Nahyun Kwon

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Research Interests (Slides)

Human-Computer Interaction, Interactive Systems, Computer Vision, Accessibility

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** — TX, USA
  Ph.D. Student - Computer Science, Advisor: Jeeeun Kim, Co-advisor: Shu Kong — *Sep 2020 - May 2025 (Estimated)*
- **Ewha Womans University** — Seoul, Korea
  B.S. - 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. *Under R&R.* Manuscript Video

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

[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 Github

[4] **Weedle: Composable Dashboard for Data-centric NLP in Computational Notebooks.** Nahyun Kwon, Hannah Kim, Sajjadur Rahman, Dan Zhang, Estevam Hruschka. WWW'23 demo. 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. In Proceedings of ACM Symposium on Computational Fabrication (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. In Proceedings of the 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. In Proceedings of ACM SIGACCESS Conference on Computers and Accessibility (ASSETS'19). Poster Session. Paper

Skills

Python (Pandas, PyTorch, Tensorflow, NumPy, Scikit-learn, Transformers, Flask, etc.), C, HTML/CSS/JavaScript, D3.js, Swift, Latex, Markdown, Firebase, Git

Experience

- **HCIED (HCI Engineering and Design) Lab, Texas A&M University** — College Station, TX, USA
  Ph.D. Student, Advisor: Dr. Jeeeun Kim. Co-advisor: Dr. Shu Kong — *Sep 2020 - Present*
- **Megagon Labs** — Mountain View, CA, USA
  Research Intern, Mentor: Hannah Kim, Sajjadur Rahman, Dan Zhang, Estevam Hruschka — *June 2022 - Aug 2022*
  - **Project** Interactive notebook widget for exploratory text analysis for NLP modeling [4]
- **Alignment Lab, George Mason University** — Fairfax, VA, USA (Remote)
  Research Intern, Advisor: Dr. Ray Hong — *June 2021 - Aug 2021*
  - **Project** AI-powered interactive 3D printing failure diagnosis & solution suggestion system for remote novice users [2]
- **Human Computer Interaction Lab, Ewha Womans University** — Seoul, Korea
  Undergrad Research Intern, Advisor: Dr. Uran Oh — *Jan 2019 - Aug 2020*
  - **Project** Improving 2D artwork accessibility for people with visual impairments [6], [7], [9]
- **WISHUPON Inc.** — Seoul, Korea
  Data Engineer Intern — *Jan 2018 - Mar 2018*
  - **Project** Dynamic scraping modules for commercial data

Projects (*Lead author project)

- ***(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.
- ***(WIP) 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 website
  - 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 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 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 of 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 techniques (e.g., topic modeling, bag of words, sentiment analysis, etc.)
- ***Creating interlocking geometry in multi material 3D FDM printing for stronger adhesion**
  - 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 spacial 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 image. Tech: Swift

Teaching & Mentoring

- **Teaching Assistant**, Human-Computer Interaction - CSCE 436 (Spring 2022, Spring 2023, Fall 2023) @ TAMU
- **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 on 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 and Awards

- 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

Volunteer Experience

- **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)

Last Update: 12/15/2023