Karl Toby Rosenberg, Ph.D. **karltobyrosenberg@nyu.edu | +1 (347) 598 7068**
Professor in CS, HCI & UI/UX Researcher & Prototyper https://ktrosenberg.github.io

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