Designing and Developing User Interfaces with AI: Advancing Tools, Workflows, and Practices

YUWEN LU*, University of Notre Dame, United States
YUE JIANG*, Aalto University, Finland
TIFFANY KNEAREM, Google, United States
CLARA KLIMAN-SILVER, Google, United States
CHRISTOF LUTTEROTH, University of Bath, United Kingdom
JEFFREY NICHOLS, Apple Inc, United States
WOLFGANG STUERZLINGER, Simon Fraser University, Canada

Designing and developing user-friendly interfaces has long been a cornerstone of HCI research. However, we are now at a turning point for how user interfaces can be designed and evaluated with new AI-based models and tools. The latest AI models have shown capabilities to model user behaviors, automate end-user tasks, and even generate user interfaces. We are at a pivotal moment to reflect on current UI design and development practices and discuss the opportunities, challenges, and risks brought by AI. Both incremental improvements and transformative opportunities exist for designers, developers, and the hand-off process in between. In this proposed workshop, we encourage participants to envision AI-enabled UI prototyping tools, workflows, and practices. By bringing together academic researchers and industry practitioners, we aim to identify opportunities to enhance prototyping tools and reshape UI creation workflows for the future as well as discuss potential negative consequences of these tools.

ACM Reference Format:
Yuwen Lu, Yue Jiang, Tiffany Knearem, Clara Kliman-Silver, Christof Lutteroth, Jeffrey Nichols, and Wolfgang Stuerzlinger. 2025. Designing and Developing User Interfaces with AI: Advancing Tools, Workflows, and Practices. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems (CHI EA '25), April 26-May 1, 2025, Yokohama, Japan.* ACM, New York, NY, USA, 11 pages. https://doi.org/10.1145/3706599.3706736

1 OVERVIEW

AI models that can generate user interfaces (UIs) led us to imagine how AI might change the UI prototyping tools and practices [14, 15, 20, 23, 28, 51]. Their potential impact on prototyping tools range from incremental task acceleration to transformative workflow paradigm shifts [18, 37, 40]. For the past several years, research prototypes [5, 10, 18**?**] and commercial products (e.g. Figma AI, V0 by Vercel, Magic Patterns[1]) have shown great promise in changing UI design and development practices. While early adopters have begun to experiment with these innovative AI tools, widespread adoption is to come. This transitional period offers a valuable opportunity for Human-Computer Interaction

*Contributed equally.
[1]Figma AI: figma.com/ai, V0 by Vercel: v0.dev, Magic Patterns: magicpatterns.com

Manuscript submitted to ACM

(HCI) researchers to reflect on existing changes enabled by AI and envision AI's ideal role in UI prototyping tools and workflows of the future[2].

Direct integration of AI into UI design and development tools is a result of years of HCI and AI research. Early research in data-driven approaches to understand UI semantics has built the foundation for UI generation with AI [35]. UI datasets such as Rico [6] and WebUI [57] have enabled training deep learning models on large-scale, diverse UI data. Various UI representation learning techniques have been proposed to utilize the multimodal nature of user interfaces [1, 25, 31, 54]. Recent large general-purpose, pre-trained multimodal AI models have enabled more sophisticated understanding and generation of UIs [19, 39, 53, 58]. For UI development, AI models' capabilities of generating UI code have also significantly improved over the years [2, 56**?**]. As AI lowers the barrier to writing UI code, it contains immense potential to transform both developer workflows and the designer-developer handoff process.

In addition to direct generation, AI has shown promise in evaluating and critiquing UI design. Research has indicated AI's technical feasibility to provide good-quality UI design critique through finetuning general purpose AI models [8, 9, 55]. Some work also explored using AI to annotate rationale for existing design examples [38]. Another important line of research in UI evaluation focuses on user behaviors: AI models that predict users' scanpaths using eyetracking data [**? ?**] and user behavior modeling [50] showed alternative methods to understand end users. These new evaluation methods opened up new, low-cost ways to test UI prototypes, yet raises concerns around the truthfulness and bias in synthetic evaluation data.

Integrating AI for end user task automation also poses new requirements and challenges for UI design and development. Past HCI research has explore many ways to accelerate end users' task execution on UIs with AI [29, 30, 32, 33, 47, 49, 53]. These technical breakthroughs have been gradually integrated into real world products, shifting the balance between the two major interaction paradigms: direct manipulation and interface agent automation [48]. More tasks can now be executed executed by AI agents fairly reliabilty, yet the impact of AI agents on user agency and autonomy remains under-explored. Nevertheless, novel user experiences that potentially involve more interface agents create new challenges for UI design and development: how might we comprehensively design for unpredictable AI task automation scenarios? What are the UI safety concerns when agents act on users' behalves? How might we maximize user agency yet utilize AI agent efficiency gains? These are prime research questions to explore in our workshop.

The introduction of AI into end-user interactions and design and development workflows has brought about numerous new challenges; however, prototyping practices have largely been passively adapting to these changes [21, 26, 40]. This is a pivotal moment for the HCI community to examine evolving industry practices, draw insights from past experiences, and reimagine future UI design and development tools that effectively leverage AI.

UI prototyping tools are at an inflection point. Building upon previous workshops on design tooling [4] and AI approaches in UI [15, 17, 18] at CHI, this workshop aims to advance the frontier of AI-driven design and development. We invite academic and industry experts to explore future directions in technical algorithms, models, design and development workflows, and human-AI interaction paradigms. Discussion will emphasize preserving designers' and developers' **agency** and **creative control**, as well as end users' autonomy and safety with AI-created design and AI task automation. We advocate for enriched dialogues encompassing both underlying technology for UI prototyping supports and prototyping workflows that effectively leverage AI. The main topics of our workshop include:

- **AI Integration in UI/UX Design and Development Tools:** This topic explores direct integration of AI technologies into UI/UX design and development tools, examining the datasets and models that power these

[2]In this proposal, we use the term "prototyping" to cover both UI design *and* development.

AI systems and how they can enhance design workflows by automating repetitive tasks, generating design suggestions, and optimizing layouts based on data-driven insights. The goal is to understand the implications of these integrations and identify best practices for leveraging AI without compromising the creative input of designers and developers.

- **Agency and Creative Control in Evolving Workflows with AI:** AI integration in prototyping workflows offers opportunities to enhance efficiency and creativity, but it also poses challenges in maintaining the agency of designers and developers. This topic examines strategies for integrating AI that enhance, rather than hinder, creative control and decision-making. Emphasis will be placed on techniques that allow designers to interact with AI suggestions dynamically, ensuring that the human touch remains central to the design process, and AI acts as a supportive partner rather than a controlling force.
- **Safety Considerations in UI Automation:** As AI-driven automation becomes more prevalent in UI design, new interaction scenarios emerge that require careful consideration of user safety and privacy. This topic addresses the risks associated with AI-enabled automation, such as unintended user actions or security vulnerabilities. Discussions will focus on developing guidelines and best practices for implementing AI in ways that prioritize user safety, including transparency, accountability, and fail-safe mechanisms to protect end-users.
- **AI-Driven UI Evaluation Techniques:** Utilizing AI for UI evaluation involves employing computational models to simulate and analyze user behavior and interaction patterns. This topic covers methods such as predictive modeling of user actions, sentiment analysis from user interactions, and leveraging AI to perform usability testing at scale. The focus is on how these techniques can provide actionable insights into design performance, enabling more responsive, adaptive, and user-centered interface design.
- **Enhancing Designer-Developer Handoff with AI:** The designer-developer handoff, where designers transfer design assets to developers for implementation, is a critical phase in the product development cycle that is often fraught with challenges. This topic investigates how AI tools can facilitate a smoother transition of design assets and specifications, automatically translating design intent into code-ready components. By improving communication and reducing manual translation efforts, AI can help bridge the gap between design and development, fostering more collaborative and efficient workflows.

2 BACKGROUND

2.1 UI Design and Development Tools, Practices, and Workflows

Since the emergence of personal computing platforms, HCI researchers and practitioners have been pushing forward our understanding of best prototyping practices (for both design and development) and innovation in tooling for prototyping. Early research explored critical aspects of user mental processes when interacting with technology, such as mental model, affordance, the gulfs of execution and evaluation, etc. [42, 45]. These insights have guided UI design and development practices ever since. Early digital design tools also emerged as HCI research prototypes [22], with later research exploring model-based UI development methods to aid designers and developers in creating UIs [12, 43]. Researchers have also emphasized the value of sketching low-fidelity prototypes in early stages, as well as parallel prototyping to avoid design fixation [3, 7]. This research has influenced tools, practices, and workflows in the UI/UX industry for decades and significantly shaped the digital ecosystem people use and create nowadays. Our workshop carries this legacy forward, aiming to further explore the evolving landscape of UI prototyping by integrating cutting-edge AI technologies.

2.2 AI Advancements to Understand, Generate, and Evaluate UIs

Data-drive methods in machine learning have been applied to the domain of UI design and development. Large-scale datasets such as Rico [6], WebUI [57], and their extensions [24, 41, 54] have enabled deep learning explorations on a variety of UI-related tasks, including design generation [13, 27, 39], code generation [37, 56], UI modeling [1, 31, 58], and user behavior prediction [46**? ?**]. AI models' impressive capabilities on these tasks opened up new opportunities to facilitate UI prototyping. In addition, the latest large pre-trained AI models pushed model capabilities further, including for UI-related tasks. Using certain prompting techniques, general-purpose large multimodal models have shown to perform well on tasks that require basic understanding of UI structure and content [53]. Fine-tuning pre-trained AI models can further improve their performance on tasks such as UI evaluation [8, 36, 55] and UI code generation [56]. Designing multi-agent workflows with pre-trained multimodal AI can also support sophisticated tasks such as UI accessibility [52] and UI design generation [11]. In this workshop, we encourage participants to discuss desired AI model capabilities, the required data and training techniques, and their applications in realistic design and development workflows.

2.3 Adopting AI Into AI Design and Development

While research systems and commercial products are gradually integrating AI into UI design and development workflows, the ideal role of AI in these workflows remain an open-ended research question. Previous survey has shown that UX professionals would like to see AI as a *creative partner* for inspirations and as an *assistant* to automate mundane tasks [21]. Research prototypes and commercial tools features often fall into these two main mechanisms of support. For example, researchers have created gallery systems to help designers find better inspirations using AI [14**? **]. Many generative UI mechanism have been proposed to automate mundane steps in UI design and development, while also kickstarting creative explorations [11, 37]. As AI lowers the barrier for both designing and developing good-quality user interfaces, a great potential touchpoint for AI integration is the designer-developer collaboration and handoff process [34]. However, how to effectively preserve user agency and creative control in AI-enabled prototyping tools remains an open research challenge and is currently left to specific design decisions [40]. Meanwhile, common concerns around AI, such as bias, trust, and copyright issues, still significantly impact its adoption in the UI/UX domain [21]. In our workshop, we seek to identify ideal roles of AI in different stages of UI design and development and address the concerns alongside of it. We encourage participants to reflect on the bigger picture of design & development practices, imagining foundational paradigm shifts that can be brought on with new AI capabilities in both *inspiration* and *automation*.

3 THE GOAL OF THE WORKSHOP

The primary objective of this workshop is to inspire the community to explore research opportunities in AI techniques and tools and their impact on design workflows and practices. Our aim is to have impact in academic, practical, and social contexts in designing and implementing high-quality, user friendly interfaces and experiences. We encourage individuals from various backgrounds, including the CHI community, adjacent academic fields, and industry practitioners to participate and think about future opportunities and challenges.

Through the discussions held during the workshop, our intention is to reflect on different ways AI will influence user interactions with interfaces and their implications on design and development requirements, tools, and practices. We draw attention to research on user behaviors, UI/UX design practices, and the latest AI capabilities to spark conversations

between attendees and inspire participatory design of the preferred future state. We intend for this workshop to act as a platform that advances both new research directions and direct product impact.

4 ORGANIZERS

The organizing team has successfully organized three workshops at CHI on different topics of computational user interfaces [16–18]. The organizing team brings a wealth of successful experience in hosting CHI workshops on related topics. Before shifting to this proposal's specific focus on AI-driven design tools and workflows, members of the team successfully organized workshops on computational methods for understanding, generating, and evaluating user interfaces. Leveraging this expertise, the organizers are committed to delivering a high-quality and inspiring workshop experience, ensuring smooth planning and execution tailored to exploring future design tooling and workflows with AI.

The organizing team includes both academic and industry researchers, ensuring a balanced perspective that bridges cutting-edge research and practical applications in AI-supported design tooling. This blend of expertise allows the team to create a workshop environment that is relevant and engaging for participants from diverse backgrounds. Their collective experience will facilitate insightful discussions and foster collaborations that drive forward the research and practical application of AI-enhanced design tools.

Yuwen Lu is a Ph.D. student in the Department of Computer Science and Engineering at the University of Notre Dame, working on using data-driven approaches for understanding and generating user interfaces to support UX research and design work. Before joining Notre Dame, Yuwen received a Master's degree in Human-Computer Interaction from Carnegie Mellon University.

Yue Jiang is a Ph.D. student in Intelligent Systems supervised by Prof. Antti Oulasvirta at Aalto University and the Finnish Center for AI in Finland. Her research focuses on computational user interface understanding, with specific interests in generating adaptive UIs for different users and contexts, AI-assisted design, and modeling human behavior.

Tiffany Knearem is a User Experience Researcher on the Material Design team at Google. Her research focus is on product designer-developer collaboration, creativity support tooling and opportunities for AI in the user interface (UI) design space. She also conducts research on human-AI alignment from a human-centered perspective which places value on human agency to foster effective human-AI collaboration. She holds a PhD in Information Sciences and Technologies from Pennsylvania State University, advised by Dr. John M. Carroll.

Clara Kliman-Silver is a Staff UX Researcher at Google who studies design teams, design systems, UX tools, and designer-developer collaboration. She specializes in participatory design and generative methods to investigate workflows, understand designer-developer experiences, and imagine ways to create UIs. In previous roles, she has conducted research on developer tools, artificial intelligence, and healthcare. Clara holds a Bachelors of Science in Cognitive Science from Brown University.

Christof Lutteroth is a Reader in the Department of Computer Science at the University of Bath. His main research interests are in HCI, with a focus on immersive technology, interaction methods, and user interface design. In particular, he has a long-standing interest in methods for user interface layout. He is the director of the REal and Virtual Environments Augmentation Labs (REVEAL), the research center for immersive technology at the University of Bath.

Jeffery Nichols is a Research Scientist in the AI/ML group at Apple working on intelligent user interfaces. Previously he was a Staff Research Scientist at Google, working on the open-source Fuchsia operating system. His most important academic contribution recently was the creation of the RICO dataset [6]. He also worked on the PUC project [44],

whose primary focus was creating a specification language that can define any device and an automatic user interface generator that can create control panels from this specification language.

Wolfgang Stuerzlinger is a Professor at the School of Interactive Arts + Technology at Simon Fraser University. His work aims to gain a deeper understanding of and to find innovative solutions for real-world problems. Current research projects include better 3D interaction techniques for Virtual and Augmented Reality applications, new human-in-the-loop systems for big data analysis, the characterization of the effects of technology limitations on human performance, investigations of human behaviors with occasionally failing technologies, user interfaces for versions, scenarios, and alternatives, and new Virtual/Augmented Reality hardware and software.

5 PRE-WORKSHOP PLANS

Before the workshop, we will distribute a call for participation across a variety of HCI-related emailing lists and social media, like Twitter and LinkedIn. The call will invite researchers and practitioners to contribute by submitting position papers. We will also advertise the workshop at upcoming HCI conferences, among research groups, and through our professional networks. All participants are expected to submit a position paper. The submissions will be reviewed by the workshop organizers and committee members. The selection of participants will be based on the relevancy, innovation, and quality presented in their submissions according to workshop topics and criteria. To help candidates get familiar with the workshop's scope and goals, we have created a website https://sites.google.com/view/computational-uichi25/home, to provide information about the workshop.

6 ACCESSIBILITY

Authors whose position papers are accepted will be strongly encouraged to make their papers accessible. While they are preparing for the camera-ready version, our organizing team will help them with suggestions on how to make the documents accessible, like adding alt-texts for pictures and tables, and setting the order. To make sure the workshop is accessible to people with disabilities, we will consider adding subtitles, depending on what the participants need.

7 WORKSHOP STRUCTURE

The workshop, scheduled for one day, will accommodate roughly 30 participants (including the organizers). The workshop will include two keynotes, presentations of paper and demo submissions to the workshop, and focused group discussions on a variety of related topics.

7.1 In-Person Format

The workshop is anticipated to be in-person. Standard equipment available at the conference center will suffice for technical requirements. The workshop website https://sites.google.com/view/computational-uichi25/home, will serve as a hub for information, hosting calls for papers, program details, organizers and speakers list, and pre-prints of accepted papers.

7.2 Workshop Schedule

Throughout the workshop, the attendees will engage with domain experts, and the organizers will guide discussions across various domains. The tentative agenda is show in Table 1.

Time	Session
9:00 - 9:30	Introduction of workshop organizers, participants, topics, and goals
9:30 - 10:30	Keynote 1 by an invited speaker
10:30 - 11:00	Coffee break
11:00 - 12:00	Paper & Demo Presentation
12:00 - 12:30	Group discussion
12:30 - 13:30	Lunch
13:30 - 14:30	Keynote 2 by an invited speaker
14:30 - 15:30	Paper Presentation
15:30 - 16:00	Coffee break
16:00 - 17:00	Group discussion
17:00 - 17:30	Discussion group report back, wrap-up
17:30	Dinner (optional)

Table 1. Tentative agenda of the workshop

7.2.1 Keynotes. We will invite two keynote speakers who are experts currently working on AI-enabled design tools and workflows. Each will give a talk for 30 minutes, followed by an extensive Q&A and interactive discussion.

7.2.2 Paper & Demo Presentations. Accepted papers and demos will be categorized based on their themes for presentation. We will select the best two position papers in each category for a full presentation, each allotted a 10-minute slot. Some selected papers will have lightning talks with 1-minute slots. The duration and number of presentations will be adjusted as needed to accommodate the number of accepted submissions.

7.2.3 Breakout Group Discussions. After each presentation section, participants will be divided into smaller discussion groups. The groups will be divided differently after each session to help participants get to communicate with more people. Participants can also suggest and create new groups based on their interests.

8 POST-WORKSHOP PLAN

After the CHI workshop, we plan to produce a report on the workshop outcome. The workshop papers and results will be available on the website before and after the workshop, providing opportunities for a larger audience to get updated on the events and results of our workshop. We may seek opportunities for an edited book or a special issue in a selected journal, *e.g.*, ToCHI, where the participants will be encouraged to publish their work.

A central goal of this workshop is community building for researchers and practitioners in this area. After the workshop, we plan to create a platform for community members to continue the discussion and share resources. Potential options may include a periodical email newsletter, a public GitHub repository, or a Slack/Discord channel. Participants and organizers will discuss the next steps at the workshop.

9 CALL FOR PARTICIPATION

"Designing User Interfaces and User Experiences with AI: Future Tools, Workflows, and Practices" is a workshop at CHI 2025. In this one-day workshop, our aim is to facilitate collaboration among researchers from various sub-disciplines of HCI, bridging the gaps between HCI and adjacent fields such as ML, CV, NLP, and Software Engineering. We welcome participants working on research and applications of AI in UI/UX design tooling and practices, from both

industry and academia. Our primary goal is to encourage discussions regarding the future potential and requirements of computational approaches for user interfaces.

We invite researchers and practitioners to contribute by submitting a 4–6 page position paper in the double-column CHI Extended Abstract format (excluding references) to participate in the workshop. Alternatively, a video demo of less than 10 minutes can be submitted if the main idea can be more easily conveyed in this format. We will have a peer-review process, with each submission reviewed by at least two committee members or organizers. Selection for submission will be based on the criteria of quality and relevance. Participants should follow the instruction on the website and submit the position papers via user.interface.workshop@gmail.com. Submissions can cover but are not limited to the following topics:

- **AI Integration in UI/UX Design and Development Tools:** We seek insights on integrating AI into design and development tools, focusing on datasets and models that enhance workflows by automating tasks, generating design suggestions, and optimizing layouts. Submissions should explore the benefits and best practices for AI integration while preserving designers' and developers' creative input.
- **Agency and Creative Control in AI-Enhanced Workflows:** We invite contributions on strategies that integrate AI into prototyping workflows without compromising designer and developer agency. Emphasis is on methods that keep human control central while enhancing creativity and efficiency.
- **Safety Considerations in UI Automation:** We welcome studies on safety and privacy challenges in AI-driven UI automation, focusing on risks like unintended actions and security vulnerabilities. Submissions should propose guidelines for safe AI implementation in design.
- **AI-Driven UI Evaluation Techniques:** Submissions are encouraged on AI methods for evaluating UIs, including predictive modeling, user interaction analysis, and large-scale usability testing. We seek approaches that offer actionable insights to improve design performance.
- **Enhancing Designer-Developer Handoff with AI:** We call for insights into AI tools that streamline the designer-developer handoff, reducing manual effort and improving collaboration. Submissions should address how AI can facilitate smoother transitions from design to development.

We will recruit researchers and practitioners in this field as program committee members to review submissions together. We will select submissions based on quality, novelty, and topic fit while aiming for a balance of different perspectives. Accepted papers will optionally be available on the workshop website (with the author's consent). At least one author of each accepted position paper must register and attend the workshop and register for at least one day of the conference. The authors of each accepted position paper will have about 8 minutes to present their work followed by an additional 2-minute Q&A.

9.1 Estimated Key Dates

- Call for participation released: December 15, 2024
- Position paper submission deadline: February 23, 2025
- Notification of acceptance: March 15, 2025
- Workshop date: April 26th, 2025

REFERENCES

[1] Chongyang Bai, Xiaoxue Zang, Ying Xu, Srinivas Sunkara, Abhinav Rastogi, Jindong Chen, et al. 2021. Uibert: Learning generic multimodal representations for ui understanding. *arXiv preprint arXiv:2107.13731* (2021).

[2] Tony Beltramelli. 2018. Pix2code: Generating Code from a Graphical User Interface Screenshot. In *Proceedings of the ACM SIGCHI Symposium on Engineering Interactive Computing Systems* (Paris, France) *(EICS '18)*. Association for Computing Machinery, New York, NY, USA, Article 3, 6 pages. https://doi.org/10.1145/3220134.3220135

[3] Bill Buxton. 2010. *Sketching user experiences: getting the design right and the right design.* Morgan kaufmann.

[4] Anna Rose Lucy Carter, Miriam Sturdee, Alan Dix, Dani Kalarikalayil Raju, Martha Aldridge, Eunice Sari, Wendy Mackay, and Elizabeth Churchill. 2022. Incontext: Futuring user-experience design tools. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts*. 1–6.

[5] Chunyang Chen, Sidong Feng, Zhenchang Xing, Linda Liu, Shengdong Zhao, and Jinshui Wang. 2019. Gallery D.C.: Design Search and Knowledge Discovery through Auto-Created GUI Component Gallery. *Proc. ACM Hum.-Comput. Interact.* 3, CSCW, Article 180 (nov 2019), 22 pages. https://doi.org/10.1145/3359282

[6] Biplab Deka, Zifeng Huang, Chad Franzen, Joshua Hibschman, Daniel Afergan, Yang Li, Jeffrey Nichols, and Ranjitha Kumar. 2017. Rico: A Mobile App Dataset for Building Data-Driven Design Applications. In *Proceedings of the 30th Annual ACM Symposium on User Interface Software and Technology* (Québec City, QC, Canada) *(UIST '17)*. Association for Computing Machinery, New York, NY, USA, 845–854. https://doi.org/10.1145/3126594.3126651

[7] Steven P Dow, Alana Glassco, Jonathan Kass, Melissa Schwarz, Daniel L Schwartz, and Scott R Klemmer. 2010. Parallel prototyping leads to better design results, more divergence, and increased self-efficacy. *ACM Transactions on Computer-Human Interaction (TOCHI)* 17, 4 (2010), 1–24.

[8] Peitong Duan, Chin-yi Chen, Gang Li, Bjoern Hartmann, and Yang Li. 2024. UICrit: Enhancing Automated Design Evaluation with a UICritique Dataset. *arXiv preprint arXiv:2407.08850* (2024).

[9] Peitong Duan, Jeremy Warner, Yang Li, and Bjoern Hartmann. 2024. Generating Automatic Feedback on UI Mockups with Large Language Models. In *Proceedings of the CHI Conference on Human Factors in Computing Systems*. 1–20.

[10] Sidong Feng, Suyu Ma, Jinzhong Yu, Chunyang Chen, Tingting Zhou, and Yankun Zhen. 2021. Auto-icon: An automated code generation tool for icon designs assisting in ui development. In *Proceedings of the 26th International Conference on Intelligent User Interfaces*. 59–69.

[11] Sidong Feng, Mingyue Yuan, Jieshan Chen, Zhenchang Xing, and Chunyang Chen. 2023. Designing with Language: Wireframing UI Design Intent with Generative Large Language Models. *arXiv preprint arXiv:2312.07755* (2023).

[12] Krzysztof Gajos and Daniel S. Weld. 2004. SUPPLE: Automatically Generating User Interfaces. In *Proceedings of the 9th International Conference on Intelligent User Interfaces* (Funchal, Madeira, Portugal) *(IUI '04)*. Association for Computing Machinery, New York, NY, USA, 93–100. https://doi.org/10.1145/964442.964461

[13] Lena Hegemann, Yue Jiang, Joon Gi Shin, Yi-Chi Liao, Markku Laine, and Antti Oulasvirta. 2023. Computational Assistance for User Interface Design: Smarter Generation and Evaluation of Design Ideas. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–5.

[14] Forrest Huang, John F. Canny, and Jeffrey Nichols. 2019. Swire: Sketch-Based User Interface Retrieval. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–10. https://doi.org/10.1145/3290605.3300334

[15] Yue Jiang. 2024. Computational Representations for Graphical User Interfaces. In *Extended Abstracts of the 2024 CHI Conference on Human Factors in Computing Systems*. https://doi.org/10.1145/3613905.3638191

[16] Yue Jiang, Yuwen Lu, Tiffany Knearem, Clara E Kliman-Silver, Christof Lutteroth, Toby Jia-Jun Li, Jeffrey Nichols, and Wolfgang Stuerzlinger. 2024. Computational Methodologies for Understanding, Automating, and Evaluating User Interfaces. In *Extended Abstracts of the 2024 CHI Conference on Human Factors in Computing Systems (CHI EA '24)*. Association for Computing Machinery, New York, NY, USA, Article 462, 7 pages. https://doi.org/10.1145/3613905.3636316

[17] Yue Jiang, Yuwen Lu, Christof Lutteroth, Toby Jia-Jun Li, Jeffrey Nichols, and Wolfgang Stuerzlinger. 2023. The Future of Computational Approaches for Understanding and Adapting User Interfaces. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI EA '23)*. Association for Computing Machinery, New York, NY, USA, Article 367, 5 pages. https://doi.org/10.1145/3544549.3573805

[18] Yue Jiang, Yuwen Lu, Jeffrey Nichols, Wolfgang Stuerzlinger, Chun Yu, Christof Lutteroth, Yang Li, Ranjitha Kumar, and Toby Jia-Jun Li. 2022. Computational Approaches for Understanding, Generating, and Adapting User Interfaces. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI EA '22)*. Association for Computing Machinery, New York, NY, USA, Article 74, 6 pages. https://doi.org/10.1145/3491101.3504030

[19] Yue Jiang, Eldon Schoop, Amanda Swearngin, and Jeffrey Nichols. 2023. ILuvUI: Instruction-tuned LangUage-Vision modeling of UIs from Machine Conversations. arXiv:2310.04869 [cs.HC]

[20] Yue Jiang, Changkong Zhou, Garg Vikas, and Antti Oulasvirta. 2024. Graph4GUI: Graph Neural Networks for Representing Graphical User Interfaces. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems*. https://doi.org/10.1145/3613904.3642822

[21] Tiffany Knearem, Mohammed Khwaja, Yuling Gao, Frank Bentley, and Clara E Kliman-Silver. 2023. Exploring the future of design tooling: The role of artificial intelligence in tools for user experience professionals. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–6.

[22] James A Landay. 1996. SILK: sketching interfaces like krazy. In *Conference companion on Human factors in computing systems*. 398–399.

[23] Hsin-Ying Lee, Lu Jiang, Irfan Essa, Phuong B. Le, Haifeng Gong, Ming-Hsuan Yang, and Weilong Yang. 2020. Neural Design Network: Graphic Layout Generation with Constraints. In *Computer Vision – ECCV 2020: 16th European Conference, Glasgow, UK, August 23–28, 2020, Proceedings, Part III* (Glasgow, United Kingdom). Springer-Verlag, Berlin, Heidelberg, 491–506. https://doi.org/10.1007/978-3-030-58580-8_29

[24] Luis A. Leiva, Asutosh Hota, and Antti Oulasvirta. 2020. Enrico: A High-quality Dataset for Topic Modeling of Mobile UI Designs. In *Proc. MobileHCI Adjunct.*

[25] Gang Li and Yang Li. 2022. Spotlight: Mobile UI Understanding using Vision-Language Models with a Focus. *arXiv preprint arXiv:2209.14927* (2022).

[26] Jie Li, Hancheng Cao, Laura Lin, Youyang Hou, Ruihao Zhu, and Abdallah El Ali. 2024. User experience design professionals' perceptions of generative artificial intelligence. In *Proceedings of the CHI Conference on Human Factors in Computing Systems*. 1–18.

[27] Jianan Li, Jimei Yang, Aaron Hertzmann, Jianming Zhang, and Tingfa Xu. 2019. Layoutgan: Generating graphic layouts with wireframe discriminators. *arXiv preprint arXiv:1901.06767* (2019).

[28] Jianan Li, Jimei Yang, Jianming Zhang, Chang Liu, Christina Wang, and Tingfa Xu. 2021. Attribute-Conditioned Layout GAN for Automatic Graphic Design. *IEEE Transactions on Visualization and Computer Graphics* 27, 10 (oct 2021), 4039–4048. https://doi.org/10.1109/TVCG.2020.2999335

[29] Toby Jia-Jun Li, Amos Azaria, and Brad A. Myers. 2017. SUGILITE: Creating Multimodal Smartphone Automation by Demonstration. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI '17)*. Association for Computing Machinery, New York, NY, USA, 6038–6049. https://doi.org/10.1145/3025453.3025483

[30] Toby Jia-Jun Li, Igor Labutov, Xiaohan Nancy Li, Xiaoyi Zhang, Wenze Shi, Wanling Ding, Tom M. Mitchell, and Brad A. Myers. 2018. APPINITE: A Multi-Modal Interface for Specifying Data Descriptions in Programming by Demonstration Using Natural Language Instructions. In *2018 IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC)*. 105–114. https://doi.org/10.1109/VLHCC.2018.8506506

[31] Toby Jia-Jun Li, Lindsay Popowski, Tom Mitchell, and Brad A Myers. 2021. Screen2Vec: Semantic Embedding of GUI Screens and GUI Components. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 578, 15 pages. https://doi.org/10.1145/3411764.3445049

[32] Toby Jia-Jun Li, Marissa Radensky, Justin Jia, Kirielle Singarajah, Tom M. Mitchell, and Brad A. Myers. 2019. PUMICE: A Multi-Modal Agent That Learns Concepts and Conditionals from Natural Language and Demonstrations. In *Proceedings of the 32nd Annual ACM Symposium on User Interface Software and Technology* (New Orleans, LA, USA) *(UIST '19)*. Association for Computing Machinery, New York, NY, USA, 577–589. https://doi.org/10.1145/3332165.3347899

[33] Toby Jia-Jun Li and Oriana Riva. 2018. KITE: Building conversational bots from mobile apps. In *Proceedings of the 16th ACM International Conference on Mobile Systems, Applications, and Services (MobiSys 2018)*. ACM.

[34] James Lin, Tiffany Knearem, and Kristopher Giesing. 2023. Relay: A collaborative UI model for design handoff. In *Adjunct Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology*. 1–3.

[35] Thomas F Liu, Mark Craft, Jason Situ, Ersin Yumer, Radomir Mech, and Ranjitha Kumar. 2018. Learning design semantics for mobile apps. In *Proceedings of the 31st Annual ACM Symposium on User Interface Software and Technology*. 569–579.

[36] Yuwen Lu, Tiffany Knearem, Shona Dutta, Jamie Blass, Clara Kliman-Silver, and Frank Bentley. 2024. AI Is Not Enough: A Hybrid Technical Approach to AI Adoption in UI Linting With Heuristics. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*. 1–7.

[37] Yuwen Lu, Alan Leung, Amanda Swearngin, Jeffrey Nichols, and Titus Barik. 2024. Misty: UI Prototyping Through Interactive Conceptual Blending. *arXiv preprint arXiv:2409.13900* (2024).

[38] Yuwen Lu, Ziang Tong, Qinyi Zhao, Yewon Oh, Bryan Wang, and Toby Jia-Jun Li. 2024. Flowy: Supporting UX Design Decisions Through AI-Driven Pattern Annotation in Multi-Screen User Flows. *arXiv preprint arXiv:2406.16177* (2024).

[39] Yuwen Lu, Ziang Tong, Qinyi Zhao, Chengzhi Zhang, and Toby Jia-Jun Li. 2023. UI Layout Generation with LLMs Guided by UI Grammar. *arXiv preprint arXiv:2310.15455* (2023).

[40] Yuwen Lu, Chengzhi Zhang, Iris Zhang, and Toby Jia-Jun Li. 2022. Bridging the Gap between UX Practitioners' work practices and AI-enabled design support tools. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts*. 1–7.

[41] Kevin Moran, Ali Yachnes, George Purnell, Junayed Mahmud, Michele Tufano, Carlos Bernal Cardenas, Denys Poshyvanyk, and Zach H'Doubler. 2022. An Empirical Investigation into the Use of Image Captioning for Automated Software Documentation. In *2022 IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER)*. 514–525. https://doi.org/10.1109/SANER53432.2022.00069

[42] Brad A Myers. 1985. The importance of percent-done progress indicators for computer-human interfaces. *ACM SIGCHI Bulletin* 16, 4 (1985), 11–17.

[43] Jeffrey Nichols, Brad A Myers, Michael Higgins, Joseph Hughes, Thomas K Harris, Roni Rosenfeld, and Mathilde Pignol. 2002. Generating remote control interfaces for complex appliances. In *Proceedings of the 15th annual ACM symposium on User interface software and technology*. 161–170.

[44] Jeffrey Nichols, Brad A. Myers, Michael Higgins, Joseph Hughes, Thomas K. Harris, Roni Rosenfeld, and Mathilde Pignol. 2002. Generating Remote Control Interfaces for Complex Appliances. In *Proceedings of the 15th Annual ACM Symposium on User Interface Software and Technology* (Paris, France) *(UIST '02)*. Association for Computing Machinery, New York, NY, USA, 161–170. https://doi.org/10.1145/571985.572008

[45] Don Norman. 2013. *The design of everyday things: Revised and expanded edition*. Basic books.

[46] Eldon Schoop, Xin Zhou, Gang Li, Zhourong Chen, Bjoern Hartmann, and Yang Li. 2022. Predicting and Explaining Mobile UI Tappability with Vision Modeling and Saliency Analysis. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 36, 21 pages. https://doi.org/10.1145/3491102.3517497

[47] Alborz Rezazadeh Sereshkeh, Gary Leung, Krish Perumal, Caleb Phillips, Minfan Zhang, Afsaneh Fazly, and Iqbal Mohomed. 2020. VASTA: A Vision and Language-Assisted Smartphone Task Automation System. In *Proceedings of the 25th International Conference on Intelligent User Interfaces* (Cagliari, Italy) *(IUI '20)*. Association for Computing Machinery, New York, NY, USA, 22–32. https://doi.org/10.1145/3377325.3377515

[48] Ben Shneiderman and Pattie Maes. 1997. Direct manipulation vs. interface agents. *interactions* 4, 6 (1997), 42–61.

[49] Amanda Swearngin, Amy J. Ko, and James Fogarty. 2017. Genie: Input Retargeting on the Web through Command Reverse Engineering. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI '17)*. Association for Computing Machinery, New York, NY, USA, 4703–4714. https://doi.org/10.1145/3025453.3025506

[50] Amanda Swearngin and Yang Li. 2019. Modeling Mobile Interface Tappability Using Crowdsourcing and Deep Learning. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–11. https://doi.org/10.1145/3290605.3300305

[51] Amanda Swearngin, Chenglong Wang, Alannah Oleson, James Fogarty, and Amy J. Ko. 2020. *Scout: Rapid Exploration of Interface Layout Alternatives through High-Level Design Constraints*. Association for Computing Machinery, New York, NY, USA, 1–13. https://doi.org/10.1145/3313831.3376593

[52] Maryam Taeb, Amanda Swearngin, Eldon Schoop, Ruijia Cheng, Yue Jiang, and Jeffrey Nichols. 2023. AXNav: Replaying Accessibility Tests from Natural Language. arXiv:2310.02424 [cs.HC]

[53] Bryan Wang, Gang Li, and Yang Li. 2023. Enabling conversational interaction with mobile ui using large language models. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–17.

[54] Bryan Wang, Gang Li, Xin Zhou, Zhourong Chen, Tovi Grossman, and Yang Li. 2021. Screen2Words: Automatic Mobile UI Summarization with Multimodal Learning. In *The 34th Annual ACM Symposium on User Interface Software and Technology* (Virtual Event, USA) *(UIST '21)*. Association for Computing Machinery, New York, NY, USA, 498–510. https://doi.org/10.1145/3472749.3474765

[55] Jason Wu, Yi-Hao Peng, Amanda Li, Amanda Swearngin, Jeffrey P Bigham, and Jeffrey Nichols. 2024. UIClip: A Data-driven Model for Assessing User Interface Design. *arXiv preprint arXiv:2404.12500* (2024).

[56] Jason Wu, Eldon Schoop, Alan Leung, Titus Barik, Jeffrey P Bigham, and Jeffrey Nichols. 2024. UICoder: Finetuning Large Language Models to Generate User Interface Code through Automated Feedback. *arXiv preprint arXiv:2406.07739* (2024).

[57] Jason Wu, Siyan Wang, Siman Shen, Yi-Hao Peng, Jeffrey Nichols, and Jeffrey P Bigham. 2023. WebUI: A Dataset for Enhancing Visual UI Understanding with Web Semantics. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–14.

[58] Keen You, Haotian Zhang, Eldon Schoop, Floris Weers, Amanda Swearngin, Jeffrey Nichols, Yinfei Yang, and Zhe Gan. 2024. Ferret-UI: Grounded Mobile UI Understanding with Multimodal LLMs. *arXiv preprint arXiv:2404.05719* (2024).