Yen-Chia Hsu

Contact

Project Scientist
CREATE Lab, Robotics Institute
Carnegie Mellon University, Pittsburgh, USA

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Biography

I am a computer scientist, researcher, and interaction designer. My research area includes **Human-Computer Interaction** (HCI) and **Community Citizen Science** (CCS), which focuses on designing, implementing, deploying, and evaluating interactive systems to support community engagement and democratize scientific knowledge.

Different from typical citizen science that focuses on engaging citizens to solve research questions driven by domain experts, CCS emphasizes "empowering communities" to represent their needs, address their concerns, and advocate for social impact. My research applies CCS to extend the conventional idea of sustainability in HCI, where experts invite lay people in facilitating common good with the intervention of technology, to a deeper level that sustains community engagement when experts are no longer involved after the intervention. Techniques that I apply include:

- **Crowdsourcing/Participatory Sensing** to engage communities in contributing user-generated content and collecting sensing measurements reliably.
- **Data Visualization/Storytelling** to enable communities to interactively explore data, identify patterns, form hypotheses, create narratives, and share findings.
- **Machine Learning/Computer Vision** to assist communities in mining scientific knowledge and interpreting complex patterns from large-scale datasets.

Education

Ph.D. in Robotics 08/2014 – 08/2018
Carnegie Mellon University, Pittsburgh, USA
Thesis Title: Designing Interactive Systems for Community Citizen Science [O4]
Committee: Illah Nourbakhsh (advisor), Aaron Steinfeld, Jeffrey Bigham, and Eric Paulos
CeDiploma ID: 185C-4146-Y9U9 (can be validated from the link below)
https://www.cmu.edu/hub/registrar/graduation/diplomas/electronic/validation/index.html

Master of Tangible Interaction Design 08/2011 – 12/2012
Carnegie Mellon University, Pittsburgh, USA

Dual B.S. in Architecture and in Computer Science 08/2005 – 05/2010
National Cheng Kung University, Tainan, Taiwan

Experiences

CREATE Lab, Robotics Institute, School of Computer Science, Carnegie Mellon University, USA
Project Scientist 12/2018 – present
Senior Research Programmer/Analyst 08/2018 – 11/2018
Ph.D. Student Researcher 09/2014 – 07/2018
Web Designer/Developer 10/2013 – 06/2014
Research Associate 01/2013 – 07/2013

Code Lab, School of Architecture, College of Fine Arts, Carnegie Mellon University, USA
Master's Student 09/2011 – 12/2012
Lab Assistant 09/2011 – 05/2012

IA Lab, Department of Architecture, National Cheng Kung University, Taiwan
Research Assistant 09/2010 - 06/2011

Awards and Honors

[A5] **Best Paper Honorable Mention Award (Top 5%)**. 2017. ACM CHI Conference on Human Factors in Computing Systems, USA. https://dl.acm.org/citation.cfm?id=3025853

[A4] **Webby People's Voice Award, Best Use of Video or Moving Image**. 2014. International Academy of Digital Arts and Sciences, USA. https://www.webbyawards.com/winners/2014/web/website-features-and-design/best-use-of-video-or-moving-image/timelapse/

[A3] **Best New Artist**. 2009. The National Golden Award for Architecture, Taiwan. http://www.yestaiwan.com.tw/page06_5.html

[A2] **Third Prize, National Country House Design Competition**. 2008. Ministry of the Interior, Taiwan.

[A1] **Outstanding Student Academic Achievement**. 2005, 2006, 2007. Department of Architecture, National Cheng Kung University, Taiwan.

Referred Conference Papers

[C4] **Yen-Chia Hsu**, Jennifer Cross, Paul Dille, Michael Tasota, Beatrice Dias, Randy Sargent, Ting-Hao (Kenneth) Huang, and Illah Nourbakhsh. 2019 (in print). Smell Pittsburgh: Community-Empowered Mobile Smell Reporting System. In 24rd International Conference on Intelligent User Interfaces. ACM.

[C3] **Yen-Chia Hsu**, Paul Dille, Jennifer Cross, Beatrice Dias, Randy Sargent, and Illah Nourbakhsh. 2017. Community-Empowered Air Quality Monitoring System. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI 2017). ACM. (Best Paper Honorable Mention Award, Top 5%)

[C2] **Yen-Chia Hsu**, Tay-Sheng Jeng, Yang-Ting Shen, and Po-Chun Chen. 2012. SynTag: A Web-based Platform for Labeling Real-time Video. In Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work (CSCW 2012). ACM.

[C1] Yang-Ting Shen, Tay-Sheng Jeng, and **Yen-Chia Hsu**. 2011. A "Live" Interactive Tagging Interface for Collaborative Learning. International Conference on Cooperative Design, Visualization and Engineering (CDVE 2011). Springer.

Referred Posters and Works-in-Progress

[P2] **Yen-Chia Hsu**, Jennifer Cross, Paul Dille, Illah Nourbakhsh, Leann Leiter, and Ryan Grode. 2018. Visualization Tool for Environmental Sensing and Public Health Data. In Proceedings of the 2018 ACM Conference Companion Publication on Designing Interactive Systems (DIS 2018 Companion). ACM.

[P1] **Yen-Chia Hsu**, Paul Dille, Randy Sargent, Christopher Bartley, and Illah Nourbakhsh. 2015. A Web-based Large-scale Timelapse Editor for Creating and Sharing Guided Video Tours and Interactive Slideshows. IEEE Information Visualization Posters, 2015.

Other Publications

[O4] **Yen-Chia Hsu**. 2018. Designing Interactive Systems for Community Citizen Science. Ph.D. Dissertation. Technical Report CMU-RI-TR-18-29. Robotics Institute, Carnegie Mellon University, Pittsburgh, PA.

[O3] Emiliano Huet-Vaughn, Nicholas Muller, and **Yen-Chia Hsu**. 2018. Livestreaming Pollution: A New Form of Public Disclosure and a Catalyst for Citizen Engagement. No. w24664. National Bureau of Economic Research, 2018.

[O2] **Yen-Chia Hsu**. 2018. SimArch: A Multi-agent System For Human Path Simulation In Architecture Design. arXiv preprint arXiv:1807.03760.

[O1] **Yen-Chia Hsu**. 2016. Industrial Smoke Detection and Visualization. Technical Report CMU-RI-TR-16-55. Robotics Institute, Carnegie Mellon University, Pittsburgh, PA.

Media and Books Coverage

[Featured.F3] **PC Magazine**. Michelle Donahue. 2018. Citizen Science: Do Try This at Home. https://www.pcmag.com/article/360317/citizen-science-do-try-this-at-home

[Featured.F2] **Pittsburgh Post-Gazette**. Ashley Murray. 2017. Carnegie Mellon Scientists Use App to Track Foul Odors in Pittsburgh. http://www.post-gazette.com/business/tech-news/2017/07/03/smell-pgh-app-carnegie-mellon-university-cmu-create-lab-foul-smell-pittsburgh/stories/201706300430

[Featured.F1] **TIME**. Jeffrey Kluger. 2013. Timelapse: Landsat Satellite Images of Climate Change. http://world.time.com/timelapse/

[M41] **World Economic Forum**. Illah Nourbakhsh. 2018. Introducing EarthTime: animations which show how our planet is changing. https://www.weforum.org/agenda/2018/04/introducing-earthtime-a-global-magnifying-glass-to-help-us-see-common-ground/

[M40] **Environmental Health News**. Kristina Marusic. 2018. ER visits for asthma dropped 38% the year after one of Pittsburgh's biggest polluters shut down. https://www.ehn.org/shenango-coke-works-closed-asthma-dropped-2566777141.html

[M39] **Hack The Grid**. Andrea Polli. 2018. Carnegie Museum Of Art. https://www.ideabooks.nl/9780880390613-andrea-polli-hack-the-grid

[M38] **Pittsburgh Tribune-Review (TribLIVE)**. Theresa Clift. 2018. Allegheny County Health Department defends air quality efforts and plans stricter coke plant rules. https://triblive.com/local/allegheny/13878930-74/allegheny-county-health-department-defends-air-quality-efforts-plans-stricter-coke-plant

[M37] **Pittsburgh Post-Gazette**. Don Hopey. 2018. Air advocates read “scroll of smells” at health board meeting. http://www.post-gazette.com/news/environment/2018/07/19/allegheny-county-air-quality-complaints-environmental-advocates-citizen-smells/stories/201807180177

[M36] **Pittsburgh Tribune-Review (TribLIVE)**. Theresa Clift. 2018. Environmental groups pressure Allegheny County officials to crack down harder on polluters. https://triblive.com/local/allegheny/13863417-74/environmental-groups-pressure-allegheny-county-officials-to-crack-down-harder-on-polluters

[M35] **ProMarket**. Emiliano Huet-Vaughn, Nicholas Z. Muller, and Yen-Chia Hsu. 2018. Livestreaming Polluters to Enforce Environmental Policy: Evidence from a Natural Experiment in Pittsburgh. https://promarket.org/livestreaming-polluters-enforce-environmental-policy-evidence-natural-experiment-pittsburgh/

[M34] **PublicSource**. Teake Zuidema. 2018. Will Pittsburgh flourish as a hub of eds and meds or gas and petrochemicals? Can we have it both ways? https://www.publicsource.org/will-pittsburgh-flourish-as-a-hub-of-eds-and-meds-or-gas-and-petrochemicals-can-we-have-it-both-ways/

[M33] **NEXTpittsburgh**. Melissa Rayworth. 2018. Once again, Pittsburgh air ranks among the worst. Here's what you can do about it. https://www.nextpittsburgh.com/latest-news/american-lung-associations-new-air-quality-report-points-areas-pittsburgh-must-improve/

[M32] **Allegheny Front**. Kara Holsopple. 2018. Turns Out Air Pollution Makes for Good Listening. https://www.alleghenyfront.org/turns-out-air-pollution-makes-good-listening/

[M31] **Pittsburgh Post-Gazette**. Rachel Filippini. 2018. Allegheny County must crack down on odor emissions violations. http://www.post-gazette.com/opinion/letters/2018/02/22/Allegheny-County-must-crack-down-on-odor-emissions-violations/stories/201802210024

[M30] **StateScoop**. Jason Shueh. 2017. A whiff of citizen engagement powers Pittsburgh's new air pollution app. https://statescoop.com/a-whiff-of-citizen-engagement-powers-pittsburghs-new-air-pollution-app/

Media and Books Coverage (Continued)

[M29] **PSFK**. Zack Palm. 2017. A New Platform in Pittsburgh Lets Citizens Report Foul Smells. https://www.psfk.com/2017/07/a-new-platform-in-pittsburgh-lets-citizens-report-foul-smells.html

[M28] **Pittsburgh Post-Gazette**. Anna Garner. 2017. The Smell PGH app helps track air pollution. http://www.post-gazette.com/opinion/letters/2017/06/27/The-Smell-PGH-app/stories/201706270077

[M27] **Lawrenceville United**. David Breingan. 2017. Joint Comments from LU and LC on Draft Operating Permit for McConway and Torley. http://www.lunited.org/tag/allegheny-county-health-department/

[M26] **NEXTpittsburgh**. Amanda Waltz. 2017. CREATE Lab clears the air with improved Smell PGH app and new website. https://www.nextpittsburgh.com/environment/create-lab-clears-the-air-with-improved-smell-pgh-app-and-new-website/

[M25] **Pittsburgh Tribune-Review (TribLIVE)**. Matthew Santoni. 2017. California Towns Adapt Carnegie Mellon's Smell Pittsburgh App. https://triblive.com/local/allegheny/12632255-74/california-towns-adapt-carnegie-mellons-smell-pittsburgh-app

[M24] **Grantcraft**. Philip Johnson. 2017. Using Low-Cost Technology to Democratize Data and Protect Public Health. http://www.grantcraft.org/blog/using-low-cost-technology-to-democratize-data-and-protect-public-health-cas

[M23] **Fast Company Co.Design**. Mark Wilson. 2017. Does Your City Literally Stink? There's An App For That. https://www.fastcompany.com/90133143/does-your-city-literally-stink-theres-an-app-for-that

[M22] **Carnegie Mellon University News**. Byron Spice. 2017. Smell PGH App Helps Pittsburghers Report Foul Odors. https://www.cmu.edu/news/stories/archives/2017/june/smell-something-say-something.html

[M21] **TechCrunch**. John Biggs. 2017. Smell PGH Lets You Report Weird Smells in Pittsburgh. https://techcrunch.com/2017/06/22/smellpgh-lets-you-report-weird-smells-in-pittsburgh/

[M20] **Pittsburgh Post-Gazette**. Stephen Riccardi and Beatrice Dias. 2017. Smelly air? There's an app for that. http://www.post-gazette.com/opinion/Op-Ed/2017/03/26/Smelly-air-There-s-an-app-for-that/stories/201703260122

[M19] **Greenapps&web**. Judit Urquijo. 2017. Smell Pittsburgh, an example of app to report pollution by foul odors. https://www.greenappsandweb.com/en/android-en/odor-pollution-report/

[M18] **NEXTpittsburgh**. Amanda Waltz. 2017. What it was like "Living Downwind" of Shenango Coke Works. https://www.nextpittsburgh.com/environment/what-it-was-like-living-downwind-of-shenango-coke-works/

[M17] **90.5 WESA**. Julie Grant. 2017. Life Smells Better After Shenango. http://www.wesa.fm/post/life-smells-better-after-shenango#stream/0

[M16] **Toxic News**. Gwen Ottinger. 2017. Lessons Learned from an Experiment in Infrastructuring. https://toxicnews.org/2017/05/16/lessons-learned-from-an-experiment-in-infrastructuring/

[M15] **The Glassblock**. Adam Shuck. 2016. If You Smell Something, Say Something: CMU Launches Mobile App Smell PGH. http://theglassblock.com/2016/09/29/smell-something-say-something-cmu-mobile-app-smell-pgh/

[M14] **Allegheny Front**. Lou Blouin. 2016. You Can Now Report Terrible Air in the Burgh with this New App. https://www.alleghenyfront.org/you-can-now-report-terrible-air-in-the-burgh-with-this-new-app/

Media and Books Coverage (Continued)

[M13] **Group Against Smog and Pollution**. 2016. A Change in the Air After the Closure of the Shenango Coke Plant. https://gasp-pgh.org/2016/06/01/a-change-in-the-air-after-the-closure-of-the-shenango-coke-plant/, https://gasp-pgh.org/wp-content/uploads/hotline-2016spring-web.pdf

[M12] **The Society for Social Studies of Science (4S)**. Gwen Ottinger. 2016. A Missing Link in Making Meaning from Air Monitoring? http://www.4sonline.org/blog/post/a_missing_link_in_making_meaning_from_air_monitoring

[M11] **HuffPost**. Illah Nourbakhsh. 2016. A Community Advocacy Success Story. https://www.huffingtonpost.com/illah-Nourbakhsh/a-community-advocacy-succ_b_8859210.html

[M10] **Pittsburgh Post-Gazette**. Don Hopey. 2015. Regulators Reviewing Shenango Coke Works' Compliance with 2012 consent decree. http://www.post-gazette.com/news/environment/2015/11/19/Regulators-reviewing-Shenango-Coke-Works-compliance-with-2012-consent-decree/stories/201511190230

[M9] **Pittsburgh Post-Gazette**. Don Hopey. 2015. Shenango Channel Keeps an Eye on the Neville Island Sky. http://www.post-gazette.com/local/west/2015/11/16/Shenango-Channel-keeps-an-eye-on-the-Neville-Island-sky/stories/201511160007

[M8] **Pittsburgh City Paper**. Ashley Murray. 2015. What you need to know about Pittsburgh news this week. https://www.pghcitypaper.com/Blogh/archives/2015/11/20/what-you-need-to-know-about-pittsburgh-news-this-week

[M7] **Carnegie Mellon University News**. Byron Spice. 2015. Shenango Channel Provides Online Resource For Sharing Images, Data About Coke Plant. https://www.cmu.edu/news/stories/archives/2015/november/tracking-coke-plant.html

[M6] **Pittsburgh Post-Gazette**. 2015. Pollution cam: Now the public has an eye on Shenango, 24/7. http://www.post-gazette.com/opinion/editorials/2015/11/21/Pollution-cam-Now-the-public-has-an-eye-on-Shenango-24-7/stories/201511300034

[M5] **Ars Technica**. Sean Gallagher. 2013. How Google built a 52-terapixel time-lapse portrait of Earth. https://arstechnica.com/information-technology/2013/06/how-google-built-a-108-terapixel-time-lapse-portrait-of-earth/

[M4] **Google Earth Engine**. 2013. Earth Timelapse. https://earthengine.google.com/timelapse/

[M3] **Google Official Blog**. 2013. A picture of Earth through time. https://googleblog.blogspot.com/2013/05/a-picture-of-earth-through-time.html

[M2] **Google AI Blog**. 2013. Building A Visual Planetary Time Machine. https://ai.googleblog.com/2013/06/building-visual-planetary-time-machine.html

[M1] **Carnegie Mellon University News**. 2013. Robotics Institute Helps Make Stunning Satellite Imagery Easily Accessible. https://www.cmu.edu/news/stories/archives/2013/may/may9_timelapse.html

Released Open Source Tools

[T11] CMU CREATE Lab. Predicting and Interpreting Smell Data Obtained from Smell Pittsburgh. Computer software. https://github.com/CMU-CREATE-Lab/smell-pittsburgh-prediction

[T10] CMU CREATE Lab. Earth Timelapse Viewer. Computer software. https://github.com/CMU-CREATE-Lab/data-visualization-tools

[T9] CMU CREATE Lab. A Mobile Application to Crowdsource and Visualize Pollution Odors. Computer software. https://github.com/CMU-CREATE-Lab/smell-pittsburgh-rails

[T8] CMU CREATE Lab. Visualization Tool for Environmental Sensing and Public Health Data. Computer software. https://github.com/CMU-CREATE-Lab/ehp-channel

Released Open Source Tools (Continued)

[T7] CMU CREATE Lab. A Web-Based Interactive Viewer for Visualizing Large-Scale Timelapses. Computer software. https://github.com/CMU-CREATE-Lab/timemachine-viewer

[T6] Yen-Chia Hsu. A HTML/CSS Template for Building Projects or Personal Websites. Computer software. https://github.com/yenchiah/project-website-template

[T5] Yen-Chia Hsu. A JavaScript Library for Creating an Interactive Geographical Heatmap. Computer software. https://github.com/yenchiah/geo-heatmap

[T4] Yen-Chia Hsu. A JavaScript Library for Creating an Interactive Timeline Heatmap. Computer software. https://github.com/yenchiah/timeline-heatmap

[T3] Yen-Chia Hsu. A Wearable Shoe-Integrated Interaction Interface. Computer software. https://github.com/yenchiah/SENSEable-Shoes

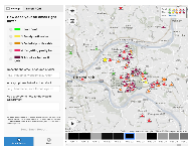
[T2] Yen-Chia Hsu. A Multi-agent System for Human Path Simulation In Architecture Design. Computer software. https://github.com/yenchiah/SimArch

[T1] Yen-Chia Hsu. A Web-based Platform for Labeling Real-time Video. Computer software. https://github.com/yenchiah/SynTag

Projects

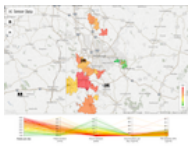
A Tool for Creating and Editing Interactive Stories on the EarthTime Timelapse [T10] 2018

I worked in a team to develop a web-based tool that enables users to create, edit, and share stories about nature changes and human impact on EarthTime, visualizing the transformation of the EarthTime over three decades with images and datasets. (https://earthtime.org)



A Mobile Application to Crowdsource and Visualize Pollution Odors [F2, T4, T9] 2017 – 2018

I worked in a team to develop Smell Pittsburgh, a mobile application for citizens to report pollution odors to regulators. A map visualizes the reports with air quality and wind data. A machine learning model predicts odors and sends push notifications. (http://smellpgh.org)



Visualization Tool for Environmental Sensing and Public Health Data [P2, T5, T8] 2017

I worked in a team to develop the Environmental Health Channel, an interactive web-based tool for visualizing health symptoms, particulate measurements, and personal stories from residents who are affected by oil and gas drilling development. (http://envhealthchannel.org)

Community-Empowered Air Quality Monitoring System [C3, O3, O1, F3, A5] 2015 – 2016

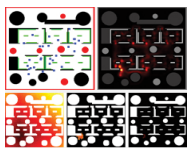
I worked with a Pittsburgh community to develop an air quality monitoring system, which provides evidence with videos, air quality data, and smell reports. The system uses computer vision to generate a series of animated smoke images.

A Web-based Large-scale Timelapse Editor for Interactive Storytelling [P1, T7] 2014

Based on the timelapse viewer, I developed a web-based tool for users to create interactive slideshows or guided tours, and then embed or share them on social media for telling interactive stories. (http://timemachine.cmucreatelab.org/wiki/EarthEngineTourEditor)

Earth Timelaspe Viewer Visualizing Landsat Satellite Imagery [F1, T7, A4] 2013

I worked in a team to develop an Earth timelapse viewer, consisting of 33 cloud-free mosaics of the planet with billions of pixels from 1984 to 2016, released with Google and TIME. (https://earthengine.google.com/timelapse/, http://world.time.com/timelapse/)



SimArch: A Multi-Agent System for Human Path Simulation [O2, T2] 2012

SimArch uses Markov Decision Process to build a behavior model. The model simulates mental states, target range detection, and collision prediction when agents behave in a museum. SimArch outputs the prediction of how likely a person will occur in a location after simulation.

SENSEable Shoes: Hands-Free and Eyes-Free Mobile Interaction [T3] 2012

SENSEable Shoes is a platform for interaction designers to create applications. It recognizes low-level activities by measuring the weight distribution over the feet with sensors embedded in the shoe pad. A Support Vector Machine classifier identifies mobile activities and foot gestures.

Draw-o-lin: A Music Visualizer for Violin 2011

What does music look like? Draw-o-lin is an interactive mobile robot visualizing music by drawing graphs on a paper according to various sound properties. Violin performers control the robot by playing various pitches, alternating the volume, and changing the tempo of the music.

SynTag: A Web-Based Platform for Labeling Real-time Video [C2, C1, T1] 2010

Users can label Good, Question, and Disagree tags in real or non-real time with visualization of time-stamp video previews on an interactive timeline. SynTag creates thumbnails by using real-time tags for presenters to receive instant feedback and for others to retrieve videos.

Grants and Other Support

Nvidia GPU Grant 2018

GeForce Titan Xp

Professional Activities

Program Committee/Reviewer

Pattern Analysis and Applications Journal 2019

ACM CHI Conference on Human Factors in Computing Systems 2019
Taiwan Association of Computer-Human Interaction (TAICHI) 2017 – 2018
IEEE Robotics and Automation Magazine 2015

Conference Presenter

ACM Conference on Human Factors in Computing Systems (CHI) 2017
Air and Waste Management Association (A&WMA) 2017
ACM Conference on Computer-Supported Cooperative Work (CSCW) 2012

Invited Talks

Undergraduate Seminar (ANTH 1750-1270), University of Pittsburgh, PA, USA 11/2018

Special Topics: Crowd Computing (05-899), Carnegie Mellon University, PA, USA 10/2017
Sustainability Salon, Local Community Meeting, Pittsburgh, PA, USA 09/2017
Google Earth Engine User Summit, Mountain View, CA, USA 2015

Invited Events

Bloomberg Philanthropies New Tech & Urban Air Pollution Meeting, New York, NY, USA 2017

Leadership

Department of Architecture, National Cheng Kung University, Taiwan

General Coordinator, Graduation Design Preparation Committee 2009
Director of General Affairs, Student Committee 2008
Class Representative 2007

Teaching

Robotics Institute, School of Computer Science, Carnegie Mellon University, USA

Teaching Assistant of 16-811 Math Fundamentals for Robotics Fall 2015

(Last updated: January 5, 2019)