare. In this workshop, we examine the emerging role of AI in the design of equitable and accessible cities, transportation systems, and interactive tools for mapping and navigation. We will solicit short papers around key Urban AI + disability themes, including autonomous vehicles, intelligent wheelchairs, assistive human-robotic interaction, assessing and navigating pedestrian pathways, indoor accessibility, and overarching challenges related to ethics, bias, and data privacy and security. We invite both traditional HCI and accessibility researchers as well as scholars and practitioners from other disciplines relevant to this workshop, including disability studies, gerontology, social work, community psychology, and law. Our overarching goal is to identify open challenges, share current work across disciplines, and spur new collaborations related to AI and urban accessibility.

## CCS Concepts

• **Human-centered computing** → **Accessibility systems and tools**; **Visualization systems and tools**; • **Applied computing** → *Law*; *Cartography*; *E-government*.

## Keywords

Urban accessibility, smart cities, urban AI, human mobility, built environment, autonomous vehicles, sidewalks

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## 1 Introduction

How will AI transform urban infrastructure for people with disabilities—from public transportation and sidewalks to the design and use of buildings, housing, parks, and transit stations? What new mobility tools and techniques will AI enable, from autonomous vehicles and micro-mobility solutions to personalized routing and accessible interactive maps? How can AI be used to effectively and ethically solve urban accessibility problems and improve the quality of life for all? How can and should people with disabilities be involved with decisions about how AI is used in cities? In this workshop, we will bring together researchers, disability advocates, and policymakers to discuss the future of urban accessibility and the role of AI therein.

These cross-disciplinary conversations are critically important. In a recent review of 83 smart cities publications spanning computer science, rehabilitation medicine, and urban studies, Zhou *et al.* [67] found that "*people with disabilities are rarely considered*" and that few studies adopt an inclusive sociotechnical perspective to design "*human-centered smart cities.*" HCI is not immune to such criticism either. In a recent HCI workshop formulating an agenda for interdisciplinary research on "Urban AI" [37], disability and inclusivity are not mentioned—though other important and intersectional topics are, including environmental sustainability, public health, ethics, privacy and surveillance, citizen science, and participatory design.

Recognizing AI's potential in the future of urban design and human mobility but the lack of emphasis on inclusivity and involvement of people with disabilities, disability advocates have launched campaigns such as *Cities4All*[1] and *SmartCities4All*[2] that align key commitments of city governments to universal design, the *Convention on the Rights of Persons with Disabilities* [45], and the *UN Sustainable Development Goals* [44]. For example, as part of Cities4All and WorldEnabled.org, the City of Amsterdam launched the *Amsterdam4All* initiative to "*monitor and use AI to measure the accessibility of Amsterdam, to predict areas with sidewalk barriers, and to identify areas in need of attention.*" For their analysis, they used computer vision, LiDAR, and Crowd+AI tools like Project Sidewalk (https://amsterdam.projectsidewalk.org) [51].

Drawing on this momentum and our previous urban accessibility workshops at the *Spatial Data Science Symposium'21* [19], *ASSETS'22* [18], and *TRB'23* [16], we propose a workshop on the role of AI in the technical inventions and socio-political processes that impact the built environment, human mobility solutions, and interactive mapping tools for people with disabilities. To propel rich discussion, we will solicit short papers around key Urban AI + disability themes such as the following. We include citations to

[1] https://cities4all.org/
[2] https://smartcities4all.org/



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initial work in this area as grounding examples but emphasize that all enumerated topics are large, open research problems:

- Mapping and assessing accessible pedestrian pathways, including sidewalk location and network topology [26], sidewalk accessibility barriers [15, 25, 63], and sidewalk surface material inference [24].
- Using AI methods to infer and analyze travel behavior of people with unique mobility needs, including wheelchair users, the elderly, the young, and comparing travel behavior outcomes for people who use mobility aids *vs.* not [6, 11, 23, 38, 53, 55].
- Techniques for the large-scale computation and assessment of spatiotemporal urban conditions that impact accessibility, such as shadows [40, 46] and outdoor comfort [29, 35].
- Autonomous vehicles and the perceptions by and opportunities for people with disabilities [8, 13, 14, 27, 48].
- Indoor accessibility assessment & navigation [22, 52, 58–60, 66].
- Semi-automatically tracking and visualizing accessibility changes in the built environment [41, 54].
- Intelligent wheelchairs and assistive human-robotic interaction [20, 31, 43, 49, 56].
- The impact of environmental burdens and climate change on urban accessibility, with a particular focus on environmental [4, 36, 50] and climate justice [28, 47].
- Personalized, accessible maps & geovisualizations [9, 17, 34, 42].
- Using AI-derived data for urban planning and analytics [33].
- AI challenges and opportunities related to housing and employment access and support [5, 12]
- Perceptions of Urban AI by people with disabilities, policy makers, and transportation officials [30, 32, 65, 67].
- Overarching challenges and considerations related to ethics [7, 21], bias [61, 64], policy and laws [3, 39], the digital divide [62], and data privacy and security [1, 2, 57].

As an inherently cross-disciplinary topic, we have assembled a similarly cross-disciplinary workshop organizing team, which not only helps bring together disparate perspectives but also provides access and visibility to a range of communities. Indeed, our previous workshops have a track record of convening not just academics across diverse fields such as computer science, disability studies, urban planning, political science, and architecture but also disability advocates and policymakers as well. Our inaugural ASSETS workshop in 2022[3] was attended virtually by over 50 people from five continents, had a keynote by Karen Tamley, the CEO of *Access Living* and former Chair of the *US Access Board*, and 13 accepted workshop papers from over 40 co-authors.

Our workshop's overarching goals are to identify open challenges, share current work across disciplines, and spur new collaborations related to AI and urban accessibility. As a secondary goal, we aim to synthesize and publish key outcomes from our discussions similar to our *Grand Challenges in Accessible Maps* article [17], which extended from our CHI'18 SIG [10].

## 2 Pre-workshop Plans

Upon acceptance of our proposal, we will create an accessible workshop website at https://accessiblecities.github.io/UrbanAccess2024 with an overview, key themes, a proposed schedule, and our CFP. Drawing on our cross-disciplinary organizing team, we will advertise our workshop broadly on social media, mailing lists, and our disciplinary and professional networks. To help build community, we will invite workshop participants to join an online discussion workspace like Discord, which will be used before, during, and after the workshop to foster conversation and share work. Before the workshop, we will post accepted CFP content to our workshop webpage for broad dissemination.

[3]The ASSETS'22 workshop site: https://accessiblecities.github.io/UrbanAccess2022/

## 3 Workshop Plans

Following our previously successful workshops at *Spatial Data Science Symposium'21* [19], *ASSETS'22* [18], and *TRB'23* [16], our primary focus is on interactivity, discussion, and community building. For example, we balance research talk sessions with breakout activities, an interactive mapathon, and full group reflections.

Both the symposium workshop and the ASSETS'22 workshop were virtual while the TRB workshop was in-person in Washington DC. For a virtual setting, we have found that interactivity is particularly important to maximize engagement and catalyze discussion. For the ASSETS'24 workshop, we will introduce an interactive Crowd+AI activity where participants will have an opportunity to try a Human-AI based tool to evaluate the accessibility of the built environment and then engage in critical discussion about opportunities and challenges related to Urban AI + disability. Following the workshop, we hope to synthesize our discussions into a report—perhaps published in the *SIGACCESS Newsletter* or *ACM Interactions*.

We envision the following timeline (subject to change):

- **Aug 7, 2024:** ASSETS'24 decision notification
- **Aug 12, 2024:** Urban AI + disability workshop website launched. CFP advertising commences. Paper deadline is Sept 30, 2024.
- **Aug 14, 2024:** Finalize workshop proposal paper & submit camera ready.
- **Sept 20, 2024:** Workshop submission deadline
- **Oct 7, 2024:** Workshop notifications out
- **Oct 16, 2024:** Workshop camera ready deadline
- **Oct 18, 2024:** Accepted workshop content posted to website and shared
- **Oct 21, 2024:** Week of workshop (exact date TBD)

## 4 Diversity and Inclusion Criteria

We are committed to organizing an inclusive workshop and creating a safe, open space for fruitful discussion. First, we will help our participants create accessible workshop content, including their PDF submissions and their presentations—adhering to the ASSETS'24 accessibility guidelines. Second, we will survey workshop attendees to understand their specific access needs and ensure accessibility accommodations are made for all participants to fully contribute. Third, we will actively encourage broad participation from individuals representing diverse backgrounds, disciplines, and lived experience. Our workshop organizing team represents disparate topical areas from public health and urban planning to data visualization and applied machine learning. Leveraging this cross-disciplinarity, we will advertise our workshop broadly via different professional networks. Moreover, we will invite not just academics but practitioners and policy makers as well. Fourth, and finally, we

**Table 1: Draft workshop schedule. As we have not yet set a clock time for the workshop to begin, all timings are relative. The schedule is subject to change based on reviewer and community feedback.**

| Time | Description | Type |
|---|---|---|
| 00:00-00:10 | Opening remarks | Welcome |
| 00:10-00:40 | Ice breaker activity | Activity |
| 00:40-01:20 | 1st talk session | Talks |
| 01:20-01:40 | 1st breakout on key themes | Breakout discussions |
| 01:40-02:00 | Full group shareout | Full-group discussions |
| 02:00-02:15 | 1st break | Break |
| 02:15-03:15 | Mapathon + discussion | Activity |
| 03:15-03:30 | 2nd break | Break |
| 03:30-04:30 | 2nd talk session | Talks |
| 04:30-04:50 | 2nd breakout on key themes | Breakout discussions |
| 04:50-05:10 | Full group shareout | Full-group discussions |
| 05:10-05:30 | Wrap up & future directions | Goodbye |

will support junior scholars and new members of the community by providing spotlight introductions and alternative contribution formats (*e.g.,* pictorials, demos). Our belief is that the ASSETS workshop program provides an alternative channel into the accessibility research community—and we want to foster diverse community growth.

## 5 Organizers

Urban accessibility, human mobility, and the role of AI therein are intrinsically cross-disciplinary. We have assembled a similarly cross-disciplinary set of workshop co-organizers, including in urban assessment, public health, urban planning, data visualization, and applied machine learning. All have experience working with and prioritizing people with disabilities in their respective topic areas.

**Jon E. Froehlich** is a Professor in the Allen School of Computer Science, core faculty of the Interdisciplinary PhD Program in Urban Design and Planning at UW, and co-founder of Project Sidewalk—an open-source project aimed at mapping and assessing every sidewalk in the world using crowdsourcing + AI. He is also a founding Associate Director of the UW's Center for Research and Education on Accessible Technology and Experiences (CREATE). At UW, he directs the Makeability Lab whose mission is to "*design, build, and evaluate new interactive tools and techniques to address pressing societal challenges.*" He is the primary contact for this workshop.

**Chu Li** is a PhD student in Computer Science at the University of Washington. Her research explores the intersection of human-computer interaction and urban science, focusing on enhancing urban accessibility through interactive technology. She holds an MS in Architecture and Urban Design from Columbia University and an MS in Information Science from the University of Toronto. Previously, she practiced as an urban designer at Skidmore, Owings & Merrill in Chicago and as a product designer at Samsung Canada.

**Maryam Hosseini** is a postdoc at the MIT Department of Urban Studies and Planning, focusing on pedestrian mobility, urban accessibility, and walkability. She develops open-source tools using computer vision and machine learning to address a wide range of urban challenges such as accessibility for people with disabilities, heat risk and poverty. Starting in 2025, Hosseini will begin as an Assistant Professor at UC Berkeley in City and Regional Planning department.

**Fabio Miranda** is an Assistant Professor in the Computer Science Department at University of Illinois at Chicago. His research centers on proposing techniques that allow for the interactive and collaborative analysis of large-scale data, combining interactive visualization, data management, and machine learning. In particular, he focuses on how urban visual analytics tools can help address different problems cities face by integrating data from multiple resolutions and diverse sources.

**Andres Sevtsuk** is Head of the City Design and Development Group and an Associate Professor of Urban Science and Planning at the Department of Urban Studies and Planning, where he also leads the City Form Lab. His research focuses on public qualities of cities, and on making urban environments more walkable, sustainable and equitable, bridging the fields of urban design, spatial analytics and mobility research.

**Yochai Eisenberg** is an Associate Professor in Disability and Human Development at the University of Illinois at Chicago and co-leads the Community Health and Disability Inclusion Research and Training Program. His research is at the intersection of disability, urban planning, and public health studying ways that neighborhood environments, local policies, and systems impact health behaviors and health outcomes for people with disabilities using a blend of big data analytics, policy evaluation, and community engaged research.

## 6 Call for Participation

Our draft Call for Participation (CFP) is below:

> How will AI transform urban infrastructure for people with disabilities—from public transportation and sidewalks to the design and use of buildings, housing, parks, and transit stations? What new mobility tools and techniques will AI enable from autonomous vehicles and micro-mobility solutions to personalized routing and accessible interactive maps? In this workshop, we examine the emerging role of AI in the design of equitable

and accessible cities, transportation systems, and interactive tools for mapping and navigation.

We invite short papers (broadly construed), including experience reports, position papers, vision pieces, demonstrations, pictorials, or research summaries up to approximately 2,000 words on this topic. For the word count, you can exclude figures, tables, captions, and the reference list. As we aim for a broad representation of viewpoints, disciplines, and work practices, please choose a format that you feel best conveys your work.

Submitted artifacts should not be anonymized and, in addition to their primary content, should include a bio of each author and rationale for attending the workshop. PDF submissions should be accessible following the ASSETS'24 Accessibility Guidelines. Artifacts will be reviewed and selected by the co-organizers to balance topics, geographies, and communities of focus. Accepted authors will be required to register and virtually attend the workshop via Zoom on <date TBD>.

Our overarching goals are to identify open challenges, share current work across disciplines, and spur new collaborations in Urban AI + disability. As a secondary goal, we aim to synthesize and publish our discussions together in a jointly authored report perhaps to the SIGACCESS Newsletter or beyond.

Please join us. Contact: urbanaccess2024@cs.uw.edu.

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