

STARRYSTUDIOAI

**FINAL DEMO PRESENTATION
DATA 298-B**

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AGENDA OVERVIEW

01

BACKGROUND

05

MODEL CONFIGURATION

02

PROPOSED SOLUTION

06

EVALUATION RESULTS

03

DATASET

07

MODEL ANALYSIS ON PASS@1

04

KNOWLEDGE GRAPH + RAG

08

GENERATED DESIGN RESULTS

AI Design Wizard

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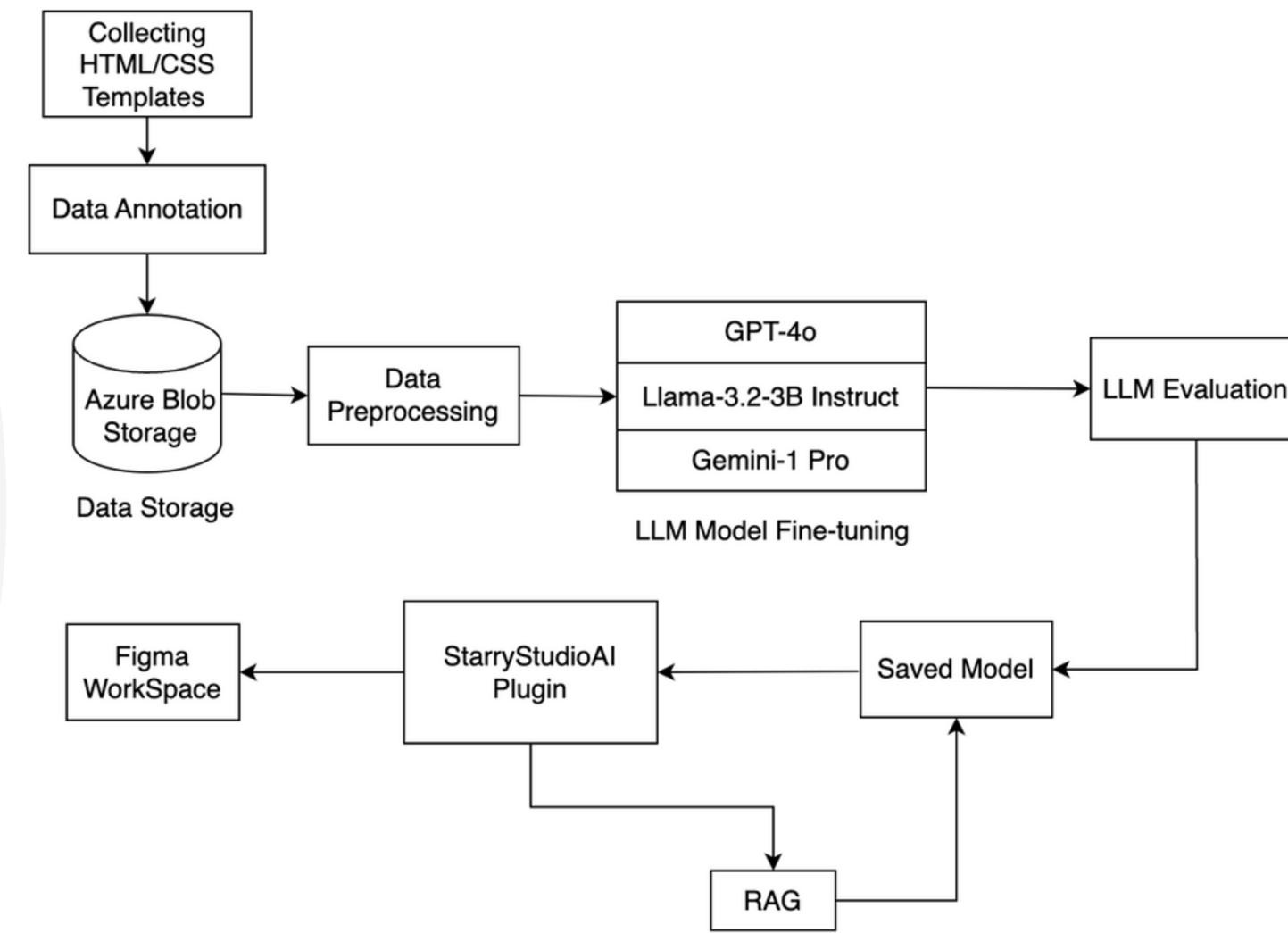
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BACKGROUND

- The designing phase is crucial for creating effective UI/UX, but teams often face challenges like limited time, expertise, and resources in producing high-quality designs efficiently.
- Automating UI design workflows, such as generating code-ready templates, minimizes effort, enhances collaboration, and accelerates the design-to-development process.
- **StarryStudioAI** is an advanced **Figma plugin** that automates high-fidelity UI designs from prompts, enhancing collaboration and streamlining workflows with LLMs, Knowledge Graph (KG) and RAG.

PROPOSED SOLUTION

- StarryStudioAI uses **RAG** and a **knowledge base** of design patterns to generate accurate, context-rich templates aligned with design standards.
- It is divided into three distinct phases, each contributing to the seamless generation of design templates:
 1. **Figma Plugin:** The plugin provides an intuitive interface, processing natural language prompts to streamline design generation for all users.
 2. **Fine-Tuned Model with RAG:** The system leverages fine-tuned LLM models (GPT-4o, Llama-3.2-3B-Instruct, Gemini-1 Pro) trained on HTML/CSS datasets, with KG and RAG enhancing output quality by retrieving relevant design patterns for contextually accurate results.
 3. **Backend Servers:** Integrated backend servers connect refined models to Figma, managing model predictions, querying KG+RAG outputs, and rendering designs directly in the workspace.



System Architecture

DATASET

```
{"messages": [{"role": "user", "content": "Create a header of a personal portfolio website with a modern, clean aesthetic. Utilize HTML for logo, navigation bar, and concise intro sections, each with distinct calls-to-action. Employ CSS to emphasize typography, color contrasts, and hover interactions, focusing on readability and intuitive layout for seamless navigation while aligning with UI/UX best practices."}, {"role": "model", "content": "

v-devstack



link



item-link



item-link1



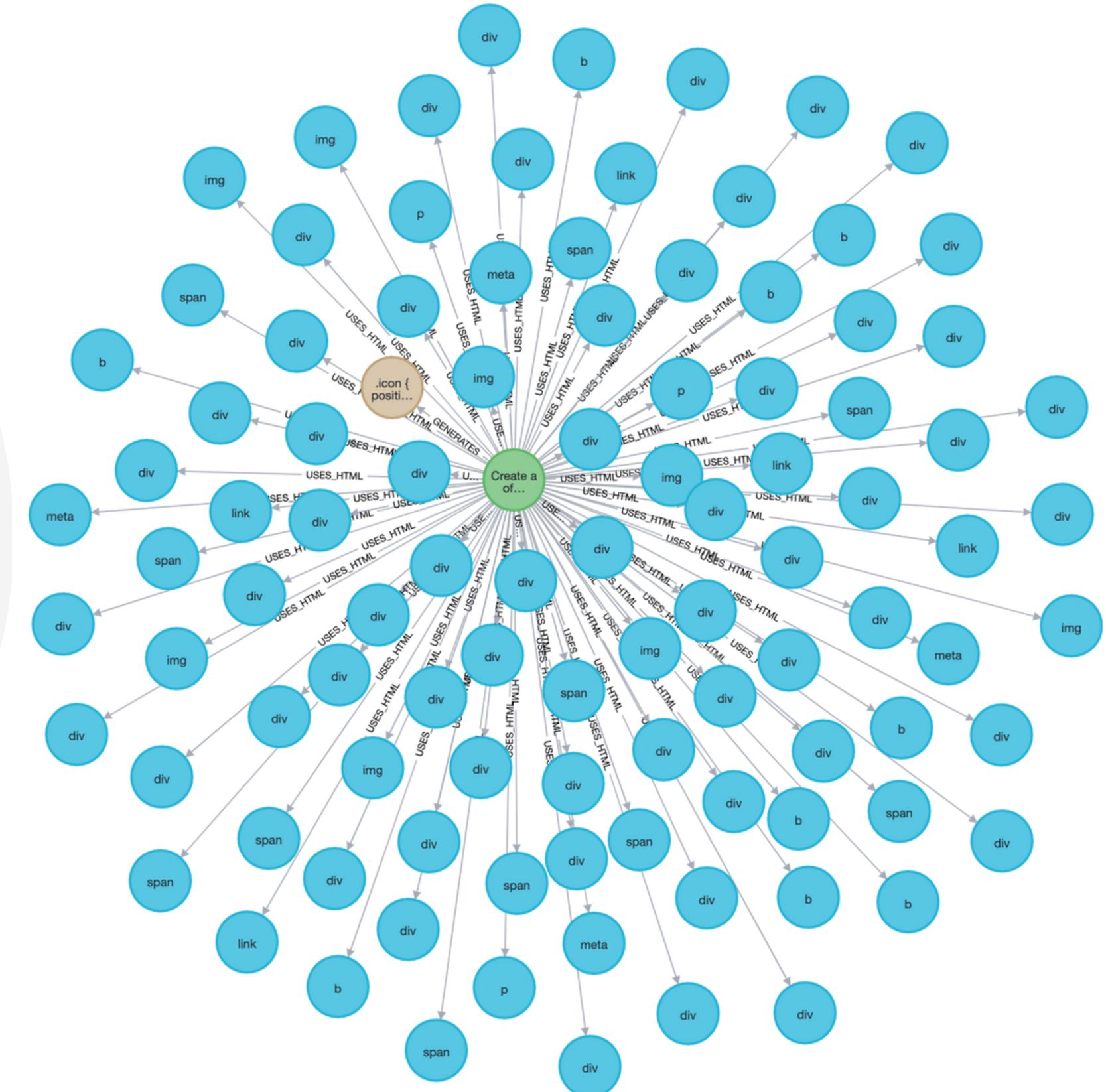
item-link2

"}}
```

- A structured dataset of **annotated design templates** (Business Portfolio and E-commerce templates) is curated using the Figma API.
 - Templates were manually organized into folders and converted to **JSON format** with role-based approach where **user role** gives text content while **model role** will generate the code.
 - The data was then **merged** into a **unified dataset** for training high-quality code generation.
 - **Prompts** emphasizing essential **UI principles** are paired with HTML/CSS data to align with web design standards.
 - **Preprocessing** **standardized** the data for model compatibility, and the finalized dataset was stored in **Azure Blob Storage** for efficient retrieval during fine-tuning GPT-4o, Llama-3.2-3B-Instruct, and Gemini-1 Pro.

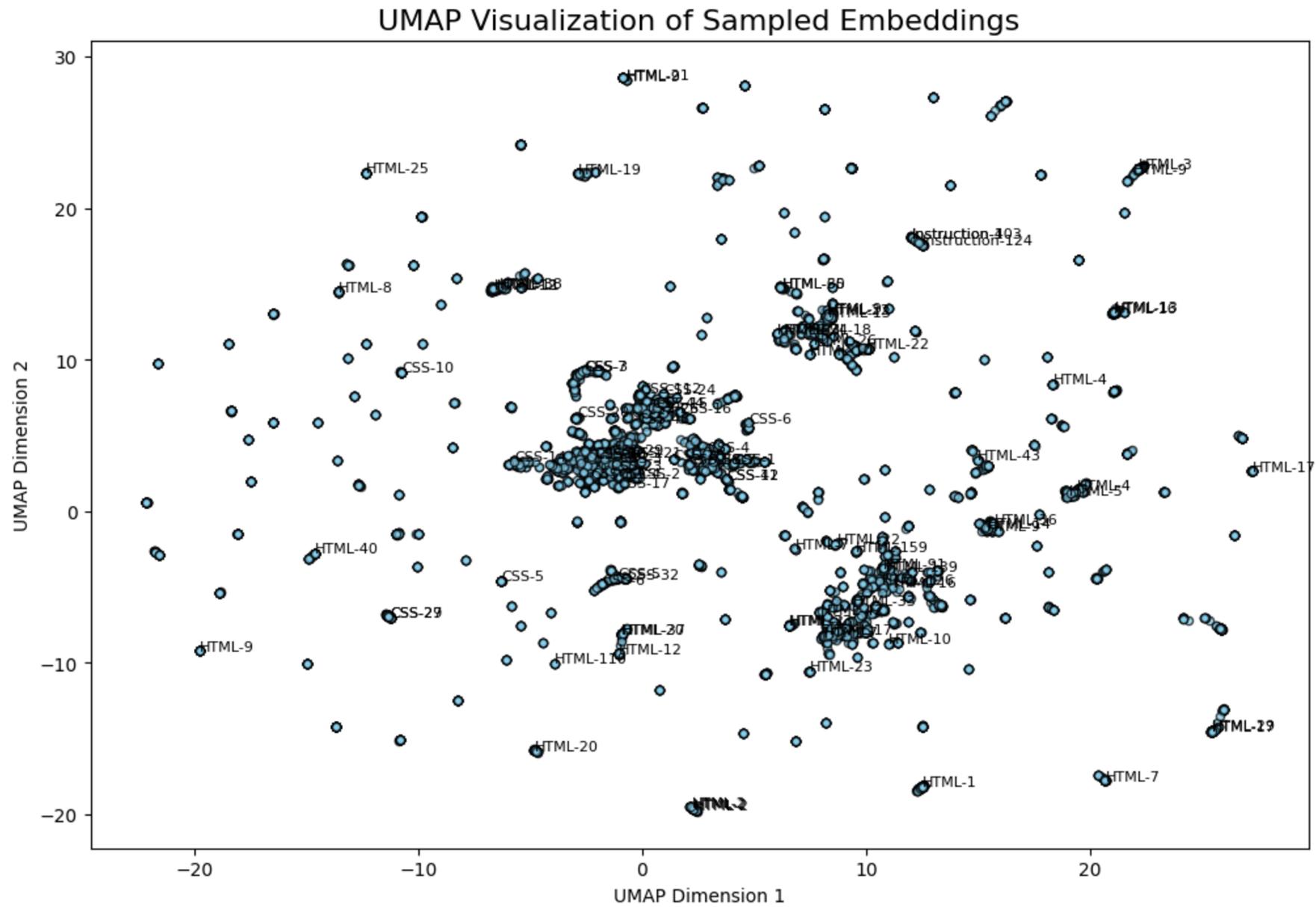
KNOWLEDGE GRAPH + RAG

- **Knowledge Graph** Representation between instruction-HTML tags- CSS properties
 - The graph visual shows an Instruction node at the center connected to multiple **HTML** and **CSS** nodes through relationships such as **USES_HTML** and **USES_CSS**.
 - It represents how an instruction is linked to various HTML and CSS components, forming a knowledge graph for retrieval and analysis.



KNOWLEDGE GRAPH + RAG

- Uniform Manifold Approximation and Projection (**UMAP**) of 384 dimensional vector database in 2D form.
- Points close to each other indicate **similar embeddings**, revealing clusters of related items that share contextual or semantic similarities, such as **similar design instructions** or **code elements**.



MODEL CONFIGURATION

1. **GPT-4o:** Pre-trained on a vast corpus of natural language and code data, it leverages **instruction fine-tuning** with **design-specific prompts** and HTML/CSS outputs, aligning its responses with UI/UX standards. Its transformer architecture is optimized for managing **hierarchical code structures** and **contextual dependencies**, making it well-suited for generating accurate and reusable code.
2. **Llama-3.2-3B-Instruct:** Fine-tuned on **design-specific data** and pre-trained HTML/CSS for **prompt responsiveness** and **reusable components**. **Advanced tokenization** ensures semantic consistency and accurate hierarchical code structures. **Mixed-precision training** optimizes resources for efficient integration into StarryStudioAI.
3. **Gemini-1 Pro:** Pre-trained on diverse datasets, uses **mixed-precision training** for memory efficiency and scalability. Its robust **multimodal processing** enhances StarryStudioAI's handling of complex design-to-code workflows. By **aligning inputs** with user specifications, it delivers high-quality outputs for diverse UI/UX needs.

EVALUATION RESULTS

To assess the performance of the models in generating HTML/CSS code aligned with user-specific prompts, a combination of quantitative and qualitative method is used, as outlined below

QUANTITATIVE EVALUATION METHOD

Quantitative evaluation method involve the selection of metrics to evaluate structural similarity, semantic relevance, syntactic robustness, and the practical usability of the generated outputs. **BLEU**, **RUBY**, **ChrF**, **BertScoreF1**, **Pass@1**, and **Pass@3** are among the metrics employed.

QUALITATIVE EVALUATION METHOD

Qualitative evaluation method involve a **Human Evaluation Survey**, conducted with 50 participants, categorised into two groups: 35 technical users and 15 non-technical users. With each user scoring their level of satisfaction with the following options after evaluating UI elements produced by StarryStudioAI, including the **Button Design**, **Navigation Bar**, **Portfolio Template**, and **E-commerce Template**.

QUANTITATIVE EVALUATION

Evaluation Metrics	LLM Models		
	Llama 3.2	GPT-4o	Gemini-1-Pro
BLEU	0.75	0.48	0.25
RUBY	0.40	0.59	0.30
ChrF	0.33	0.73	0.44
BertScore F1	0.74	0.79	0.64
Pass@1	0.00	0.33	0.16
Pass@3	0.16	0.50	0.33

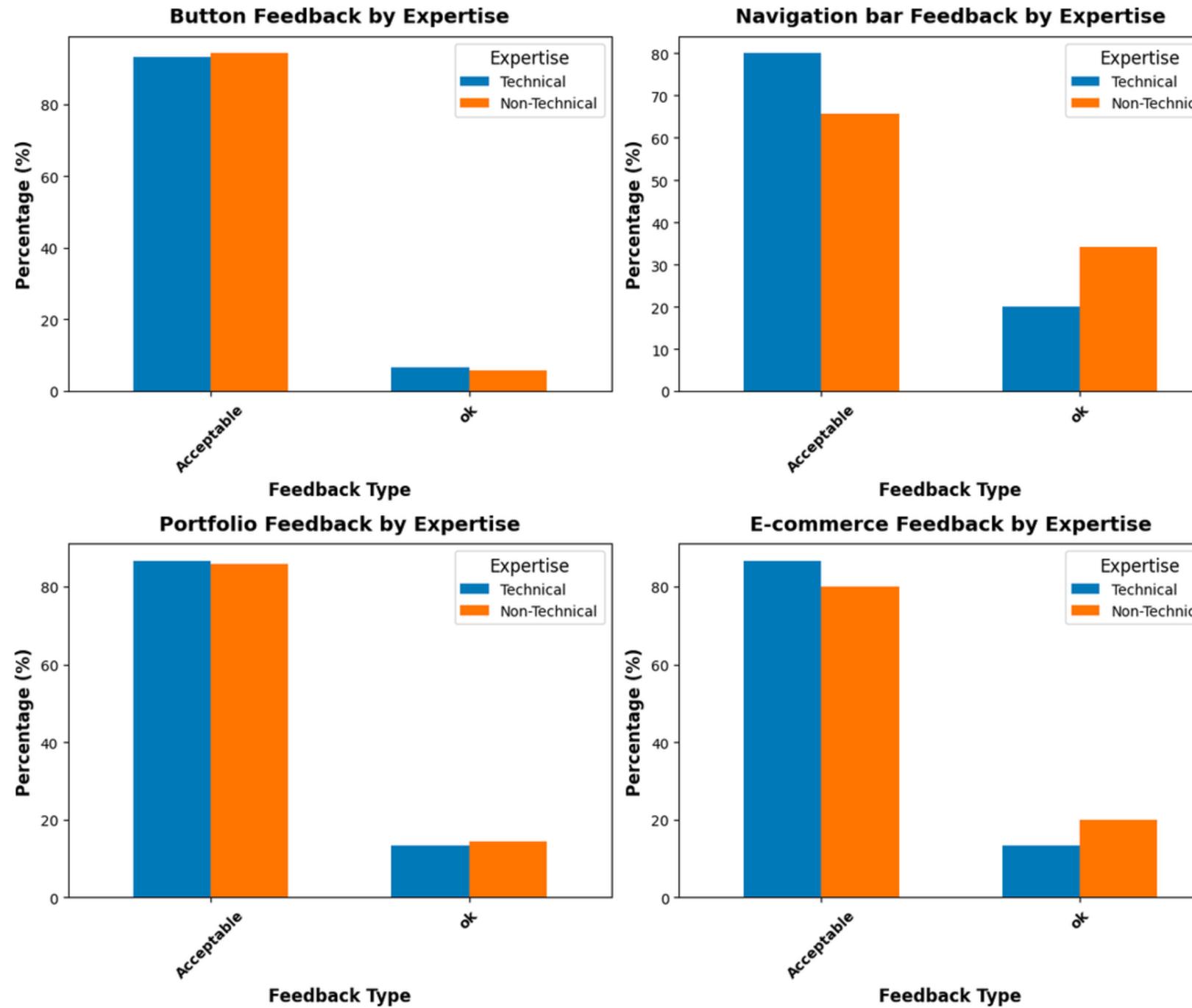
- Llama-3.2 achieves a top **BLEU** score of 0.75, indicating superior n-gram precision for structural similarity.
- **GPT-4o** leads in **RUBY** with a score of 0.59, reflecting its semantic relevance and contextual alignment.
- **GPT-4o** scores 0.73 in **ChrF**, showcasing strong character-level accuracy for syntactic robustness.
- **GPT-4o** achieves the highest **BERTScoreF1** of 0.79, highlighting exceptional semantic alignment with prompts.
- **Pass@1** and **Pass@3**: **GPT-4o** excels in usability, with scores of 0.33 and 0.50, showing efficient and accurate output generation.

QUALITATIVE EVALUATION

- High acceptability (0.93+) for **Button design** indicates minimal modification needs.
- **Navigation bar** acceptability (0.65 for technical users vs. 0.80 for non-technical users) reveals higher functionality expectations from technical users.
- **Portfolio and e-commerce templates** show strong acceptability (over 0.80) across all users, reflecting broad satisfaction.

Category	Group	Acceptable	Ok
Button	Technical	0.94	0.06
	Non-Technical	0.93	0.07
Navigation Bar	Technical	0.65	0.35
	Non-Technical	0.80	0.20
Portfolio	Technical	0.85	0.15
	Non-Technical	0.86	0.14
E-commerce	Technical	0.80	0.20
	Non-Technical	0.77	0.23

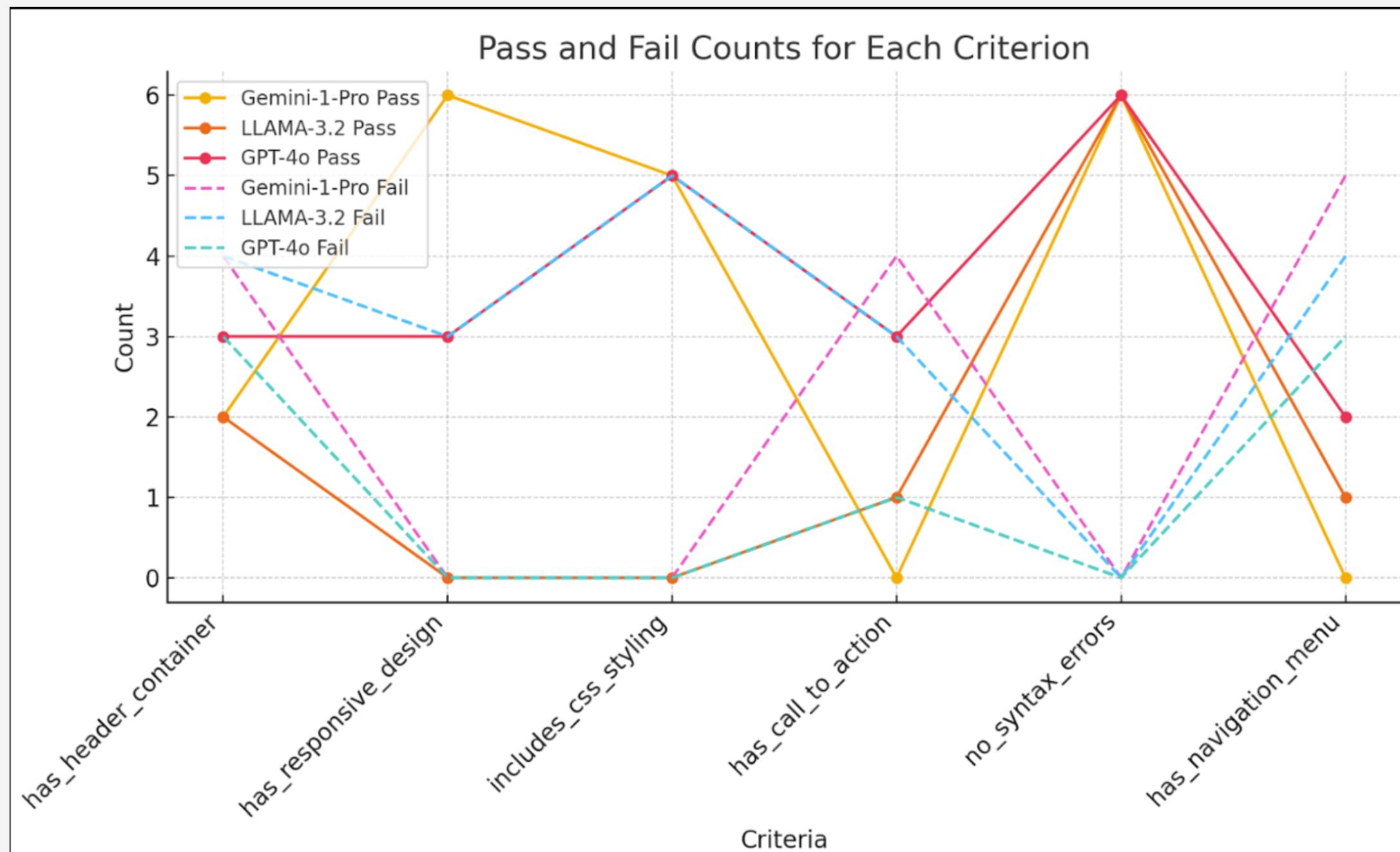
QUALITATIVE EVALUATION



- **"Acceptable" Dominates:** Over 80% of feedback across all features is "Acceptable" for both Technical and Non-Technical users.
- **Portfolio Consistency:** Portfolio feedback is nearly identical for both groups, showing strong agreement.
- **E-commerce Preference:** Technical users rate E-commerce designs slightly higher (~85% "Acceptable") compared to Non-Technical users (~80%).

MODEL ANALYSIS ON PASS@1

Pass@1 measures if a model's **first attempt** meets predefined criteria, showcasing its practicality and accuracy.



GENERATED DESIGN RESULTS

The Gourmet Spot

Home Menu Reservation Contact

Savor the Taste Of Excellence

We pride ourselves on offering fresh, delicious, and vibrant cuisine that is perfect for family meals and small gatherings

[View Menu](#)

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1

Freelance UI/UX Designer

I'm a UI/UX Designer based in Paris, France. I have a passion for creating beautiful and intuitive designs that are both functional and user-centered. I believe that good design is not only visually appealing, but also solves problems and enhances the overall user experience. I'm constantly striving to create the best possible experiences for my users and I'm always looking for new challenges to push me to grow as a designer.

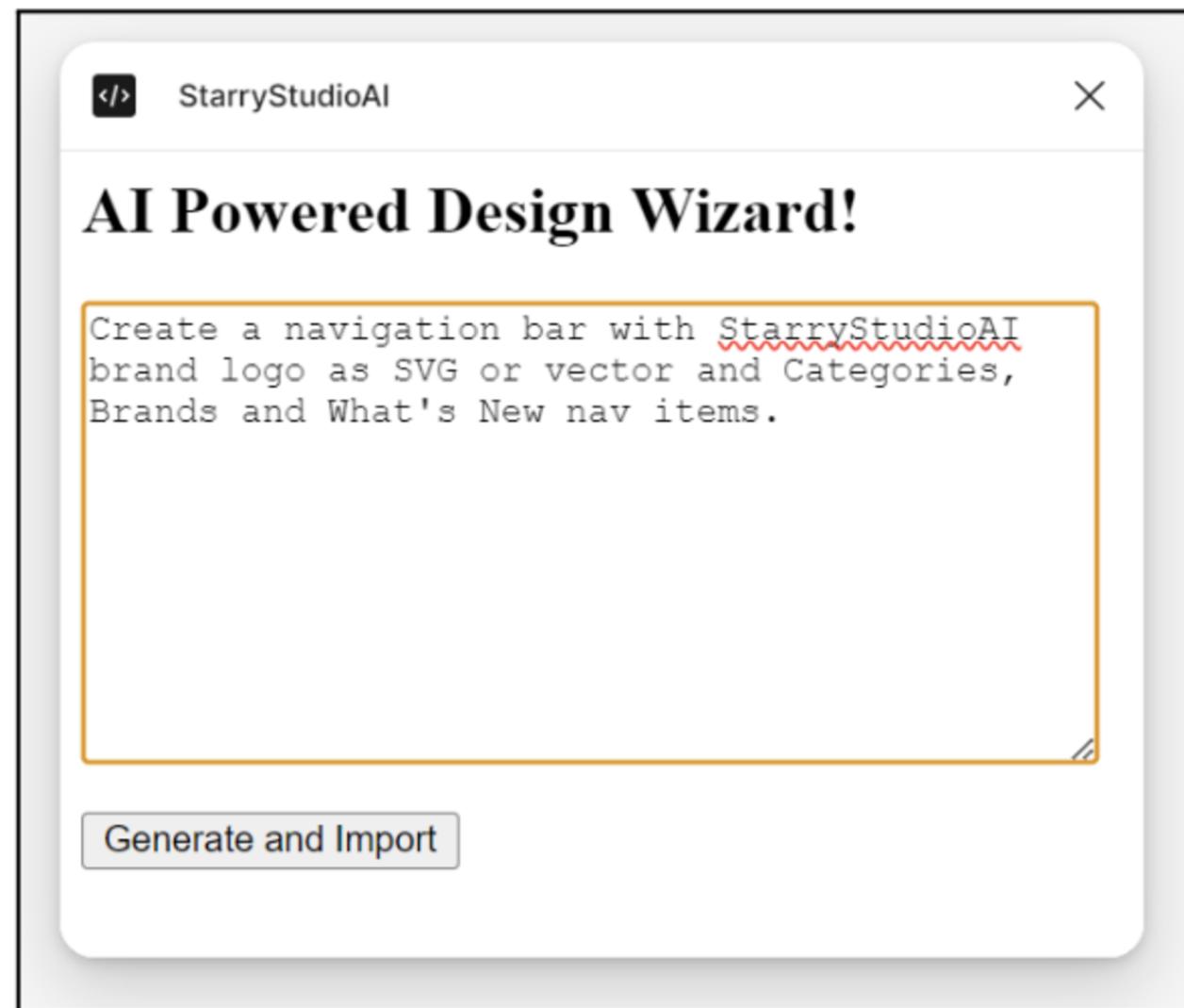
8+ years of experience

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LIVE DEMO



THANK YOU!