UTC Project Information	
Project Title	Enabling a New Data Science for Urban Accessibility for All
University	University of Washington
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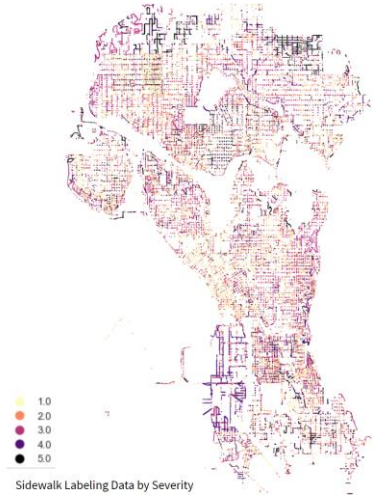
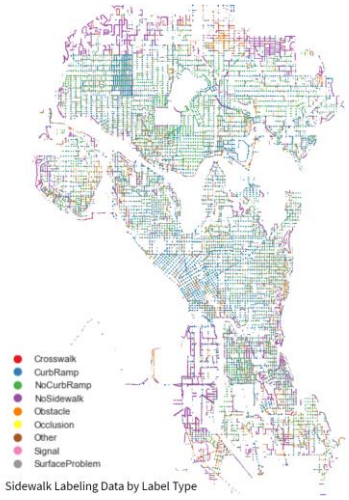
Funding Source(s) and Amounts Provided (by each agency or organization)	University of Washington PacTrans $40,000 University of Washington $40,000
Total Project Cost	$ 80,000
Agency ID or Contract Number	69A3551747110
Start and End Dates	March 16, 2021- Sept 15, 2022
Brief Description of Research Project	In our work, we are exploring sidewalk auditing approaches that are fast, reliable, and low-cost using a combination of remote crowdsourcing, machine learning, and online map imagery. Previously, we received PacTrans funding for **Project Sidewalk** (https://projectsidewalk.org), a web tool that enables online users to remotely label sidewalks and identify accessibility problems by virtually walking through city streets similar to a first-person, immersive video game. For each label, users provide a severity score, mark relevant tags, and can also supply open-ended descriptions. Labels are used to create new urban accessibility visualizations, inform government policy and funding decisions, and to train deep learning networks to assess sidewalks automatically—further scaling our approach. Our PacTrans-funded research project explored how to leverage Project Sidewalk's unique cross-regional sidewalk dataset and investigate the research questions via new data analytics and visualization tools such as: what are the geo-spatial patterns and key correlates of urban accessibility? What new cities should we expand into? How might the crowdsourced data be used in urban planning and ADA transition plans?

Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	At the time of writing our PacTrans proposal, we had deployed Project Sidewalk into six cities, including Seattle, WA, Newberg, OR, Columbus, OH, Pittsburgh, PA, Mexico City, MX, San Pedro, MX and collected 400k geo-located sidewalk labels. Aided, in part, by PacTrans support we have now deployed Project Sidewalk in 12 cities across four countries: US, Mexico, Netherlands, and Switzerland. We are also in conversations with Juneau, Alaska, Auckland, New Zealand, and Taipei, Taiwan. Overall, we have collected over 1 million crowdsourced datapoints, including nearly 740,000 labels and 370,000 validations. One notable result is PhD student Chu Li's equity analysis of sidewalks in Seattle based on Project Sidewalk data, which was published in UrbanAcess2022. The Figure below shows the spatial distribution of collected sidewalk labels by severity and label type. Chu studied how these sidewalk patterns corresponded to census block data.  Sidewalk Labeling Data by Severity  Sidewalk Labeling Data by Label Type Another notable result is our close collaboration with Oradell, NJ and a local disability advocacy organization, a local Girl Scouts troop, and a local hospital. Here, Project Sidewalk was used to collect 12k accessibility labels and 18k validations showing significant surface problems due to uplifted panels from root growth and large areas of missing sidewalks. These results will be presented by the Girl Scouts to the Oradell City Council in December, and we are working on a manuscript for a top-tier publication venue. 

	Finally, a team of undergraduate researchers used Project Sidewalk data to train computer vision algorithms to semi-automatically verify identified sidewalk problems in streetview imagery. They performed two experiments: in Experiment 1, we examined the effect of a large, unvalidated training dataset vs. a subset composed of positively validated labels. In Experiment 2, we conducted a series of sub-experiments examining the ability to general a trained model across cities. This work was published at ASSETS'22.
Impacts/Benefits of Implementation (actual, or anticipated)	Our deployed tools and collected data are making real-world impact. Some highlights: • In Amsterdam, we are working closely with the city government to assess the viability of crowdsourced data collection, to help with urban planning, and to train machine learning algorithms. We have hosted multiple mapathons in collaboration with the city (some in person, some remote only) and have collected over 27k labels and 30k validations. • In Oradell, our work has been a featured service learning project for the Girl Scouts and will be presented to the Oradell City Council in December. We have collected 12k labels and 18k validations. • Building on Oradell, we have begun multiple service learning efforts with high schools, community colleges, and universities examining the potential of using Project Sidewalk as a vehicle for learning about urban design, disability, and civics while contributing valuable data. • We have multiple publications underway to top scientific venues in accessible technology and urban planning.
Web Links • Reports • Project Website	You can try Project Sidewalk at https://projectsidewalk.org.