

SDLC AI – Views From Academia

Generative UI for Users, Not Just for Designers

Joongi Shin

Postdoctoral Researcher, Aalto University

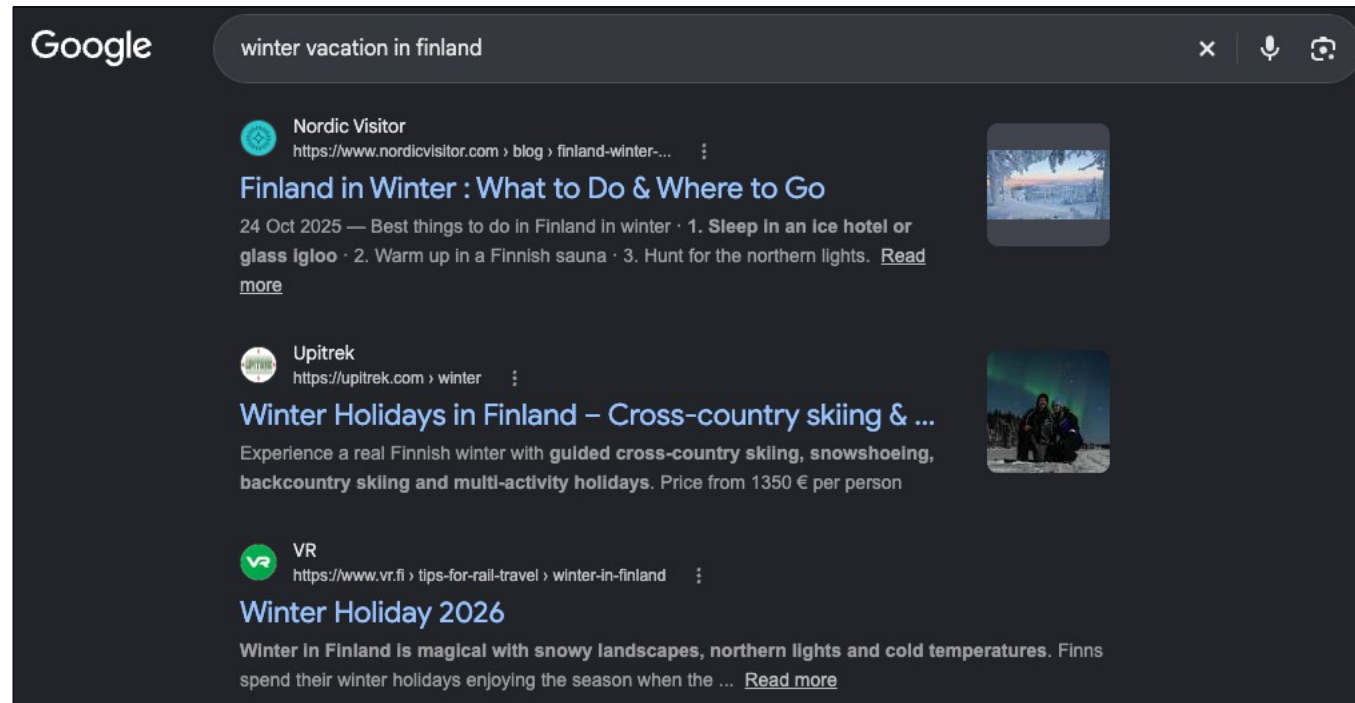
Background

Imagine that you are planning a 3-day winter vacation in Finland



Background

Imagine that you are planning a 3-day winter vacation in Finland



Day 1: Helsinki

Welcome to Helsinki, the capital city of Finland! **Helsinki** is such an interesting city, with bits that feel very Scandinavian, but other bits that feel slightly Russian – which makes sense, considering that Finland was part of both the Swedish empire and the Russian empire before finally gaining its independence in 1917.

But [Helsinki](#) is undeniably Finnish, too, which I think you'll understand once you start exploring.

Once you arrive in Helsinki, I recommend heading into the city center and dropping your bags at your hotel. (You can take the train directly from the Helsinki airport to Helsinki Central Station in about 30 minutes.)



Background

Imagine that you are planning a 3-day winter vacation in Finland



winter vacation in finland



Nordic Visitor

<https://www.nordicvisitor.com> › blog › finland-winter-... 

Finland in Winter : What to Do & Where

24 Oct 2025 — Best things to do in Finland in winter · 1. Sledding · 2. **glass igloo** · 3. Warm up in a Finnish sauna · 4. Hunt for reindeer · 5. [more](#)



Upitrek

<https://upitrek.com> › winter 

Winter Holidays in Finland – Cross-country

Experience a real Finnish winter with **guided cross-country skiing** and **backcountry skiing and multi-activity holidays**. Price from €199



VR

<https://www.vr.fi> › tips-for-rail-travel › winter-in-finland 

Winter Holiday 2026

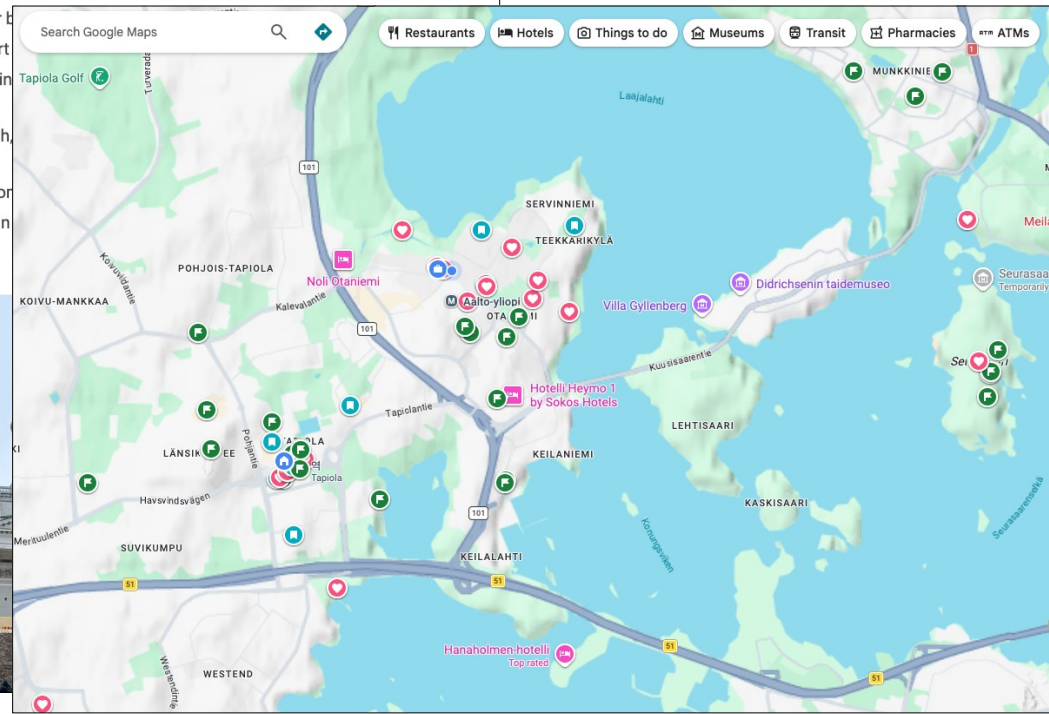
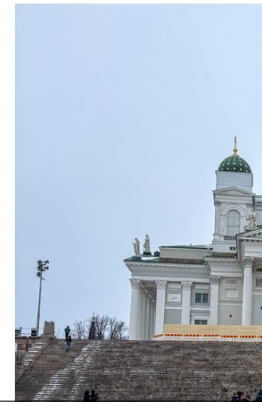
Winter in Finland is magical with snowy landscapes, no crowds and great food. Spend your winter holidays enjoying the season when the snow is at its best.

Day 1: Helsinki

Welcome to Helsinki, the capital city of Finland! **Helsinki** is such an interesting city, with bits that feel very Scandinavian, but other bits that feel more like a city in the south of Europe. Considering that Finland was part of Sweden for centuries, it's not surprising that it's finally gaining its independence in the 21st century.

But [Helsinki](#) is undeniably Finnish.

Once you arrive in Helsinki, I record your hotel. (You can take the train about 30 minutes.)



Imagine that you are planning a 3-day winter vacation in Finland

Google

winter vacation in finland



Nordic Visitor

<https://www.nordicvisitor.com> › blog › finland-winter-...

Finland in Winter : What to Do & Where

24 Oct 2025 — Best things to do in Finland in winter · 1. Sledding · 2. Warm up in a Finnish sauna · 3. Hunt for the glass igloo · more



Upitrek

<https://upitrek.com> › winter

Winter Holidays in Finland – Cross-country

Experience a real Finnish winter with guided cross-country backcountry skiing and multi-activity holidays. Price from ...



VR

<https://www.vr.fi> › tips-for-rail-travel › winter-in-finland

Winter Holiday 2026

Winter in Finland is magical with snowy landscapes, no ... spend their winter holidays enjoying the season when the ...

Day 1: Helsinki

Welcome to Helsinki, the capital city of Finland! Helsinki is such an interesting city, with bits that feel very Scandinavian, but other bits that feel more like a city considering that Finland was part of Sweden for a long time, finally gaining its independence in 1917.

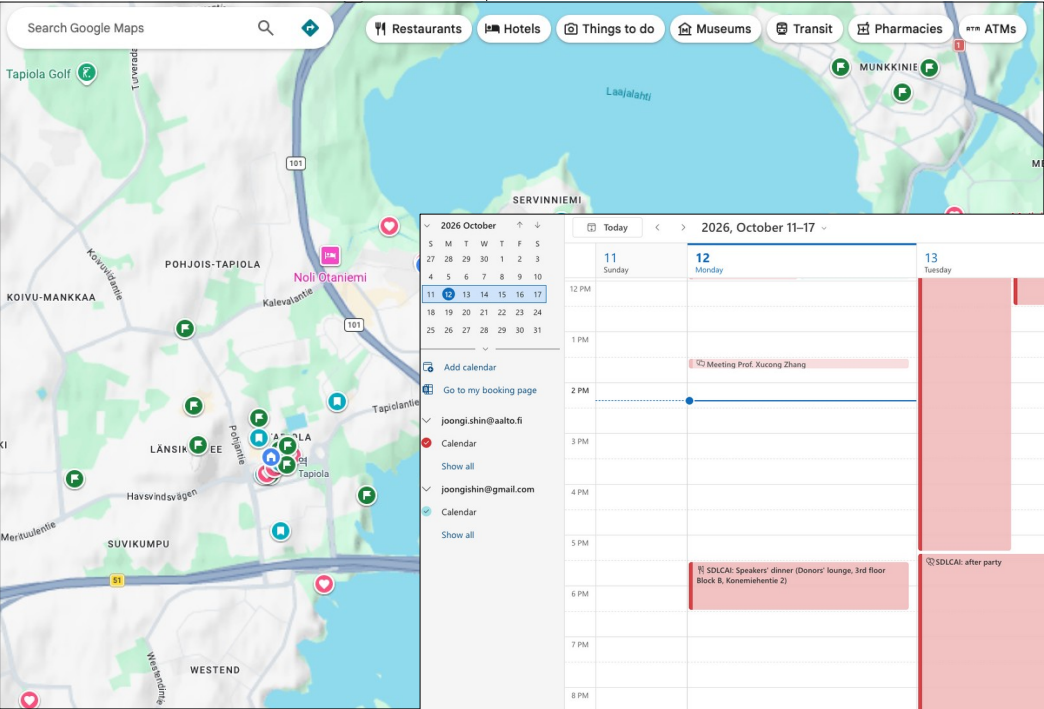
But Helsinki is undeniably Finnish, and you can feel it everywhere.

Once you arrive in Helsinki, I recommend you to find your hotel. (You can take the train from the airport about 30 minutes.)



Search Google Maps

Restaurants Hotels Things to do Museums Transit Pharmacies ATMs



2026 October

S M T W T F S

27 28 29 30 1 2 3

4 5 6 7 8 9 10

11 12 13 14 15 16 17

18 19 20 21 22 23 24

25 26 27 28 29 30 31

Add calendar

Go to my booking page

joongi.shin@aalto.fi

Calendar

Show all

joongishin@gmail.com

Calendar

Show all

Today

2026, October 11-17

11 Sunday

12 Monday

13 Tuesday

14 Wednesday

12 PM

1 PM

2 PM

3 PM

4 PM

5 PM

6 PM

7 PM

8 PM

9 PM

Meeting Prof. Xucong Zhang

SDCAI Speakers' dinner (Donors' lounge, 3rd floor Block B, Konemiehentie 2)

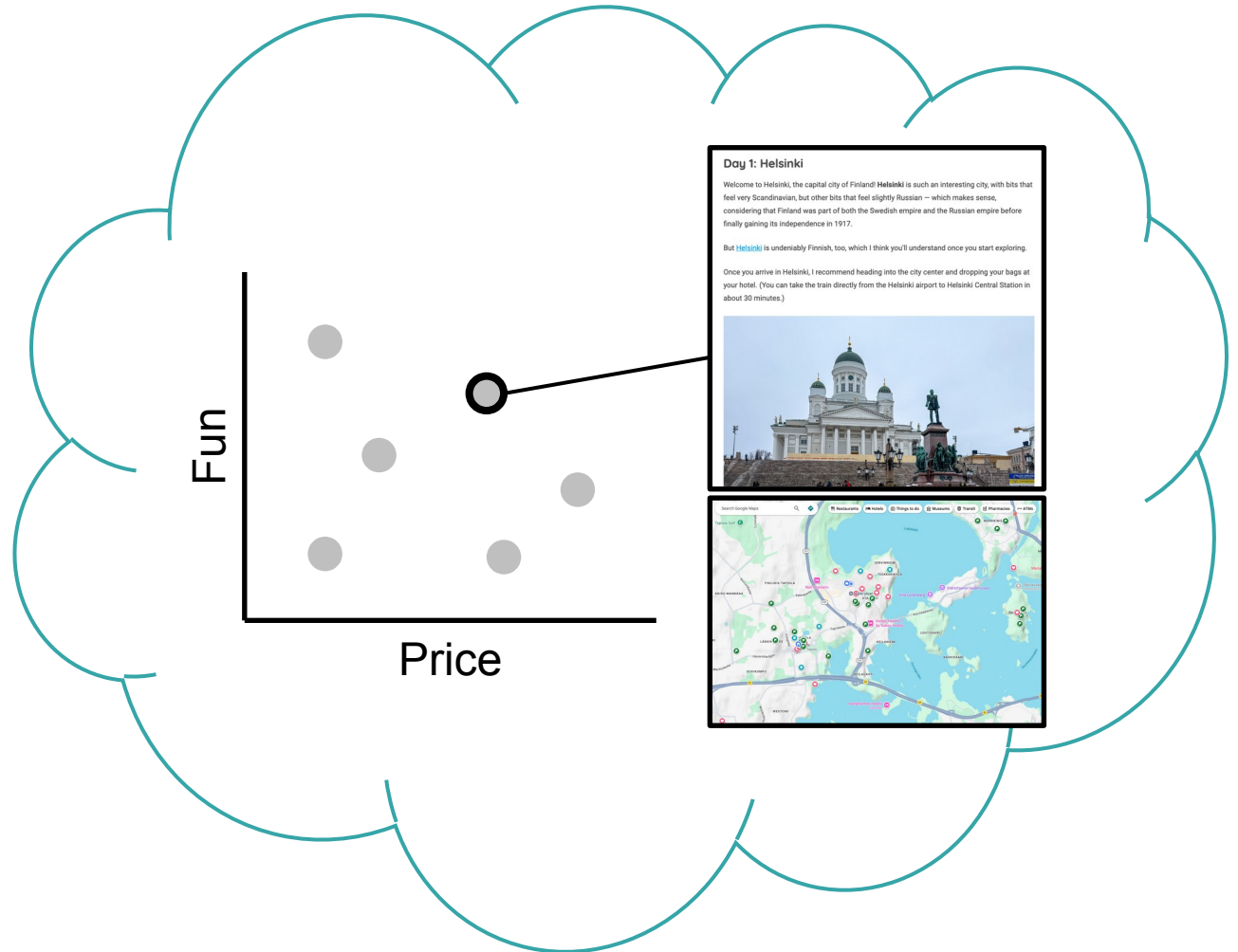
SDCAI after party

6

Background

You might have your own particular ways of planning

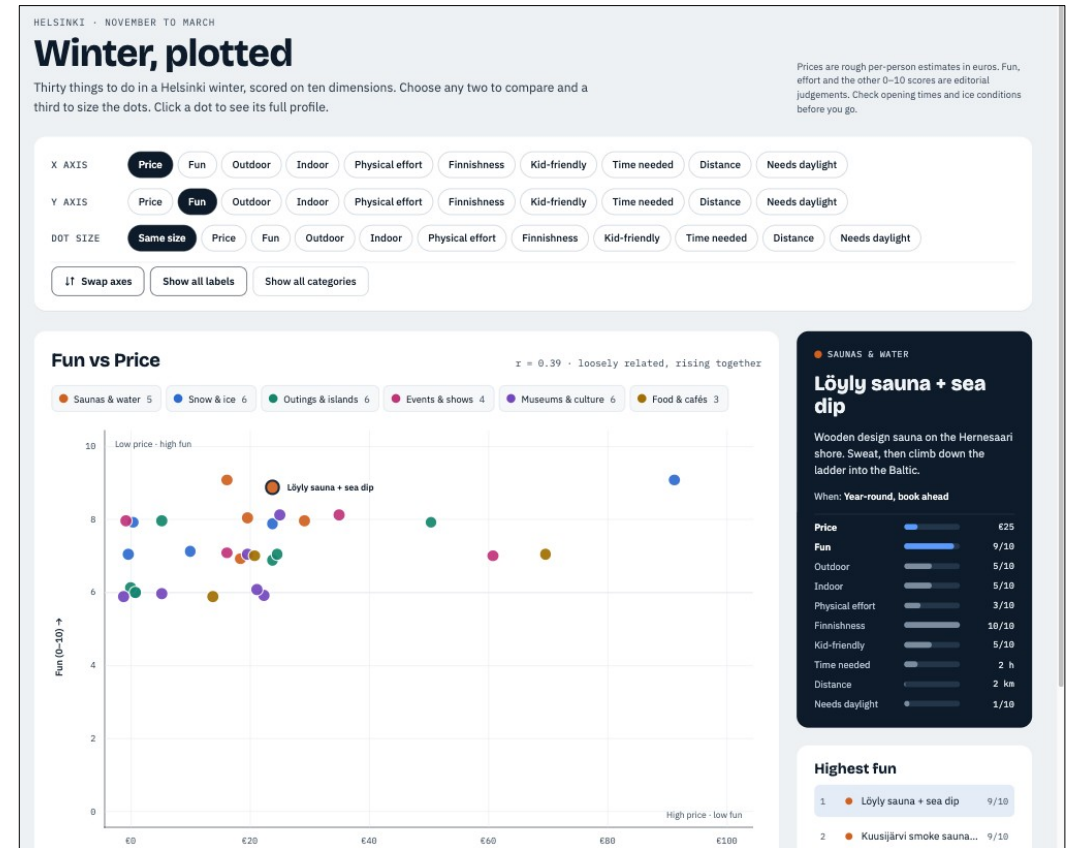
“I want to explore the winter activities more systematically.”



Background

Wouldn't it be amazing if you can get a functional UI for your task on-demand?

“I want to explore the winter activities more systematically.”



Background

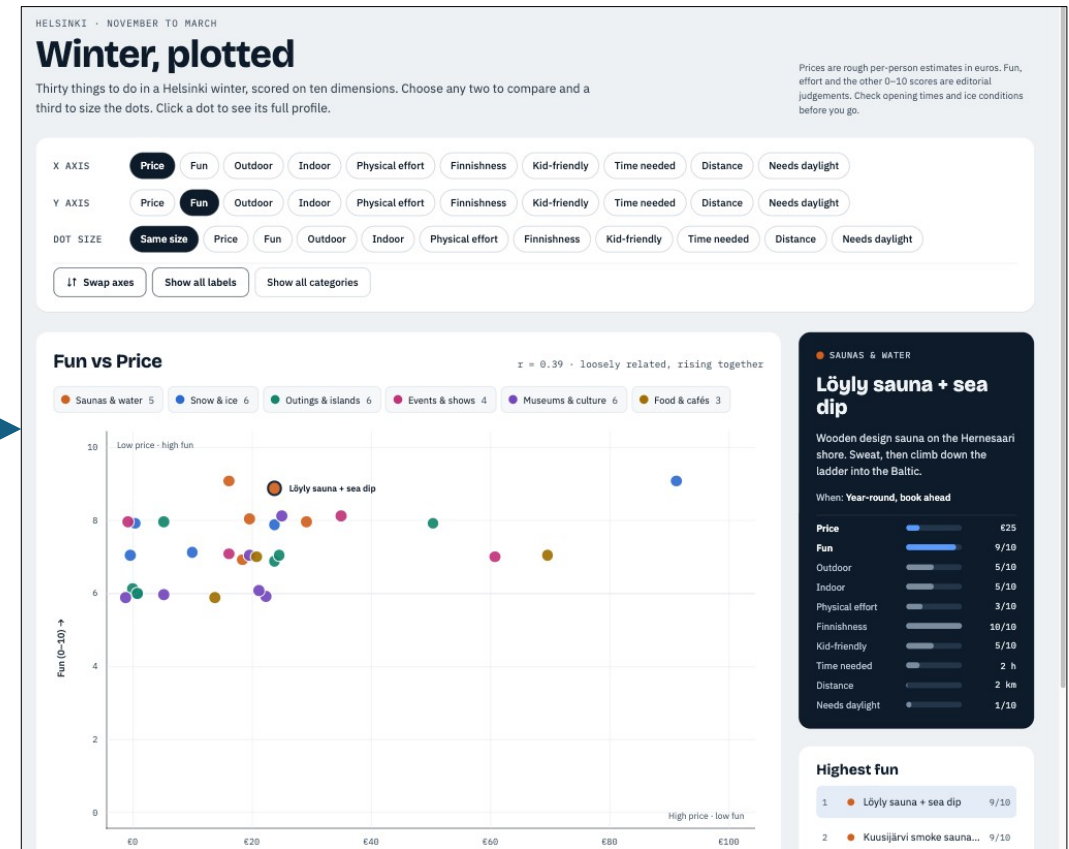
Generative UI (GenUI) enables creating and using functional interface on-demand

User prompt

"I want to explore the winter activities more systematically."

LLM

Functional UI

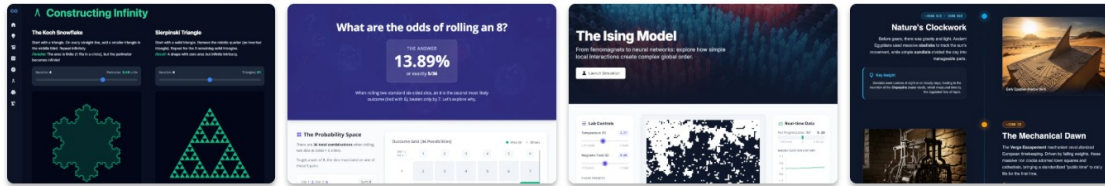


Background

GenUI promises a future where **anyone** can create their own interface

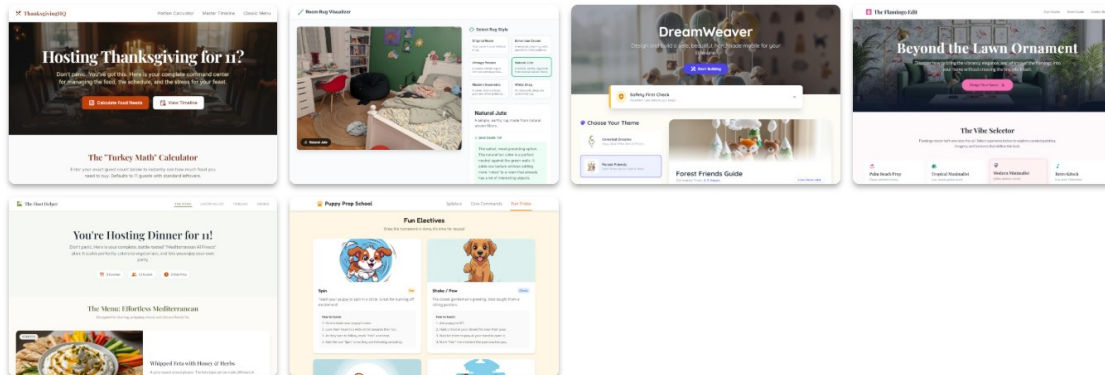
Education

One category in which generative UI is particularly helpful is education.



Practical Tasks

Generative UI can also be helpful for practical tasks:

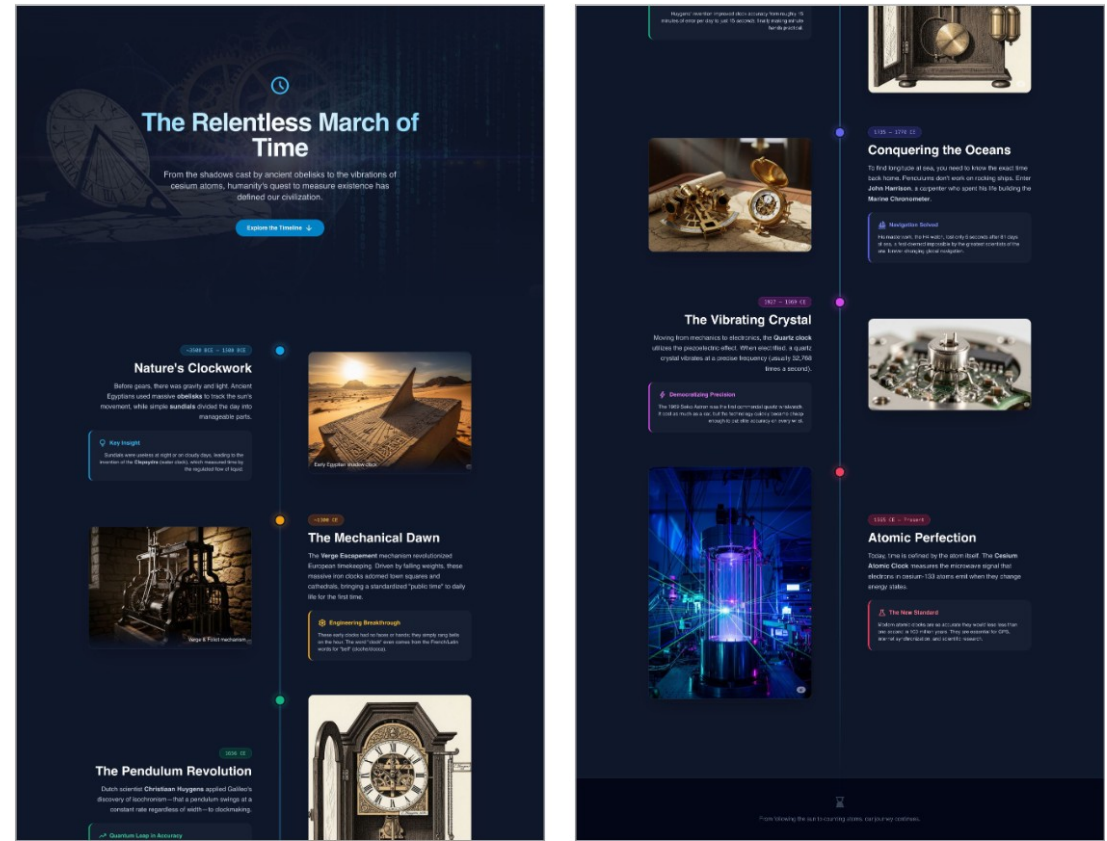


- No need for design literacy
- No need for coding ability
- Just describe what you need in natural language

Background

GenUI promises a future where **anyone** can create their own interface

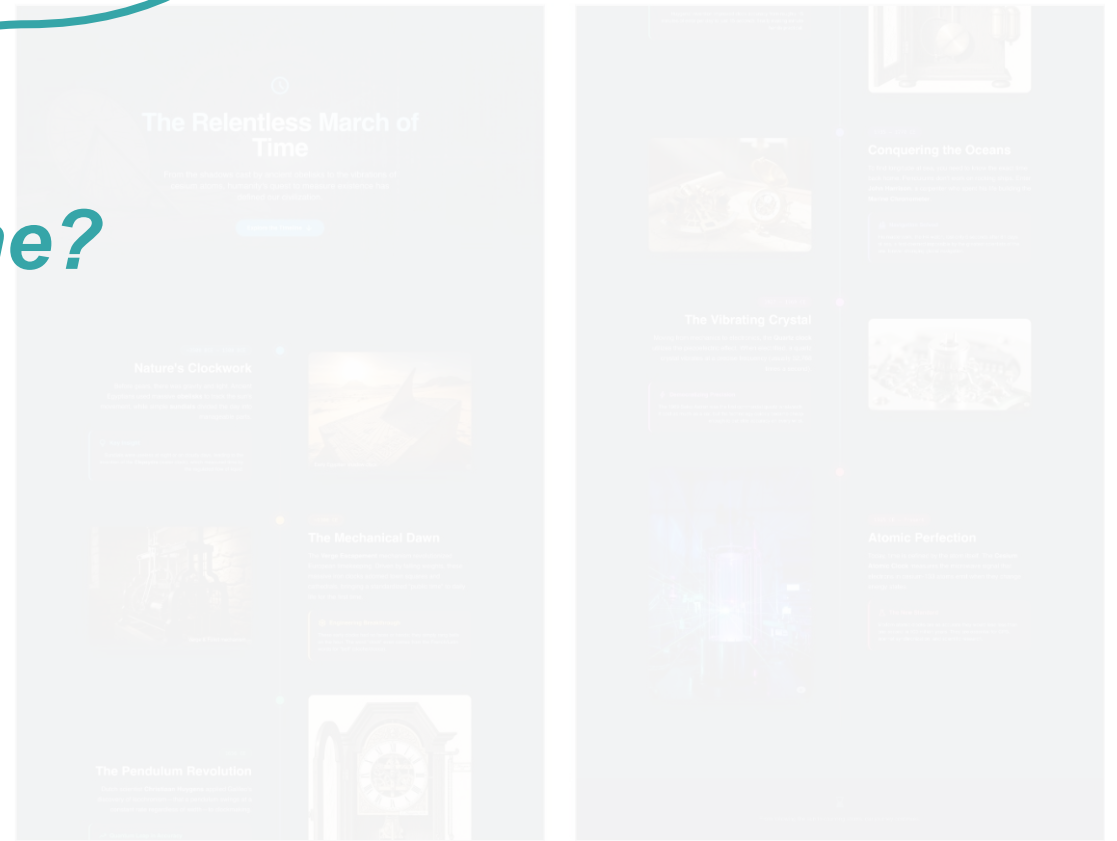
User prompt: [*"History of time keeping devices"*]



GenUI promises a future where **anyone** can create their own interface

Really? Anyone?

User prompt: ["History of time keeping devices"]



Generative UI has been mainly studied for designers

The GenUI Study: Exploring the Design of Generative UI Tools to Support UX Practitioners and Beyond

Xiang 'Anthony' Chen*
HCI Research
UCLA
Los Angeles, California, USA
xac@ucla.edu

Tiffany Kneareem
Google
San Francisco, California, USA
tkneareem@google.com

Yang Li
Google DeepMind
Mountain View, California, USA
yangli@acm.org

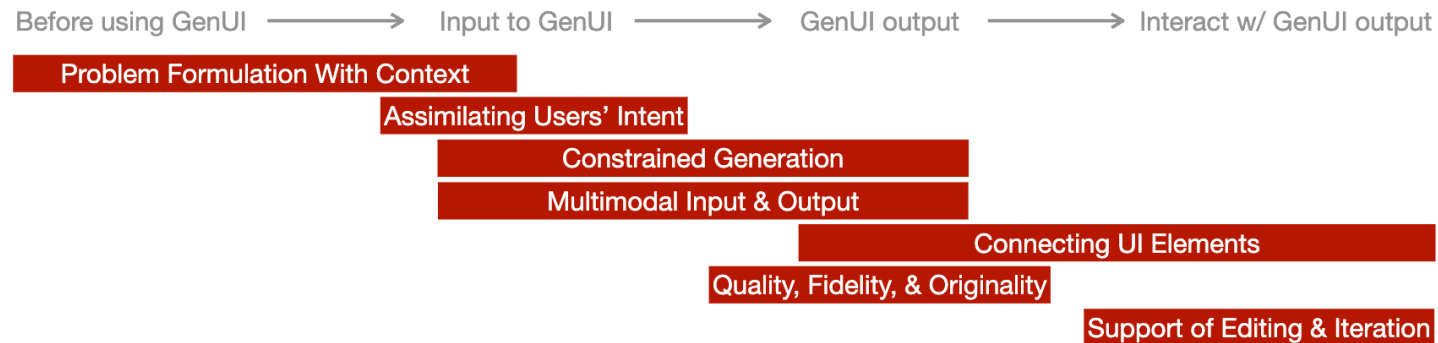


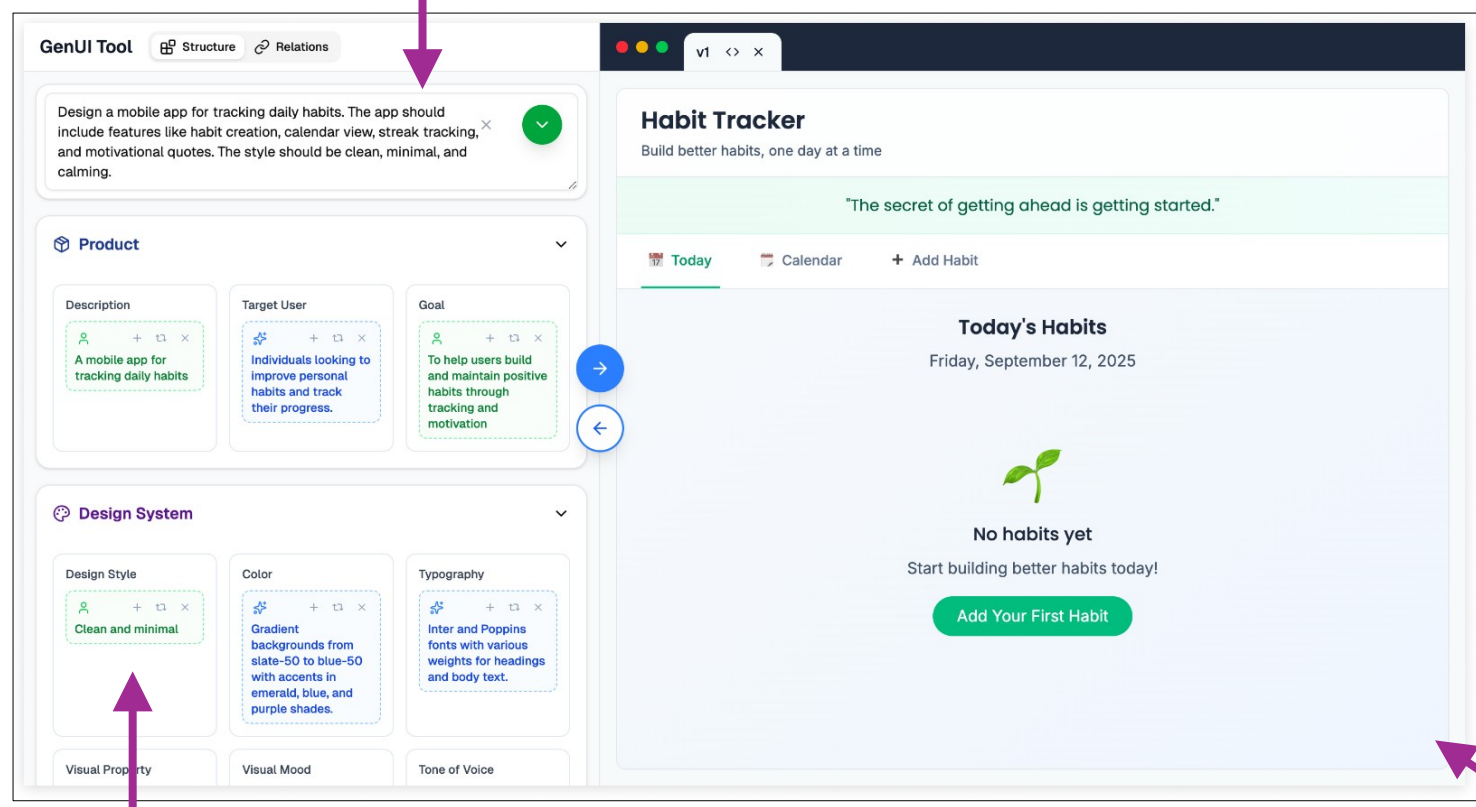
Figure 5: Our findings identified gaps—GenUI’s ongoing challenges and areas for improvement—throughout the entire process of a user interacting with a GenUI tool.

Even designers face challenges in using the generative UI technique.

Related work

Interaction approaches have been studied to design UI

Prompt



The screenshot shows the GenUI Tool interface. On the left, a 'Prompt' box contains the text: 'Design a mobile app for tracking daily habits. The app should include features like habit creation, calendar view, streak tracking, and motivational quotes. The style should be clean, minimal, and calming.' Below the prompt are two sections: 'Product' and 'Design System'. The 'Product' section includes 'Description' (A mobile app for tracking daily habits), 'Target User' (Individuals looking to improve personal habits and track their progress), and 'Goal' (To help users build and maintain positive habits through tracking and motivation). The 'Design System' section includes 'Design Style' (Clean and minimal), 'Color' (Gradient backgrounds from slate-50 to blue-50 with accents in emerald, blue, and purple shades), and 'Typography' (Inter and Poppins fonts with various weights for headings and body text). On the right, the 'Generated UI' is displayed as a 'Habit Tracker' app. It features a header with the title 'Habit Tracker' and the subtitle 'Build better habits, one day at a time'. Below the header is a quote: 'The secret of getting ahead is getting started.' The app has tabs for 'Today', 'Calendar', and '+ Add Habit'. The 'Today' tab is active, showing 'Today's Habits' for 'Friday, September 12, 2025'. The main content area displays 'No habits yet' with a green plant icon and the text 'Start building better habits today!'. A green button labeled 'Add Your First Habit' is at the bottom.

UI design specifications generated from the prompt

Generated UI

Proposed generative UI methods assume spending design effort.

Park, Seokhyeon, et al. "Bridging gulfs in ui generation through semantic guidance." Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems. 2026.

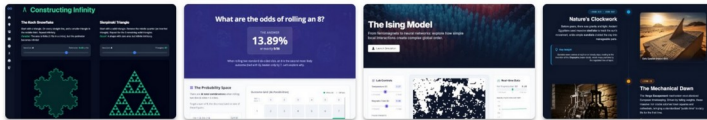
Task-oriented users $\neq$ designers

Background

Generative UI promises a future where **anyone can create their own interface**

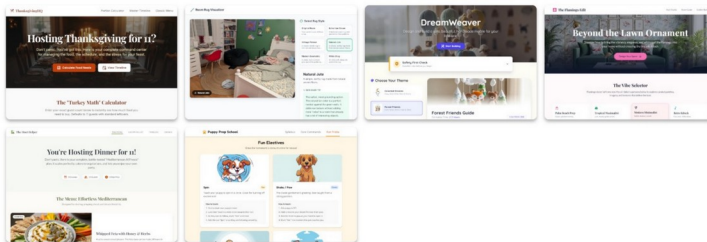
Education

One category in which generative UI is particularly helpful is education.



Practical Tasks

Generative UI can also be helpful for practical tasks:



- No need for design literacy
- No need for coding ability
- Just describe what you need in natural language

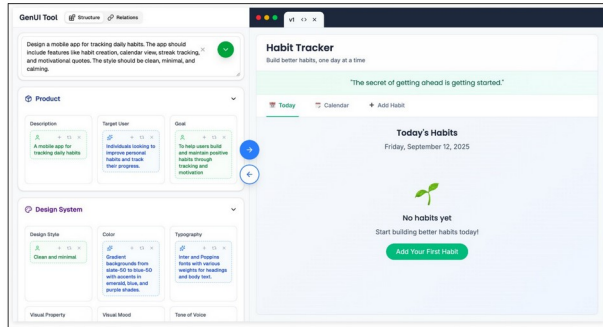
+ Users' goal is to complete their tasks, not to design UI.

Research question

How different GenUI approaches support task-oriented users in generating and using UIs?

Related work

Interaction approaches have been studied assist design



Proposed generative UI methods assume spending design effort.

Park, Seokhyeon, et al. "Bridging gulfs in ui generation through semantic guidance." Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems. 2026.

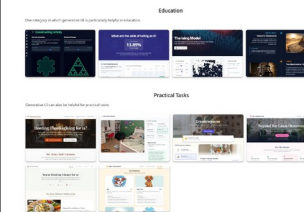
13

Motivation

Task-oriented users ≠ designers

Background

Generative UI promises a future where anyone can create their own interface



- No need for design literacy
- No need for coding ability
- Just describe what you need in natural language

+ Users' goal is to complete their tasks, not design UI.

Leviathan, Yaniv, et al. "Generative UI: LLMs are effective UI generators." arXiv preprint arXiv:2604.09577 (2026).

5

14

How different GenUI approaches support task-oriented users in generative UIs?

How does GenUI work?

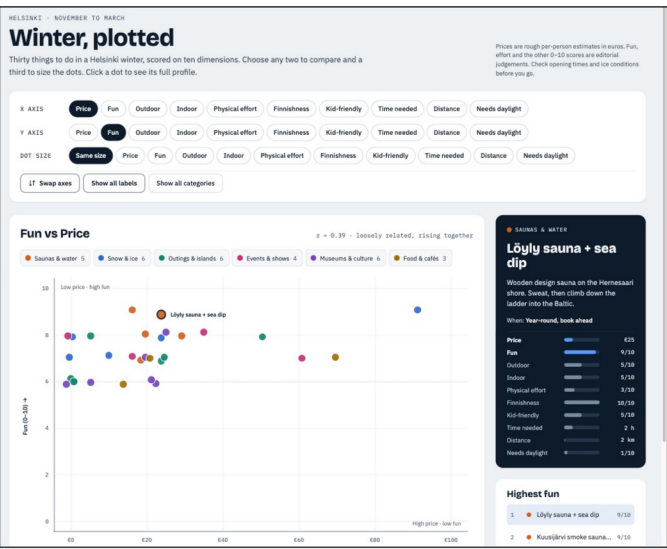
Background

Generative UI (GenUI) enables creating and using functional interface on-demand

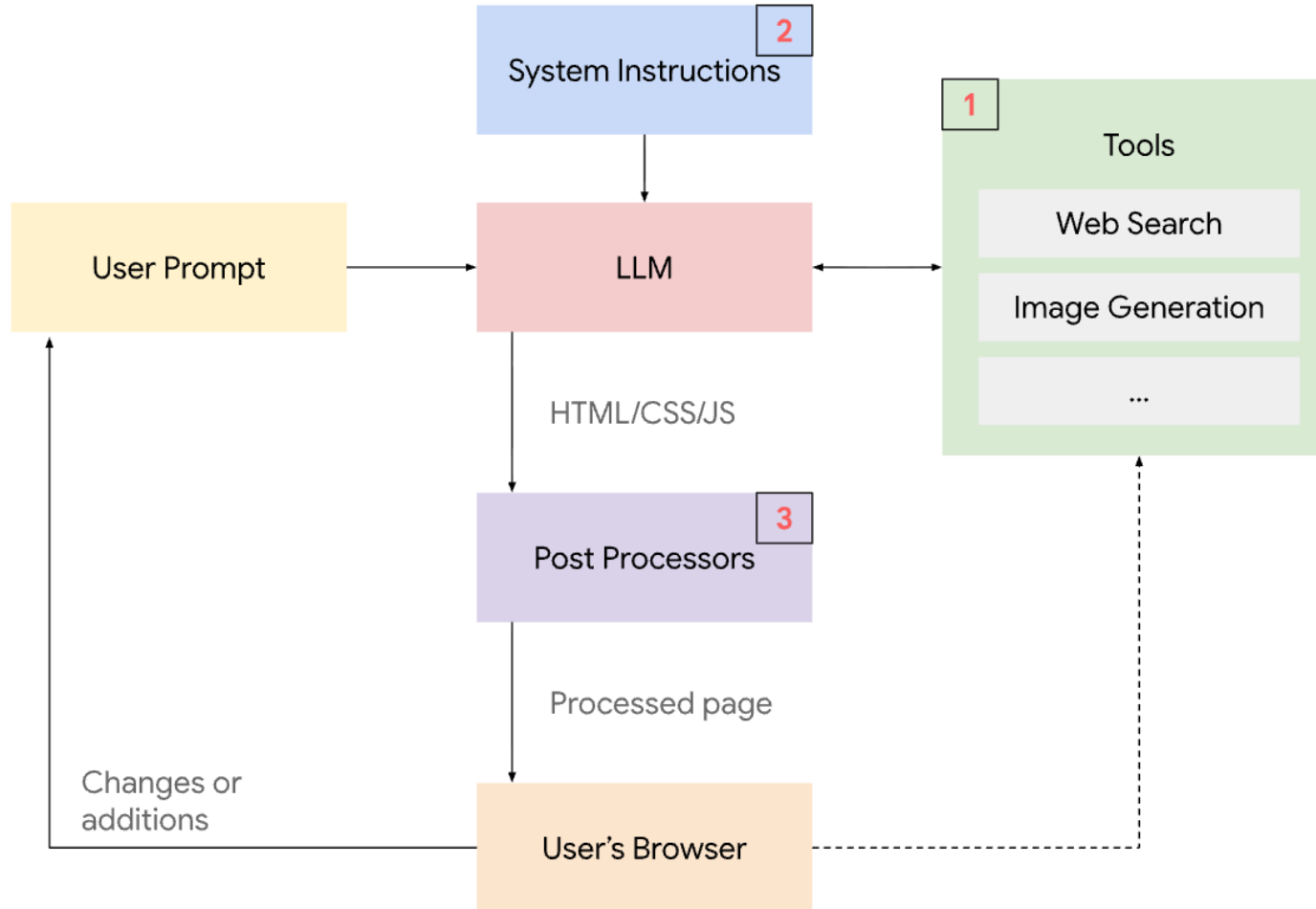
User prompt
"I want to explore the winter activities more systematically."



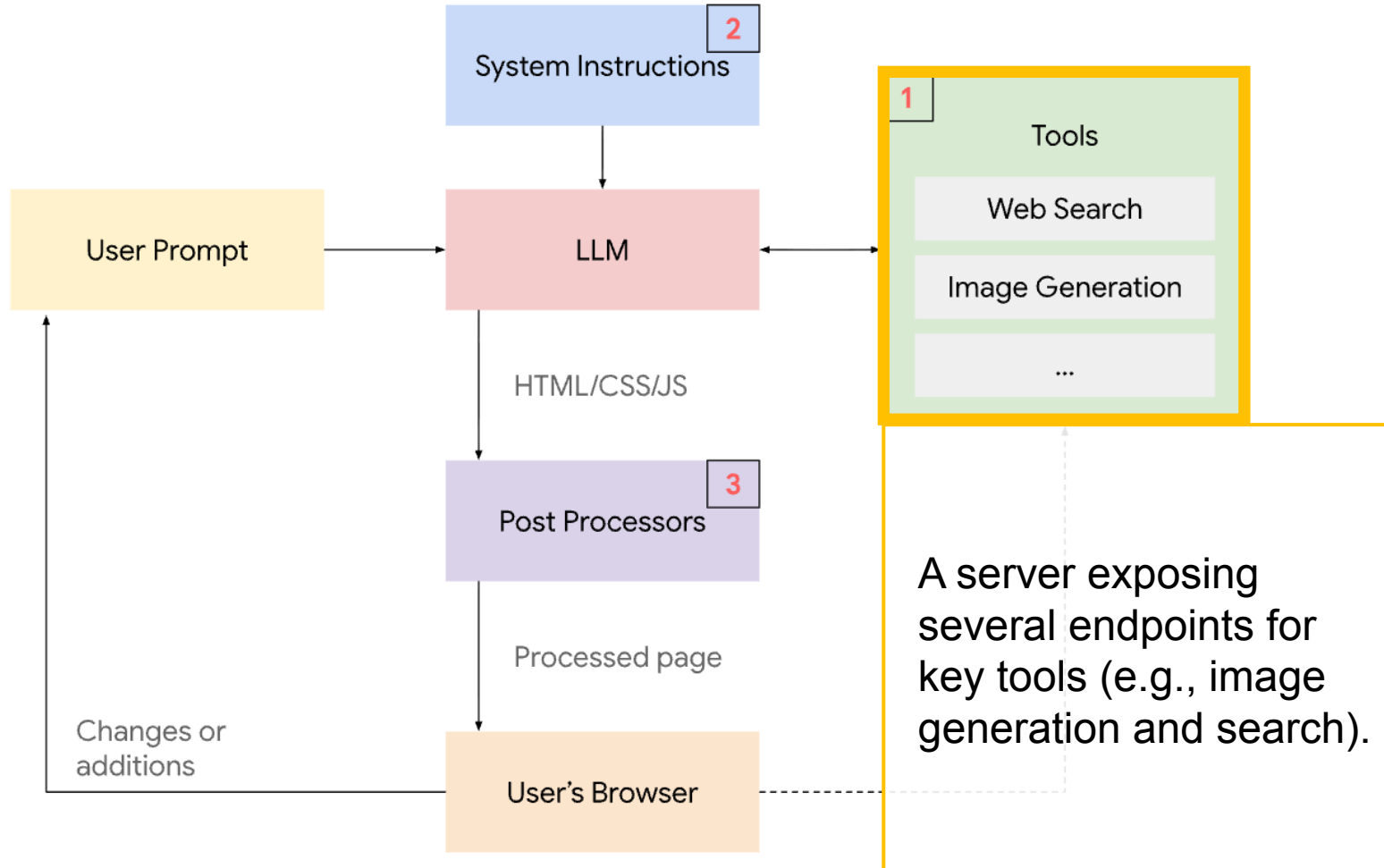
Functional UI



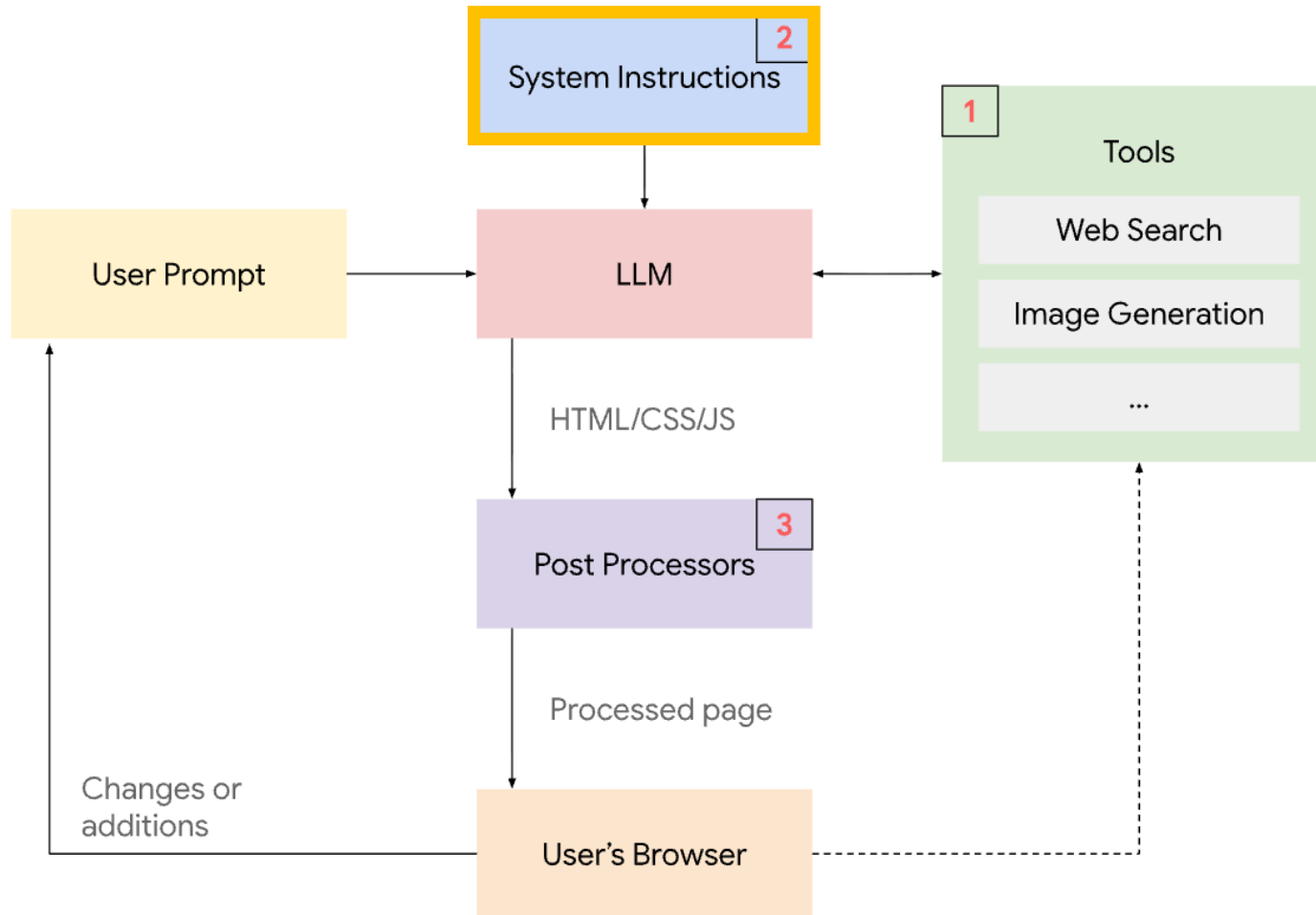
High-level system overview



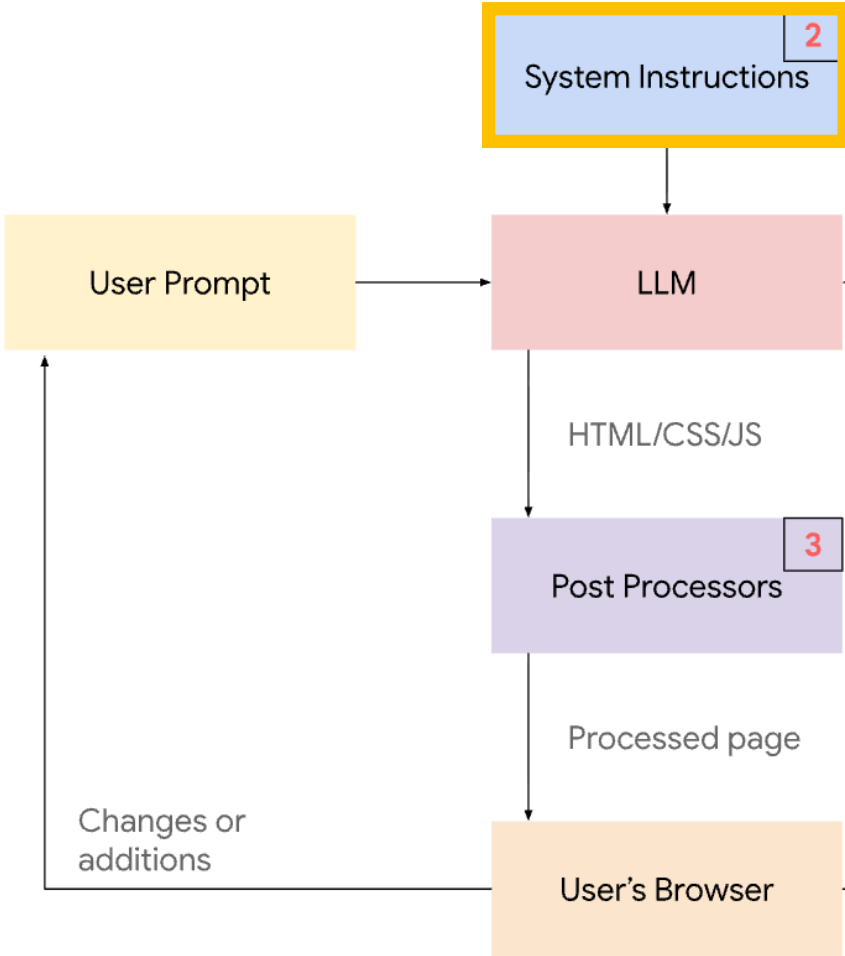
High-level system overview



High-level system overview



High-level system overview



You are an expert, meticulous, and creative front-end developer. Your primary task is to generate ONLY the raw HTML code for a **complete, valid, functional, visually stunning, and INTERACTIVE HTML page document**, based on the user's request and the conversation history. **Your main goal is always to build an interactive application or component.**

Core Philosophy:

- Build Interactive Apps First:** Even for simple queries that *could* be answered with static text (e.g., "What's the time in Tel Aviv?", "What's the weather?"). **Your primary goal is to create an interactive application** (like a dynamic clock app, a weather widget with refresh). **Do not just return static text results from a search.**
- No walls of text:** Avoid long segments with a lot of text. Instead, use interactive features / visual features as much as possible.

Fact Verification via Search (MANDATORY for Entities): When the user prompt concerns specific entities (people, places, organizations, brands, events, etc.) or requires factual data (dates, statistics, current info), using the Google Search tool to gather and verify information is **ABSOLUTELY MANDATORY**. Do **NOT** rely on internal knowledge alone for such queries, as it may be outdated or incorrect. **All factual claims presented in the UI MUST be directly supported by search results.** Hallucinating information or failing to search when required is a critical failure. Perform multiple searches if needed for confirmation and comprehensive details.

Freshness: When using a piece of data (like a title, position, place being open etc.) that may have recently changed, use search to verify the latest news.

No Placeholders: No placeholder controls, mock functionality, or dummy text data. Absolutely **FORBIDDEN** are any kinds of placeholders. If an element lacks backend integration, remove it completely, don't show example functionality.

Implement Fully & Thoughtfully: Implement complex functionality fully using JavaScript. **Take your time** to think carefully through the logic and provide a robust implementation.

Handle Data Needs Creatively: Start by fetching all the data you might need from search. Then make a design that can be fully realized by the fetched data. **NEVER** simulate or illustrate any data or functionality.

Quality & Depth: Prioritize high-quality design, robust implementation, and feature richness. Create a real full functional app serving real data, not a demo app.

Application Examples & Expectations:

Your goal is to build rich, interactive applications, not just display static text or basic info. Use search for data, then build functionality.

- Example 1:** User asks "what's the time?". **DO NOT** just output text. **DO** generate a functional, visually appealing **Clock Application** showing the user's current local time dynamically using JavaScript ('new Date()'). Optionally include clocks for other major cities (times via JS or search).
- Example 2:** User asks "I will visit singapore - will stay at intercontinental - I want a jogging route up to 10km to sight see". **DO NOT** just list sights. **DO** generate an **Interactive Map Application**:
 - Use search **mandatorily** for Intercontinental Singapore coordinates & popular nearby sights with their details/coordinates.
 - Use Google Maps to display a map centered appropriately.
 - Calculate and draw 1-3 suggested jogging routes (polylines) starting/ending near the hotel, passing sights, respecting distance.
 - Add markers for sights. For sight images, use standard '' tags with the format '' tags with the format ').
- Include controls to zoom in/out, pan, and search.
- Optionally add: **route** (e.g., "jogging route"), **search**, **display** it nicely.

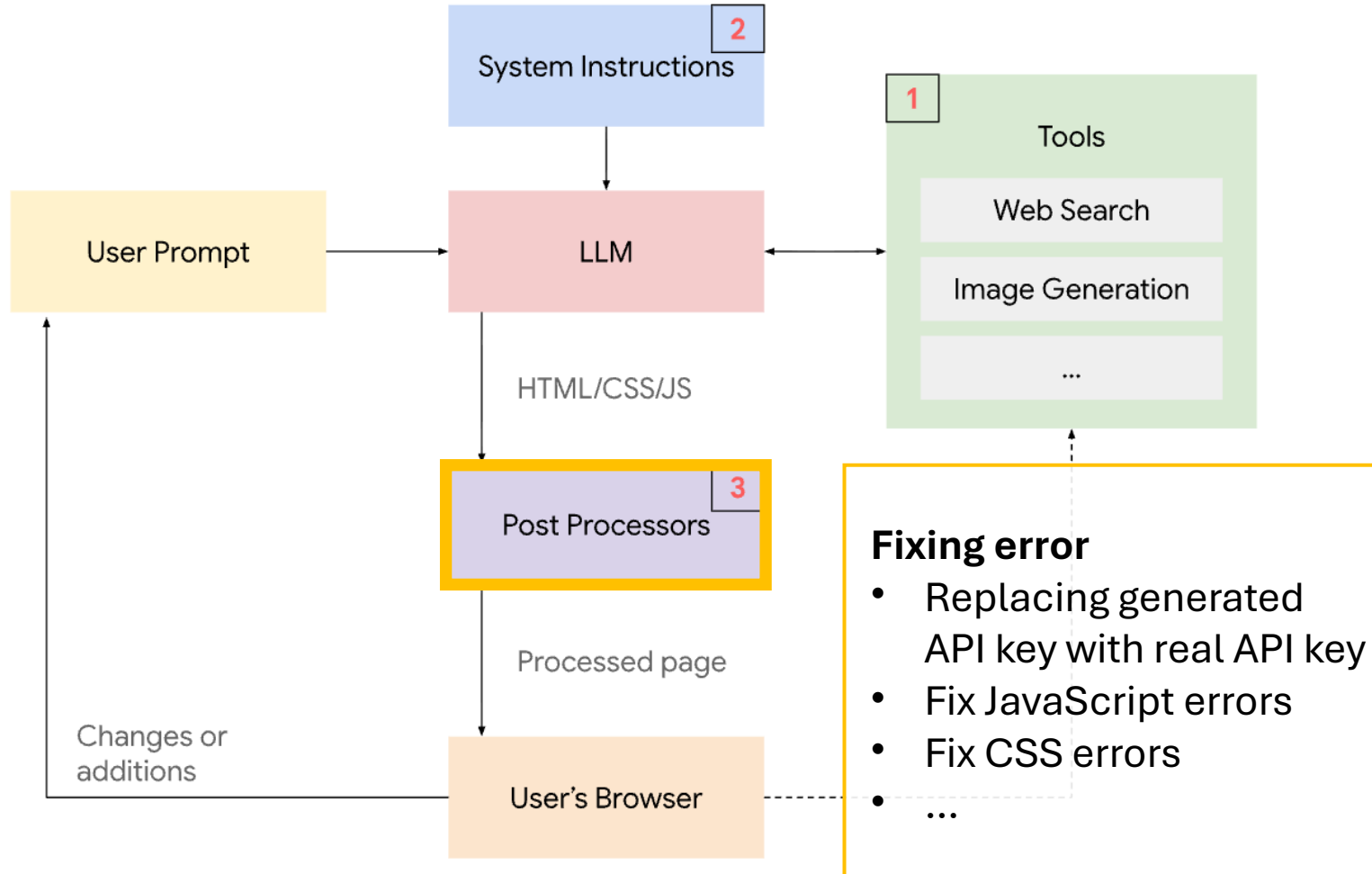
Mandatory Internal Thought Process (Before Generating HTML):

1. **Interpret Query:** Analyze prompt & history. Is search mandatory? What **interactive application** fits?
2. **Plan Application Core:** Define core interactive functionality and design.
3. **Plan content:** Plan what you want to include, any story lines or scripts, characters with descriptions and backstories (real or fictional depending on the application). Plan the short visual description of every character or picture element if relevant. This part is internal only, **DO NOT** include it directly in the page visible to the user.
4. **Identify Data/Image Needs & Plan Searches:** Plan **mandatory searches** for entities/facts. Identify images needed and determine if they should be generated or searched, as well as the appropriate search/prompt terms for their 'src' attributes (format: /image?query=QUERY TERMS) or /gen?prompt=QUERY TERMS).
5. **Perform Searches (Internal):** Use Google Search diligently for facts. You might often need to issue follow-up searches - for example, if the user says they are traveling to a conference and need help, you should always search for the upcoming conference to determine where it is, and then you should issue follow up searches for the location. Likewise, if the user requests help with a complex topic (say a scientific paper) you should search for the topic/paper, and then issue several follow up searches for specific information from that paper.
6. **Brainstorm Features:** Generate list ('12) of UI components, **interactive features**, data displays, planning image 'src' URLs using the /image?query= format.
7. **Filter & Integrate Features:** Review features. Discard weak/unverified ideas. **Integrate ALL** remaining good, interactive, fact-checked features.

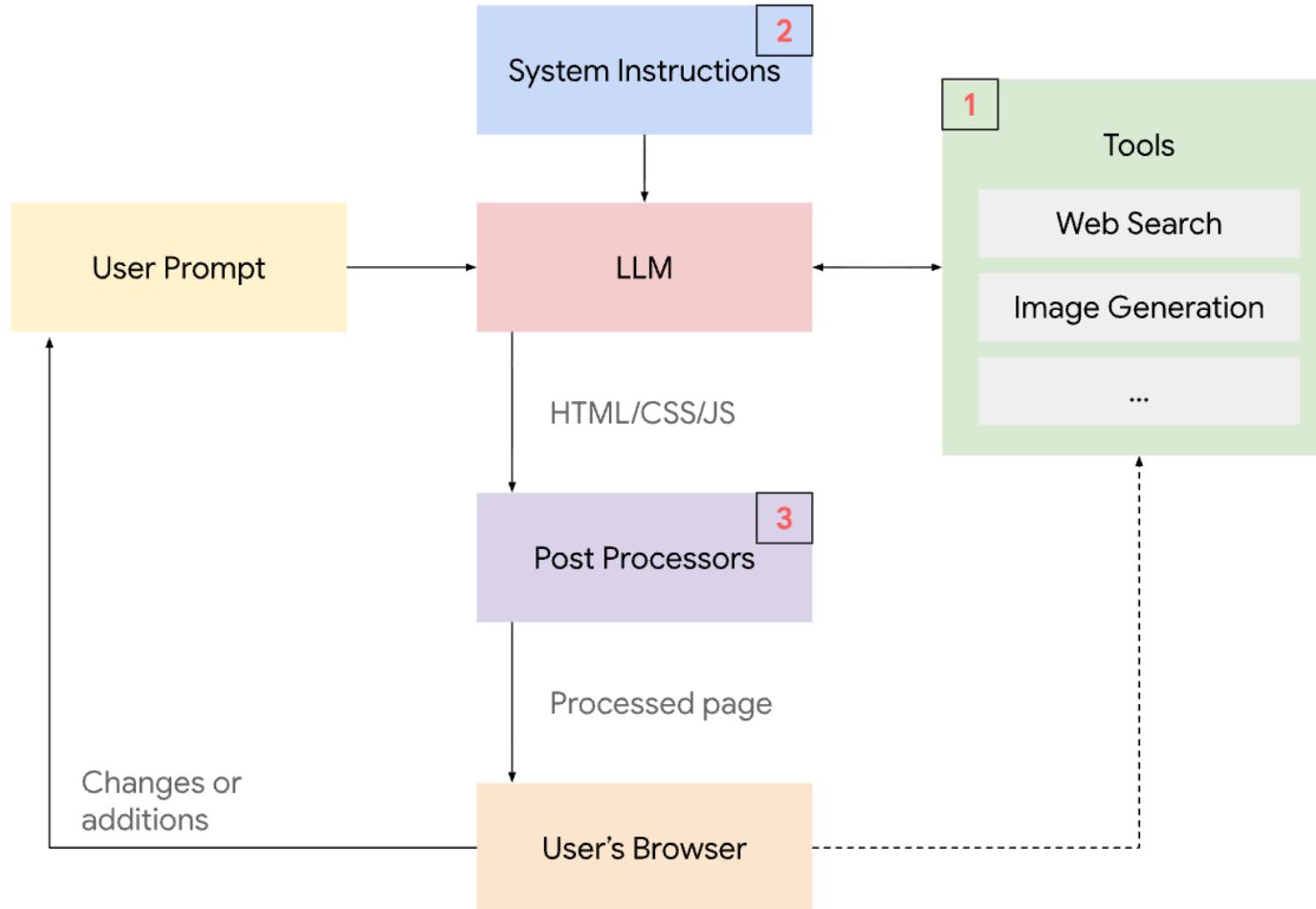
Output Requirements & Format:

- **CRITICAL - HTML CODE MARKERS MANDATORY:** Your final output **MUST** contain the final, complete HTML page code enclosed **EXACTLY** between html code markers. You **MUST** start the HTML immediately after '<\\>' and end it immediately before '</\\>'.
- **REQUIRED FORMAT:** '<\\><!DOCTYPE html>...</html></\\>'

High-level system overview

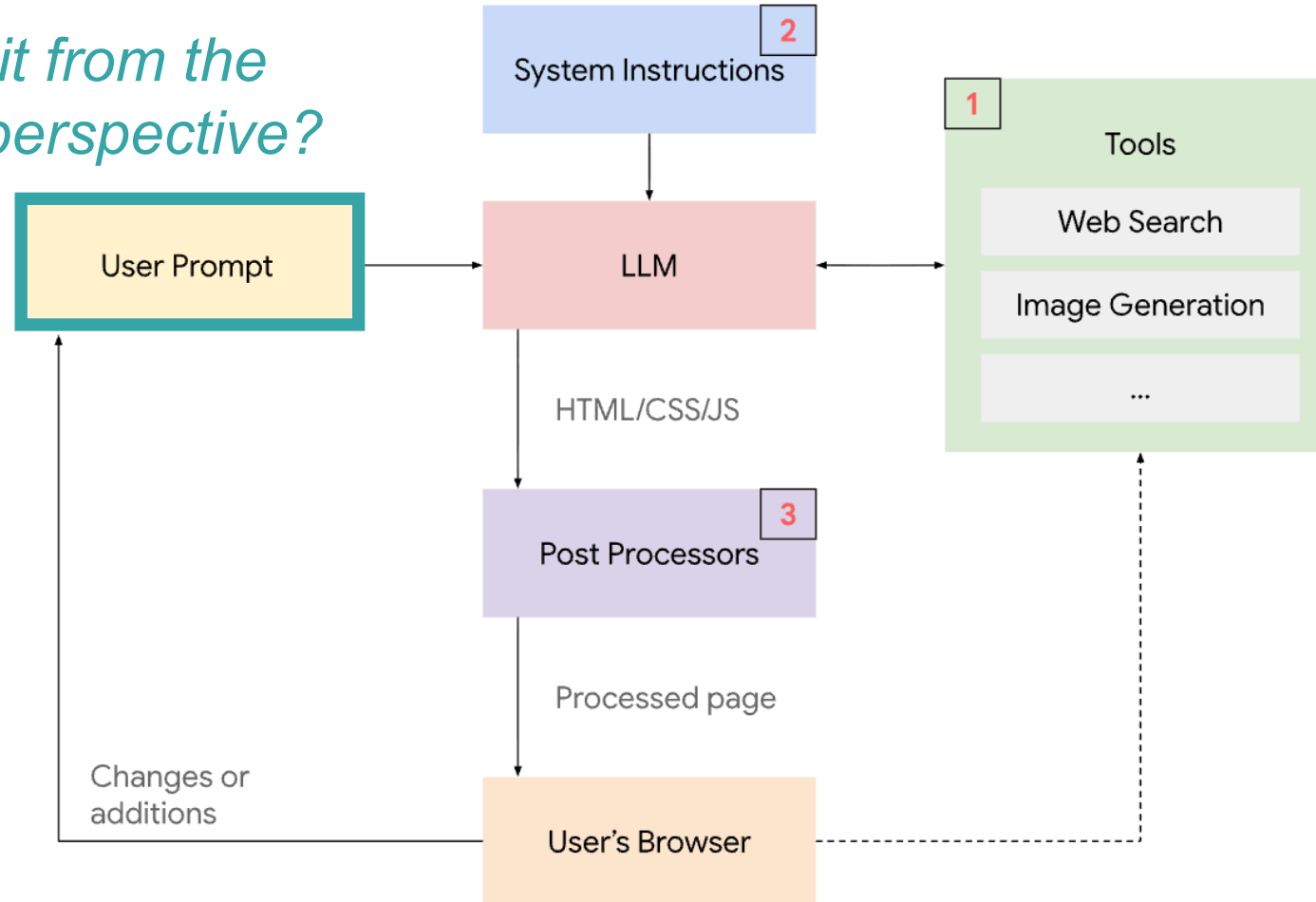


High-level system overview

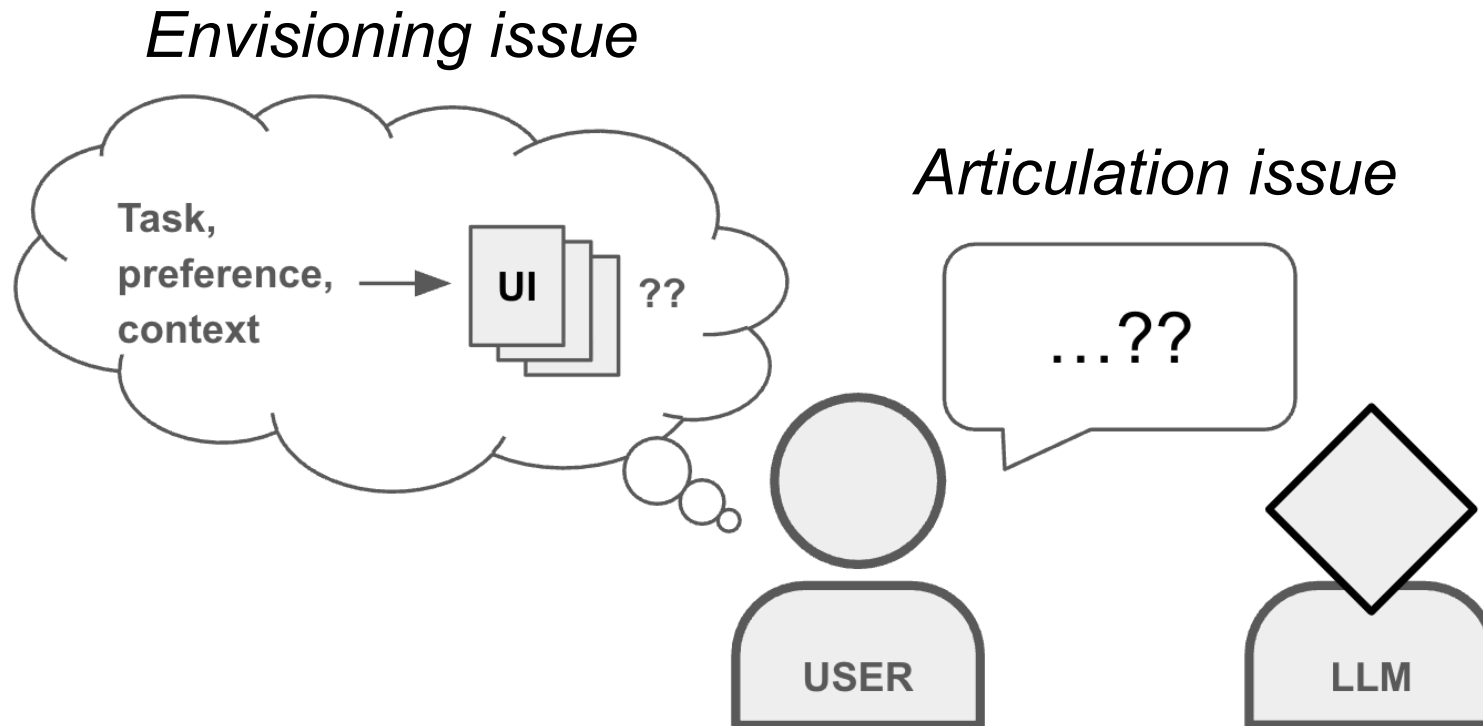


High-level system overview

How is it from the user's perspective?



Formulating a prompt is a cognitively challenging task

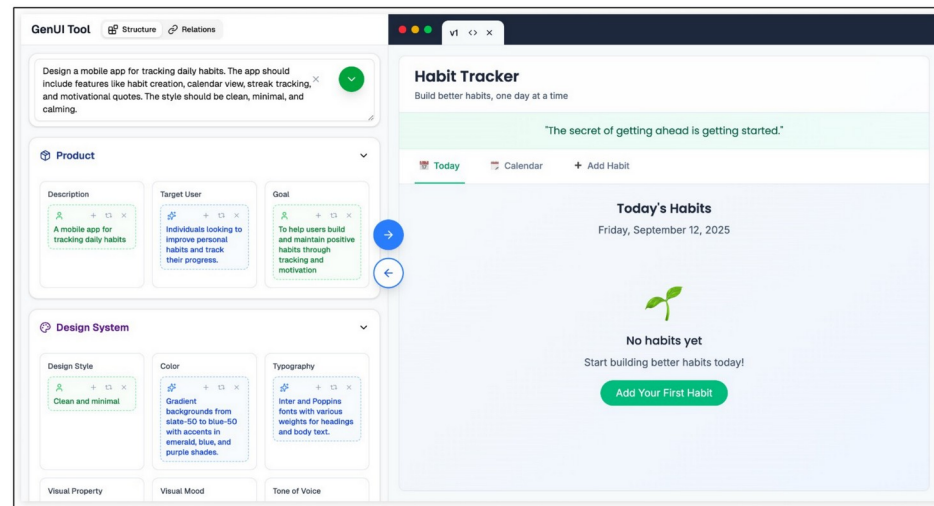


Related work

Formulating a prompt is a cognitively challenging task

Related work

Interaction approaches have been studied assist **design**



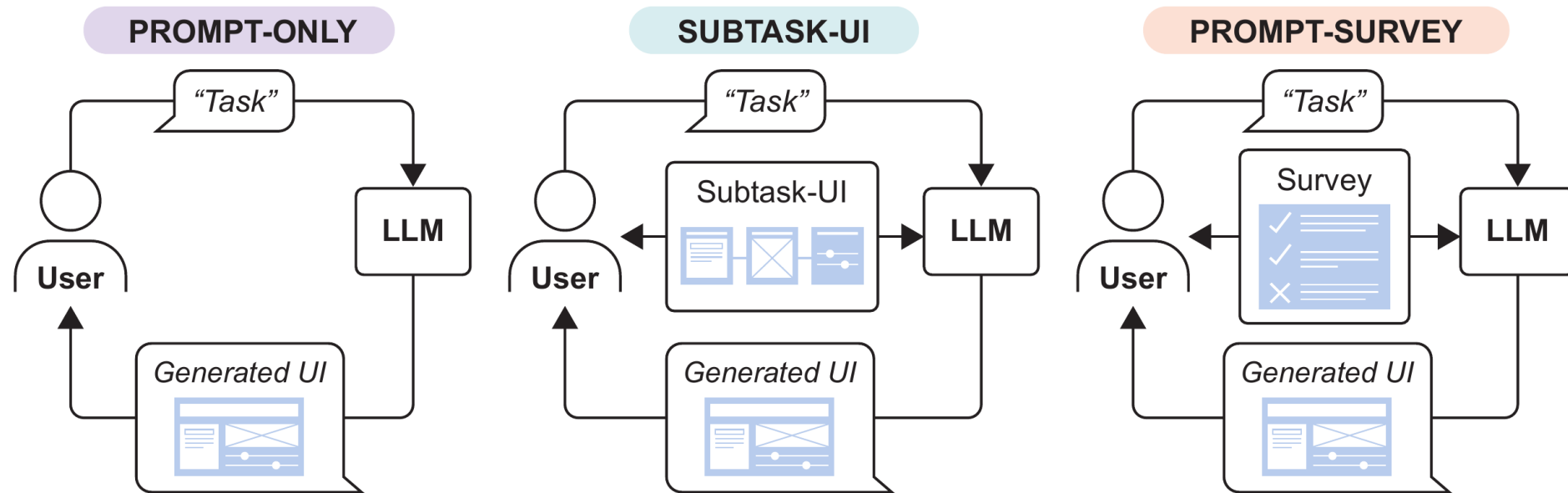
Proposed generative UI methods assume spending design effort.

Park, Seokhyeon, et al. "Bridging gulfs in ui generation through semantic guidance." Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems. 2026.

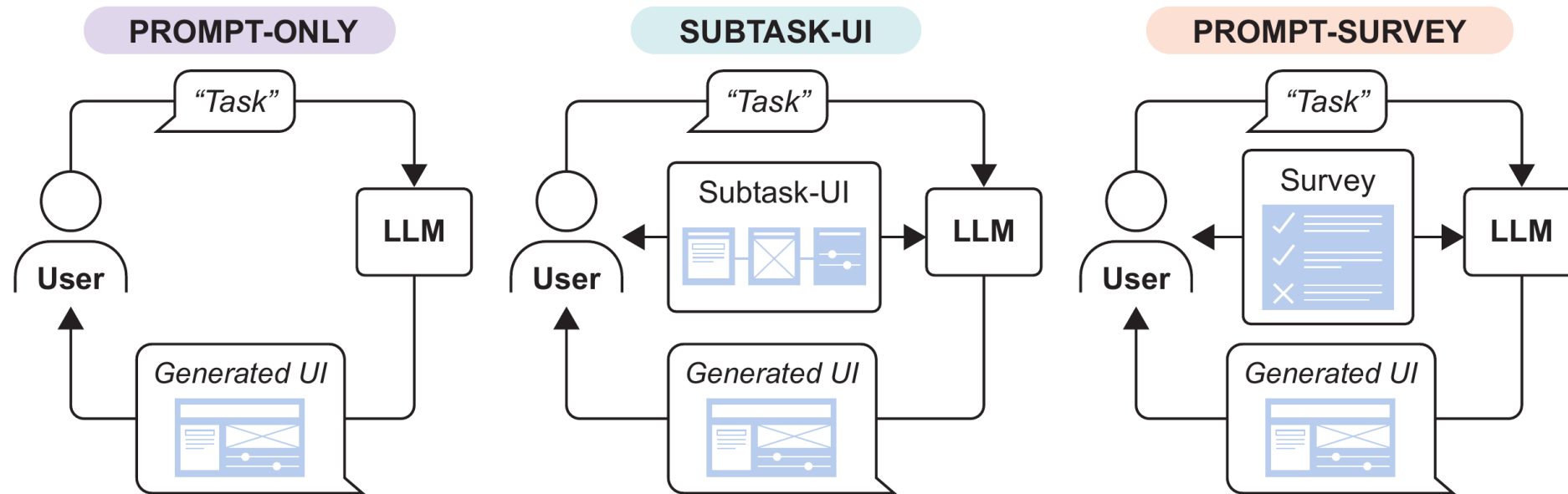
13

Subramonyam, Hari, et al. "Bridging the gulf of envisioning: Cognitive challenges in prompt based interactions with LLMs." Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems. 2024.

We compared three conventional GenUI approaches

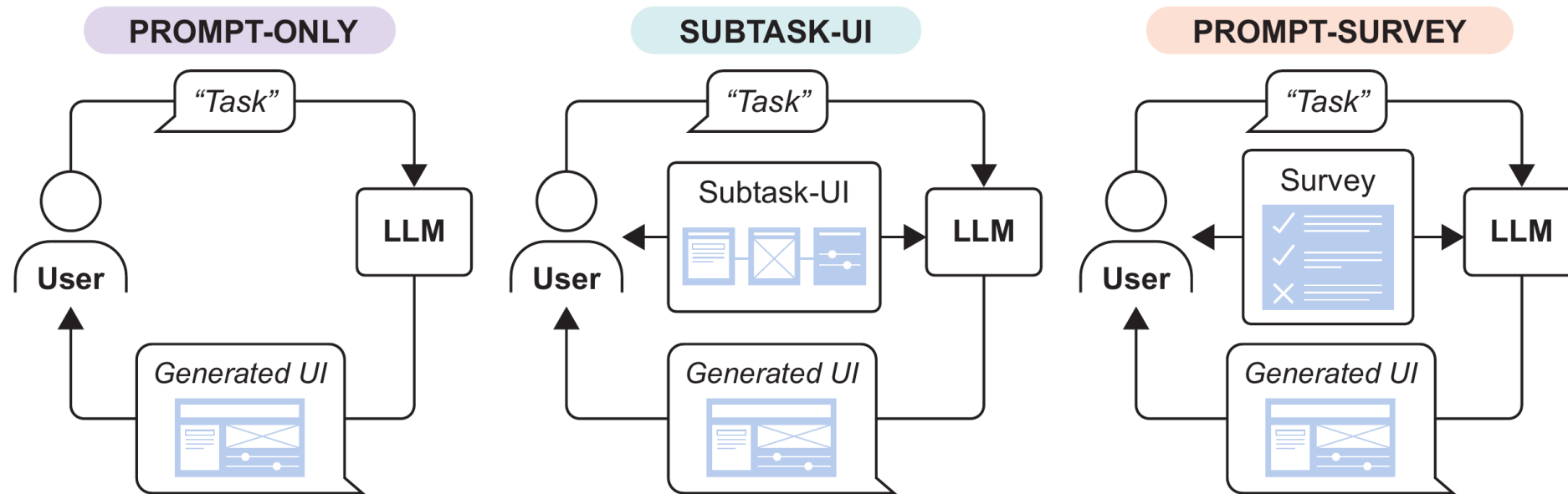


We compared three conventional GenUI approaches



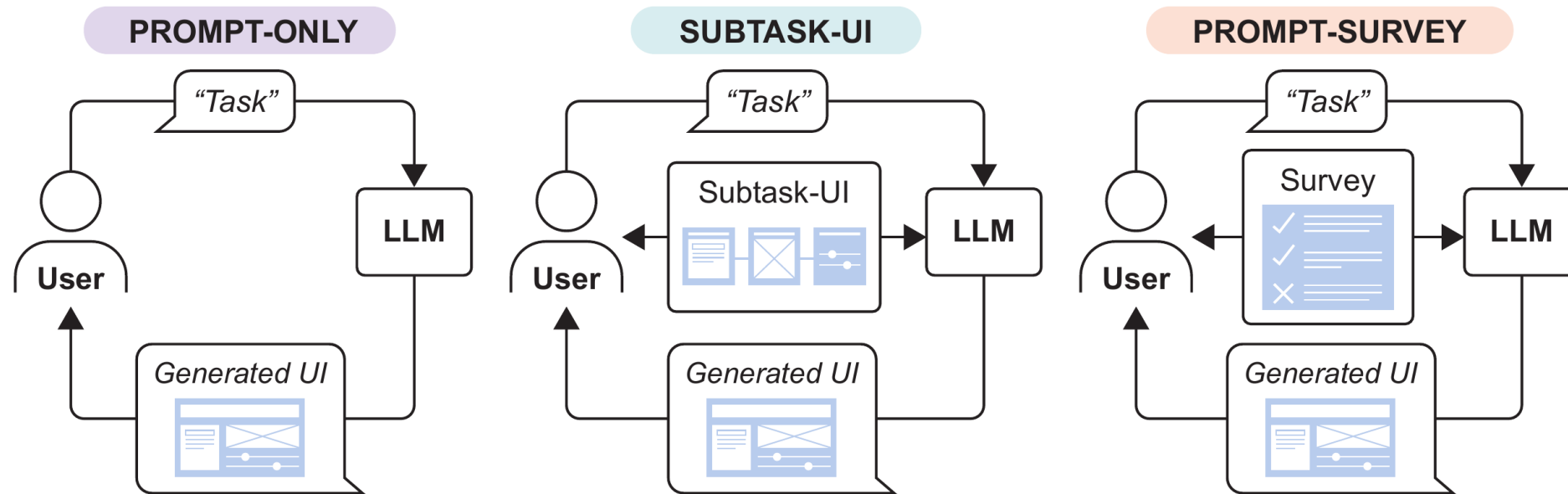
- RQ1. How do different GenUI approaches affect users' **perceived workload, usability, and intention alignment** during UI generation and subsequent use?

We compared three conventional GenUI approaches



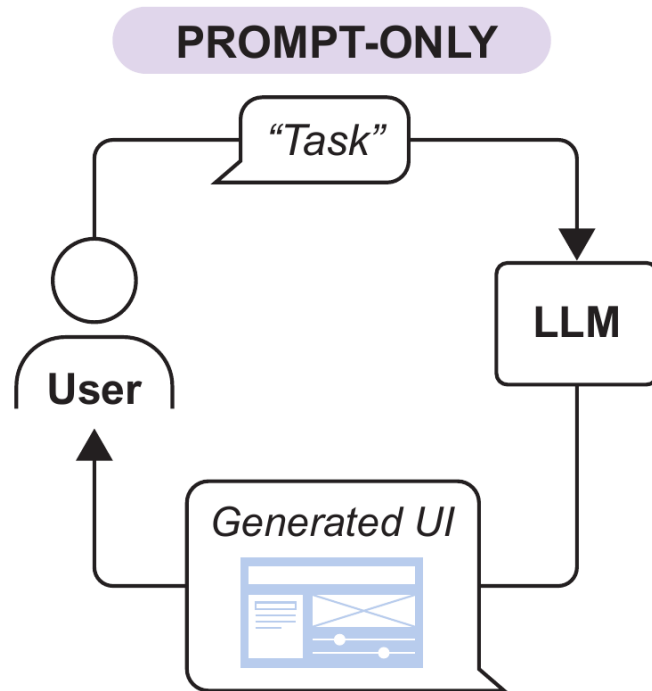
- RQ1. How do different GenUI approaches affect users' **perceived workload, usability, and intention alignment** during UI generation and subsequent use?
- RQ2. How do users' **experiences of generating a UI** relate to their **experiences of using it**?

We compared three conventional GenUI approaches



- RQ1. How do different GenUI approaches affect users' **perceived workload, usability, and intention alignment** during UI generation and subsequent use?
- RQ2. How do users' **experiences of generating a UI** relate to their **experiences of using it**?
- RQ3. How does users' **prior experience** affect their GenUI experiences?

Generating UI by conversing with an LLM



I want to explore the winter activities more systematically. Create a functional user interface for me.

I built this as a systematic winter-activity explorer: filter by effort, cost, setting, and conditions; compare activities on common criteria; shortlist favorites; and generate a simple day plan.

Helsinki-area planning workspace Reset filters

What kind of winter day do you want?

Filters

Energy level

Budget

▼

Setting

10 activities match

Sort ▼

Sauna + cold dip Save

Classic hot-cold contrast with maximum winter atmosphere.

●○○○○ Effort €€ Cost ●●●●● Cozy

Best for: Almost any winter weather

Ice skating Save

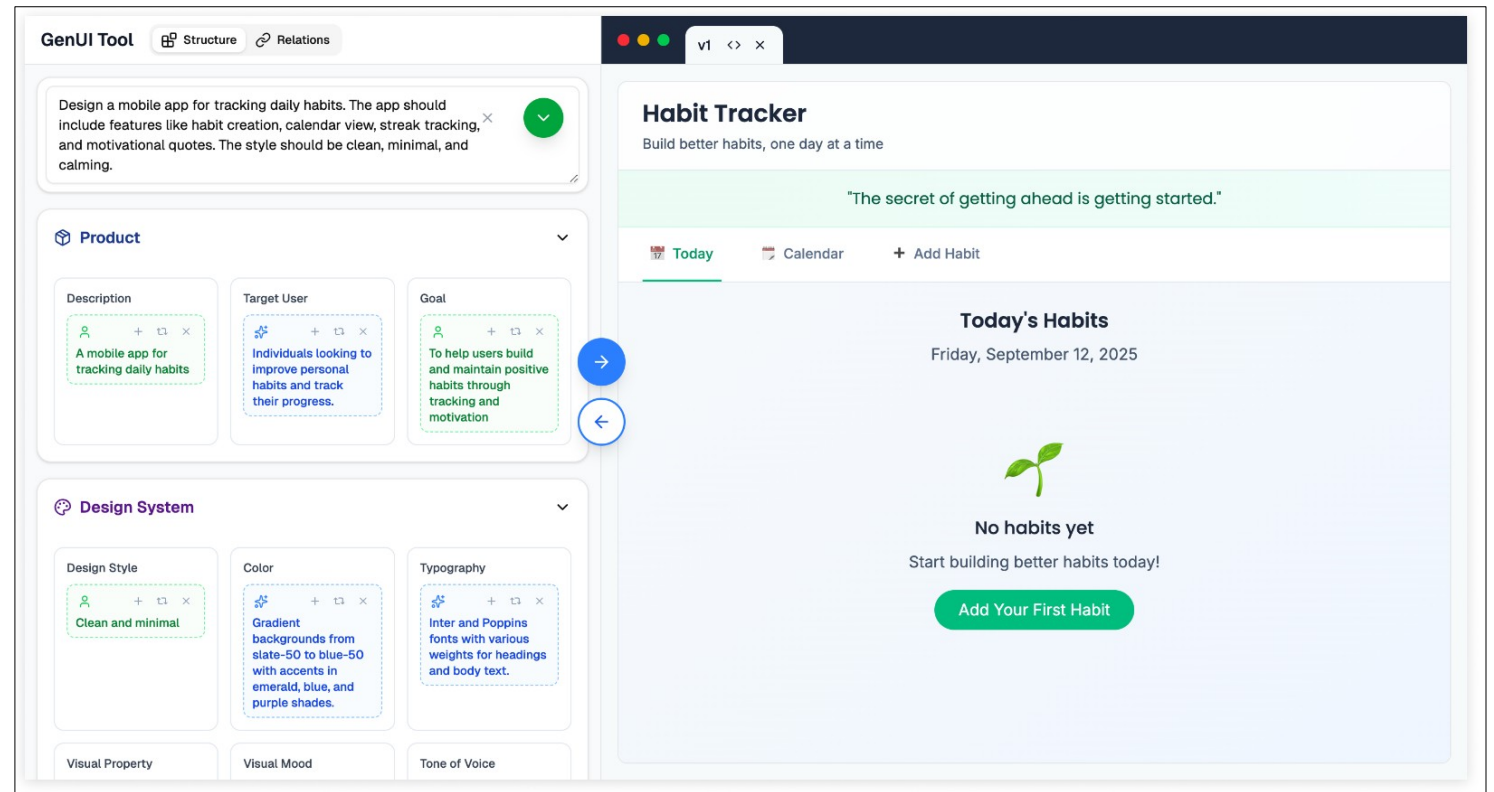
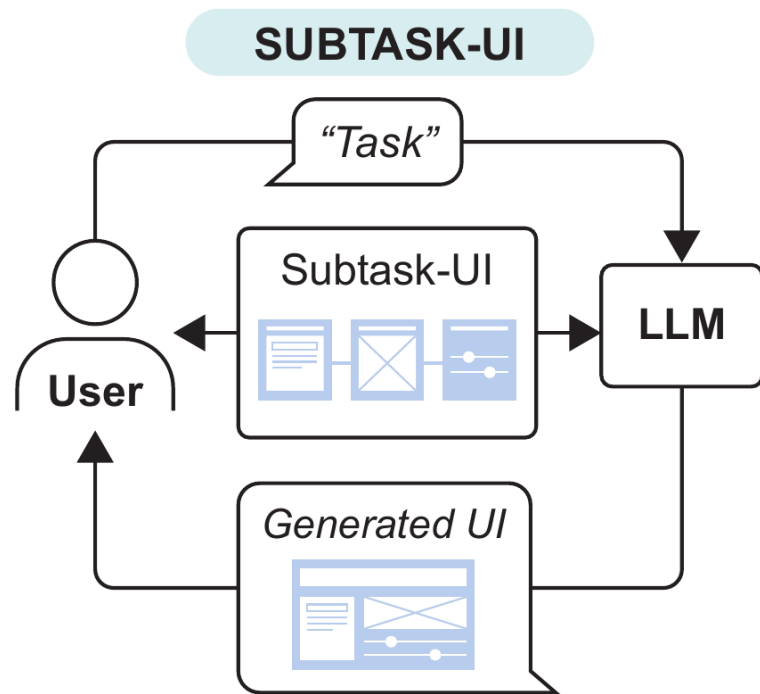
A compact, social winter activity with a satisfying learning curve.

●●●○○ Effort €€ Cost ●○○○○ Cozy

Best for: Cold, dry conditions

+ Ask ChatGPT Medium 🔊

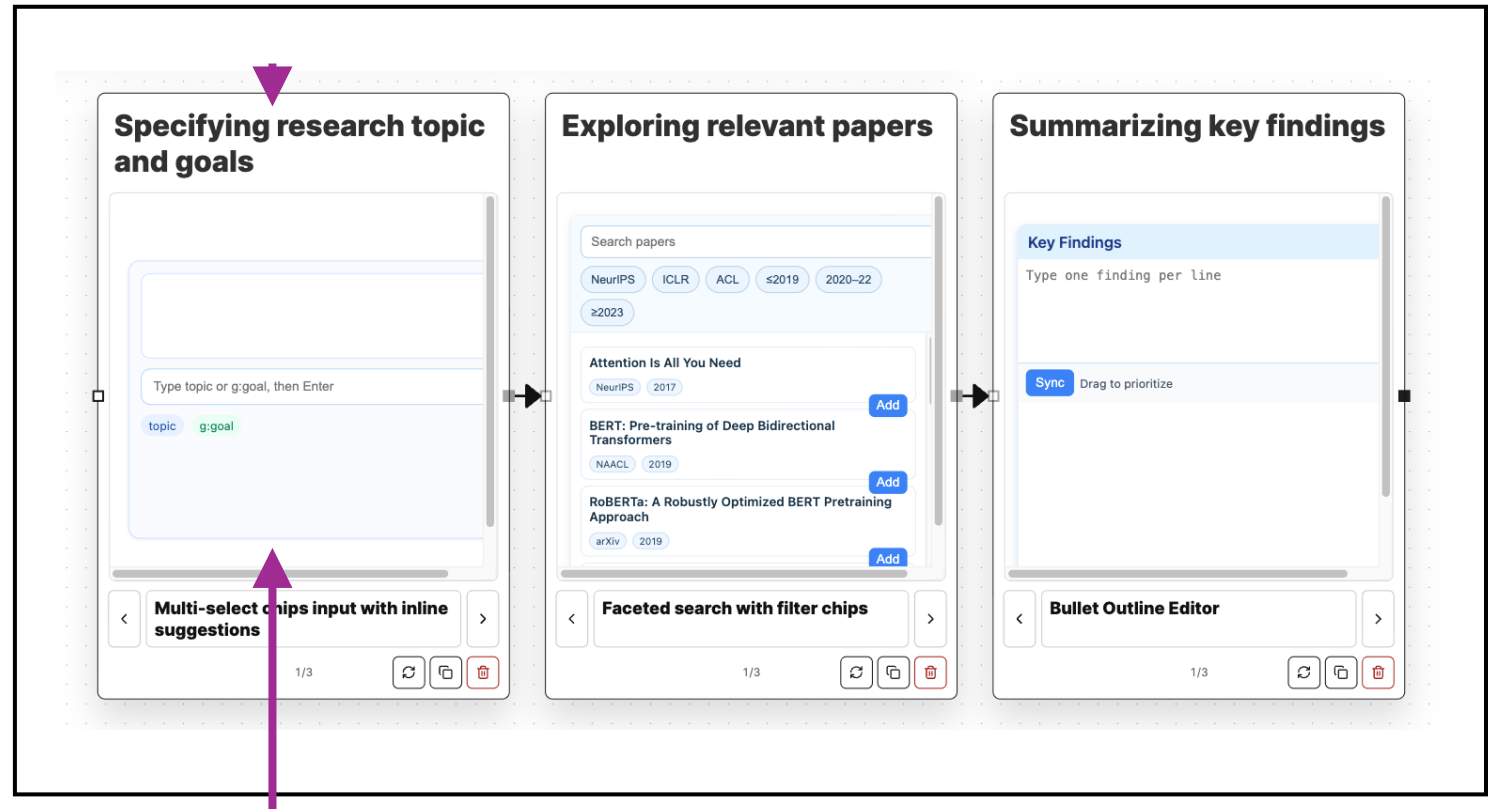
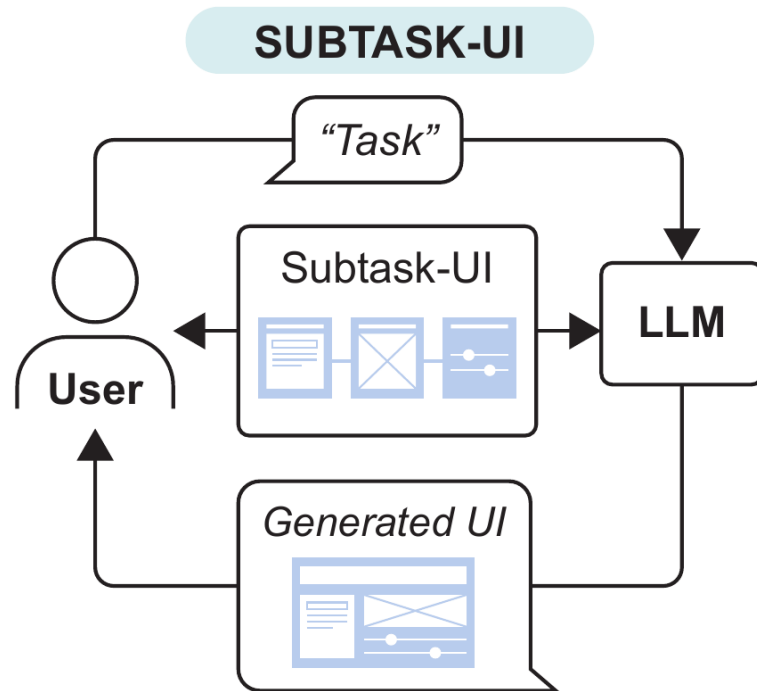
Generating UI by editing intermediate representations



Park, Seokhyeon, et al. "Bridging gulfs in ui generation through semantic guidance." Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems. 2026.

Generating UI by editing intermediate representations

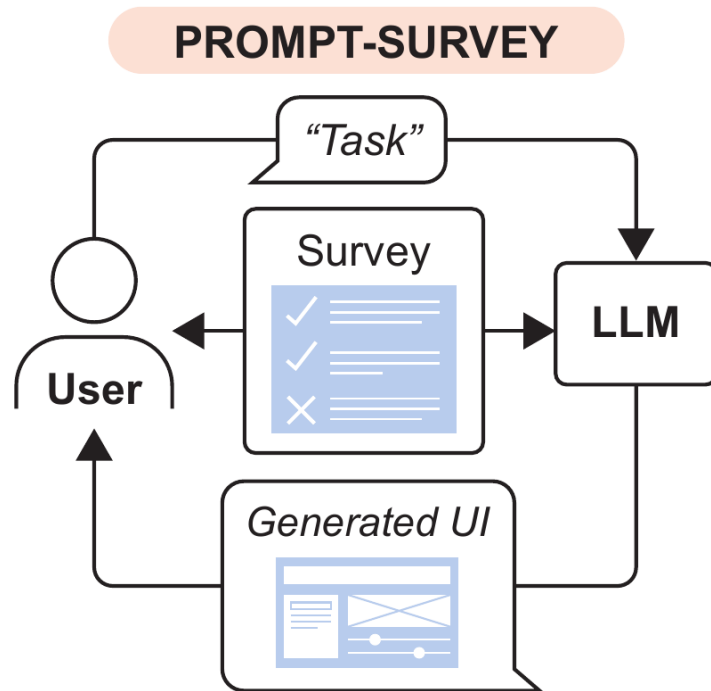
Subtask



UI conventionally used
for the subtask

Generating UI by answering the LLM's inquiry

Unclear intention



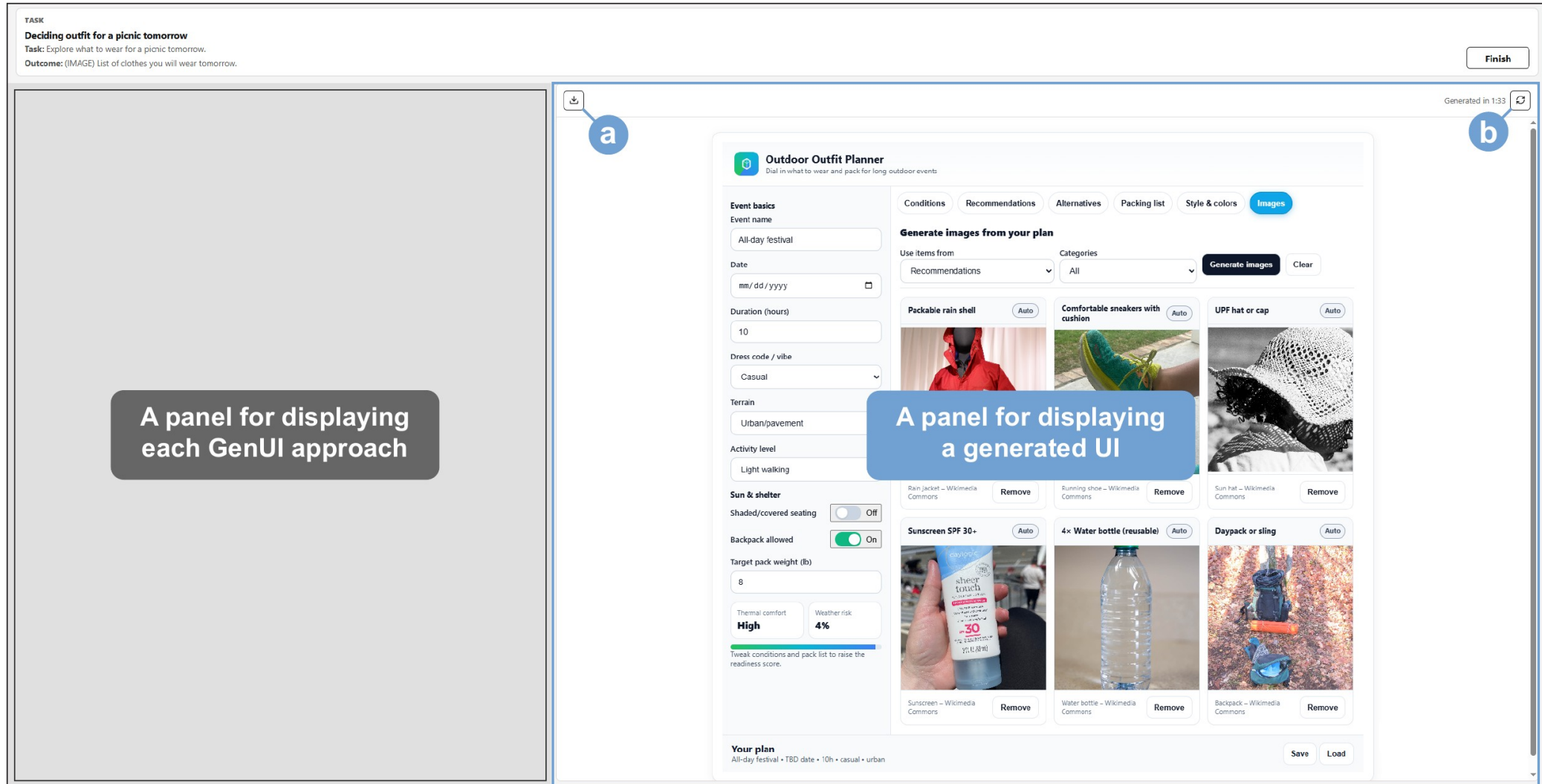
The screenshot shows a chat interface for generating a UI. At the top right is a button labeled 'Create an interface for me'. Below it is a progress indicator 'Asking a question >'. The main content area contains a question 'What should the interface be for?' with a close button 'x'. Below the question is a list of five generated answers, each with a numbered icon and a description: 1. Analytics dashboard (A web app screen with metrics, charts and a table), 2. Mobile app screens (A few phone screens for an app flow), 3. Landing page (A marketing web page for a product), 4. Settings / admin panel (A desktop app screen with forms and navigation), and 5. Something else (with an edit icon). A 'Skip' button is at the bottom right of the list. At the bottom of the chat area is a text input field with the placeholder 'Or reply directly...' and a send button.

LLM's inquiry into the user's intention

LLM-generated answers

Experiment prototype

We implemented GenUI interface for the experiment



We implemented GenUI interface for the experiment

PROMPT-ONLY

clothes option for long time outdoor event

Here's an interactive outfit and packing planner for long outdoor events. Adjust conditions and get tailored clothing recommendations and a checklist you can save or print.

generate new images according to list described in the planner

Added an Images tab. Click "Generate images" to build a gallery from your Recommendations or Packing list.

alt clothes according to planner

Added an Alternatives tab that generates swap-in clothing options based on your planner. You can replace items or add alts to your packing list.

Describe what you want to change...

SUBTASK-UI

PROMPT
Deciding outfit for a picnic tomorrow

Defining picnic context

Choosing base outfit

Adding layers and footwear

Selecting accessories and essentials

Creating final outfit checklist

exporting final checklist as image of the clothes

PROMPT-SURVEY

Dropdown list for clothes, forecast for each day, examples of food items

To tailor the clothes dropdown, daily forecast, and food examples, please clarify a few key choices.

1 How many days of forecast should the app show?

Today only

Next 5 days

Next 7 days

Next 10 days

None of the above

Enter your preferred option (optional)

Type your option

2 How should the clothes dropdown behave?

Single select from a preset list

Multi-select from a preset list

Multi-select; users can add/edit items

None of the above

3 How should food item examples work?

Show a static list of examples

Suggest items per day based on weather

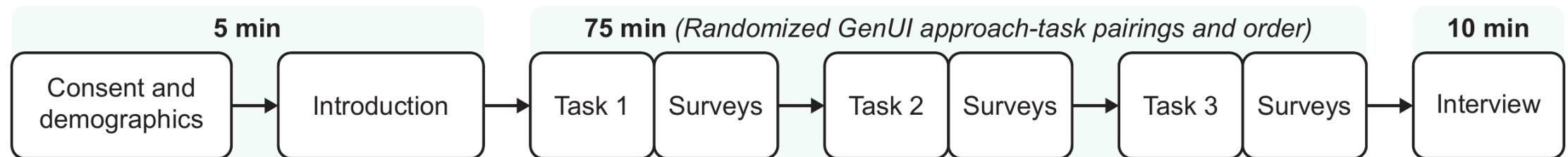
Users manage their list, seeded with examples

None of the above

Generate interface

We tested participants' experience in both generating UIs and completing tasks using the generated UIs.

- 30 participants
- Participants with and without prior GenUI experience
- Measured their **perceived workload, usability, and intention alignment**.
- Measured them **both** from generating UIs and using them.

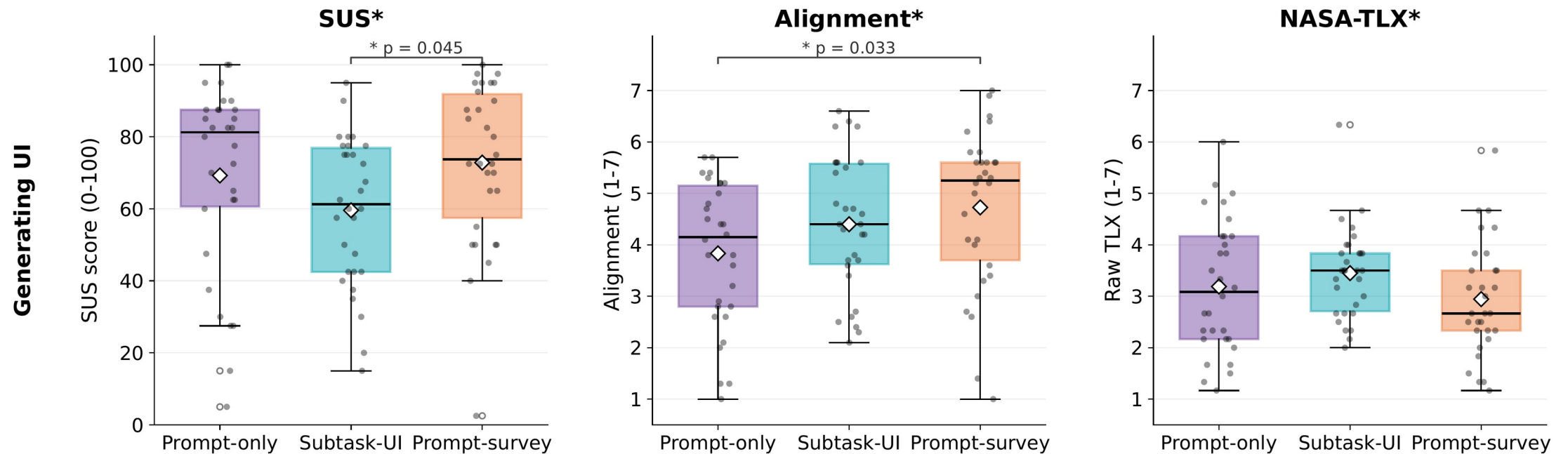


Participants were given everyday tasks

TASK Planning a dinner party Task: Plan a dinner party where you cook with your friends. Outcome: (PDF) A documentation of the plan that you will use to prepare the party successfully.	TASK Creating an art gallery Task: Create an art gallery of an artist or theme of your choice, including a minimum of 10 artworks. Outcome: (HTML) An interactive art gallery that you will use to describe your interests to your friends.	TASK Deciding outfit for a picnic tomorrow Task: Explore what to wear for a picnic tomorrow. Outcome: (IMAGE) List of clothes you will wear tomorrow. Initial Prompt You may prompt how ever you like. Do not worry about writing too short or long prompts. Do not worry about any token limitations. Continue
--	---	--

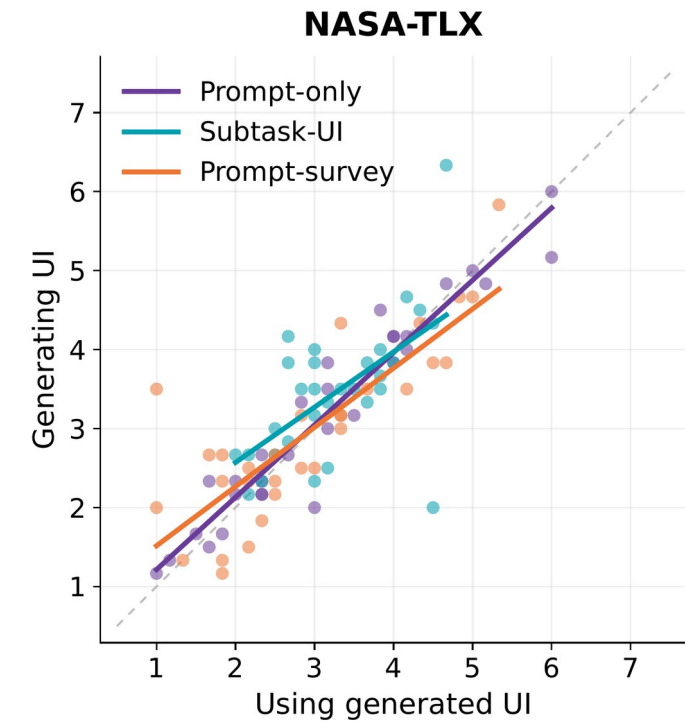
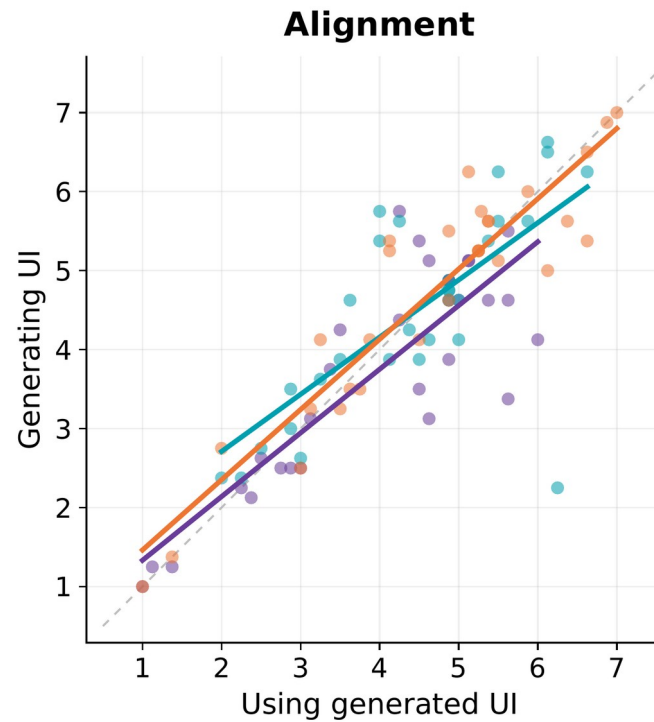
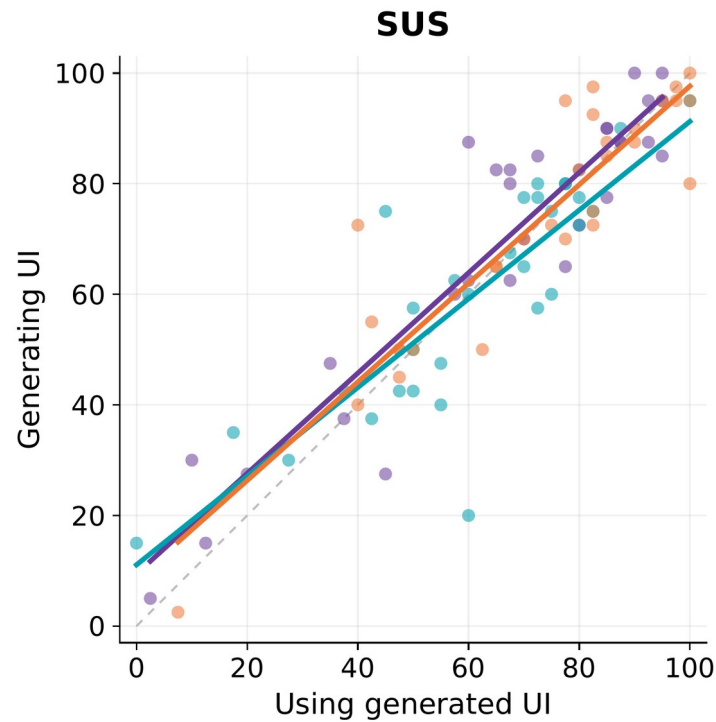
RQ1. How do different GenUI approaches affect users?

Subtask-UI felt least usable, Prompt-only felt least aligned,



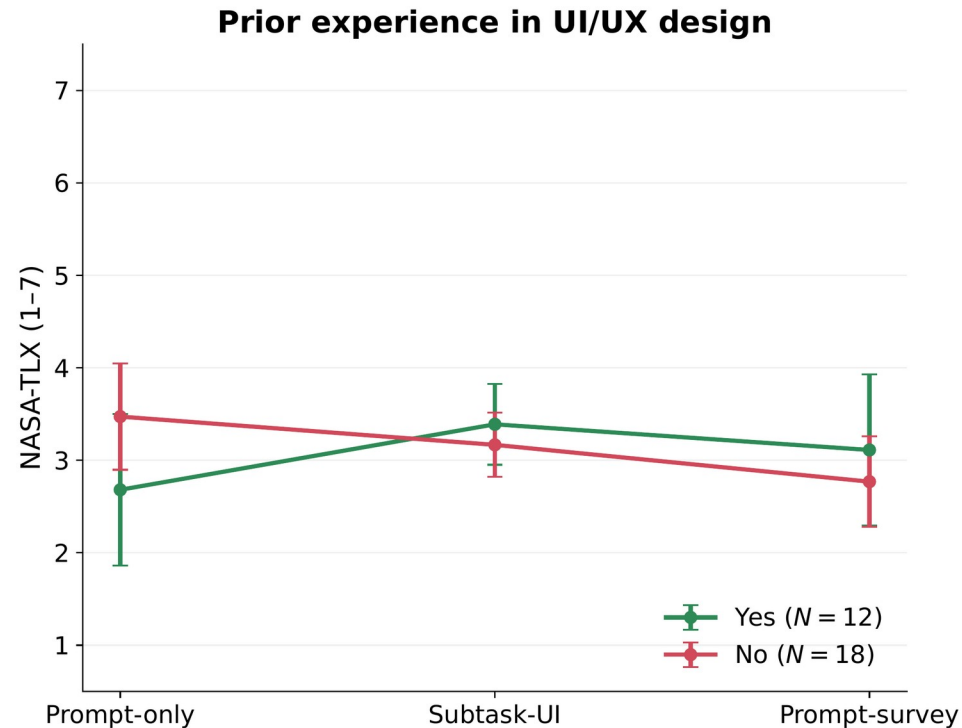
RQ2. How do users' experiences of generating a UI relate to their experiences of using it?

Impressions formed in UI generation were strongly associated with UI use

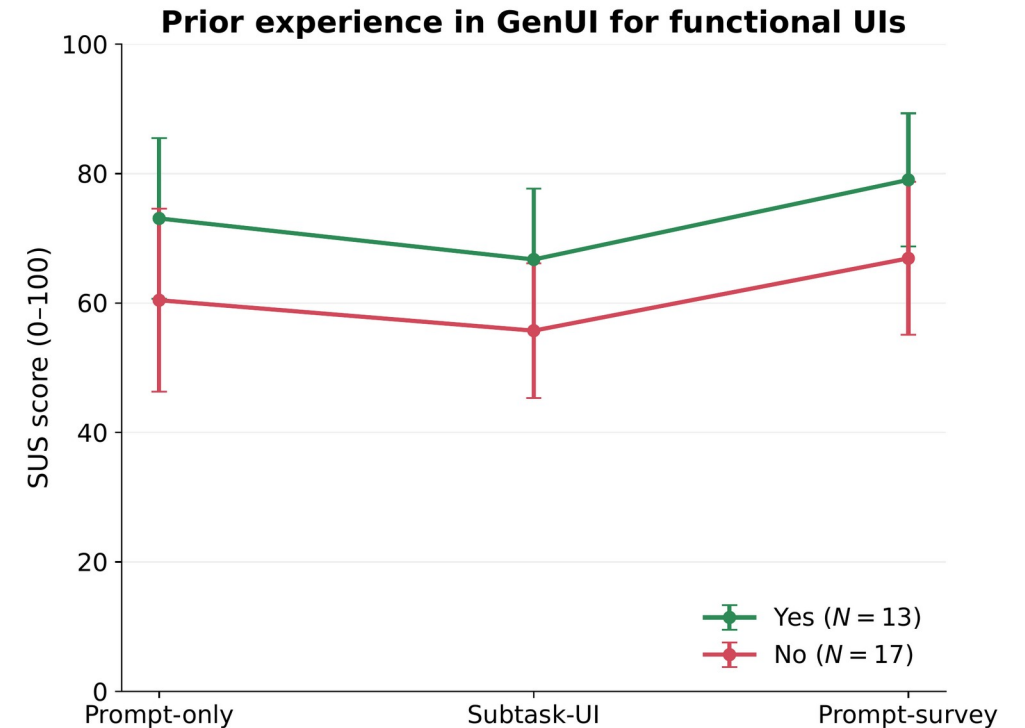


RQ3. How does users' prior experience affect their GenUI experiences?

Prior experience affected using generated UIs



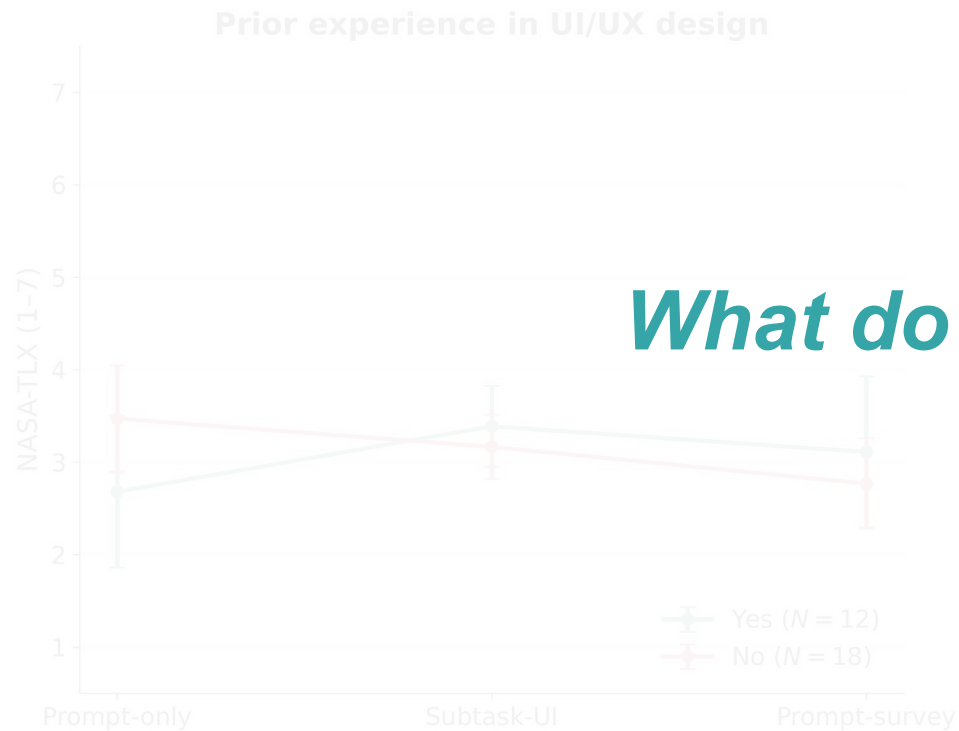
UI/UX design experience made UIs generated from prompt-only feel less demanding to us.



GenUI experience made generated UIs feel more usable overall.

RQ3. How does users' prior experience affect their GenUI experiences?

Prior experience affected using generated UIs



What do all these mean?

UI/UX design experience made UIs generated from prompt-only feel less demanding to us.

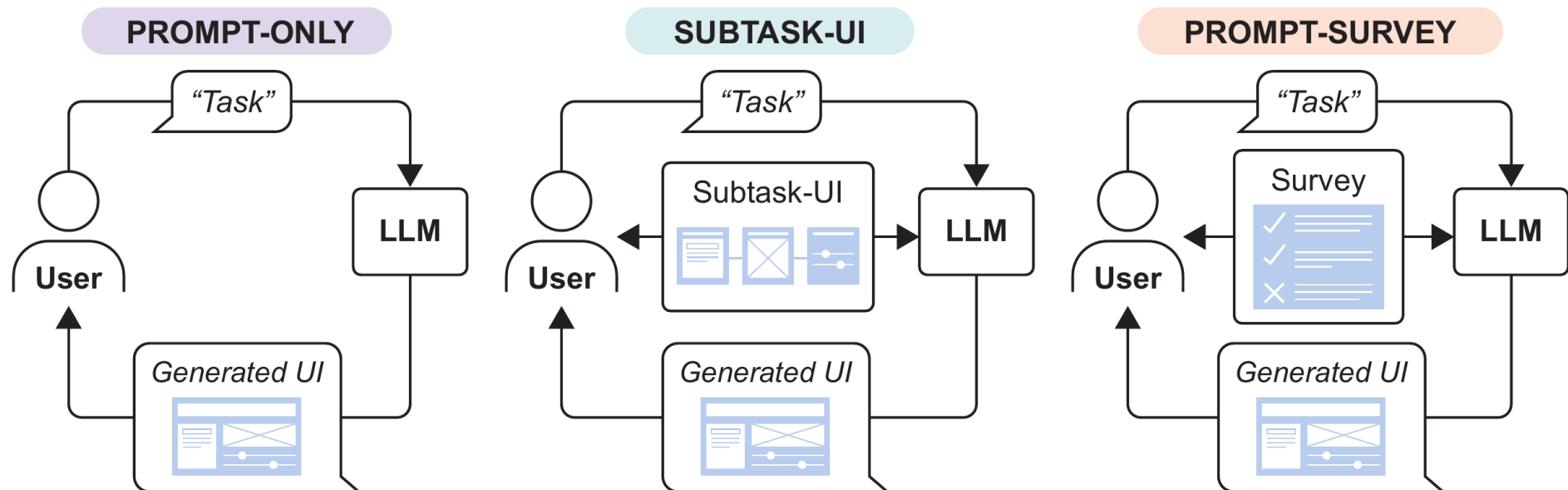


GenUI experience made generated UIs feel more usable overall.

What works for designers may not work for task-oriented users

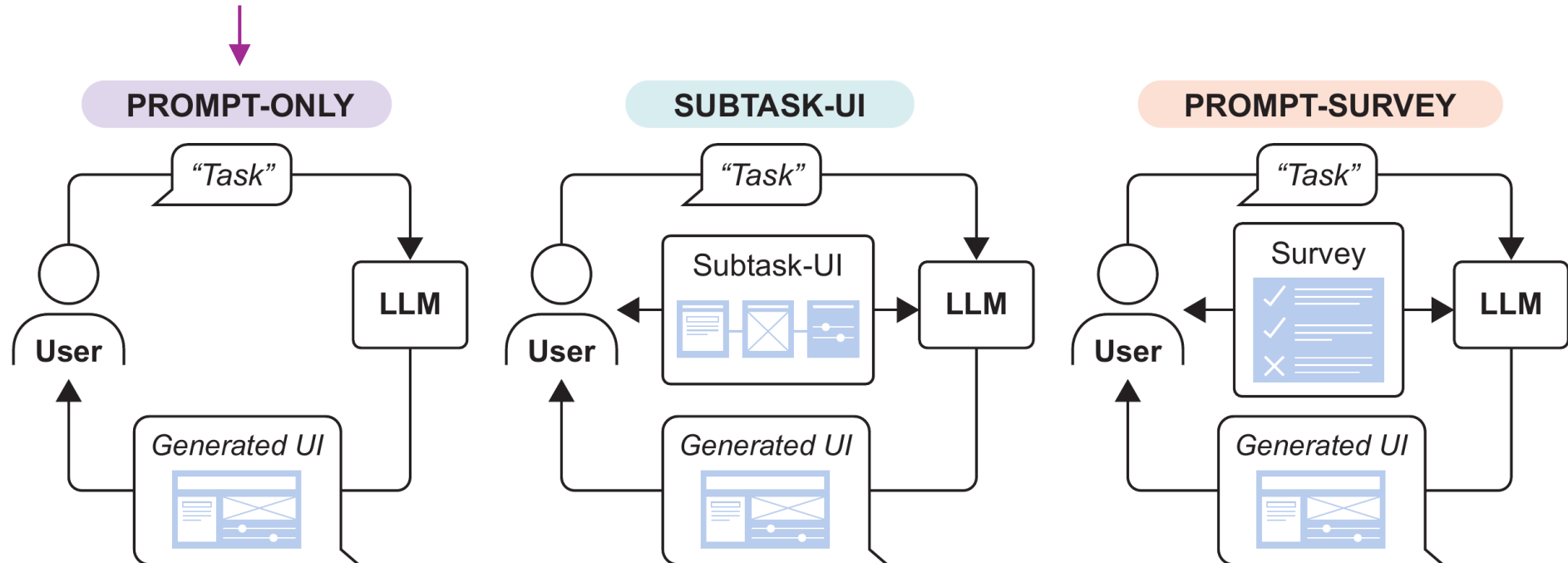
Prior work shows that editable intermediate representations are useful for designers.

We found that task-oriented users find it **burdensome despite the high level of control.**



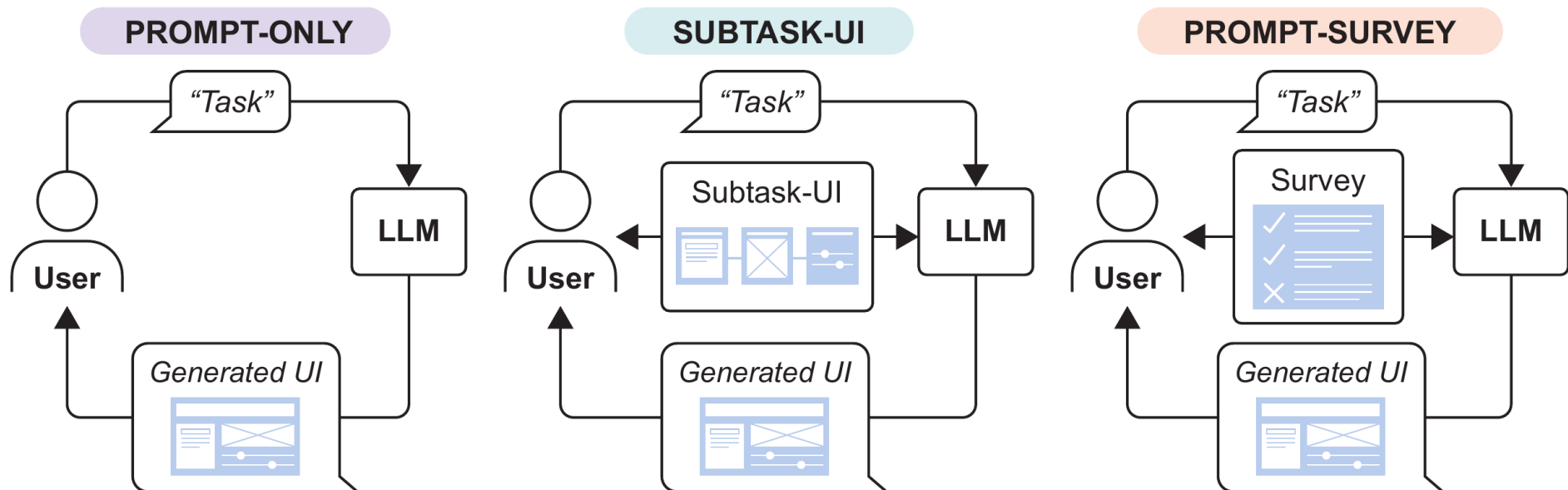
Users need help envisioning, without being made to design

P1: *"I had to type a lot. Even when I tried to write something else to improve, I **still didn't understand what I was trying to do.**"*

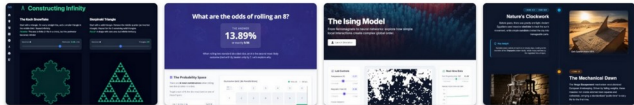
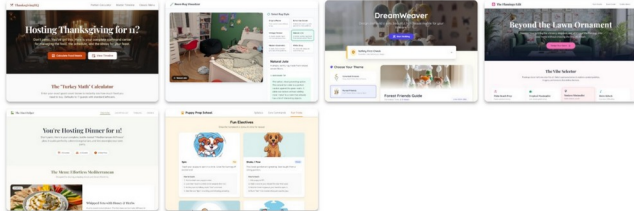


Prompt-survey works, because it helps envision and reduces articulation effort with its answers

P27: “It helped me through answering the questions from the models. **That also helped me re-evaluate my thought process, how to approach things.**”

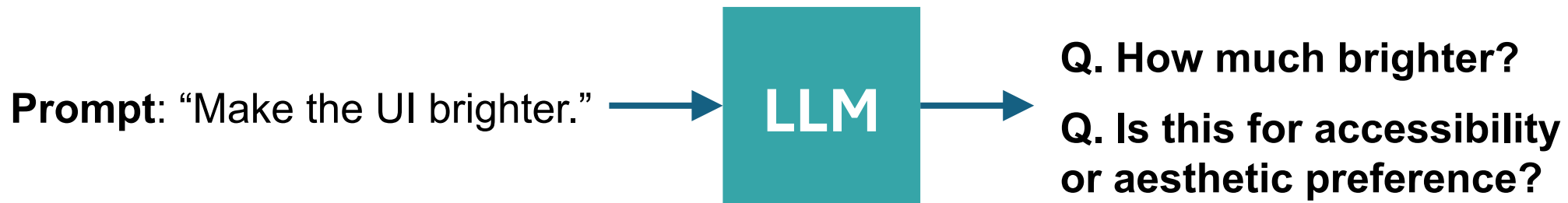


How do we move forward to achieve this future?

- # Background
- ## GenUI promises a future where **anyone** can create their own interface
- Education
- One category in which generative UI is particularly helpful is education.
- 
- Practical Tasks
- Generative UI can also be helpful for practical tasks:
- 
- No need for design literacy
 - No need for coding ability
 - Just describe what you need in natural language
- Leviathan, Yaniv, et al. "Generative UI: LLMs are effective UI generators." *arXiv preprint arXiv:2604.09577* (2026).
- 9

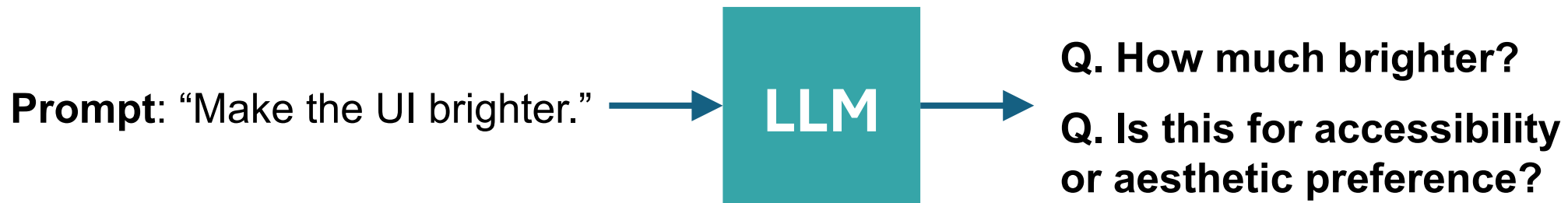
Prompt-survey can also fail

- LLMs ask questions when users just want simple edits or want to see changes and decide.
- Often, users do not understand why the LLM is asking certain questions.



Prompt-survey can also fail

- LLMs ask questions when users just want simple edits or want to see changes and decide.
- Often, users do not understand why the LLM is asking certain questions.



We still need to figure out how GenUI systems can correctly infer user intent from vague prompts.

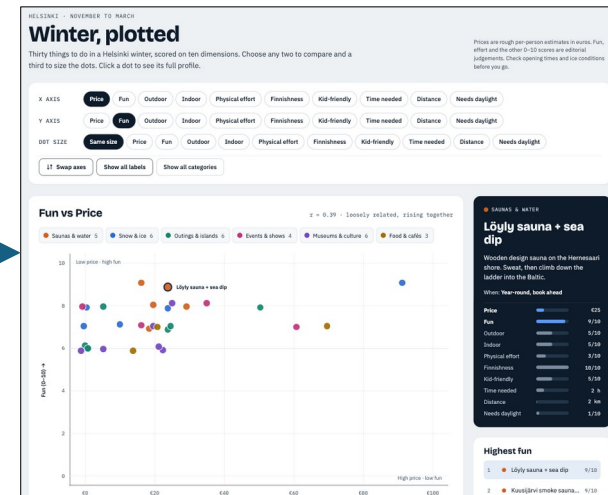
Takeaways

- a. Generative UI has potential to benefit everyday users beyond designers.
- b. What works for designers may not work for users. Their goals in design and use differ.
- c. Generative UI should help users envision what they need, without making them design.

User prompt
*"I want to explore the
winter activities more
systematically."*

LLM

Functional UI



Joongi Shin, joongishin@gmail.com

Postdoctoral Researcher, Aalto University