Ananya Nandy

Ph.D. Candidate @ UC Berkeley · Decision Making, Human-Centered Computing & Engineering Design

https://ananyan.github.io/ google scholar

Education

Ph.D., Mechanical Engineering Exp. Aug 2024

University of California, Berkeley

Dissertation: Human-Machine Alignment for Early-Stage Design

Committee: Kosa Goucher-Lambert, Björn Hartmann, Hannah Stuart

Minors: Human-Computer Interaction and Computational Modeling of Cognition

M.S., Mechanical Engineering Dec 2022

University of California, Berkeley

B.S., Mechanical Engineering Jun 2019

Massachusetts Institute of Technology (MIT)

Experience

Toyota Research Institute – Human-Centered AI Research Intern May 2023 – Aug 2023

Future Product Innovation Group - Advised by Shabnam Hakimi and Matthew Klenk *Los Altos, CA*

- Conceptualized and led project to analyze human-led multi-modal translation (from abstract words to 3D) to provide insights into how text-input generative AI models can support design innovation
- Developed 3D interface (using Unity) to log sequential task actions and survey to capture self-reported information
- Deployed interface as web app to conduct online study with over 500 participants
- Analyzed quantitative data (input experimental manipulations and outcome states) using statistical modeling
- Used machine learning techniques in Python for data processing and classification (analyzing image and text)
- Collaborated with Toyota stakeholders and worked within team of researchers and software engineers

UC Berkeley – Graduate Researcher Aug 2019 – Present

Cognition and Computation in Design (Co-Design) Lab - Advised by Kosa Goucher-Lambert *Berkeley, CA*

- Led quantitative analyses of decision-making to improve human-machine alignment for engineering design tools
- Developed and deployed multiple user interfaces (web-based and virtual reality) to collect behavioral data
- Worked within multi-disciplinary teams including engineers, computer scientists, and cognitive scientists
- Disseminated findings through 6 conference paper presentations, 4 journal articles, and 2 workshop papers, communicating to multidisciplinary audiences and resulting in a best paper award and a best paper nomination

AI-Assisted Decision Making

- Conceptualized and implemented experimental study on the impact of AI-assisted decision making on the multi-objective decision making
- Developed user interface (using Unity and deployed as a web app) to collect behavioral and self-reported measures
- Analyzed data using generalized linear mixed models in R

Human-Machine Alignment

- Developed real-time human-in-the-loop models (using Bayesian optimization in PyTorch) to enable personalized optimization during ergonomic design
- Developed web-based interface (using Flask, HTML, CSS, and JavaScript with a Python-language backend) to deploy models in an online study, resulting in personalized outcomes
- Collected behavioral and self-reported measures to analyze perceptions of human-in-the-loop process
- Applied network modeling to quantify similarity for complex engineering systems and developed low-dimensional embeddings from large-scale survey data to compare human vs. machine similarity representations

Spatial Interactions in VR for Design Space Exploration - with Berkeley HCI (Advised by Björn Hartmann)

- Co-developed novel gesture and action-based interactions using Unity and Meta Quest 2 to facilitate intuitive, non-semantic searches across thousands of alternatives
- Designed and conducted a user study in 3D and VR environments
- Analyzed sequential actions and quantitative survey data to develop guidelines for interaction design

MIT Media Lab – Undergraduate Researcher Sept 2018 – May 2019

Responsive Environments Group *Cambridge, MA*

- Manufactured novel electro-mechanically robust connector systems to attach stretchable electronic sensor modules
- Characterized resistance and strain to failure of connected modules during tensile testing

Skills

Research Methods: Experimental Design, Interface Development, Statistical Data Analysis, Computational Modeling

Programming Languages: Python (Fluent), R (Proficient), Javascript (Proficient), HTML/CSS (Familiar), MATLAB (Familiar), C# (Proficient for use with Unity & Rhino/Grasshopper)

Tools, Packages, & Software: Unity, Flask, Python Data Science Stack (pandas, numpy, scipy, scikit-learn), Bayesian optimization in PyTorch, Hugging Face Transformers, CAD (Autodesk Fusion 360, SolidWorks, OpenSCAD/JSCAD)

Prototyping & Fabrication: 3D Printing, Laser Cutter, Machining, Basic Electronics/Arduino/Raspberry Pi

Relevant Coursework: Principles and Techniques of Data Science, User Interface Design, Immersive Computing & Virtual Reality, Designing for Emerging Technologies, Bayesian Models of Cognition, Algorithmic Human-Robot Interaction

Publications

Peer-Reviewed Journal Articles

4. **Ananya Nandy** & Kosa Goucher-Lambert. Under Review. Computationally adapting designs to align with semantic attributes: understanding how an interactive optimization method influences outcomes and human perceptions. *Journal of Computing and Information Science in Engineering*.
3. **Ananya Nandy**, David Antonio Herrera & Kosa Goucher-Lambert. Submitted. Adopting "blackbox" engineering advice: the influence of imperfect suggestions during AI-assisted decision making with multiple objectives. *Computers in Human Behavior.*
2. **Ananya Nandy** & Kosa Goucher-Lambert. 2022. Do Human and Computational Evaluations of Similarity Align? An Empirical Study of Product Function. *Journal of Mechanical Design*.
1. **Ananya Nandy**, Andy Dong & Kosa Goucher-Lambert. 2022. Evaluating Quantitative Measures for Assessing Functional Similarity in Engineering Design. *Journal of Mechanical Design*. ★ **Featured Article**

Peer-Reviewed Conference Proceedings

6. **Ananya Nandy**, Monica Van, Jonathan Li, Kosa Goucher-Lambert, Matthew Klenk & Shabnam Hakimi. 2024. Semantic properties of word prompts shape design outcomes: understanding the influence of semantic richness and similarity. *Design Computing and Cognition*.
5. **Ananya Nandy** & Kosa Goucher-Lambert. 2023. Adaptive Optimization of Subjective Design Attributes: Characterizing Individual and Aggregate Perceptions. *ASME International Design Engineering Technical Conferences*.
4. **Ananya Nandy**, James Smith, Nicholas Jennings, Michael Kuniavsky, Björn Hartmann & Kosa Goucher-Lambert. 2023. VR or Not? Investigating Interface Type and User Strategies for Interactive Design Space Exploration. *International Conference on Engineering Design*.
3. **Ananya Nandy** & Kosa Goucher-Lambert. 2022. How does machine advice influence design choice? The effect of error on design decision making. *Design Computing and Cognition*. 🏆 **Best Paper in Design Cognition/Neurocognition**
2. **Ananya Nandy** & Kosa Goucher-Lambert. 2021. Aligning Human and Computational Evaluations of Functional Design Similarity. *ASME International Design Engineering Technical Conferences*. ★ **Nominated for Best Design Theory & Methodology Paper**
1. **Ananya Nandy**, Andy Dong & Kosa Goucher-Lambert. 2020. A Comparison of Vector and Network-Based Measures for Assessing Design Similarity. *ASME International Design Engineering Technical Conferences*.

Extended Abstract & Workshop Papers

2. Nicholas Jennings, **Ananya Nandy**, Xinyi Zhu, Yuting Wang, Fanping Sui, James Smith & Björn Hartmann. 2022. GeneratiVR: Spatial Interactions in Virtual Reality to Explore Generative Design Spaces. *ACM Conference on Human Factors in Computing Systems Extended Abstracts*.

1. **Ananya Nandy** & Kosa Goucher-Lambert. 2021. Considerations for Collaborative Human-AI Decision-Making in Engineering Design. *NeurIPS 2021 Workshop on Human Centered AI*.

Awards & Honors

Mechanical Engineering Department Summer Fellowship (UC Berkeley) Summer 2024
David A. Dornfeld Graduate Fellowship (UC Berkeley) Spring 2024
Graduate Division Block Grant Award (UC Berkeley) Summer 2022, Spring 2023
Best Design Cognition/Neurocognition Paper Prize (DCC'22 Conference) Summer 2022
Conference Travel Grant (UC Berkeley) Summer 2022, Summer 2023
Outstanding Graduate Student Instructor Award (UC Berkeley) Fall 2020
Mechanical Engineering Department First Year Fellowship (UC Berkeley) Fall 2019 - Summer 2020
Tau Beta Pi & Pi Tau Sigma Honor Society (MIT) Spring 2019

Teaching

Human-Centered Design Methods Fall 2020, 2022, 2023
Graduate Student Instructor *UC Berkeley*

- Mentored over 50 graduate-level project teams through human-centered design process (user research, concept generation & selection, prototyping)
- Received Outstanding Graduate Student Instructor Award for Fall 2020 🏆

Design Methodology Spring 2022
Graduate Student Instructor *UC Berkeley*

- Mentored 14 undergraduate-level project teams in introduction to human-centered design
- Gave guest lecture on concept exploration and prototyping

Prototyping and Fabrication Summer 2021
Graduate Student Instructor *UC Berkeley*

- Assisted students (UC Berkeley and non-UC Berkeley) from interdisciplinary backgrounds complete projects for remote prototyping class.

Remote Instruction of Design Skills and Methodologies Summer 2020
Graduate Student Instructor *UC Berkeley*

- Developed resources for Jacobs Institute of Design Innovation to ensure equity in remote instruction of design classes

Design and Manufacturing II Spring 2019
Lab Assistant *MIT*

- Assisted teams on mold design and manufacturing using CAD/CAM during lab sections

Service & Mentorship

Reviewer
ASME International Design Engineering Technical Conference (IDETC) *Mar 2022 – Present*

Graduate Women in Engineering - New Student Committee
Chair *Aug 2023 – Present*

- Leading committee to organize orientation outreach and events for new students
- Leading buddies mentorship program for first-year women in engineering graduate students

Committee Member *Aug 2022 – May 2023*

- Helped run buddies mentorship program with first-year and returning students
- Organized professional development workshops including Grad School 101 series to support new students' transition to graduate school

UC Berkeley MEng Team Capstone Mentor
Arman Baradaran, Rajveer Oberoi, Varin Kansal: Trust Measurement for Human-Machine Interaction *Sept 2023 – May 2024*

Berkeley Engineering Design Scholar Program Mentor
Antonio Herrera: Human-AI Interactions in Engineering Design *Jun 2023 – Aug 2023*
Resham Khanna: XR as a Design Aid *Jun 2021 – Aug 2021*
Amy Jiang: Encouraging Sustainable Behavior through Gaming *Jun 2020 – Aug 2020*

Other Experience

Busch Vacuum Pumps and Systems - R&D Intern Jun 2019 – Aug 2019

Pre-development Group *Baden-Württemberg, Germany*

- Simulated acoustics of claw compressor for the development of a new pulsation dampener
- Designed and executed experiment to characterize claw compressor acoustics for validation

Sistine Solar - Product Design Intern Jun 2018 – Aug 2018

Greentown Labs *Somerville, MA*

- Developed alpha prototype for device to efficiently apply thin films with custom visuals on solar panels to enable seamless aesthetic blending into surrounding environments

Mitsubishi Electric – R&D Intern Jun 2017 – Aug 2017

Smart Systems Group *Hyogo, Japan*

- Applied machine learning methods in Python to disaggregate appliance level energy consumption data from smart meter data