Nahyun Kwon

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Research Interest

Human-Computer Interaction, Interactive Systems, Computer Vision, Accessibility (Slides)
I specialize in designing and developing **AI-powered interactive systems** that aim to bridge the gap between rapidly evolving technologies and novice or inexperienced users. My primary goal is to make these technologies more understandable and accessible to a broader audience. My research focuses on enhancing the understanding of visual information, with a strong emphasis on accessibility. I utilize cutting-edge AI techs for innovative solutions to tackle various HCI problems.

Education

Texas A&M University — College Station, TX
Ph.D. in Computer Science. Advisor: Jeeeun Kim, Co-advisor: Shu Kong — *Aug 2018 – May 2025 (Estimated)*

Ewha Womans University — Seoul, Korea
B.S. in Computer Science. Advisor: Uran Oh — *Mar 2015 – Feb 2020*

Publications

[1] **AccessLens: Auto-detecting Inaccessibility of Everyday Objects.** Nahyun Kwon, Emory Lu, Hasham Qazi, Joanne Liu, Changhoon Oh, Shu Kong, Jeeeun Kim. CHI'24. *To appear.* [Paper] [Video] [Dataset]

[2] **3DPFIX: Improving Remote Novices' 3D Printing Troubleshooting Experience through Human-AI Collaboration Design.** Nahyun Kwon, Tong Sun, Yuyang Gao, Liang Zhao, Xu Wang, Sungsoo Ray Hong, Jeeeun Kim. CSCW'24. *To appear.* [Paper] [Poster]

[3] **A High-Resolution Dataset for Instance Detection with Multi-View Instance Capture.** Qianqian Shen, Yunhan Zhao, Nahyun Kwon, Yanan Li, Jeeeun Kim, Shu Kong. NeurIPS'23 datasets and benchmarks track. [Paper] [Repo]

[4] **Weedle: Composable Dashboard for Data-centric NLP in Computational Notebooks.** Nahyun Kwon, Hannah Kim, Sajjadur Rahman, Dan Zhang, Estevam Hruschka. WWW'23 demo. [Paper]

[5] **Multi-ttach: Techniques to Enhance Multi-material Attachments in Low-cost FDM 3D Printing.** Nahyun Kwon*, Himani Deshpande*, Md Kamrul Hasan, Aryabhat Darnal, Jeeeun Kim. SCF'21. [Paper]

[6] **Touch Screen Exploration of Visual Artwork for Blind People.** Dragan Ahmetovic, Nahyun Kwon, Uran Oh, Cristian Bernareggi, Sergio Mascetti. In Proceedings of the Web Conference 2021 (WWW'21) [Paper]

[7] **Supporting a Crowd-powered Accessible Online Art Gallery for People with Visual Impairments: A Feasibility Study.** Nahyun Kwon, Yunjung Lee, Uran Oh. Universal Access in the Information Society (2021) [Paper]

[8] **3D4ALL: Toward an Inclusive Pipeline to Classify 3D Contents.** Nahyun Kwon, Chen Liang, Jeeeun Kim. TExSS'21, Workshop on IUI'21. [Paper]

[9] **Supporting Object-level Exploration of Artworks by Touch for People with Visual Impairments.** Nahyun Kwon, Youngji Koh, Uran Oh. ASSETS'19. Poster Session. [Paper]

Experience

Ph.D. Student — Sep 2020 – Present
HCIED (HCI Engineering and Design) Lab, Texas A&M University — *College Station, TX*
- Committee: Jeeeun Kim, Shu Kong, Hank Walker, Yoonsuck Choe, Courtney Starrett

Research Intern — June 2022 – Aug 2022
Megagon Labs — *Mountain View, CA*
- Mentor: Hannah Kim, Sajjadur Rahman, Dan Zhang, Estevam Hruschka
- Project: Interactive notebook widget for exploratory text analysis for NLP modeling [4]

Research Intern — May 2019 – July 2019
Alignment Lab, George Mason University — *Fairfax, VA*
- AI-powered interactive 3D printing failure diagnosis & solution suggestion system for remote novice users [2]

Undergrad Research Intern Jan 2019 – Aug 2020
Human Computer Interaction Lab, Ewha Womans University *Seoul, Korea*
- Improving 2D artwork accessibility for people with visual impairments [6], [7], [9]

Data Engineer Intern Jan 2018 – Mar 2018
WISHUPON Inc. *Seoul, Korea*
- Implemented dynamic scraping modules to keep up-to-date commercial data for price comparison
- Defined new issue codes for better communication between engineers through VCS & agile management.
- Kept the implemented code clean with refactoring and detailed documentation

Projects

*Denotes lead author projects

***(WIP) Large Language Models as Tools for Inclusive Environments**
- Synthetic Data: Utilizing synthetic data pipelines for instruction-tuning of LLMs for accessibility domain.
- Prompt Engineering: Aiming to automate prompt generation for users with limited expertise.
- Quality Enhancement Module: Improving prompt quality through human-in-the-loop.
- User Studies: Conducting controlled lab studies to assess the quality and effectiveness of accessibility prompts of non-expert users.

***Fine-grained Type & Inaccessibility Detection of Everyday Objects in Indoor Scenes** [1]
- Development of a refined dataset of indoor scene images for precise inaccessibility detection automation. [Dataset]
- Creation of an AI-powered system aimed at increasing users' awareness of indoor inaccessibility by (1) automatically detecting challenges from images and (2) offering 3D assistive augmentation solutions to address challenges.
- Design of metadata structures for the categorization of 3D assistive augmentations.
- Impact: Our end-to-end system showed a substantial increase in the cognitive ability of non-experts to identify inaccessibility, understand challenging contexts, and proactiveness in adopting solutions compared to written guidelines.

Novel multi-view dataset for object instance detection [3]
- Novel instance detection protocol/dataset with multi-view object profile images
- Non-learned method using SAM and DINOv2
- Creating synthetic dataset with instance profile images on indoor background images for baseline
- Experimenting with existing one-stage detectors (FCOS, CenterNet, YOLO, RetinaNet) for synthetic training data
- Modifying the head of FCOS detector to adopt the novel structure for instance detection

***Human-augmented AI to facilitate intelligent & interactive 3D printing troubleshooting** [2]
- Building novel dataset for 3D printing failures based on *accumulated social annotations* on Reddit
- Training ResNet for each 3D printing failure type. Tech: Pytorch
- Designing an interactive system for 3D printing novices to detect printing failures and obtain applicable solutions
- Human-subject study: Designed online survey questionnaires, controlled lab study, and semi-structured interview. Qualitative & quantitative analysis, Kruskal-Wallis/Chi-square test, Power analysis
- Impact: Our system significantly improved remote novices' troubleshooting experience to their best practice

***Dialog summarization for customer service via chat** [Manuscript] [Repo]
- Led NLP class project, fine-tuning Bart dialog summarization model for Twitter customer service dialog dataset
- Achieved 20% increase in Rouge score compared to pre-trained models by fine-tuning
- Tech: transformers, pandas

***Interactive notebook widget for exploratory text analysis for NLP modeling** [4]
- Defining design requirements and designing structure & features for an interactive data viz widget
- Implementing Python packages for centralized text data analysis for NLP modeling
- Tech: ipywidget, Python NLP libraries (e.g., topic modeling, bag of words, sentiment analysis, etc.)

***Creating interlocking geometry in multi-material 3D FDM printing for stronger adhesion** [5]
- Developing algorithm to create various interlocking structures using trajectory info in G-code with Python
- Creating web-based end-user interface for user input 3D model. Tech: Flask

***Improving 2D artwork accessibility for people with visual impairments** [6], [7], [9]
- Collected crowdsourced artwork annotation and implemented VoiceOver-compatible web interface for spatial exploration of 2D artwork.
- Designed controlled lab study, and semi-structured interview. Tech: mTurk, D3.js

***Mobile gesture recognition for people with visual impairments** [Repo]
- Mobile gesture recognition for people with visual impairments: Implemented custom gestures for various functional zooming of the screen on iOS for effective & rigorous exploration of images. Tech: Swift

Technical Skills

Languages: Python, Java, C, SQL, JavaScript/HTML/CSS
Developer Tools: Git, VS Code, Visual Studio, PyCharm, Latex, Markdown
Libraries: Pandas, NumPy, Matplotlib, Pytorch, Tensorflow, Transformers, Altair, Flask, etc.

Teaching & Mentoring

Teaching Assistant: Human-Computer Interaction. CSCE 436 @ TAMU (Spring 2022, Spring 2023, Fall 2023, Spring 2024)
Research Mentoring: Kavya Kotra (CS Undergrad, 2023), Emory Lu (CS PhD, 2023), Joanne Liu (CS Undergrad, 2023), Muhammad Hasham Qazi (CS Undergrad, 2022), Harsha Siripurapu (CS Undergrad, 2021)
Guest Lecture, CSCE 436 HCI @ TAMU: Data Analysis & Data at Scale (Fall 2023), CV applications in Human-Computer Interaction: Image Processing & Camera Input (Spring 2023), Image Annotation & Crowdsourcing (Spring 2022)

Coursework

Machine Learning, Deep Learning, Artificial Intelligence, Natural Language Processing, Data Visualization

Honors

ACM CRA-W Grad Cohort, 2022
TAMU CSE Travel Grant, 2021, 2022, 2023
Ewha Future Capability Scholarship, Ewha Womans University, 2019
Dean's List, Hanium ICT Mentoring Competition Award, Ewha Womans University, 2018

Teaching & Mentoring

Student Volunteer. IUI'21, CHI'22: Organized the paper sessions and resolved technical issues in virtual&in-person conference
Workshop Coordinator. [TxHCI] Seminar Series: Coordinated an interdisciplinary seminar across Texas institutions to foster an HCI community (Spring 2021, Fall 2023)

Last Update: 1/30/2024