

Karl Toby Rosenberg, Ph.D.

Professor in CS, HCI & UI/UX Researcher & Prototyper

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<https://www.linkedin.com/in/ktrosenberg/>

Interests

My interests mix Human-Computer Interaction, creative interfaces, graphics, art, sketching, and games. I use technology to extend our natural abilities like drawing and use of language to support richer creative expression, communication, and collaboration. I've built and researched sketching interfaces, human - AI interactions, and spatial virtual and augmented reality systems. I enjoy working with artists and students.

Thesis: DrawTalking: Building Interactive Worlds by Sketching and Speaking

- **Main Page** — Technical Paper, Demo Videos, Code: <https://ktrosenberg.github.io/drawtalking/>
- **Adobe:** <https://research.adobe.com/publication/drawtalking-building-interactive-worlds-by-sketching-and-speaking/>

Education

New York University, New York, NY

Ph.D. - Computer Science - Advisor: Dr. Kenneth Perlin, NYU Future Reality Lab

Sept 2018 - Jan 2024

Bachelor's - Computer Science Major, German Minor

Sept 2013 - May 2017

GPA: 3.969 *summa cum laude* | Courant CS Prize for Academic Excellence (one of two recipients)

Undergraduate Humanities Fellow, Phi Beta Kappa Honors Society

Relevant Courses: Graphics, Multi-Core, NLP, Computer Systems, Networks, Data Structures, Algorithms

Professional Experience

Ph.D. Research Engineer and Prototyper Intern in Human Computer Interaction

Sept 2023 - Dec 2023

Google Research, San Francisco CA

- Mentored by RuoFei Du, Interactive Perception and Graphics Lead
- Designed interactions for intelligent 3D sketching in augmented reality on any surface (Unity XR)

Ph.D. Researcher and Prototyper Intern in Human Computer Interaction

May 2021 - Sept 2021

Adobe Research, Creative Intelligence Lab (remote)

- Mentored by Rubaiat Habib Kazi, Li-Yi Wei, Wilmot Li, Professor Haijun Xia
- Led project "DrawTalking" from initial idea through design, implementation, evaluation, UIST paper
- Developed interactions language-driven live interactive sketching and programming
- Iterated via storyboarding and prototyping of multimodal interactions (e.g. speech + multi-touch)

Visiting Graduate Researcher in Human Computer Interaction

May 2020 - May 2021

University of California, San Diego (UCSD), Advised by Professor Haijun Xia

- Led project: designed, workshopped, and built initial prototypes for what became DrawTalking

Project Technical Lead & Graphics Programmer

Nov 2017 - Sept 2018

Solomon R. Guggenheim Foundation, Time-Based Media; New York, NY

- Blog Post: <https://www.guggenheim.org/articles/checklist/the-guggenheim-restores-john-f-simon-jr-early-web-artwork-unfolding-object>
- Presented analysis of digital art *Unfolding Object* by John F. Simon Jr. for digital humanities art conservation research (advised by NYU CS Prof. Engel and Time-Based Media staff)
- As the sole project programmer, restored *Unfolding Object* for viewing by new audiences by porting accurately to modern browsers; **built own web graphics renderer (WebGL 2) from-scratch**
- Co-conducted interviews with the artist for feedback on the port to respect their intent

Publications and Papers

- DrawTalking: Building Interactive Worlds by Sketching and Speaking. **Karl Toby Rosenberg**, Rubaiat Habib Kazi, Li-Yi Wei, Haijun Xia, Ken Perlin. 2024. ACM UIST '24. <https://dl.acm.org/doi/10.1145/3654777.3676334> | **Website:** <https://ktrosenberg.github.io/drawtalking/> Accept. 24%
- Exploring Configuration of Mixed Reality Spaces for Communication. Zhenyi He, **Karl Toby Rosenberg**, Ken Perlin. 2019. ACM CHI EA '19. <https://dl.acm.org/doi/10.1145/3290607.3312761>
- Chalktalk : A Visualization and Communication Language -- As a Tool in the Domain of Computer Science Education. *SPLASH LIVE Programming Workshop 2018*. Boston MA. <https://arxiv.org/abs/1809.07166>
- Mixed Reality Collaboration for Complementary Working Styles. Keru Wang, Zhu Wang, **Karl Toby Rosenberg**, Zhenyi He, Dong Woo Yoo, Un Joo Christopher, Ken Perlin, SIGGRAPH '22: ACM SIGGRAPH 2022 Immersive Pavilion. <https://dl.acm.org/doi/10.1145/3532834.3536216>

Academic Service † indicates special recognition for outstanding review

Reviewer ACM UIST '19 '20 '22† '23† '25†; ACM CHI '25† 26; VRST '25, **Associate Chair** ACM CHI '25 LBW

Teaching

<https://ktrosenberg.github.io/teaching/>

New York University Courant Institute; New York, NY:

Visiting Assistant Professor (Teaching / Clinical Faculty)

Sept 2025 - current

- Emphasis on creative and visual learning, Fall 2025: Intro to Programming, Data Structures

Adjunct Assistant Professor, Introduction to Programming

Jan 2024 - May 2024, Sept 2024 - Sept 2025

- 5x, mentored ~15-40 student cohorts, created original teaching material and assignments

Teaching Assistant / Recitation Leader (2x), Data Structures (Prof. Klukowska)

Sept 2020 - May 2021

- Guided ~20 students in building skills and enthusiasm for data structures and algorithms
- Created my own supplementary material and exercises for recitations and office hours

Course Tutor, Introduction to Programming in Python (Prof. Kapp, Prof. Bloomberg)

Sept 2016 - Dec 2016

- Led two tutoring sections, guided beginner students in learning fundamental programming skills

Sole Course Tutor, Data Structures – Advanced Curriculum (Brett Bernstein)

June 2016 - Aug 2016

- Sole tutor, held office hours and taught extended curriculum e.g. dynamic programming, graph theory; worked with students to develop problem-solving skills

Private One-on-One Tutoring, Data Structures (NYU Courant Curriculum)

2021 - Various

Projects

<https://ktrosenberg.github.io/projects.pdf> | <https://github.com/KTRosenberg>

DrawTalking: Building Interactive Worlds by Sketching and Speaking (thesis)

May 2020 - present

- **Project leader, built project from the ground-up. Led research, design, and team direction.**
- Designed and prototyped a system for building interactive worlds by sketching and speaking.
 - Users create interactive scenes and tell stories simultaneously with sketching + speaking
 - Programming-like capability without needing code; for spontaneous creative exploration on a canvas (e.g. animation, designs, storytelling, games, simulation)
 - Human-AI interaction balancing fluid input and user control with machine automation
 - Designed for the iPad from the ground-up; custom interactions, C++, Metal GPU API
 - Terms: intelligent systems and interfaces, graphics, NLP, language, compilers, games
 - Designed and performed user studies (evaluation, interviews, artifact-generation)
- **Web Page with Demo Videos and Paper (accepted to UIST 2024) - code available by-request**
 - <https://ktrosenberg.github.io/drawtalking/> | <https://arxiv.org/abs/2401.05631>

Future Classroom XR, MetaRoom VR Platform (Lead developer on team project)

Aug 2019 - 2022

- Architected cross-device VR / desktop system for live-coding multi-user experiences for WebXR
- Multiple co-located VR users experience live changes while a desktop user programs the world
- Built for a graduate VR class – for the professor's live coding, student assignments, final projects

Chalktalk (Key UI / UX programmer and collaborator)

Spring 2017 - present

- Tool for live talks using interactive animated drawings that come-to-life via sketch recognition

Chalktalk Virtual Reality - Multi-User Spatial Presence and 3D Drawing Canvases

Sept 2018 - May 2019

- Co-engineered (team of 2) an extension of Chalktalk into a multi-user VR system supporting multiple spatial configurations of users and virtual drawing surfaces. Unity Engine, JavaScript.
- CHI 2019 Late Breaking Work research paper: <https://dl.acm.org/doi/10.1145/3290607.3312761>
- Exhibited demo at Oculus Connect 6 (2019) (Now Meta)

Personal Projects | <https://github.com/KTRosenberg>

Custom Renderer for Interface Prototyping: StrataDraw, written in C++, Metal Graphics

Mar 2018 - present

- Renderer for prototyping 2.5D multi-layered user interfaces and games
- Testbed for modern computer graphics and APIs, drives graphics for Project "DrawTalking"

Projection Draw, Virtual Reality prototype in Unity

Nov 2017 - Mar 2018

- Enables interactive sketching in 3D, using the space around you for the creative drawing surface
- The user draws lines that are projected onto object surfaces seen from the user's point-of-view

Skills: Programming Languages, Tools, Productivity Software

C, C++, Python, C#, JavaScript, NodeJS, Java, HTML, CSS, Bash, WASM, ObjC, Swift, iOS, iPadOS, macOS, UIKit, AppKit, ARKit, OpenGL, WebGL, GLSL, Metal Graphics API / Shaders, Unity Engine, WebXR, XR, AR, VR, spatial devices e.g. Meta Quest, Applied AI / ML UX & UI e.g. generative / GPT, Xcode, Git, Logic Pro, Steinberg Cubase DAW (Audio), Adobe Photoshop, Illustrator, Figma, Final Cut Pro, MS Office, GSuite

Music, Art, Hobbies

- **Music:** composition and production of original works, MIDI and audio editing
 - <https://soundcloud.com/synchronizerman>
- **Artwork:** concept drawings, game maps, logos; pencil, computer-aided
- **Language:** German (intermediate) - spoken, written, translation