

Shano Liang Research Statement

Human-Computer Interaction // Visualization // Interactive Media & Game Studies // Human-centered Design

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My research is situated in human-computer interaction (HCI) and spans games, interactive media, and interactive data visualization. I focus on the **underexamined experiences** produced through interactive systems, responses and meanings that emerge through interaction but remain insufficiently named, explained, and connected to the design decisions that shape them.

In research on designing for interactive systems, the most informative knowledge is often the reaction we think deviated from intended experiences. As all models can always be uncertain, users who actually sit with the designed system usually fall somewhere off that center of design intention, and those distances aren't scattered around a true value. I work on those distances, those underexamined experiences, which include both unanticipated experiences and familiar ones whose design mechanisms remain unclear. I investigate the **experience-forming dynamics** through which design choices, contexts, and interpretation produce these experiences; By explaining these dynamics, I aim to help designers better understand **what people feel, perceive, read, and act** in interactive systems.

I pursue this problem through three connected lines of research (Fig. A): ① **Diagnosis** identifies and explains these experiences. ② **System Building and Evaluation** turns these accounts into working systems and examines how experiences take shape in use. And ③ **Research Infrastructure** creates tools for tracing and reusing interaction evidence across studies.

My ability to carry this study paradigm across research communities comes from repeated disciplinary and technical transitions. I moved from a BFA in Game Arts to an MS in Interactive Media & Game Development, and now a Ph.D. candidate in Computational Media conducting HCI and interactive visualization research. Each transition requires me to learn new research backgrounds, methods, and necessary technical skills. This background equips me to enter an ongoing research program or team, learn its domain quickly, immediately start the work that is expected of me to handle, and independently carry a project from question through implementation and empirical evaluation, without requiring dedicated onboarding or engineering support or a lengthy transition into a new area.

My endeavors have resulted in notable publications across HCI, interactive media, critical and cultural media research, games, and data visualization. Across this trajectory, I have designed and developed more than **19** interactive system projects and authored more than **17** peer-reviewed papers, at least 9 as first author, with publications at top-tier conferences and journals including ACM CHI, PACMHCI/CHI PLAY, ACM ToCHI, IEEE VIS, and IEEE TVCG. My research and interactive-media projects have received an **ACM CHI Honorable Mention** [4], **MIT Reality Hack Art Grant** [11], and approximately **\$20,000** in competitive awards.

A. Research Overview

I investigate the **experience-forming dynamics** in which design choices, contexts, and interpretation produce these experiences, through **three connected lines of research**.

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1 Diagnosis of Experiences
understanding human perception & feeling
 Liang, Chen et al. TVCG '26 [2]
 Cormier, Liang et al. CHI '25 [10]
 Liang, Chen et al. ACM Games '25 [6]
 Liang, Cormier et al. CHI PLAY '23 [7]
 Liang, Cormier et al. ToCHI '25 [5]
 Liang, Cormier et al. CHI '25 [4]  paper award
 Seaborn, Liang et al. CHI '26 [9]
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2 Building & Evaluation
making experiential & feelable interactive systems
 Liang, Chen et al. TVCG '26 [2]
 Liang, Chen et al. CHI PLAY '26 [1]
 Ponti, Liang et al. VISxVISION '26 [12]
 Chen, Liang et al. CHI PLAY '23 [11]
- 
3 Research Infrastructure
making user experience traceable & replayable
 Liang, Chen et al. TVCG '26 [3]
 Liang, Chen et al. (under review)

Diagnosis of Underexamined Experiences

Underexamined experiences imply that they have no vocabulary a designer can act on. In my such ① **diagnostic research**, I develop vocabularies and frameworks for underexamined experiences and trace the experience-forming dynamics through which design decisions, interactions, and contexts shape them. Across my past 7 publications, I used methods ranging from qualitative and quantitative, interpretive and thematic analysis to controlled studies to build explanations that serve as pioneers to guide future research and design [2,4,5,6,7,9,10].

- I introduced and operationalized the game design concept of "*juice*" (or "juiciness") into the data visualization design space for analyzing user engagement (and distraction, too) [2].
- My work on "*Shitty User Experience*" (SUX) analyzed 31 games to connect unconventional controls, exaggerated responses, and fast failure with hard-earned satisfaction, character bonding, absurdity, and spite [10].
- I led a reflexive thematic analysis of 83 physical and digital "*Jubensha*" games, covering more than 406 logged hours, and developed a taxonomy of how scripts, distributed cognition, and group play organize collaborative sensemaking activities [6].

(iv) My analysis of games and related texts connected sensory cues, constrained choices, and narrative framing with unexpected discomfort among a specific player community [7], and (v) the further analysis modeled how common digital system designs can unintentionally contribute to systematic exclusion for that community [5]. Moreover, moving from the experiences of discomfort to positive ones, (vi) I developed a *Design-Dynamics-Experience* (DDE) vocabulary framework connecting specific interactive system designs with euphoria, a psychological positive and well-being mental state, to provide a knowledge base for HCI designers to conduct projects about evoking euphoric experiences [4]; And, as an expansion of the euphoria design framework, (vii) I worked with three coauthors on a mixed-methods study of 142 participants, confirming and finding that reported euphoria was also associated with player groups and how they themselves read the optional designs [9].

System Building and Evaluation

Following how ① **diagnosis identifies experiences** to explain how they form, ② **building** the working interactive system gives those explanations concrete validation; Thus, the dynamic between design and experience can be studied in use. Studies in this stage draw on my hands-on interdisciplinary practice spanning design, visual art, audio, and programming, enabling me to complete research system building all independently, and to ③ **examine** how specific design decisions are related to user experiences and perceptions [1, 2, 12].

(i) For the "juice" concept abovementioned that I brought from game design into interactive visualization design practice, I built 26 controlled "*JuicyVIS*" prototypes (**Fig. B**), and evaluated them in three mixed-methods studies with 119 participants [2]. Results show that the post-interaction feedback type was associated with higher engagement, aesthetic, and readability ratings, while intensity alone produced no reliable rating differences.

(ii) For the idea of HCI design for euphoria, building on my DDE framework [4], I translated it into "*Rainborough*," a playable life-simulation research interactive system [1] (**Fig. C**). I led the development through an 11-week period, and then conducted an online mixed-methods evaluation with 56 players from the intended community. Responses from 49 participants were coded as the system successfully evoked euphoria. Meanwhile, the study also identified three unexpected dynamics that I further included in my euphoria DDE framework as new theorized knowledge production.

(iii) In addition, in my work on opacity *just-noticeable difference* (JND) perception, I built layered area-chart stimuli for a within-subject two-alternative forced-choice study [12]. Participant differences exceeded color-scheme differences, suggesting opacity steps of 5% or more as a practical starting point for distinguishable encodings.

Beyond these studies, my interactive system building practice also spans alternative controllers, tangible AR, and immersive or ambient environments through projects (please check my website for full details) such as "*Chuan*", "*No Shake*", *Stackable Music AR* [11], *Flow Chemistry AR*, *360 Lab Tours* (**Fig. D**), and *Mythic Hue*; In which, the Stack AR later received a \$500 MIT Reality Hack Art Grant.

Research Infrastructure

As ④ **building and evaluation** make the experience-forming dynamics observable in use, ⑤ **research infrastructure** construction makes that evidence traceable by keeping design decisions, participant actions, and system state connected. I also develop tools that maintain these connections across deployment, data collection, replayable interaction traces, and analytic platforms in one pipeline, to facilitate the prior two stages of my studies.

In my most recent work on reVISit-XR [3] (**Fig. E**), I extended the reVISit framework to make customizable WebXR stimuli embeddable, trackable, and replayable within empirical HCI and visualization studies. I developed two interconnected open-source packages that let researchers build and adapt their XR scenarios, sequence them with instructions and questionnaires, and keep study state synchronized across the workflow. For each session, reVISit-XR collects semantic provenance and scene-authored state such as user poses, layouts, anchors, and interaction events, recorded alongside timestamped headset and controller traces. These records keep task-level evidence compact while interpretable. Through semantic state rehydration, researchers can reconstruct participant-visible conditions, replay interactions, and relate those moments to stored task responses during analysis. This project was supported in part by NSF award #2213757.



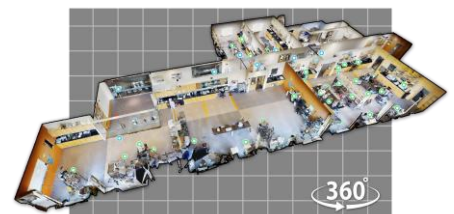
B. JuicyVIS prototype(s)

A screenshot of JuicyVIS with pre- and post-interaction feedback added.

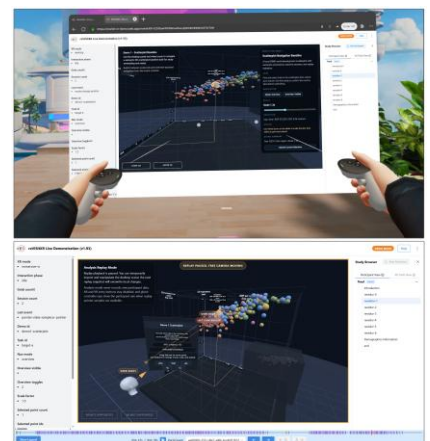


C. Euphoria & Rainborough

A screenshot of the interactive system Rainborough, which is designed to evoke euphoria experience.



D. 360 Lab Tours (Showcase)



E. reVISit-XR

Entering embedded XR stimuli from a reVISit study (Top); Frame-by-frame replay of XR interactions (Bottom).

Future Research Agenda

With technological advancements in artificial intelligence (AI) and generative systems now rapidly reshaping computing and visualization practices, I see and deeply believe that the "human" side of human-computer interaction is carrying increasing weight in defining the meaning of creating interactive systems. This belief has motivated my past 4 years of research on how interactive systems shape human experience, especially those complex, rare, and underexamined experiences. My future work will continue the exploration of the dynamics between design and human perceptions and experiences. Below are three research topics I plan to address:

(i) Extending Experience Diagnosis to New Interaction Contexts. I want to apply my **① diagnostic approach** developed through my prior work to a wider range of interactive systems, identifying and developing design vocabulary for underexamined experiences, tracing how particular design choices, contexts of use, and interpretations give them shape. *For example, what design can cause "Anhedonia" (a lack of motivation or pleasure in engaging in activities such as starting to play a video game) in interaction with the system, and how can we promote users to be motivated?* I intended to leave the target medium open, as my background and method themselves have a highly flexible nature that can be carried onto various objects. Here I proposed three that are already in my mind: In multisensory interaction, I would like to examine how touch, smell, sound, and combinations of sensory cues contribute to what people perceive and feel; In alternative and/or embodied interactive systems, I would investigate how physical form and spatial arrangement produce particular design guidance for target experiences; Moreover, I would also study how experience-forming strategies from games and interactive media can be adapted to purpose-driven systems for education, public understanding, and decision support.

(ii) Building Experiential/Feelable Interactive Systems for Public Understanding and Decision Support. Building on the practice of how I diagnosed dynamics into playable simulations and experiential data interfaces in Rainborough and JuicyVIS [1, 2], I want to bring feedback design, embodied interaction, and other game-design informed methods **② adapted into novel interfaces, visualization, and purpose-driven systems**, so people can explore abstract concepts or data, navigate uncertainty, and compare outcomes through action. I will evaluate how implementations relate to comprehension, engagement, trust, and judgment in science communication, civic media, education, and collaborative decision-making.

(iii) Creating Open Infrastructure for Cross-Media Experience Research. Starting from reVISit-XR [3], I plan to extend embeddable, trackable, and replayable study workflows across multisensory systems, tangible interaction, ambient environments, and/or other complicated and specific tricky scenarios that I may learn from the community. In my mind's blueprint, no matter what medium, it should be able to have shared provenance schemas that connect design configurations, semantic events, system state, interaction log, and study outcomes. Based on the specific topic requirement, I will **③ organize and build reusable authoring components, replay tools, and analysis workflows** so the whole research team(s) can move from prototype to deployable study and compare evidence across implementations. I hope these resources I built can support efficient, transparent, and reproducible work across labs.

Reference

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