Manaswi **Saha**

PHD CANDIDATE IN COMPUTER SCIENCE AND ENGINEERING

Paul G. Allen School of Computer Science and Engineering, University of Washington, Seattle, WA - 98195, USA

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Overview

A **computer scientist** conducting **interdisciplinary research** across **high impact problem domains** such as accessibility, sustainability, and health
• Combining **AI**, **data-driven tech**, and **human-centered design processes** with **large-scale real-world deployments** to design and build **better interactive systems** for enriching people's interactions with data, tools, and the world

Skills: system building | large-scale deployments | multi-faceted stakeholder analysis | design space development

Research Interests: human computer interaction | urban informatics | data visualization | ubiquitous computing | accessibility | sustainability

Accomplishments and Real-World Impact:
• Engineered **Project Sidewalk**, a tool deployed in **10 cities around the world**; used by **11000+ users**; generated **datasets with 700,000+ data points**
• Research recognized by media, notably in **New York Times and NPR**, blogs by **World Bank**, and TV news outlets in Seattle and DC
• **Invited speaker** across academic institutions, tech industry, government conferences, and local meetups

Education

University of Washington
Seattle, USA

PH.D. IN COMPUTER SCIENCE AND ENGINEERING | M.S. IN COMPUTER SCIENCE AND ENGINEERING   *September 2017 - August 2022 (expected)*

Advisor: Prof. Jon Froehlich • Google PhD Fellowship 2020 - 2022

University of Maryland
College Park, USA

PH.D. IN COMPUTER SCIENCE - *transferred to University of Washington*   *August 2015 - August 2017*

Advisor: Prof. Jon Froehlich • Dean's Fellowship 2015 - 2017

Vellore Institute of Technology (VIT) University
Vellore, India

MASTER OF COMPUTER APPLICATIONS (MCA)   *July 2009 – May 2012*

Top 3 in the MCA batch of 2012

University of Mumbai
Mumbai, India

BACHELOR OF SCIENCE – INFORMATION TECHNOLOGY (B.Sc.IT)   *June 2006 – April 2009*

Top 3 in the B.Sc.IT batch of 2009

Research and Industry Experience

University of Washington
Seattle, USA

GRADUATE RESEARCH ASSISTANT • MAKEABILITY LAB   *September 2017 – May 2022*

Advisor: Prof. Jon Froehlich • Collaborator(s): Prof. Jeffrey Heer (UW)

Designing Interactive Tools for Visualizing and Modeling Urban Accessibility At Scale
Led formative work around designing interactive visualization tools for urban accessibility using Project Sidewalk data • Built geovis prototypes using mapbox, leaflet, d3, and kepler.gl • Designed and ran qualitative studies (N=25) to understand multi-stakeholder needs and sensemaking practices of stakeholders, including policymakers, disability advocates, government officials, and people with disabilities • **Paper(s)**: P.9, EA.4, EA.5, EA.7

Urban Accessibility as a Socio-Political Problem
Led a formative interview study with five stakeholders (N=25)—policymakers, transportation department officials, people with disabilities, caregivers, and accessibility advocates—to understand the socio-political challenges impeding accessible infrastructure development and the role of technology to facilitate cross-stakeholder interactions • **Paper(s)**: P.8

Project Sidewalk: Enabling Crowd-powered Sidewalk Accessibility Data Collection
Lead researcher and engineer of Project Sidewalk (PS), a Google Street View based crowdsourcing tool • Led a 10-person R&D team to develop, publicly deploy, and maintain PS tool • Wrote 15.5K lines of code for HTML/CSS/JS frontend and Java/Scala/PostgreSQL backend • Generated dataset with 250,000+ labels over a 18-month deployment in Washington DC • Designed and ran interview studies with multiple stakeholders (N=14) in the government and the disability community • **Paper(s)**: P.6, EA.3, EA.5-6 • `http://projectsidewalk.io`

Autodesk Research
Toronto, Canada

RESEARCH INTERN • HCI/VIS: USER INTERFACE RESEARCH GROUP • REMOTE INTERNSHIP   *June 2020 – October 2020*

Mentor: Justin Matejka

Understanding people's perception of metrics, especially environmental sustainability metrics
Explored how people assessed different metrics to gain insights towards effective communication of sustainability information • Built a HTML/CSS/JS web app for an online study with 50+ sustainability experts and novices on people's abilities in making assessments for length, weight, cost, power, and carbon footprint • **Paper(s)**: *In-prep*

Microsoft Research
Redmond, USA

Research Intern • Ability and Enable Groups
June 2018 – September 2018

Mentors: Meredith Ringel Morris, Ed Cutrell, Alex Fiannaca, and Melanie Kneisel

Last-few-meters Wayfinding Challenge for People with Visual Impairments
Engineered Landmark AI, a mobile app prototype using navigational 3D-audio and computer vision algorithms for addressing the last-few-meters challenge in GPS systems • Conducted a design-probe study to understand and address wayfinding challenges for visually impaired users • Ran a survey and an interview study with 12 participants to create the design space for AI-driven navigation tools • **Paper(s)**: P.7

Adobe Research
San Jose, USA

Research Intern • Big Data Experience Lab
May 2016 – August 2016

Mentors: Tom Jacobs and David Tompkins

Beacon-based Personalized Information Delivery
Created an ecosystem design and prototype for Bluetooth beacon-based personalized information delivery for the digital marketing domain that bridges the online world with the physical (brick and mortar stores) • **Patent** as the lead filed in Feb 2017 (PA.1)

University of Maryland
College Park, USA

Graduate Research Assistant • Makeability Lab
August 2015 – August 2017

Advisor: Prof. Jon Froehlich

Novice Thermography
Explored the use of thermal cameras mounted on smartphones by novices (e.g., DIY enthusiasts) to conduct thermography in homes • Analyzed the interview data for a 4-week field study with 10 participants • **Paper(s)**: P.5, EA.2

Indraprastha Institute of Information Technology Delhi
New Delhi, India

Research Associate • Mobile and Ubiquitous Computing Lab
November 2012 – July 2015

Advisor: Prof. Amarjeet Singh • Collaborator(s): Prof. Anind Dey (UW), Prof. Yuvraj Agarwal (CMU), Prof. Pushpendra Singh (IIIT-Delhi)

Personal Energy Monitoring in Smart Homes
Led research that explored using smartphone sensors with smart electricity meter for inferring and aggregating daily energy consuming activities to individuals • Engineered EnergyLens+, a real-time energy apportionment and feedback system for smart living spaces to provide real-time personal energy usage information; a Python/Django/MySQL server and an Android app for visualizing feedback • Evaluated the system with a small-scale deployment in single and multi-occupant homes over 2 weeks • **Paper(s)**: P.2, P.3

SensorAct: An Occupant-aware Middleware for Building Energy Management
Led a major engineering effort that allowed SensorAct, a Java/MongoDb-based middleware to operate hardware sensor modules, mounted with ambient environmental sensors, through an online interface and share their access and control with building occupants • **Paper(s)**: P.4, EA.1

Publications

Peer-reviewed Conference Papers

2022   P.9   **Visualizing Urban Accessibility: Investigating Multi-stakeholder Perspectives through a Map-based Design Probe Study**
M. Saha, S. Patil, E. Cho, E. Y. Cheng, C. Horng, D. Chauhan, R. Kangas, R. McGovern, A. Li, J. Heer, and J. E. Froehlich
CHI: SIGCHI Conference on Human Factors in Computing Systems. New Orleans, USA. *(Acceptance Rate: 24.7%)*

2020   P.8   **Urban Accessibility as a Socio-Political Problem: A Multi-Stakeholder Analysis**
M. Saha, D. Chauhan, S. Patil, R. Kangas, J. Heer, and J. E. Froehlich
CSCW: ACM Conference on Computer-Supported Cooperative Work and Social Computing. Virtual. *(Acceptance Rate [minor rev.]: 7.9%)*

2019   P.7   **Closing the Gap: Designing for the Last-Few-Meters Wayfinding Problem for People with Visual Impairments**
M. Saha, A. J. Fiannaca, M. Kneisel, E. Cutrell, M. R. Morris
ASSETS: ACM SIGACCESS Conference on Computers and Accessibility. Pittsburgh, USA. *(Acceptance Rate: 26%)*

      P.6   **Project Sidewalk: A Web-based Crowdsourcing Tool for Collecting Sidewalk Accessibility Data At Scale**
🏆   **M. Saha**, M. Saugstad, H. Maddali, A. Zeng, R. Holland, S. Bower, A. Dash, S. Chen, A. Li, K. Hara, J. Froehlich
CHI: SIGCHI Conference on Human Factors in Computing Systems. Glasgow, UK. *(Acceptance Rate: 23.8%)* • **Best Paper Award (Top 1%)**

2017   P.5   **Exploring Novice Approaches to Smartphone-Based Thermographic Energy Auditing: A Field Study**
M. L. Mauriello, **M. Saha**, E. Brown, J. E. Froehlich
CHI: SIGCHI Conference on Human Factors in Computing Systems. Denver, USA. *(Acceptance Rate: 25%)*

2015   P.4   **SensorAct: A Decentralized and Scriptable Middleware for Smart Buildings**
P. Arjunan[*], **M. Saha**[*], H. Choi, M. Gulati, A. Singh, P. Singh, M. B. Srivastava
IEEE UIC: IEEE International Conference on Ubiquitous Intelligence and Computing . Beijing, China. *(Acceptance Rate: 30.6%)*

2014   P.3   **WattShare: Detailed Energy Apportionment in Shared Living Spaces within Commercial Buildings**
S. Thakur, **M. Saha**, A. Singh, Y. Agarwal
BuildSys: ACM International Conference on Embedded Systems for Energy-Efficient Buildings. Memphis, USA. *(Acceptance Rate: 27%)*

	P.2	**EnergyLens: Combining Smartphones with Electricity Meter for Accurate Activity Detection and User Annotation**
		M. Saha, S. Thakur, A. Singh, Y. Agarwal
		e-Energy: ACM International Conference on Future Energy Systems. Cambridge, UK. *(Acceptance Rate: 20%)*
2012	P.1	**Bandwidth Management Framework for Multicasting in Wireless Mesh Networks**
		M. Saha, P. V. Krishna
		IJIEE: International Journal of Information and Electronics Engineering. Vol. 2, No. 3.

Peer-reviewed Posters, Extended Abstracts, Doctoral Colloquium, and Workshops

2021	EA.7	**The Future of Global-Scale Spatial Data Collection and Analyses on Urban (in)Accessibility for People with Disabilities**
		J. E. Froehlich, F. Miranda, M. Hosseini, N. Bolten, A. Caspi, R. M. Cesar Jr., H. Dieterich, Y. Eisenberg, V. Pineda, **M. Saha** et al.
		Spatial Data Science Symposium 2021. Virtual.
2020	EA.6	**Towards Mapping and Assessing Sidewalk Accessibility Across Sociocultural and Geographic Contexts**
		J. E. Froehlich, M. Saugstad, **M. Saha**, M. Johnson
		AVI Workshop: Data4Good - Designing for Diversity and Development. Ischia, Italy.
2019	EA.5	**Interactive Computational Tools for Assessing and Understanding Urban Accessibility At Scale**
		M. Saha
		ASSETS: ACM SIGACCESS Conference on Computers and Accessibility. Doctoral Colloquium. SIGACCESS Newsletter. Pittsburgh, USA.
2018	EA.4	**Interactively Modeling and Visualizing Neighborhood Accessibility at Scale: An Initial Study of Washington DC**
		A. Li, **M. Saha**, A. Gupta, J. E. Froehlich
		ASSETS: ACM SIGACCESS Conference on Computers and Accessibility. Poster & Demo. Galway, Ireland.
2017	EA.3	**A Pilot Deployment of an Online Tool for Large-Scale Virtual Auditing of Urban Accessibility**
		M. Saha, K. Hara, S. Behnezhad, A. Li, M. Saugstad, H. Maddali, S. Chen, J. E. Froehlich
		ASSETS: ACM SIGACCESS Conference on Computers and Accessibility. Poster & Demo. Baltimore, USA.
2016	EA.2	**The Future Role of Thermography in Human-Building Interaction**
		M. L. Mauriello, M. Dahlhausen, E. Brown, **M. Saha**, J. E. Froehlich
		CHI Workshop: Future of Human-Building Interaction. San Jose, USA.
2013	EA.1	**SensorAct: Design and Implementation of Fine-grained Sensing and Control Sharing in Buildings**
		P. Arjunan, **M. Saha**, M. Gulati, N. Batra, A. Singh, P. Singh
		NSDI: USENIX Symposium on Networked Systems Design and Implementation. Poster. Lombard, USA.

Patents

2017	PA.1	**Digital Content Output Control in a Physical Environment Based on a User Profile**
		Manaswi Saha, Tom Jacobs, David Tompkins, Peter Fransen
		Adobe Research. Filed in February 2017. Patent Pending.

Skills

Programming	Python, Java, C, C++, Shell Scripting
Front-end	HTML/CSS, JavaScript
Web Frameworks	Play, Django
Backend Databases	PostgreSQL, MySQL, MongoDB
Visualization Tools	mapbox, d3, Tableau, kepler.gl
Data Analysis and Applied ML	Python: pandas, numpy, matplotlib, sklearn
Crowdsourcing Data	Mechanical Turk, Prolific
Other Tools	Latex, Github, IntelliJ IDEA, Eclipse
User Research	Interviews, surveys, thematic analysis, affinity diagramming, stakeholder analysis

Honors & Awards

2020 Google PhD Fellowship in HCI To support thesis work on interactive tools for urban accessibility	*Seattle, USA*
2019 Amazon Catalyst Award of $10,000 To support thesis work on interactive tools for urban accessibility	*Seattle, USA*
Best Paper Award ACM CHI 2019 for Project Sidewalk	*Glasgow, UK*
ACM-W Scholarship ACM CHI 2016	*San Jose, USA*
CRA-W Grad Cohort Participation Grant Grad Cohort Workshop 2016	*San Diego, USA*
Dean's Fellowship University of Maryland, College Park (2015 – 2017)	*College Park, USA*
Microsoft Research India Travel Grant To present at ACM e-Energy 2014	*Cambridge, UK*
Merit Scholarship VIT University (2009 – 2012) – awarded all three years – top 3 (of 120) students	*Vellore, India*
Certificate of Merit B.Sc.IT batch (2006 – 2009) – awarded all three years – top 3 (of 60) students	*Mumbai, India*
Certificate of Merit Best Bachelor's (B.Sc.IT) Project	*Mumbai, India*

Talks

2022	T.17	**Visualizing Urban Accessibility: Investigating Multi-stakeholder Perspectives through a Map-based Design Probe Study**
		ACM Conference on Human Factors in Computing Systems (CHI). New Orleans, USA. May 2022

| 2021 | T.16 | **Visualizing Urban Accessibility: Understanding Sensemaking Processes across Multiple Stakeholders**
IEEE VIS 2021 Workshop on Visualization for Social Good. Virtual. October 2021 |
| | T.15 | **Designing Interactive Computational Tools for Understanding Urban Accessibility: Exploring the Nexus of Urban Informatics x Accessibility**
Guest lecture for Computing for Social Good, University of Delaware. Virtual. April 2021 • **Invited Talk** |
| | T.14 | **Designing Interactive Tools for Urban Accessibility: A Socio-Political and Socio-Technical Perspective**
Guest Lecture for Population, Economy, and Society, IIT Kanpur. Virtual. April 2021 • **Invited Talk** |
| 2020 | T.13 | **Designing Interactive Tools for Understanding Urban Accessibility**
NWFSC Monster Seminar Jam Series at Northwest Fisheries Science Center, NOAA. Virtual. October 2020 • **Invited Talk** |
| | T.12 | **Urban Accessibility as a Socio-Political Problem: A Multi-Stakeholder Analysis**
ACM Conference on Computer-Supported Cooperative Work and Social Computing (CSCW). Virtual. October 2020 |
| | T.11 | **Urban Accessibility as a Socio-Political Problem: A Multi-Stakeholder Analysis**
Accessibility Colloquium, University of Washington. Seattle, USA. October 2020 |
| | T.10 | **Project Sidewalk: Mapping the Accessibility of the Physical World At Scale Using Interactive Computational Tools**
Google Tech Talk. Seattle, USA. January 2020 • **Invited Talk** |
| 2019 | T.9 | **Closing the Gap: Designing for the Last-Few-Meters Wayfinding Problem for People with Visual Impairments**
ACM International SIGACCESS Conference on Computers and Accessibility (ASSETS). Pittsburgh, USA. October 2019 |
| | T.8 | **Project Sidewalk: Mapping the Accessibility of the Physical World At Scale Using Interactive Computational Tools**
Washington State Ridesharing Organization (WSRO) Annual Conference. Spokane, USA. September 2019 • **Keynote Speaker** |
| | T.7 | **Project Sidewalk: A Web-based Crowdsourcing Tool for Collecting Sidewalk Accessibility Data At Scale**
ACM Conference on Human Factors in Computing Systems (CHI). Glasgow, UK. May 2019 • **Best Paper Award (Top 1%)** |
| 2017 | T.6 | **Bridging the Pedestrian Accessibility Informational Gap: User-Facing Applications and Large-Scale Virtual Auditing**
Affiliates Research Day, University of Washington. Seattle, Washington. November 2017 |
| | T.5 | **Project Sidewalk: Assessing Urban Accessibility using Crowdsourcing and Google Street View**
HCIL Symposium, University of Maryland. College Park, USA. May 2017 |
| | T.4 | **Project Sidewalk: Characterizing Physical World Accessibility at Scale**
WalkHackNight II. Arlington, USA. February 2017 • **Invited Talk** |
| 2016 | T.3 | **Interactive Computational Tools For Accessibility**
Diversity in Computing Summit, University of Maryland. College Park, USA. November 2016 |
| | T.2 | **Tech+Design: Interaction Design For A Purpose**
Technica: Tech+X Talk Series. College Park, USA. November 2016 |
| 2014 | T.1 | **EnergyLens: Combining Smartphones with Electricity Meter for Accurate Activity Detection and User Annotation**
Fifth International Conference on Future Energy Systems (ACM e-Energy). Cambridge, UK. June 2014 |

Press and Media Coverage

Apr 2022	Accessible Sidewalks for Inclusive Cities World Bank's Sustainable Cities Blog ⬚
Dec 2021	Behind the effort to make sidewalks accessible NPR's "Here and Now" ⬚
May 2021	Make The World Better With One Of These Nine Ideas New York Times ⬚
Oct 2020	Manaswi Saha wins 2020 Google Fellowship for advancing computing research with social impact Allen School News ⬚
Oct 2020	Manaswi Saha, Lead Graduate Student for Project Sidewalk, Wins Google Fellowship Urbanalytics News ⬚
Oct 2020	Announcing the 2020 Google PhD Fellows Google AI News ⬚
Dec 2019	Can Mapping Sidewalks Increase Ridership? National Center for Mobility Management ⬚
Oct 2019	Manaswi Saha wins Amazon Catalyst Award to develop techniques for visualizing urban accessibility at scale Allen School News ⬚
Oct 2019	Amazon Catalyst announces new round of Fellows CoMotion News ⬚
May 2019	Graduate students want to map the world's sidewalks for their accessibility KIRO 7 News ⬚
May 2019	Players label accessibility of city streets in new game IEEE GlobalSpec Electronics 360 ⬚
Apr 2019	Newberg streets second in nation to be studied with new accessibility metric The Newberg Graphic ⬚
Apr 2019	Seattle's got terrible sidewalks. You can help fix them. Crosscut ⬚
Apr 2019	Project Sidewalk helps users map accessibility around Seattle, other cities UW News ⬚
Feb 2017	Make D.C.'s sidewalks more accessible with this crowd-sourced map Curbed DC ⬚
Feb 2017	University of Maryland project looks to crowdsource an accessibility map of DC's sidewalks Mobility Lab ⬚
Jan 2017	Clear the Way - UMD Computer Scientists Seek Public Help Mapping Sidewalk Accessibility Terp Magazine ⬚
Nov 2016	How Project Sidewalk is making DC more accessible Technical.ly ⬚
Nov 2016	New tool makes DC sidewalks more accessible for everyone WUSA9 News ⬚
Oct 2016	A UMD team made an app highlighting D.C. areas inaccessible to people with disabilities The Diamondback ⬚
Oct 2016	You Can Help Map the Accessibility of the World Next City ⬚
Sep 2016	Missing sidewalks? There's an app for that Greater Greater Washington ⬚

Teaching Experience

University of Washington
GRADUATE TEACHING ASSISTANT

Seattle, USA

January 2018 – August 2022

Paul G. Allen School of Computer Science and Engineering

CSE/STAT416: Introduction to Machine Learning	*Summer 2022*
CSE482A: Capstone Software Design to Empower Underserved Populations	*Spring 2020*
CSE599H: Crowdsourcing, Citizen Science, and Large-scale Online Experimentation	*Winter 2020*
CSE599S: The Future of Access Technologies	*Fall 2019*
CSE441: Advanced HCI: Advanced User Interface Design, Prototyping, And Evaluation	*Spring 2018, Spring 2019*
CSE440: Introduction to HCI	*Winter 2018, Fall 2018, Winter 2019*

University of Maryland
GRADUATE TEACHING ASSISTANT

College Park, USA

August 2015 – May 2016

Department of Computer Science

CMSC132: Object-Oriented Programming II	*Spring 2016*
CMSC131: Object-Oriented Programming I	*Fall 2015*

Service

2021	SDSS 2021 Workshop Organizing Team: The Future of Global-Scale Spatial Data Collection and Analyses on Urban (in)Accessibility
2021	ACM CHI 2022 Reviewer
2020	ACM CHI 2021 Reviewer
	ACM CSCW 2020 Reviewer
2019	ACM CHI 2020 Reviewer
	Incoming UW CSE PhD Students' Mentor
2018	DUB PhD Student Retreat Co-organizer
	UW HCI Skillshares Organizer
	ACM CHI 2018 Student Volunteer
2016	Adobe Girls Who Code Mentor
	ACM CHI 2016 Student Volunteer

Mentorship

University of Washington   Evie Yu-Yen Cheng (Masters), Emily Cho (Masters), Chris Horng (Masters), Devanshi Chauhan (Masters), Rachel Kangas (Masters), Siddhant Patil (Masters), Richard McGovern (Masters), Johnson Kuang (Freshman), Aileen Zeng (Sophomore)

University of Maryland   Anthony Li (Senior), Aditya Dash (Senior), Steven Bower (Senior), Chirag Shankar (Junior), Maria Furman (Senior), Ji Hyuk Bae (Freshman)

University of Michigan   Sage Chen (Sophomore)

Montgomery Blair High School   Ryan Holland (Senior)

IIIT-Delhi   Vedant Das Swain (Senior, Now PhD Student at Georgia Tech), Shailja Thakur (Masters, Now PhD Student at University of Waterloo)

Courses Taken

University of Washington, Seattle

Computer Systems, Principles of Data Management, Data Visualization, Introduction to Artificial Intelligence, Computing for Social Good

University of Maryland, College Park

Computational Linguistics I, Computer Processing of Pictorial Information, Human Factors in Security and Privacy, Information Centric Design of Systems, Empirical Research Methods in Computer Science

VIT University   (selected ones)

Algorithm Analysis and Design, Data Structures, Discrete Mathematics, Operating Systems, Database Management Systems, Computer Networks, Mobile Computing, Pervasive Computing, Software Engineering, Open Source Programming