



CS 329X: Human Centered LLMs

Generative Interface & Interaction

Diyi Yang

Announcements

Midway feedback will be out tonight

Homework 2 due today; homework 3 out

- Michael Ryan is giving a quick overview of homework 3

Stop by our office hours for chats!

Nov 4th, democracy day, no class



Overview

- Natural Language As the New Interface (10 mins)
- Generative Interface (10 mins)
- Generative Interaction (20 mins) by guest speaker Michelle Lam

Learning Objective: understand interface vs. interaction and how to use LLMs to generate interface and facilitate interaction

Good user interfaces have a tremendous impact on individuals' ability to accomplish things and on our society as a whole!



Bad designs can cost people's lives



Emergency telephone where you're supposed to dial 999. However, the physical telephone itself only has the numbers 1, 2, 3.



Norman Door Video: <https://www.youtube.com/watch?v=yY96hTb8Wgl>

How to design good user interfaces?

Examples Types of UI

- Graphical User Interfaces
- Augmented / Virtual Reality
- Conversational / Speech Interfaces
- Ambient / Ubiquitous Interfaces
- Embodies Agents, e.g., robots

- Guiding theories and principles
 - E.g., visible to users, etc.
- **Prototype and iterate**
- **Get feedback from users**

Design is about “how things work” not “how things look”
The user is not you!

Natural Language as the New User Interface

This section is modified based on tutorial by Diyi Yang, Sherry Wu, Marti Hearst on “Human-AI Interaction in the age of LLMs”.

Slides for Natural Language as the New Interface credited to **Marti Hearst**

Human Are Tool Users

Tool design is determined by the available tech and how people interact with the tool



Command-based User Interfaces



pros:

- + precise
- + efficient input
- + portable

cons:

- inflexible input
- hard to learn / remember
- output display is limited

Graphical User Interfaces (GUIs)



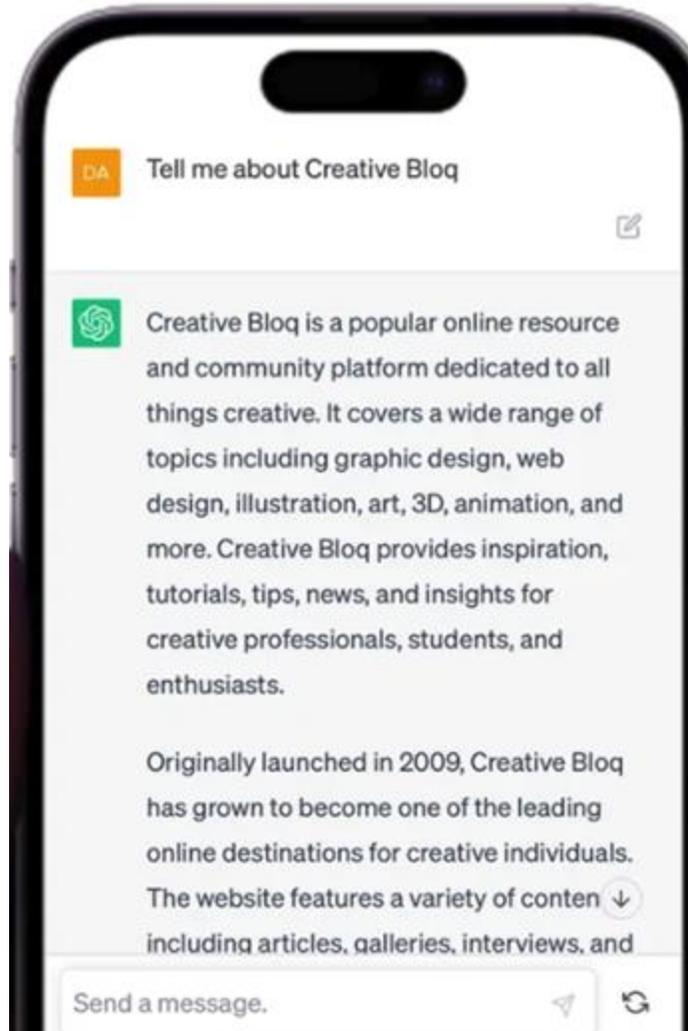
pros:

- + pointing / gestures / voice
- + flexible display / feedback
- + easier to learn / remember

cons:

- less precise
- less efficient input
- platform-specific

Chat-based User Interfaces



pros:

- + flexible, natural input
- + easy to learn / remember
- + portable

cons:

- imprecise
- feedback constrained
- failed expectations

Natural language interfaces have long been a goal

Early NL Database (1973); only narrowly applicable

```
38**(WHAT IS THE AVERAGE CONCENTRATION OF ALUMINUM IN HIGH ALKALI ROCKS)
***
PARSING
1331 CONSES
4.987 SECONDS
INTERPRETING
2427 CONSES
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INTERPRETATIONS:
(FOR THE X13 / (SEQL (AVERAGE X14 / (SSUNION X15 / (SEQ TYPEAS) :T ; (DATALINE (WHQFILE X15)
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W. A. Woods: Progress in natural language understanding—An application to lunar geology, AFIPs 1973

Language-based Chat is the New User Interface!

what is a 'natural' user interface? Answer in 300 characters or fewer.



A "natural" user interface (NUI) enables intuitive interaction with systems using touch, gestures, voice, or other human inputs, mimicking real-world interactions to make technology more accessible and user-friendly. Examples include touchscreens, motion sensors, and voice-controlled virtual assistants.



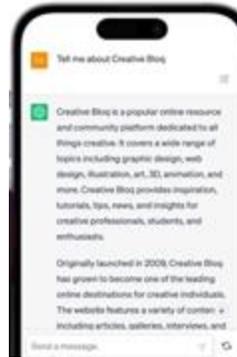
Message ChatGPT



Many problems are now solved, but new ones arise

Language-based Chat is the New User Interface!

Pro: Can allow for great flexibility in expression

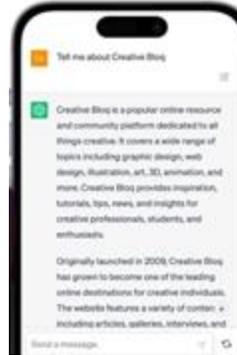


“Write code in python for jupyter notebook to extract paper titles from the enclosed pdf.”

Easier to write this than code it

Language-based Chat is the New User Interface!

Pro: Can allow for great flexibility in expression



“Write code in python for jupyter notebook to extract paper titles from the enclosed pdf. Paper titles are in boldface, author names and affiliations are in normal text. Extract only the titles even if they wrap to a second line, convert unicode to ascii, and output to a csv. Assume the files are in the same directory as the code.”

Although often requires refinements

AI: First New UI Paradigm in 60 Years



Jakob Nielsen

June 18, 2023

 Share

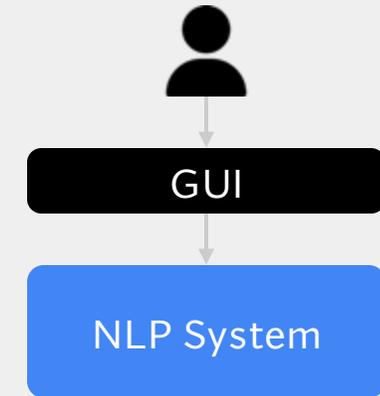
AI is introducing the third user-interface paradigm in computing history, shifting to a new interaction mechanism where users tell the computer what they want, not how to do it — thus reversing the locus of control.

NLP & Interfaces

UI for an NLP system aka “A wrapper on top”

e.g., Autocomplete, Google Translate

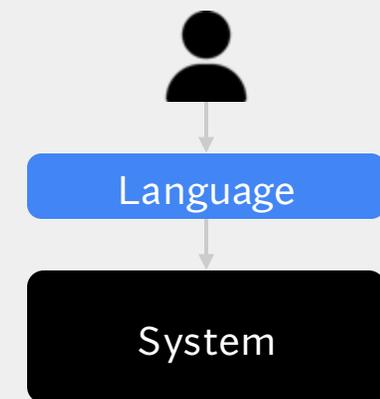
- Designing an interface to make use of the underlying NLP system for achieving user tasks.

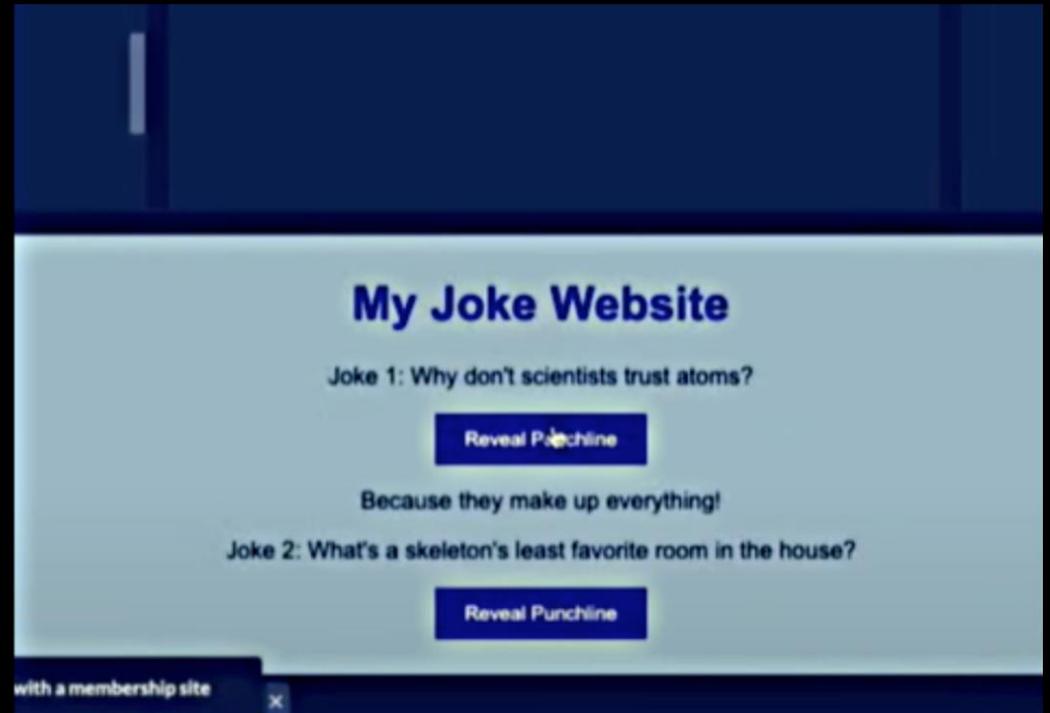
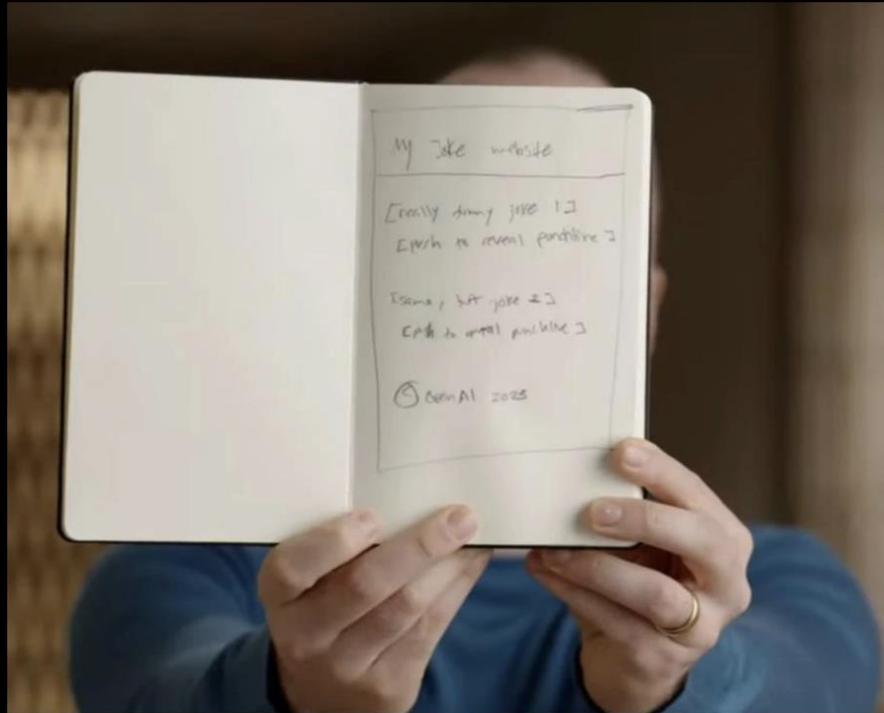


Natural language UI aka “the wrapper itself”

e.g., Alexa, Google Search, GPT4 Web Search, AutoGPT

- Using language as a medium to interact with tools, applications and other systems.



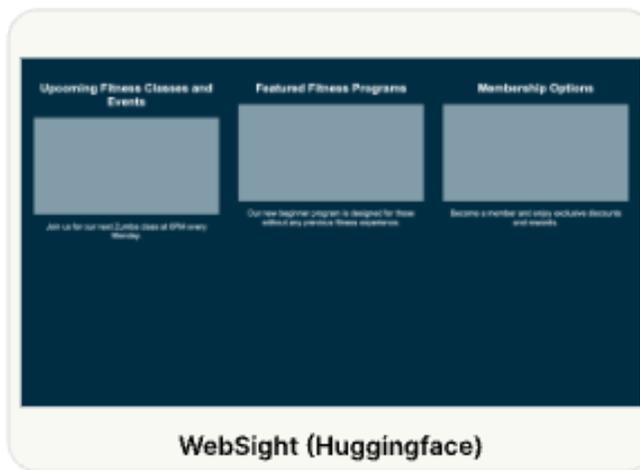




WebSight (Huggingface)



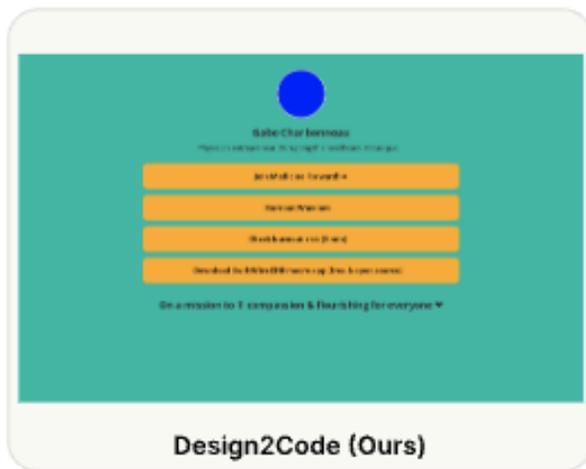
WebSight (Huggingface)



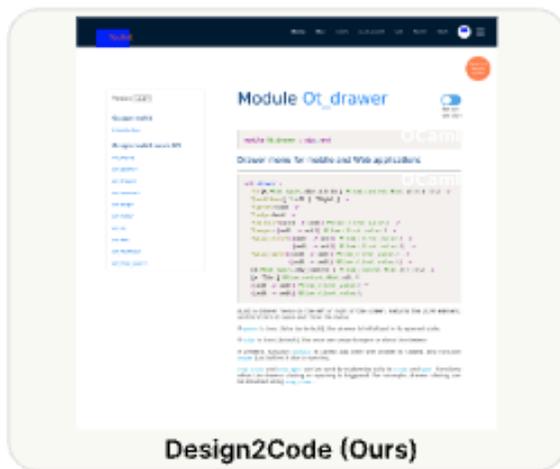
WebSight (Huggingface)



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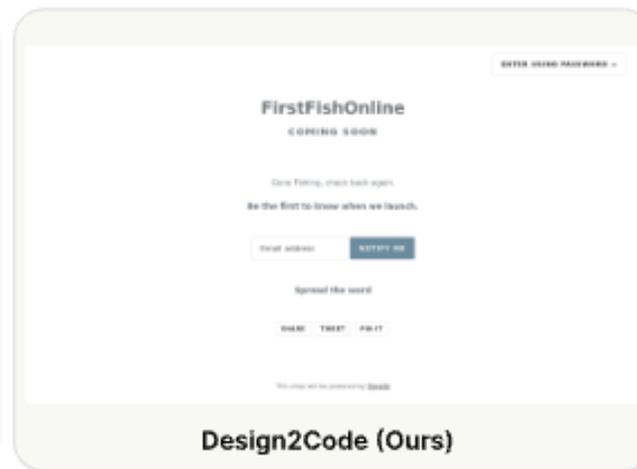
Design2Code (Ours)



Design2Code (Ours)



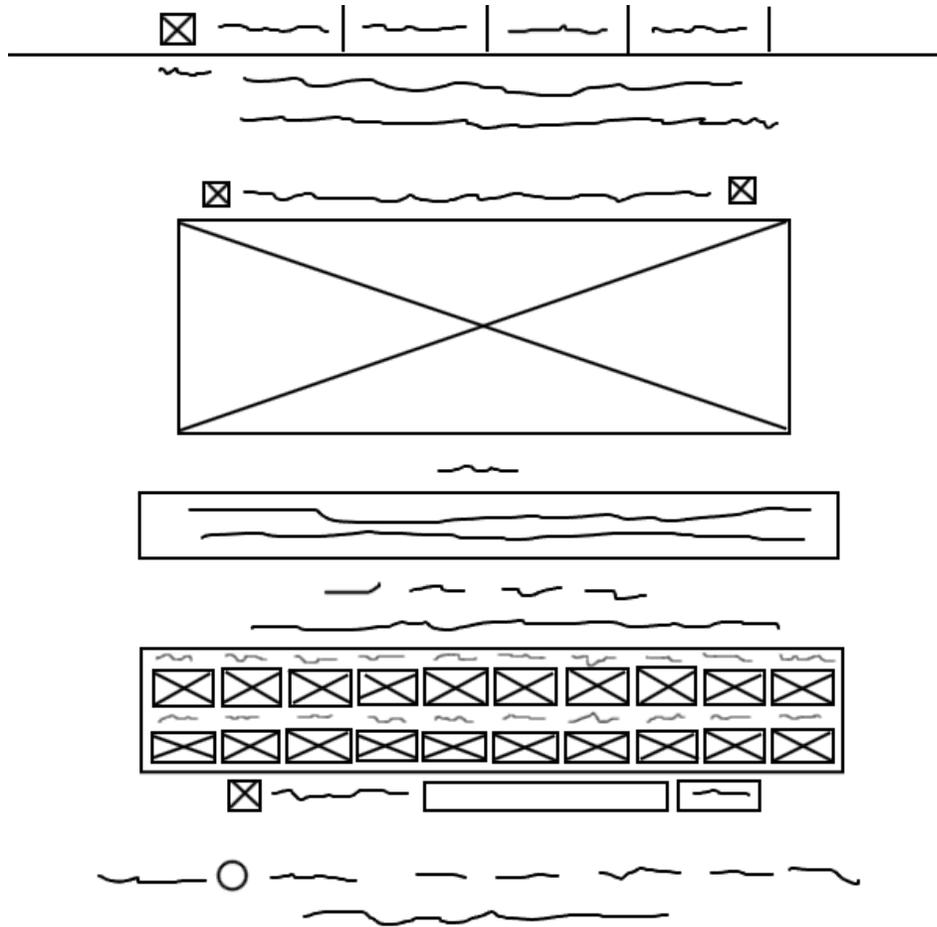
Design2Code (Ours)



Design2Code (Ours)

Sj, Chenglei*, Yanzhe Zhang*, Zhengyuan Yang, Ruibo Liu, and Diyi Yang.
 "Design2Code: How Far Are We From Automating Front-End Engineering?." arXiv preprint arXiv:2403.03163 (2024).

What if using sketch rather than screenshot?



Overview

✓ Natural Language As the New Interface (20 mins)

➤ **Generative Interface (10 mins)**

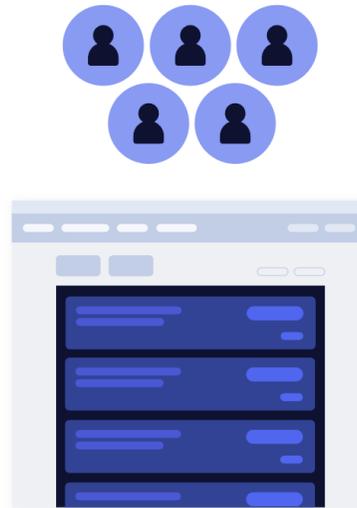
Defining **Generative UI**

“A generative UI is a user interface that is dynamically generated in real time by artificial intelligence to provide an experience customized to fit the user’s needs and context”

<https://www.nngroup.com/articles/generative-ui/>

Today

Same interface for everyone

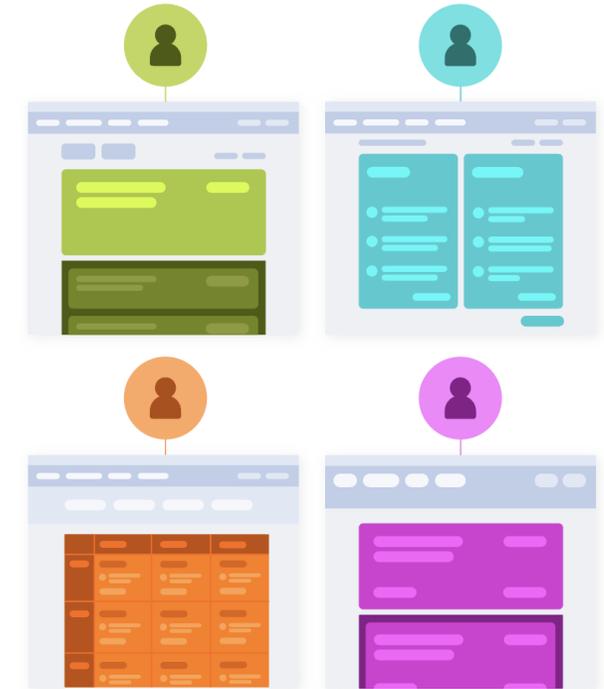


nngroup.com

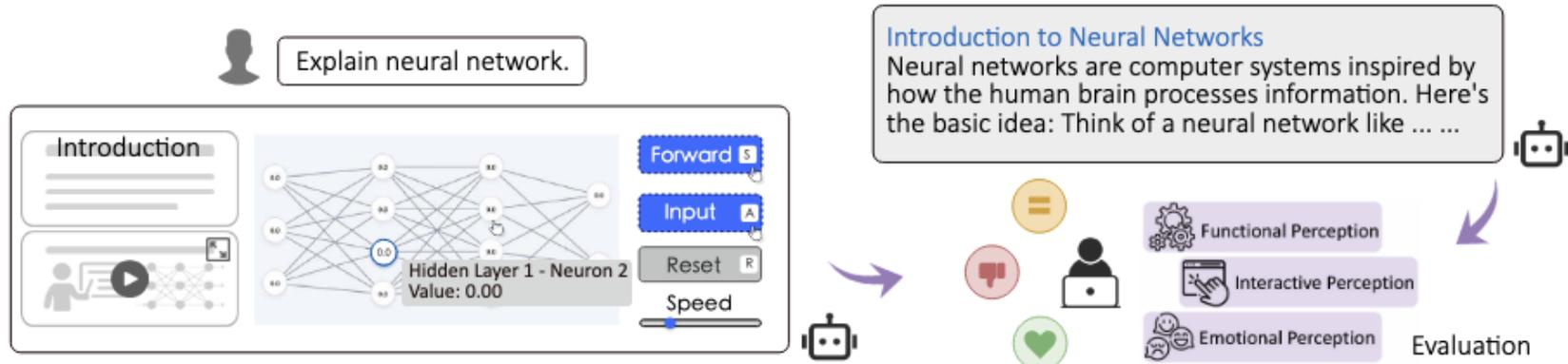
NN/g

Future with GenUI

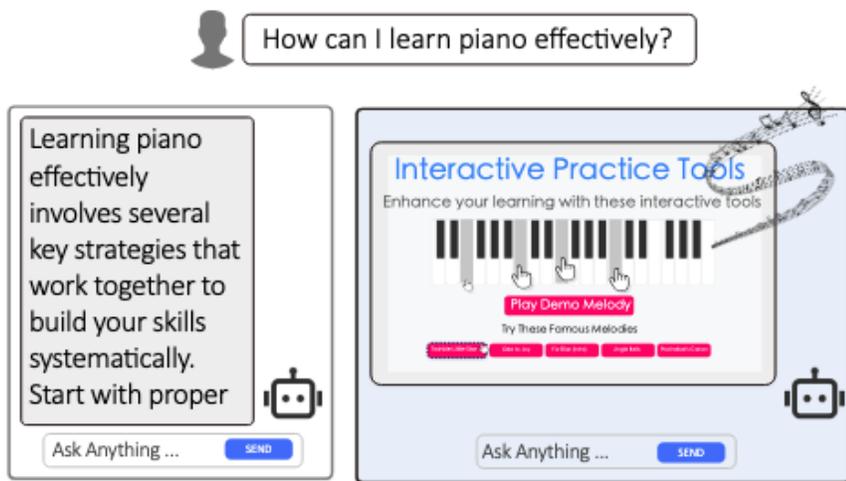
Personalized interface for each user



Generative Interfaces for Language Models



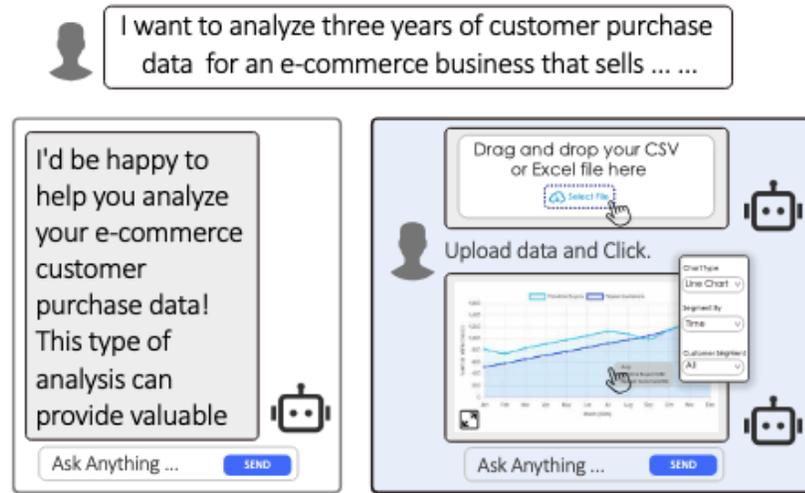
(a) Generative vs. Conversational



Conversational

Generative

(b) Introducing Interactive Experiences



Conversational

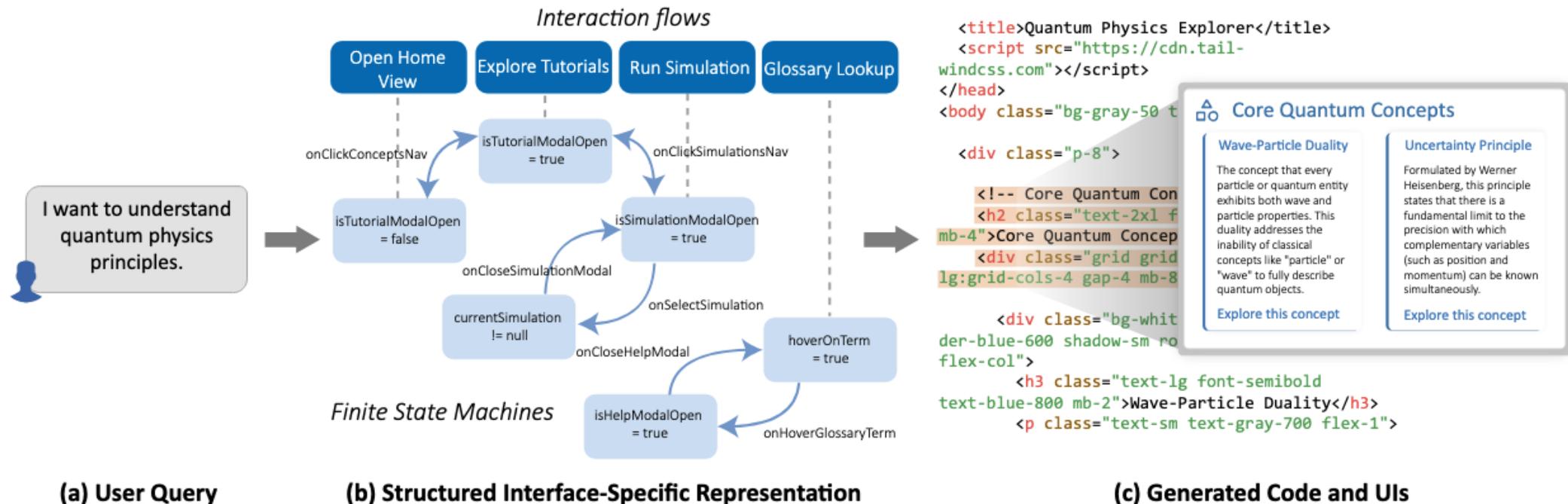
Generative

(c) Multistep task execution

Generative Interfaces infrastructure

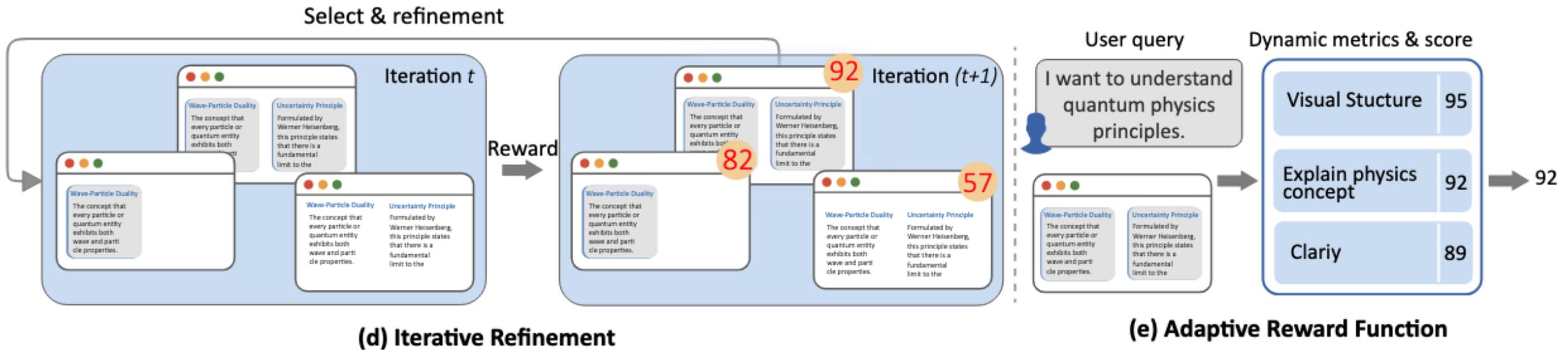
1. User query => Structured Representation

- High-level: Interaction Flows
- Low-level: Finite State Machines



Generative Interfaces infrastructure

1. User query => Structured Representation => UI
2. Iterative Refinement
 - Adaptive Reward Function



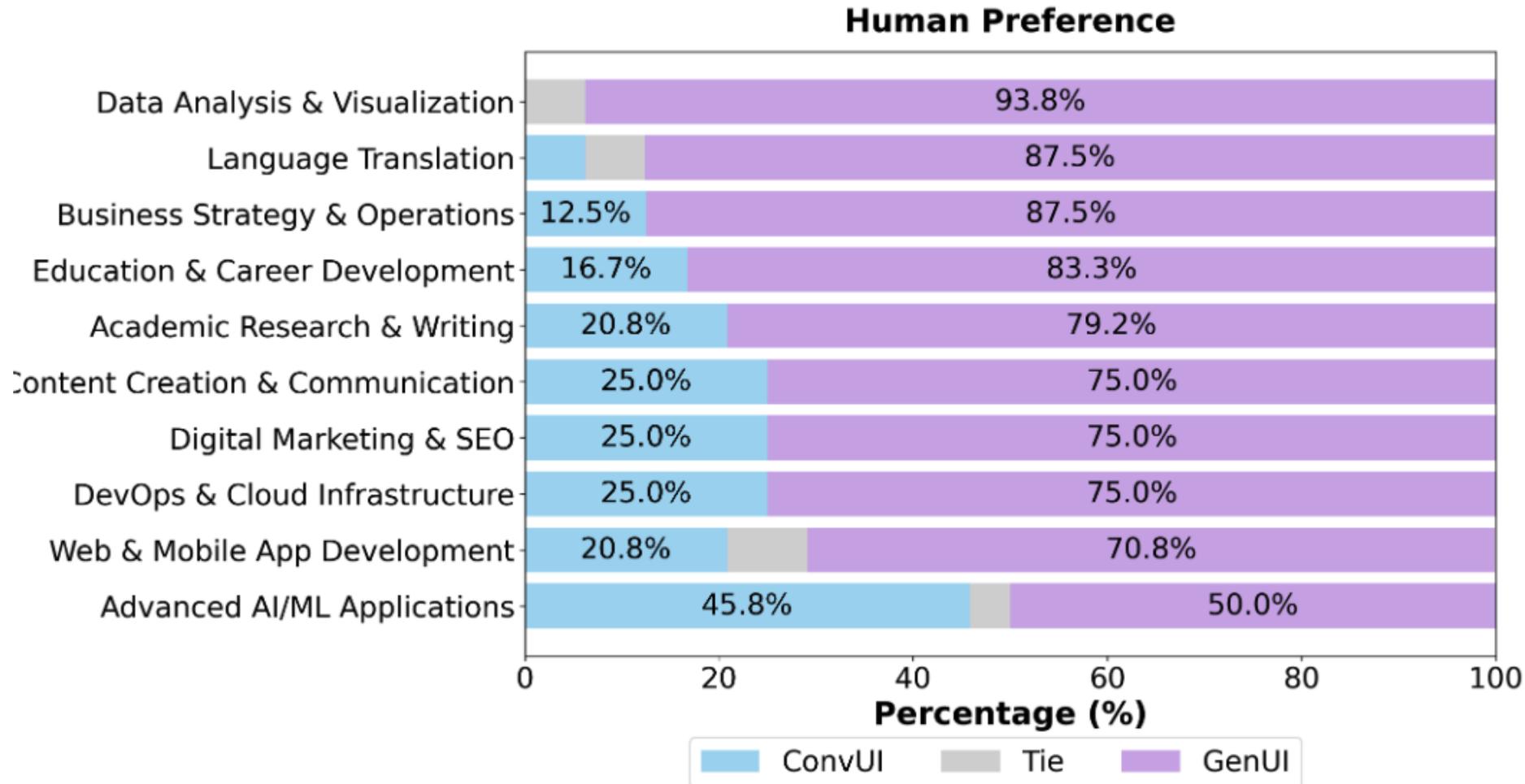
What Defines the Quality of LLM Interfaces

Nielsen et al. (2012) and Hartmann et al. (2008),

- Functional Perception
- Interactive Perception
- Emotional Perception

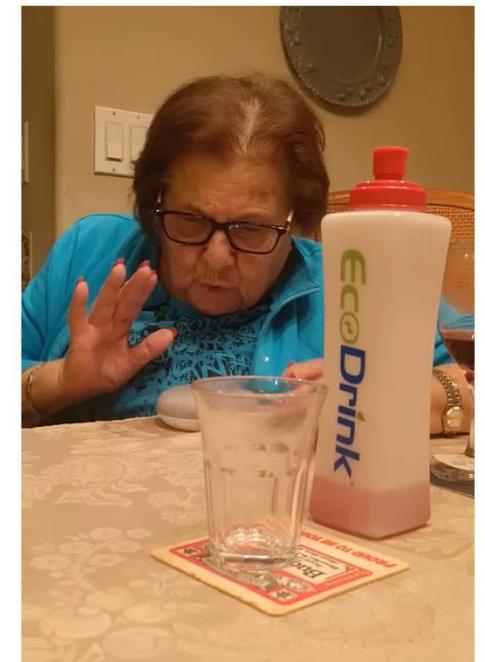
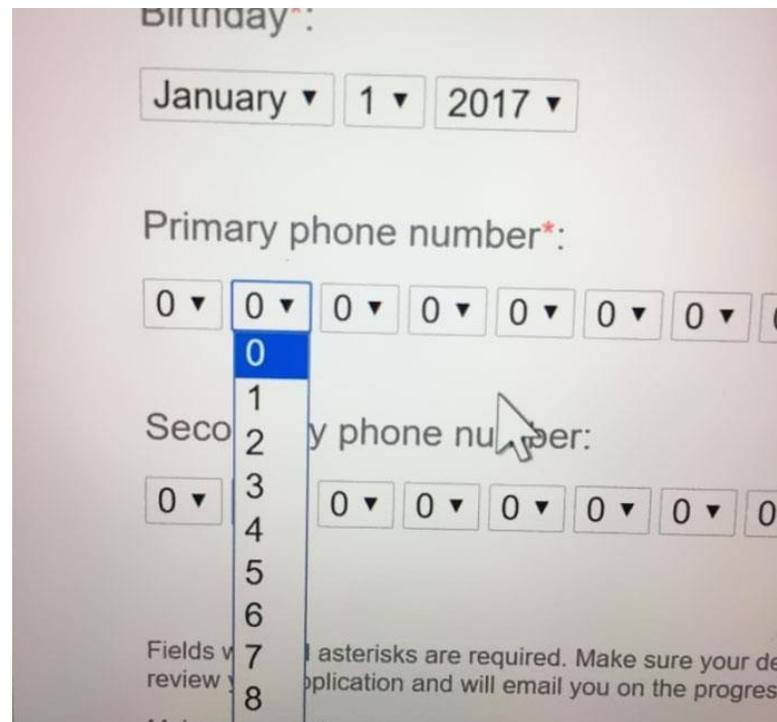
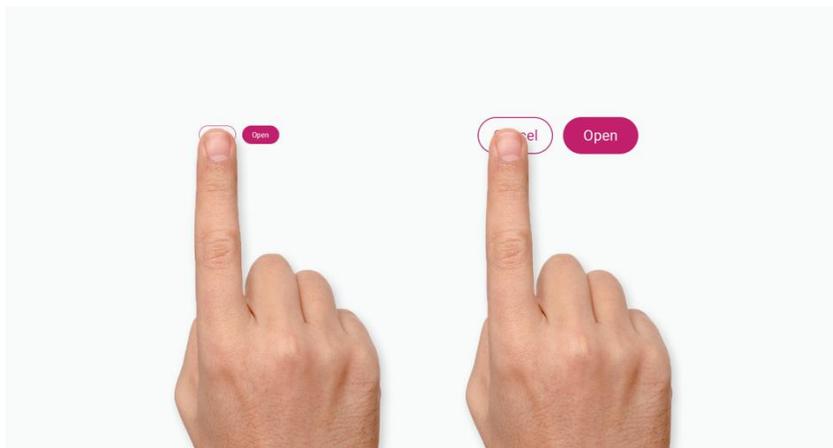
Evaluating Generative UI

GenUI is preferred because of visual aesthetics, information organization, and reduced cognitive load. User preferences are query-dependent and domain-dependent.

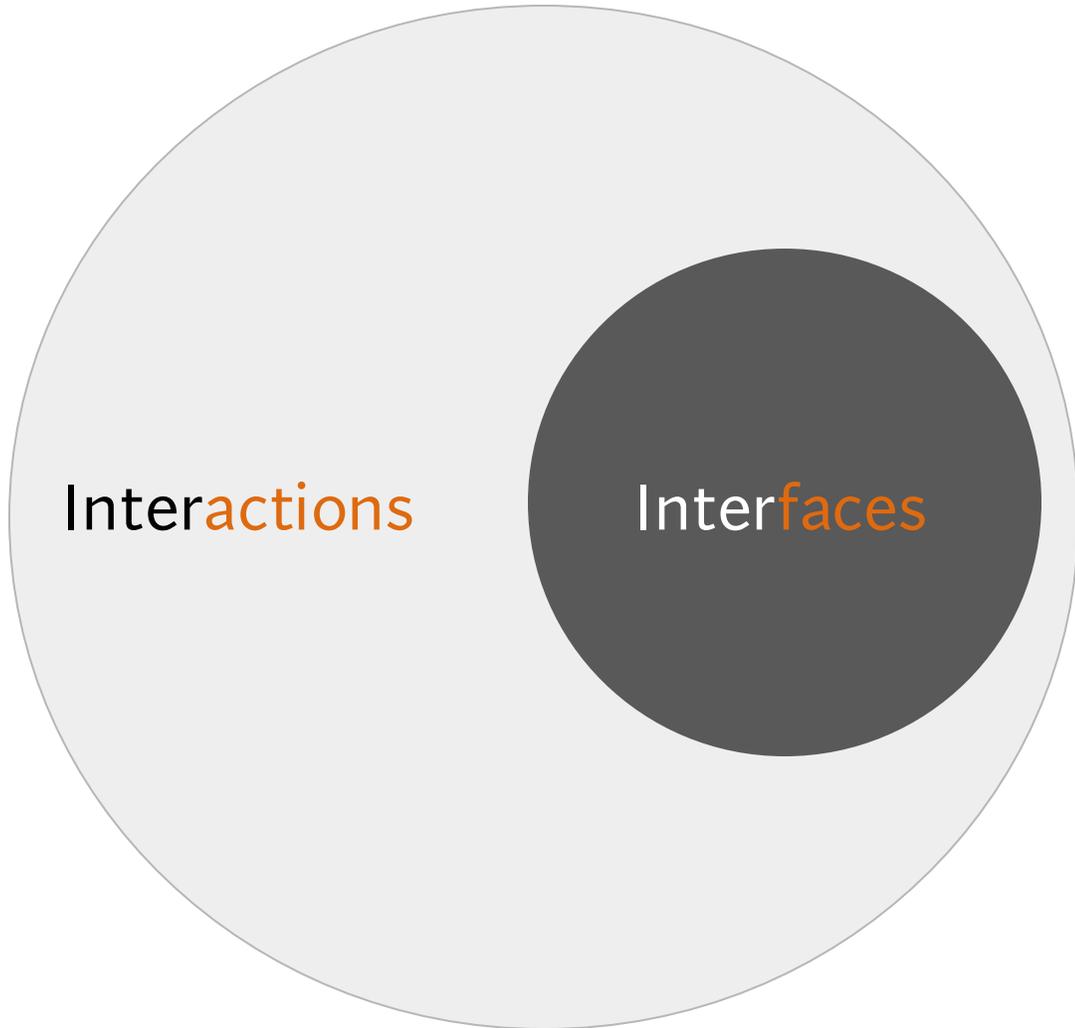


Reflections on Generative UI

- Shift from designing interfaces to interactions
- Shift from designing for the majority to everyone



Interfaces vs. Interactions



Interfaces

Tangible i.e. visual, auditory, tactile inputs to the system. Designing interfaces are at the surface & physical level, often limited to styling.

Interactions

Understanding the context of user, their needs, how they operate. Includes psychological aspects such as trust, goals, user behavior.

Aspects of Interaction

Cognition, Perception and extending humans

Offload cognitively loaded tasks, make space for humans to be creative.

Trust, Reliance and other user-machine behavior

Users feel comfortable using and depending on AI systems for achieving their tasks.

Fairness, Accountability, Transparency, Ethics

Ensure equitable treatment of all individuals, regardless of their race or gender. Not perpetuate bias or discrimination and ability to understand model decisions.

Personalization, Adaptation, Feedback and Guidance

Tailoring AI interactions to individual user preferences and needs, and in turn also learn and improve itself over time to align with human preferences.

Overview

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- ✓ Generative Interface (10 mins)