Ananya Nandy

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

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Quantitative researcher passionate about using emerging technologies to enhance decision making in complex technical domains. Leveraging expertise in engineering, product design, and design cognition, I excel at prototyping user interfaces that leverage new technologies and conducting behavioral experiments to guide the development of useful and usable interactive systems.

Education

University of California, Berkeley   Exp. Aug 2024
Ph.D. Mechanical Engineering (Minor in Human-Computer Interaction)
Thesis: Human-Machine Alignment for Early-Stage Design

Massachusetts Institute of Technology (MIT)   Jun 2019
B.S. Mechanical Engineering

Experience

UC Berkeley – Graduate Researcher   Aug 2019 – Present
Cognition and Computation in Design (Co-Design) Lab - Advised by Kosa Goucher-Lambert   *Berkeley, CA*

- Led comprehensive quantitative analyses of design decision-making processes using a variety of modalities (text, images, and 3D models) to improve human-machine alignment for design support tools.
- Developed and deployed multiple web-based and virtual reality (VR) interfaces to collect complex behavioral data
- Communicated research findings through 6 conference paper presentations, 4 journal articles, and 2 workshop papers, effectively communicating complex concepts to multidisciplinary audiences and resulting in a best paper award and a best paper nomination

Spatial Interactions in VR for Design Space Exploration - Collaboration 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 design alternatives (generated with Rhino3D/Grasshopper software)
- Designed and conducted a comprehensive user study in 3D and VR environments to evaluate interaction usability, analyzing sequential actions and self-reported quantitative data to derive actionable insights
- Communicated research outcomes through 2 publications and presentations at prominent HCI and design conferences

AI-Assisted Decision Making for Design Tasks

- Developed and evaluated real-time human-in-the-loop Bayesian optimization models to efficiently and accurately express subjective qualities in 3D designs
- Programmed custom web application with dynamic 3D rendering to deploy models (using Python, Flask, HTML/CSS/JavaScript, and Bayesian optimization in PyTorch) and conducted online user study to investigate perceptions of optimization process and outcomes
- Designed and executed a behavioral experiment to explore AI-assisted decision making in multi-objective scenarios, analyzing data using generalized linear mixed models in R
- Created a Unity-based web application to enable 3D visualization and data collection from online participants
- Presented findings through 2 publications at HCAI and design venues, earning a best paper award

Human-Machine Representations of Similarity in Engineering Design

- Evaluated network modeling and other quantitative methods for computing similarity between complex engineering systems, providing critical insights for the development of computational design-by-analogy tools
- Launched text and image-based surveys to collect over 1000 triplet ratings for human similarity assessment and developed low-dimensional triplet embeddings to accurately quantify human perceptions
- Presented research findings at prominent design conferences, resulting in 2 first-author journal publications and a best paper nomination

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 multi-modal translation (text and 3D) to provide insights into how text-input generative AI models can support design innovation
- Built a Unity-based interface to deploy study to 500 online participants and log outcomes, actions, and perceptions
- Leveraged vision and language transformer models in Python to analyze image and semantic data generated through study
- Developed statistical models in R to analyze experimental manipulations and outcomes, providing actionable insights for AI-driven design support

Skills

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

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

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

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

Leadership, Teaching, & Mentorship

Graduate Women in Engineering Board – New Student Committee Chair   Aug 2023 – Present
Leading a committee to organize outreach, professional development, and mentorship for first-years

UC Berkeley Master of Engineering Capstone Mentor   Sept 2023 – May 2024
Trust Measurement for Human-Machine Interaction (A. Baradaran, R. Oberoi, V. Kansal)

Human-Centered Design Methods – Graduate Student Instructor (GSI)   Fall 2020, 2022, 2023
Mentored over 50 teams through design process 🏆 **2020 Outstanding GSI Award**

UC Berkeley Engineering Design Scholar Program Mentor   Summer 2020, 2021, 2023
Human-AI Interactions in Engineering Design (Antonio Herrera)
XR as a Design Aid (Resham Khanna)
Encouraging Sustainable Behavior through Gaming (Amy Jiang)

Publications

Peer-Reviewed Journal Articles

4. Computationally adapting designs to align with semantic attributes: understanding how an interactive optimization method influences outcomes and human perceptions
    Ananya Nandy, Kosa Goucher-Lambert
    Journal of Computing and Information Science in Engineering. Submitted.

3. Adopting "Blackbox" Design Advice: The Influence of Imperfect Suggestions during AI-Assisted Decision Making
    Ananya Nandy, David Antonio Herrera, Kosa Goucher-Lambert
    Design Science. Under Review.

2. Do Human and Computational Evaluations of Similarity Align? An Empirical Study of Product Function
    Ananya Nandy, Kosa Goucher-Lambert
    Journal of Mechanical Design. April 2022.

1. Evaluating Quantitative Measures for Assessing Functional Similarity in Engineering Design
    Ananya Nandy, Andy Dong, Kosa Goucher-Lambert
    Journal of Mechanical Design. March 2022. ⭐ **Featured Article**

Peer-Reviewed Conference Proceedings

6. Semantic properties of word prompts shape design outcomes: understanding the influence of semantic richness and similarity
   Ananya Nandy, Monica Van, Jonathan Li, Kosa Goucher-Lambert, Matthew Klenk, Shabnam Hakimi
   Design Computing and Cognition (DCC'24). Under Review.

5. Adaptive Optimization of Subjective Design Attributes: Characterizing Individual and Aggregate Perceptions
   Ananya Nandy, Kosa Goucher-Lambert
   ASME International Design Engineering Technical Conferences (IDETC'23). August 2023.

4. VR or Not? Investigating Interface Type and User Strategies for Interactive Design Space Exploration
   Ananya Nandy, James Smith, Nicholas Jennings, Michael Kuniavsky, Björn Hartmann, Kosa Goucher-Lambert
   International Conference on Engineering Design (ICED'23). July 2023.

3. How does machine advice influence design choice? The effect of error on design decision making
   Ananya Nandy, Kosa Goucher-Lambert
   Design Computing and Cognition (DCC'22). July 2022. 🏆 **Best Paper in Design Cognition/Neurocognition**

2. Aligning Human and Computational Evaluations of Functional Design Similarity
   Ananya Nandy, Kosa Goucher-Lambert
   ASME International Design Engineering Technical Conferences (IDETC'21). August 2021. ⭐ **Nominated for Best Design Theory & Methodology Paper**

1. A Comparison of Vector and Network-Based Measures for Assessing Design Similarity
   Ananya Nandy, Andy Dong, Kosa Goucher-Lambert
   ASME International Design Engineering Technical Conferences (IDETC'20). August 2020.

Extended Abstract & Workshop Papers

2. GeneratiVR: Spatial Interactions in Virtual Reality to Explore Generative Design Spaces
   Nicholas Jennings, **Ananya Nandy**, Xinyi Zhu, Yuting Wang, Fanping Sui, James Smith, Björn Hartmann
   ACM Conference on Human Factors in Computing Systems Extended Abstracts (CHI '22 LBW). May 2022.

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