IDC School of Design अभिकल्प विद्यालय

IIT Bombay

Designing an AI-Enabled Automation Tool for Doctors

Submitted in partial fulfilment of the requirements of the degree of Masters of Design

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Approval Sheet

Interaction Design Project 3 titled “Designing an AI-Enabled Automation Tool for Doctors” by Sparsh Gupta (Roll number 22M2252) is approved for partial fulfillments of the requirements for the degree of “Masters in Design” in Interaction Design at Industrial Design Center, Indian Institute of Technology, Bombay.

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Declaration

I declare that this written document represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/ source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Lastly, I dedicate this project to my beloved "Nana," who I lost this year. His wisdom and lessons about life have been a guiding light, and this work is a tribute to his enduring influence on me.

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Designing an AI-Enabled Automation Tool for Doctors

Sparsh Gupta, Prof. Jayesh Pillai

Abstract

This project explores the development of an AI-driven smart assistant for healthcare professionals, focusing on building trust and transparency in AI-powered tools. Through primary research involving interviews with doctors and observation of hospital workflows, key challenges and opportunities were identified. The research highlighted the need for a doctor-centric approach that prioritizes explainability and user control, while emphasizing the AI's role as a collaborative assistant rather than a replacement for human expertise. The project aims to create a desktop application that streamlines workflows, enhances clinical decision-making, and fosters trust through transparent AI interactions and customizable features. By addressing the "black box" problem and empowering doctors with control over their AI-powered tools, this project strives to contribute to the responsible and effective integration of AI in healthcare.

Keywords: Artificial Intelligence (AI), Healthcare, Medical Professionals, Automation, Workflows, Decision Support, Explainable AI (XAI), User Experience (UX), Trust, Transparency

Introduction

The objective of this project is to develop an AI-driven automation tool that serves as a smart assistant for healthcare professionals. Designed to offer support by adapting to various workflows and capabilities, it improves the quality of clinical judgments and simplifies administrative duties. Emphasising trust, transparency, and a design focused on the needs of doctors, this initiative is undertaken in collaboration with KOITA Lab for Digital Health at IIT Bombay. In the process, we delve into understanding trust within the context of AI systems, aligning our efforts with key design values: Trust, Transparency, Explainability, Accountability, and a Doctor-Centric approach. Our primary aim is to deliver value through Automation, enhanced clinical decision-making, and the streamlining of administrative and medical tasks. The final deliverable of this project is a user-friendly desktop interface, designed with these principles at its core.

Project Positioning

As a design student, the motivation to embark on this project stems from a deep fascination with the evolving landscape of AI and its potential impact on

user experience (UX). I am particularly drawn to the challenge of building trust in AI-driven tools, especially given the "black box" nature of many algorithms. This project presents a unique opportunity to explore how UX and interaction design can foster transparency and user confidence in AI systems. Additionally, the workflow creation aspect of the project aligns with my interest in gamification. I see potential in applying gamification principles to enhance user engagement and motivation when designing and executing automated workflows. By addressing these interconnected aspects of design, AI, and gamification, I aim to gain valuable insights and contribute to the development of more effective and user-centered AI-powered tools.

The project aims to develop a desktop application for medical professionals (doctors, lab personnel, nurses) that streamlines workflows and enhances clinical decision-making. The project will focus on:

Core Features

Automated Workflow Creation & Customization: Empower users to build and tailor workflows to their specific needs.

AI Skill Creation & Training: Enable the development and training of AI models that can be integrated into workflows.

AI-Powered Interactions: Facilitate seamless interactions with AI tools for specific use cases, such as tuberculosis detection through X-ray analysis.

Voice & Text Input Processing: Offer flexible input options for user convenience.

Workflow & Skill Library Management: Provide a centralised repository for organizing and accessing workflows and AI skills.

Value Proposition

Automation: Reduce manual effort and streamline repetitive tasks.

Enhanced Clinical Decision-Making: Leverage AI to provide data-driven insights and recommendations.

Streamlined Workflows: Optimize processes to improve efficiency and accuracy in healthcare delivery.

Design Values

Trust: Prioritize accuracy, reliability, and explainability to foster user confidence in the AI system.

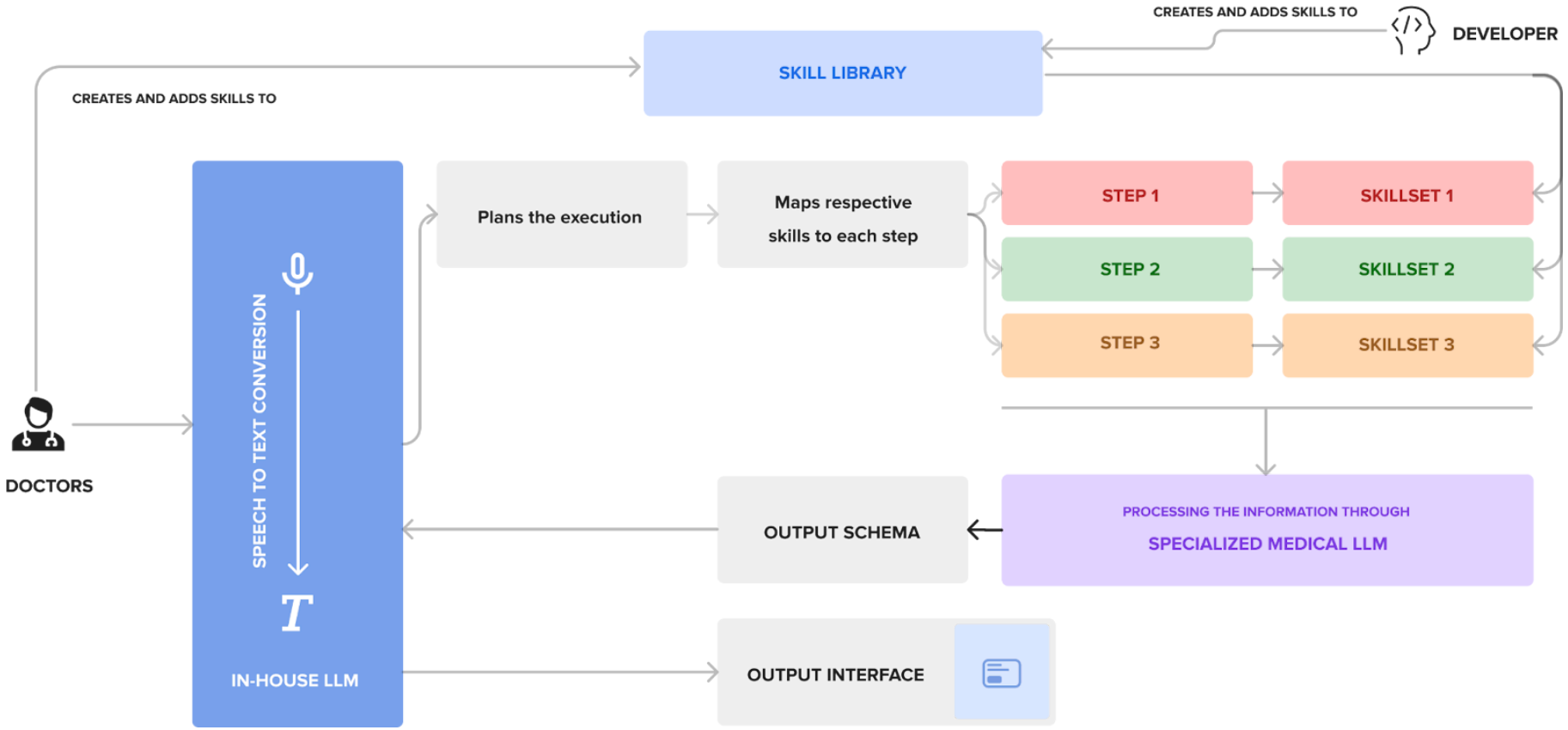
Transparency: Make AI decision-making processes clear and understandable.

Doctor-Centric: Tailor the interface and functionality to meet the unique needs of healthcare professionals.

Deliverables

Functional Desktop Application Interface: A user-friendly desktop interface that integrates all core features and adheres to the design values.

Background



This project is done as a collaborative effort with KCDH, IIT Bombay, who are making steady efforts in creating innovative AI tools. The intent of this project is to create an AI enabled automation platform for medical professionals. Which is based on their specialised medical LLM.

This LLM is capable of synthesising Audio and text based prompts to break them down into actionable steps. These actionable steps are mapped to relevant AI skills (from the open sourced skill library). The output then gets synthesised into a schema of which a report can be generated. The intent of the platform is not to replace the medical proficiency of doctors, but to act as a copilot in their daily work life.

Secondary Research

Artificial Intelligence

Artificial Intelligence (AI) refers to the ability of computer systems to perform tasks that typically require it to mimic human intelligence. John McCarthy, one of the founding fathers of AI, defined it as "the science and engineering of making intelligent machines."

AI encompasses a broad range of techniques and approaches, including:

Machine Learning (ML): Which revolves around finding patterns and predicting outcomes.

Natural Language Processing (NLP): Which is to understand and communicate with the user in a humane way.

Computer Vision: Which revolves around understanding and mutating visual content like images and videos.

Robotics: Manipulation of physical objects in accordance with stimuli and logic.

AI is rapidly evolving and has the potential to be adapted to many industries. Artificial intelligence (AI) can be conceptualized through two distinct yet complementary lenses:

Acting Humanly (The Turing Test Approach): This approach emphasizes creating AI systems that can convincingly simulate human behaviour. The Turing Test, proposed by Alan Turing in 1950, serves as a benchmark for this perspective. A machine passes the test if a human evaluator cannot reliably distinguish it from another human in a text-based conversation. This approach is valuable for applications like chatbots, virtual assistants, and creative fields where human-like interaction is paramount.

Thinking Rationally (The Rational Agent Approach): This approach prioritizes developing AI systems that make logical decisions to achieve specific goals. It's grounded in the idea that intelligent agents should perceive their environment, reason about it, and choose actions that maximize their chances of success. Formal logic and decision theory often underpin this approach, aiming to create systems that act optimally in various situations. This approach is crucial for tasks demanding logical reasoning, decision-making, and optimization, such as medical diagnosis, financial analysis, and autonomous vehicles.

Where do we apply AI?

Artificial Intelligence (AI) has transformative potential across various domains, but its application requires careful consideration. We (the users) and our system have their separate intelligence. But when using the system, we together become a part of a "collective intelligence". This collective intelligence is most often acting as a team, marching toward an objective. Hence, there would be some division of tasks among the two (or multiple) parties. You, a human (most likely, at least for now), and a system (a machine), both specialize in certain tasks, and the goal is to complement each other and cover up for each other's limitations. “Human and machines are symbiotic partners that help and improve each other”

Where are the strengths of a machine and a human?

Machines	**Humans**
No fatigue	Identifying nuances in what otherwise is ambiguous
Can perform routine and redundant tasks faster than humans	Decision making
Instant exchange of information	Making ethical choices

Roles of an AI

In this synergistic partnership, AI can inhabit different roles in relation to the human counterpart. These can be:

AI as a tool: Gives the user most amount of control
AI as an assistant: Responds to user request and are pro-active at the same time
AI as a peer: Is capable of executing independent functions on consent
AI as a manager: Organises your tasks for maximum

Problems with current AI systems

While Artificial Intelligence (AI) has made significant strides in recent years, current systems still face a number of challenges and limitations that hinder their widespread adoption and effectiveness:

Lack of Explainability (The "Black Box" Problem): Many AI models, especially deep learning models, are opaque in their decision-making processes. It's often difficult to understand why a model arrived at a particular output, which raises concerns about trust, accountability, and bias. This lack of transparency can be particularly problematic in high-stakes domains like healthcare, finance, and criminal justice.

Bias and Fairness: AI systems can perpetuate and even amplify existing biases in the data they are trained on. This can lead to discriminatory outcomes, especially for marginalized groups. Ensuring fairness and mitigating bias in AI algorithms is a critical challenge.

Data Dependency: AI models often require large amounts of high-quality data to train effectively. Obtaining, cleaning, and labeling data can be expensive and time-consuming. Additionally, if the training data is not representative of the real world, the AI system may not generalize well to new situations.

Robustness and Generalization: AI systems can struggle to handle situations that fall outside of their training data. They may be brittle and fail unexpectedly when faced with new or unusual inputs. Improving the robustness and generalization capabilities of AI is an ongoing area of research.

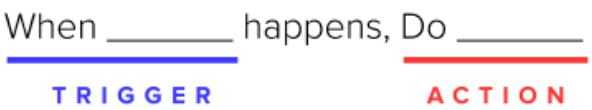
Safety and Security: As AI systems become more integrated into critical infrastructure and decision-making processes, their safety and security become paramount. Adversarial attacks, where malicious actors manipulate AI inputs to produce desired outcomes, are a growing concern.

Ethical Concerns: The use of AI raises ethical questions regarding privacy, autonomy, and the potential for misuse. For example, the use of facial recognition technology for surveillance has sparked debates about privacy and civil liberties.

Automation

Automation involves the use of technology to perform tasks with minimal human intervention. It relies on pre-defined rules and instructions to execute repetitive, predictable processes. Automation excels at improving efficiency, reducing human error, and handling large volumes of data.
AI, a subset of automation, involves creating systems that can mimic human cognitive functions such as learning, reasoning, problem-solving, perception, and decision-making. AI systems can adapt to new information, identify patterns in data, and improve their performance over time.

Structurally, automation workflows can be broken down to 2 key components. A trigger which is a stimuli by the user or any other touchpoint of the ecosystem and an action, which is performed by the system on receiving that stimuli.



Difference between AI and Automation

Features	Automation	Artificial Intelligence
Decision Making	Follows pre-defined rules	Learns from data and makes independent decisions
Adaptability	Limited to pre-programmed scenarios	Can adapt to new situations and data
Task Complexity	Handles repetitive and predictable tasks	Tackles complex and unstructured problems
Human Interaction	Minimal, focused on task execution	Can involve collaboration and learning from humans

AI and Automation in healthcare

The adoption of Artificial Intelligence (AI) in the medical field is gradually gaining momentum, spurred by its potential to revolutionize various aspects of healthcare. From diagnostic assistance and personalized treatment plans to drug discovery and administrative efficiency, AI offers promising solutions to long-standing challenges. However, the widespread integration of AI faces hurdles, including concerns regarding data quality and availability, potential biases in algorithms, and the need for transparent, explainable AI systems that foster trust among healthcare professionals. Addressing these challenges is crucial to ensure the ethical and effective adoption of AI in medicine, ultimately leading to improved patient outcomes and a more efficient healthcare system.

What can AI's role be in this space?

Diagnosis and Treatment:

Image Analysis: AI algorithms excel at analyzing medical images like X-rays, CT scans, MRIs, and ultrasounds to detect abnormalities, tumours, or other signs of disease.

Risk Prediction: AI models can analyze patient data (e.g., medical history, genetic information, lifestyle factors) to predict the likelihood of developing certain diseases or complications.

Treatment Recommendation: AI can assist clinicians in choosing the most appropriate treatment options based on patient data and evidence-based guidelines.

Personalized Medicine: AI can tailor treatment plans to individual patients, taking into account their unique characteristics and genetic profiles.

Administrative Tasks:

Claims Processing: AI can automate insurance claims processing, reducing errors and speeding up reimbursement.

Appointment Scheduling: AI-powered chatbots can interact with patients to schedule appointments, reducing the workload for administrative staff.

Medical Transcription: AI can convert spoken language from consultations or dictations into written medical records.

Research and Development:

Drug Discovery: AI can analyze large datasets to identify potential drug targets and predict the effectiveness of new compounds, accelerating the drug discovery process.

Clinical Trials: AI can help optimize clinical trial design and recruitment, leading to faster and more efficient trials.

Literature Review: AI-powered tools can analyze vast amounts of medical literature to identify relevant studies and extract key findings.

What can Automation's role be in this space?

Patient Engagement:

Appointment Reminders: Automated systems can send reminders to patients about upcoming appointments via SMS, email, or phone calls.

Medication Adherence: Automated reminders can encourage patients to take their medications on time.

Operational Efficiency:

Inventory Management: Automated systems can track medical supplies, predict demand, and reorder stock to prevent shortages.

Patient Flow Management: Automation can optimize patient flow within hospitals and clinics, reducing wait times and improving resource utilization.

Data Management: Data Extraction and Integration: Automation can extract relevant information from electronic health records (EHRs) and other data sources, integrating it into a unified view for analysis.

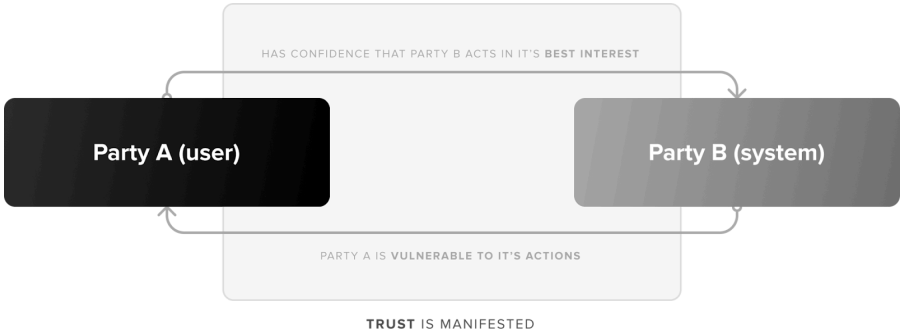
Data Cleaning and Standardization: Automated processes can identify and correct errors in medical data, ensuring data quality for research and clinical decision-making.

Trust in context of AI

Trust is essentially the belief or confidence that a user places in a system to act or perform in a manner that aligns with the user's expectations or the specified contract. It involves the user accepting some level of vulnerability, with the expectation that the AI system will behave as anticipated, especially in the presence of uncertainty.

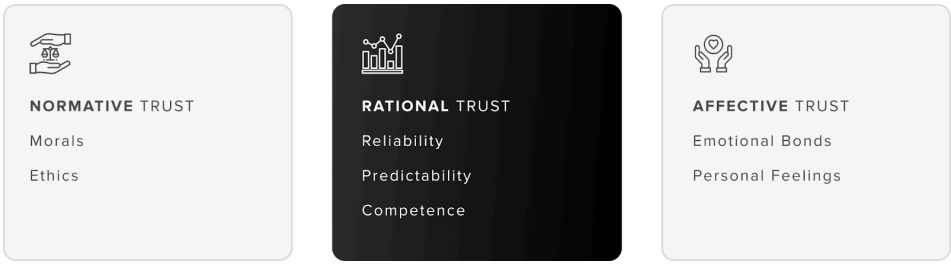
Between 2 subjects (A & B), if Subject A believes that Subject B will act in its best interest and is vulnerable to any actions that Subject B takes or suggests, we can say that Subject A trusts Subject B.

Failure of any stage in this establishment of trust is termed as “Distrust” between the two subjects.



How is trust established?

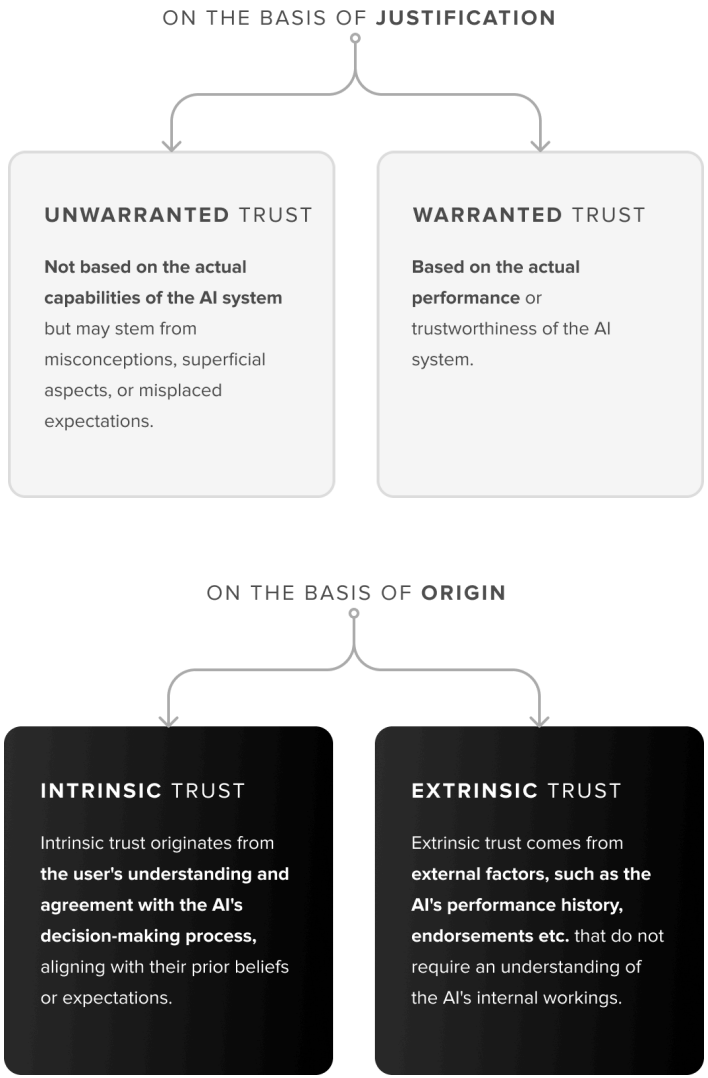
Trust is classified into the three categories—normative, affective, and rational—based on the underlying basis or foundation upon which the trust is established.



AI is considered suitable for rational trust because it involves reliance on the system's reliability, predictability, and known capabilities. However, AI is not suitable for normative and affective trust. Hence AI is advocated to be termed as “reliable” rather than “trustworthy”.

Types of trust

Trust can be classified into following types on the basis of their origin:



What is Distrust

In the context of AI, distrust refers to the skepticism, apprehension, or lack of confidence that individuals or groups may have towards AI systems and their outputs.

Sources of Distrust

Lack of Transparency (In reference to the "Black Box Problem"): The opacity of many AI algorithms, especially deep learning models, makes it difficult for users to understand how decisions are made, leading to skepticism and concerns about potential biases or errors.

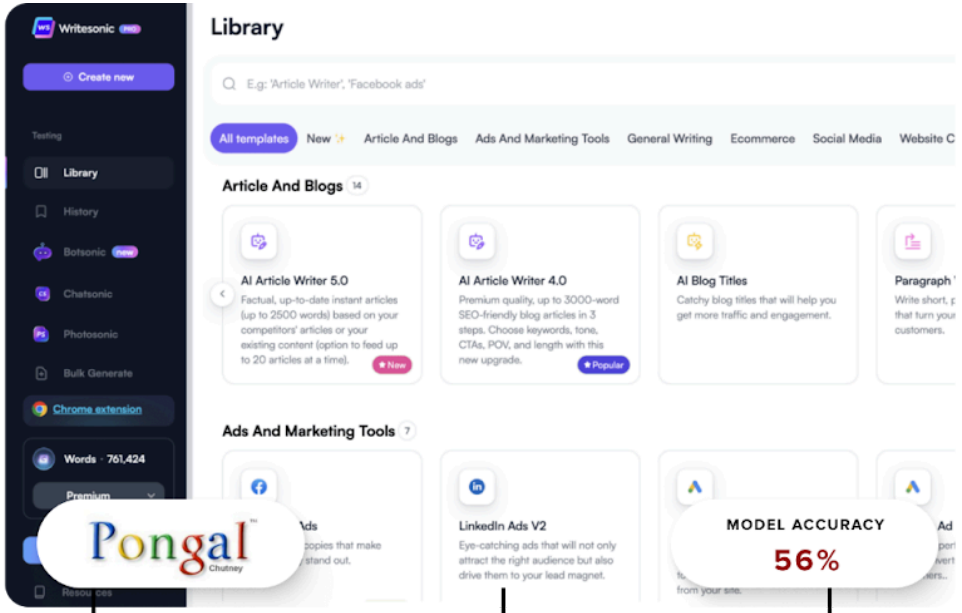
Performance Concerns: Instances of AI errors or failures, especially in high-stakes domains like healthcare or finance, can erode trust and raise questions about the reliability and safety of AI systems.

Misaligned Interests: When the goals of AI developers or deployers do not align with the interests of those affected by the technology, it can lead to distrust.

Data Privacy and Security: Concerns about how AI systems collect, use, and protect personal data can contribute to distrust.

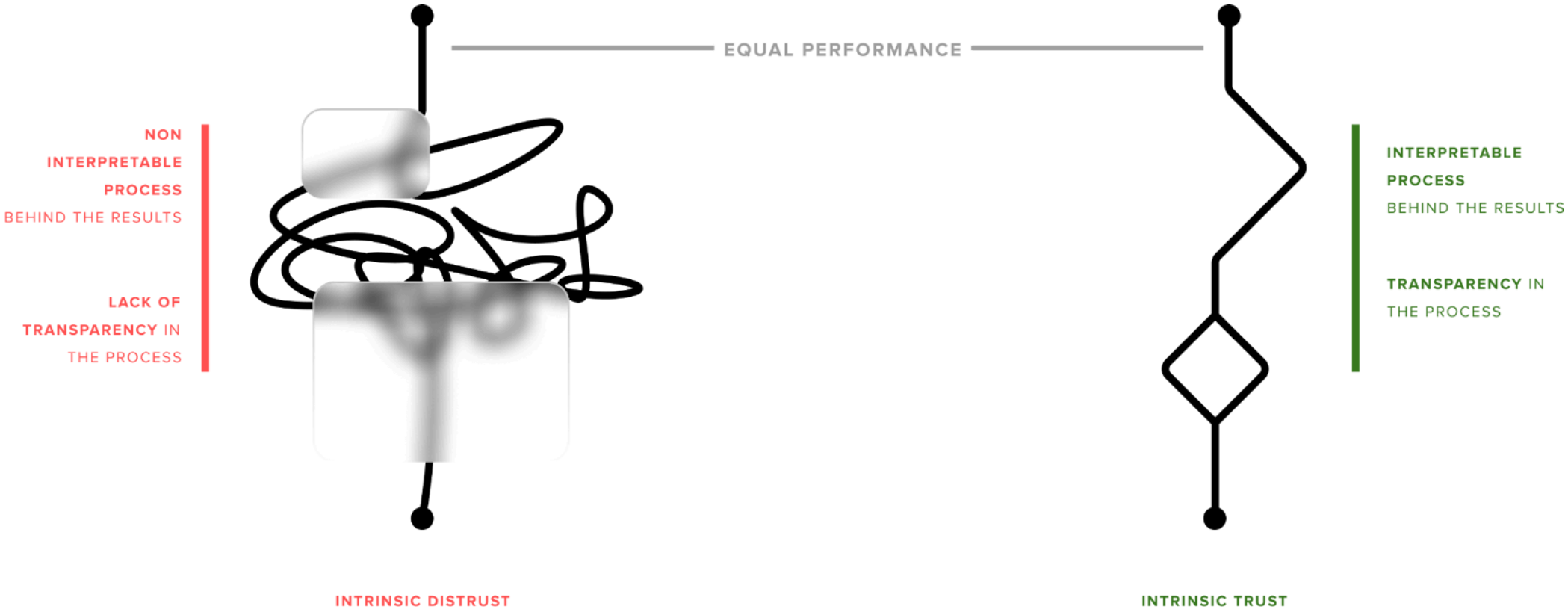
Lack of Control: When users feel they have limited control over AI systems or their outputs, it can lead to feelings of disempowerment and distrust.

Examples of warranted and unwarranted trust/distrust



A user might initially avoid a system from a lesser-known company with an outdated interface due to unwarranted distrust. However, if they give it a chance and discover its superior accuracy, they may develop extrinsic trust and hence warranted trust in the platform. The user will be retained.

Similarly, a user might be attracted to a system from a reputed company with a sleek interface due to unwarranted trust. But continued usage of the platform will reveal its inferior performance, developing extrinsic distrust and hence warranted distrust in the system



Considering the performance of the systems is the same, if the decision making process is opaque and non comprehensible to the user, i.e. the user is not able to anticipate the outcome of the system, it will cause an intrinsic distrust in the relationship between the user and the system.

While, if the decision making process is transparent and easily comprehensible to the user, i.e. the user is able to anticipate the outcome of the system, it will cause an intrinsic trust to build in the relationship between the user and the system.

Goals while designing for trust

To sum up in simple terms

Warranted trust: Trust which is backed up by method. (Performance indexes, Accuracy etc.)

Unwarranted trust: Blind faith in the system due to superficial factors (like appearance of the platform, branding, company reputation)

Intrinsic trust: Trusting a system because it's transparent in its decision making process.

Extrinsic trust: Trusting a system because it has often been right or accurate.

While having unwarranted trust in a system can attract users to a system for a short period of time (or just initially). Prolonged usage of the system will reveal methodological specificities to the users. **Hence it is warranted trust of the user on the platform which will motivate them to use the system.**

Intrinsic and extrinsic trusts are some mechanisms which become the ingredients to build warranted trust. While **extrinsic trust will be built on the basis of the methodological indexes like usage and accuracy,** we need to be transparent about it while designing the system. This is also a way to build normative trust (Refer Trust in context of AI) in the system.

Intrinsic trust is built on the user's ability to anticipate the AI's impact, that is it's not just about the outcome of the system, the **process by which the system arrived at the outcome should be transparent and understandable by the user.**

Explainable AI (XAI)

XAI [Explainable Artificial Intelligence] are AI systems designed in a way where users can understand and trust the results and outputs the system produces. The goal of XAI systems is to be transparent and interpretable. A good XAI system provides insights on how the system made a decision.

The key motivation of an Explainable AI is:
1- To increase the trustworthiness of an AI (Refer Trust in context of AI)
2- To increase the trust of the user in a trustworthy AI.
3- To increase the distrust of the user in a non-trustworthy AI.

How do we design for trust

Throughout the literature review that I did, I was able to generalize design intervention to elicitate trust into 2 broad categories:

1- Explainability

2- Control

Primary Research

Study 1: User Interviews

The first phase of primary research involved me getting in touch with currently practising doctors. For this the first step was to develop a protocol, through which we can gain insights into what their daily work life looks like while also gaining insights into their views on AI in their field.

Developing the protocol

A necessary step was to interview doctors with a non-solution oriented lens. My pilot study was more solution based (Questions based on what their views were on the proposed system), because of which I got hypothetical yes's and no's as answers. But this time focus was laid on nuances of their daily work lives and their perception about AI and automation in this context.

The book "The Mom Test" helped me out a lot to see the errors in my past protocol and gave a direction to my approach this time.

Protocol Questionnaire

1. Can you describe your current role and responsibilities as a doctor?
2. What is your medical specialization, and how long have you been practicing in this field?
3. Could you walk me through a typical day in your life as a doctor? What are the most time-consuming tasks?
4. How do you prioritize your tasks and manage your time effectively?
5. Who are the key individuals or teams you collaborate with on a daily basis?
6. If I had a medical background, how would my role as your assistant differ?
7. If I had a medical background, how would my role as your assistant differ? What specific skills or areas of knowledge would you expect me to have or be willing to teach me?
8. What is your general opinion on the integration of AI in the medical field?
9. Do you have any concerns or optimistic views about AI impacting your daily work?
10. Are there any AI tools or technologies you currently use in your practice? If so, what are they and how do they benefit your work?

11. If you don't use AI tools, what are the main barriers or reasons for not incorporating them into your practice?
12. From your perspective, what are the potential benefits and drawbacks of using AI in medicine?
13. How do you see AI transforming the healthcare sector in the next 5-10 years?
14. In your opinion, what are the main reasons some doctors might be hesitant to integrate AI into their practice?
15. Are there specific concerns related to trust, reliability, or ethical considerations that you believe need addressing?
16. What do you think could be done to make AI a more trustworthy and reliable assistant in the medical field?
17. Are there specific features, regulations, or forms of support that you believe would facilitate the broader adoption of AI by healthcare professionals?

The interviews were conducted online with 3 doctors and offline with 1. The interviews were kept partially open ended and lasted for 40-45 minutes.

Study 2: Fly on the Wall

As suggested in feedback, there were still gaps in my knowledge of how hospitals worked and where my solution fit in. Hence I intended to conduct a fly on the wall study to gain insights into the ecosystem of a hospital as a service. But since I didn't manage to get permission from the hospital premises, I went in for regular OPD checkups in the Ophthalmology Department in Holy Spirit Hospital, Mumbai.

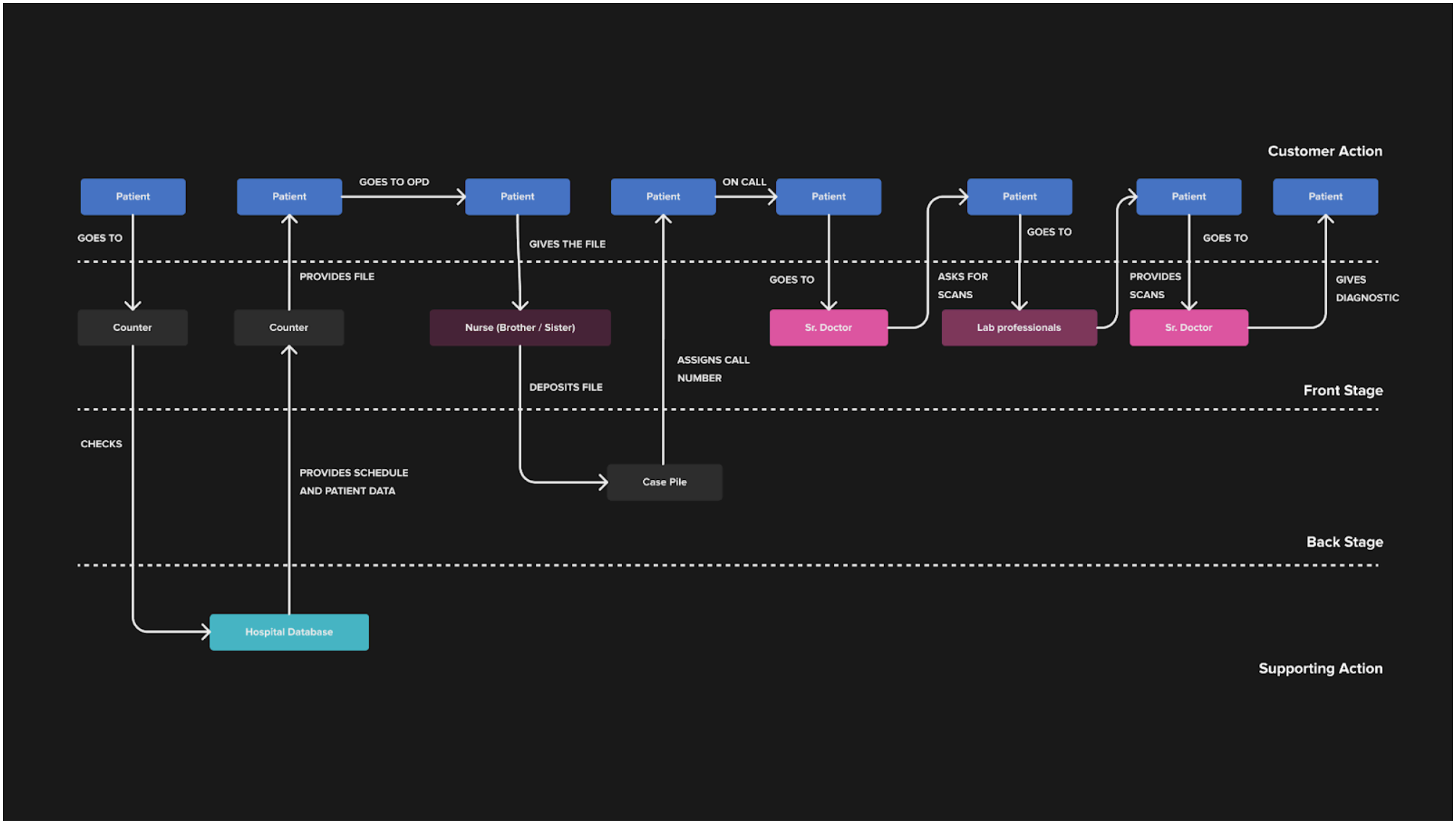
(Not an actual photo, since photography was prohibited)

Viewing hospitals as a service

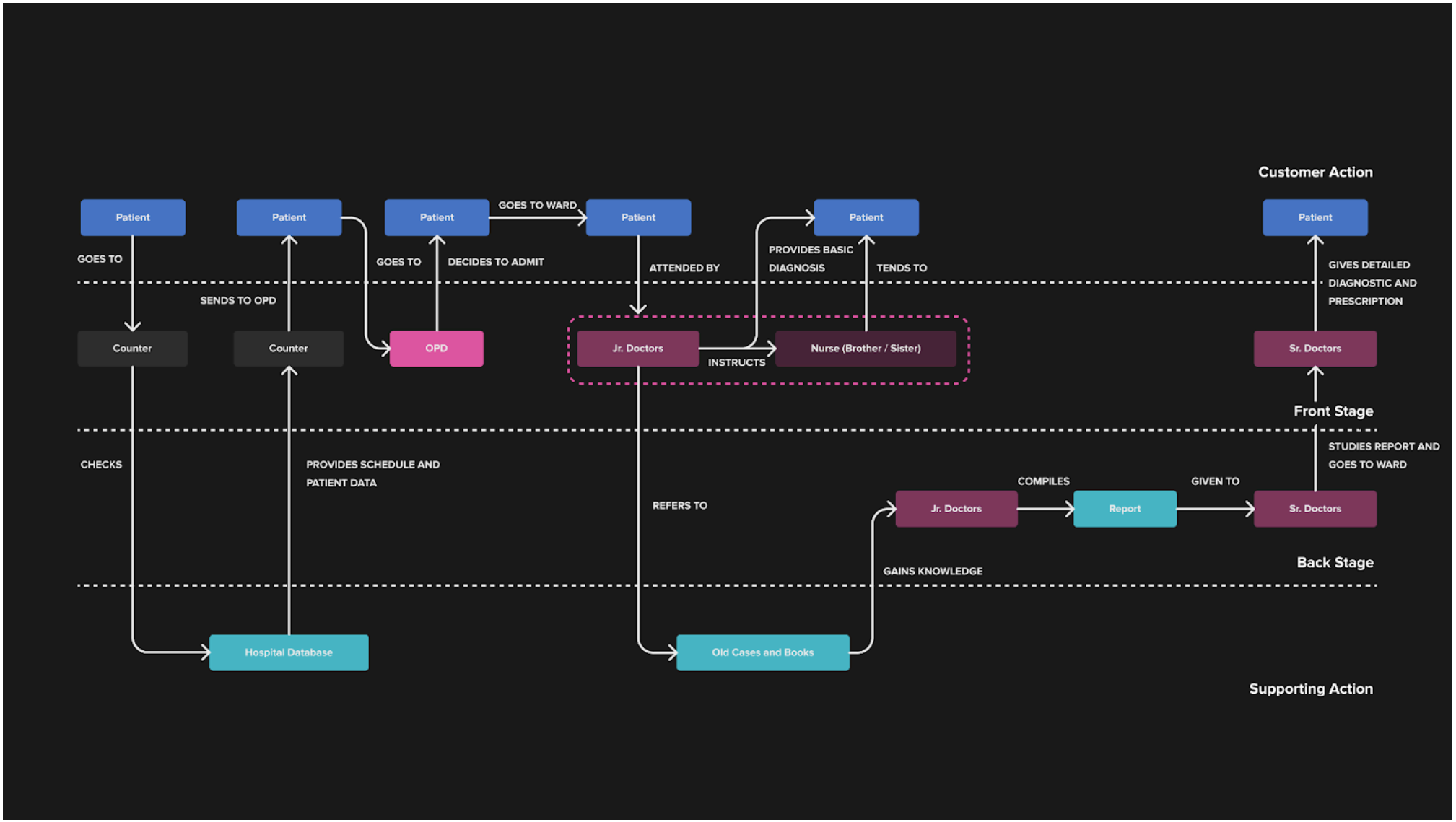
To understand the nuances of daily life of a medical professional and to see where my solution fits in, I mapped out hospitals as a service.

- OPD appointment
- Emergency (Trauma)
- Emergency (Non Trauma)

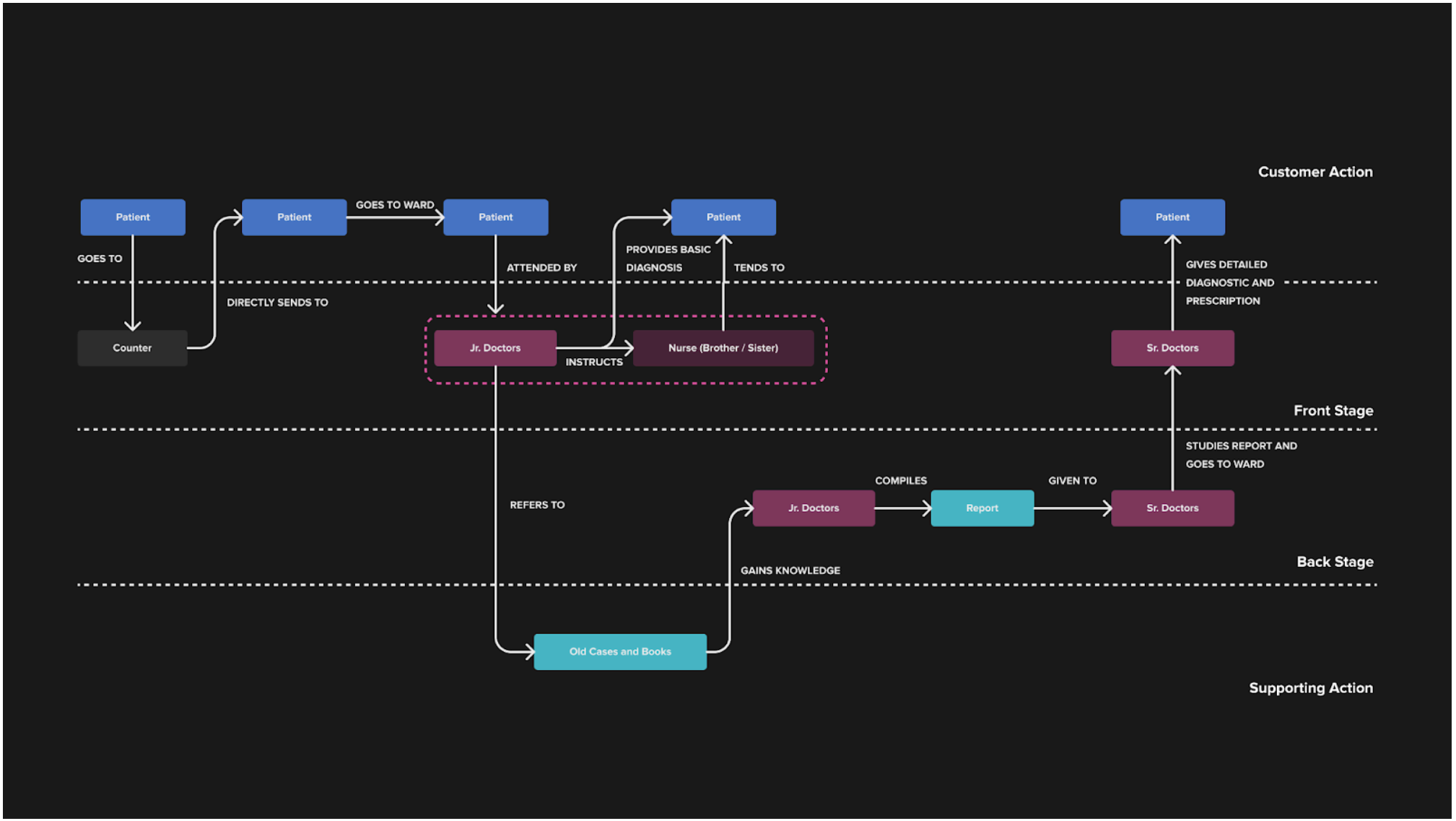
Service Blueprint- OPD Appointment



Service Blueprint- Emergency (Non-Trauma)



Service Blueprint- Emergency (Trauma)



Insights

Lack of time: Especially with sr. doctors, they don't get a lot of time to attend on a patient

Adeptness in Filling forms: A doctor's interactions with documents are majorly in the shape of forms. Muscle memory of where to write what for effective communication is the key.

Patient details get hidden under a pile: There are piles of cases, most often patient details get hidden under.

Remembering patients by Face & Case: Doctors surprisingly remember a patient's face or case.

Reliance on Jr. Doctors: During ward in cases, sr. doctors rely on the reports generated by a junior doctor

Reliance on other medical staff: Doctors rely on medical staff for tending to patients and details

Personalised Treatment methods: Treatment methods tend to differ from doctor to doctor.

Referencing old cases: Jr. Doctors often rely on old cases and books to provide rigour for report

OPD Management: During OPD hours, there is a lot of rush, so often their is a lot of informal sequencing of patients, depending on severity and time.

Awareness of AI/Automation tools: The doctors were aware of these tools but have never used them in practice.

Trust on these tools: Doctors often want to be accountable for the cases they are handling. Since they have their own ways of handling a case, they don't prefer other doctors consulting their patients due to missing past knowledge. Hence a tool handling a case on their behalf is not something they might prefer.

Patient's perspective: According to doctors, patients when in distress, trust a doctor because of their credibility. Patients might be uncomfortable knowing an AI handled their case.

Redefined Goals

The project prioritizes building inherent and justifiable trust in the AI platform by ensuring transparency and mitigating opacity. The platform aims to function as an intuitive assistant for doctors, offering multiple input modes and allowing for personalized workflow creation to foster a collaborative, mentor-mentee-like relationship. Key objectives include:

1. **Transparency and Explainability:** Demystifying the AI's decision-making process, making it predictable and understandable to users.
2. **Doctor-Centric Design:** Developing features that support the unique needs of medical professionals, empowering them to leverage AI as a collaborative tool.
3. **Assistance, Not Replacement:** Fostering normative trust by positioning the AI as a co-pilot, not a replacement, for doctors' expertise. This includes creating an explainable AI system (XAI) that offers insights and recommendations while respecting the doctor's ultimate authority.

Design Takeaways

Doctor's Agency to Control: Doctors should be given choice to control the way in which the system produces results.

Patient records to be made more accessible: Patient records can be sorted for and searched in a more systemised way.

Ease of referencing old cases: A repository of old cases and reports for references would be great for the system to learn from

Doctors Decision making: We should keep the doctor's decision making opportunities to minimal without compromising their agency

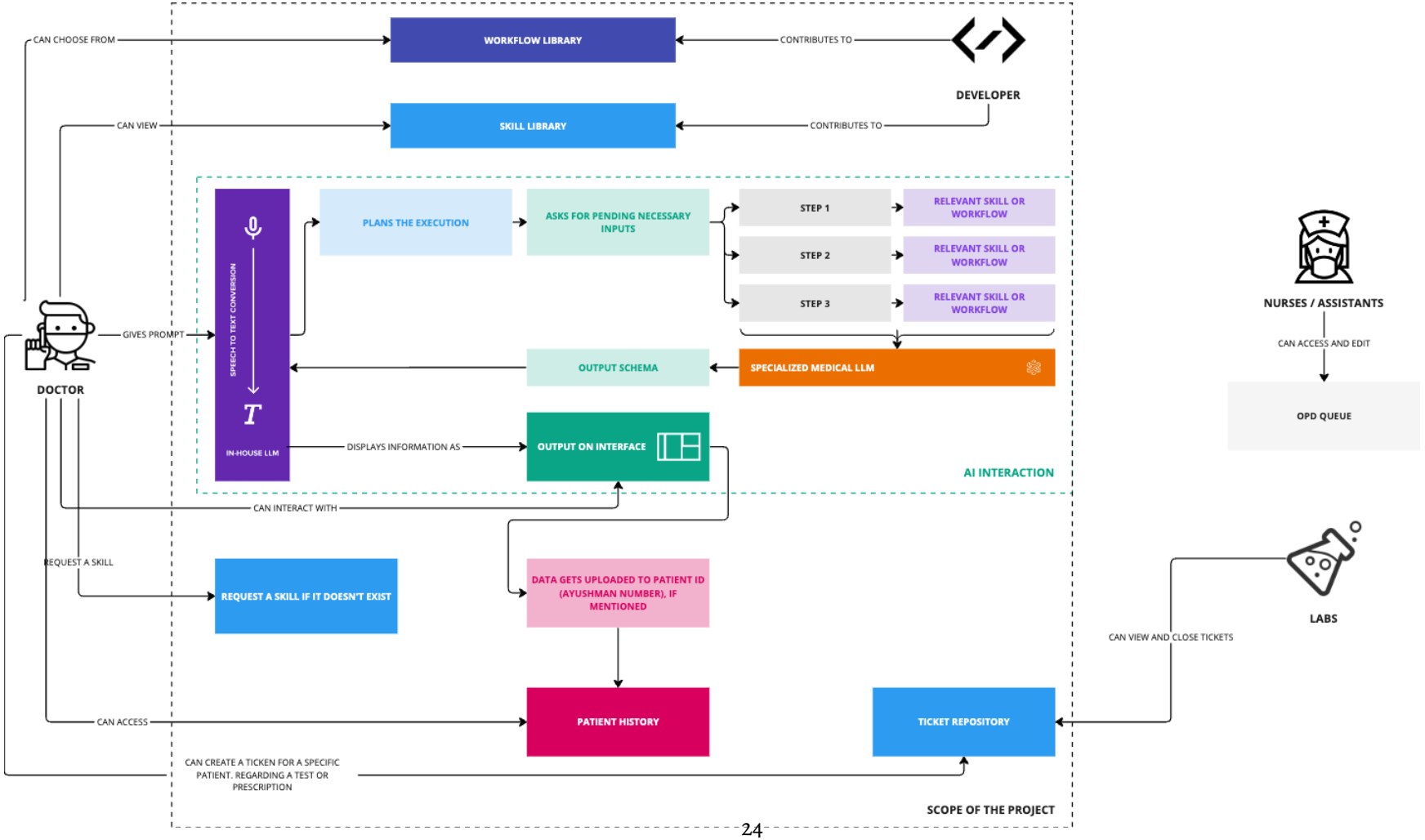
Explainability enhanced with references: Old cases can be used to provide a rigorous explanation for decisions taken by the system.

Leaving skill creation to developers: As established, Doctors have a lack of time to invest in skill creation and getting familiar to the system

System Overview

Conceptualization

Through primary research and observing hospital operations, key gaps were identified, which informed the re-conceptualization the system mentioned in the background (Refer Background)



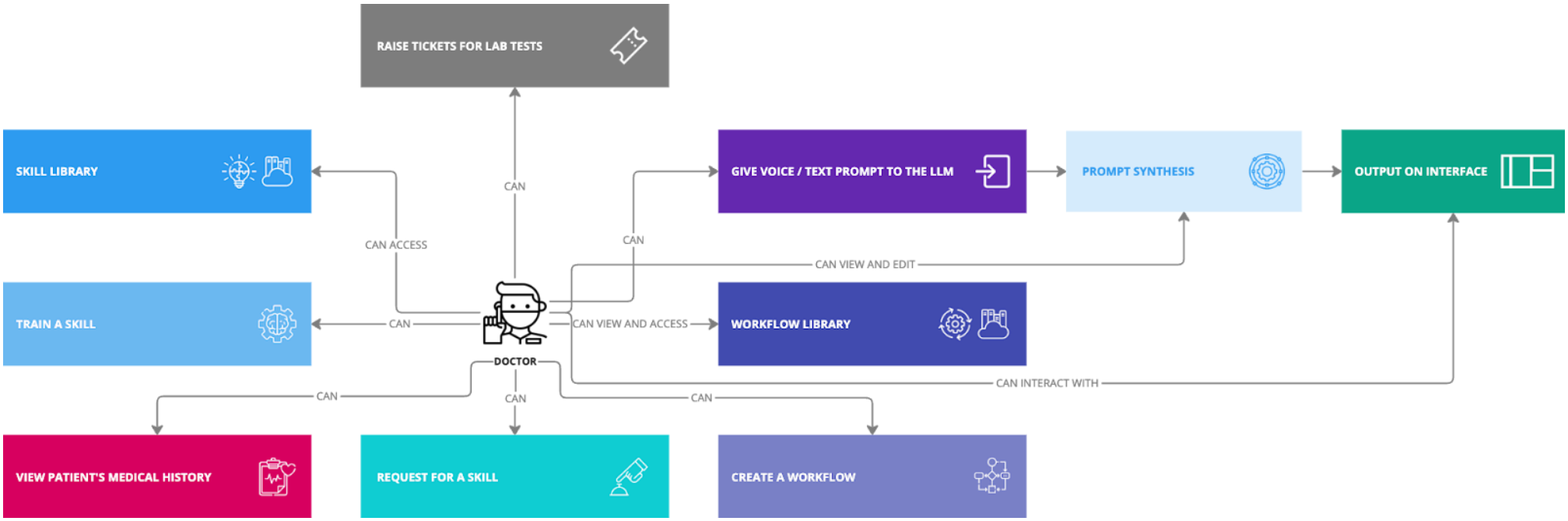
Ayushman Bharat

Individuals can generate a unique health identifier called the Ayushman Bharat Health Account or ABHA and share their health records. While health accounts are common in many countries, its adoption in India might be late, but is inevitable.

With the extensive repository of data, we might be able to skip the need for individual patient IDs, with every consultation referencing or adding to the health record.

Simplistic use-case-based overview

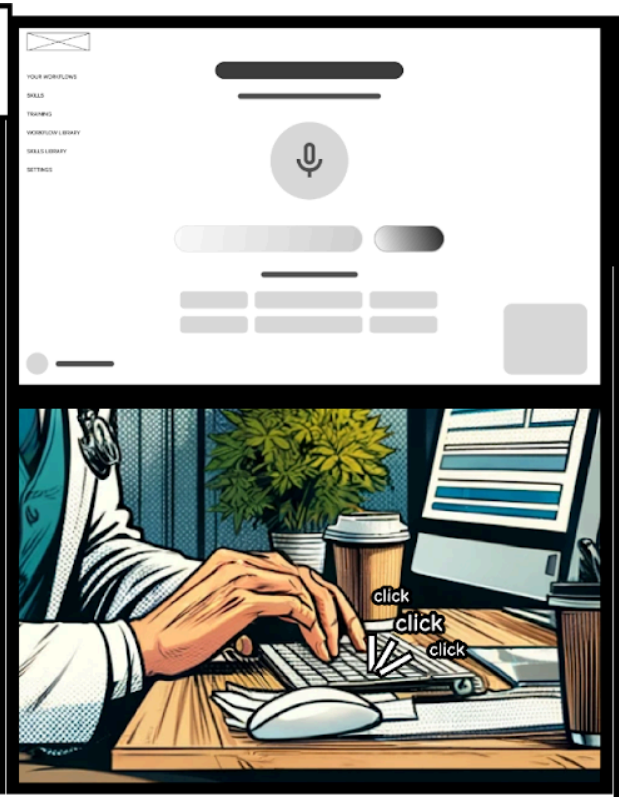
This is a simplistic view of what value we want to provide to the doctor, or in other words what a doctor can do in the context of out proposed system.

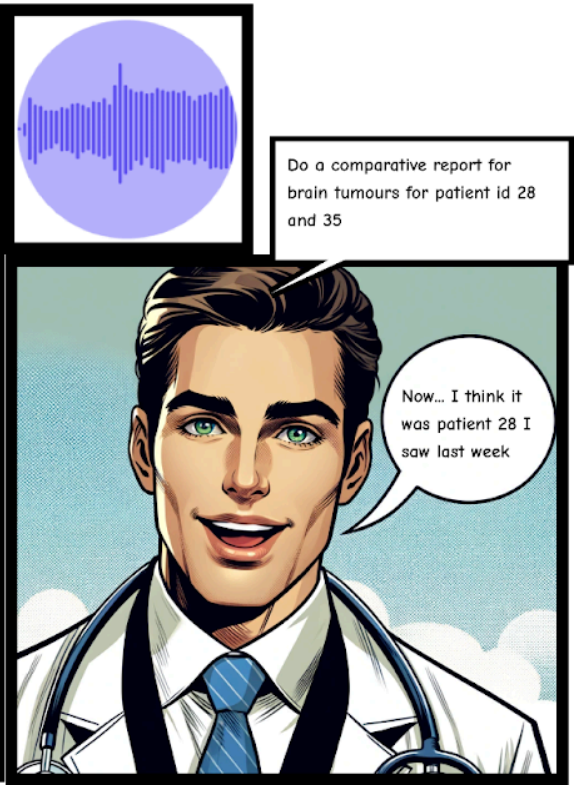


Use Cases

Using AI Assistant from a Doctor's POV

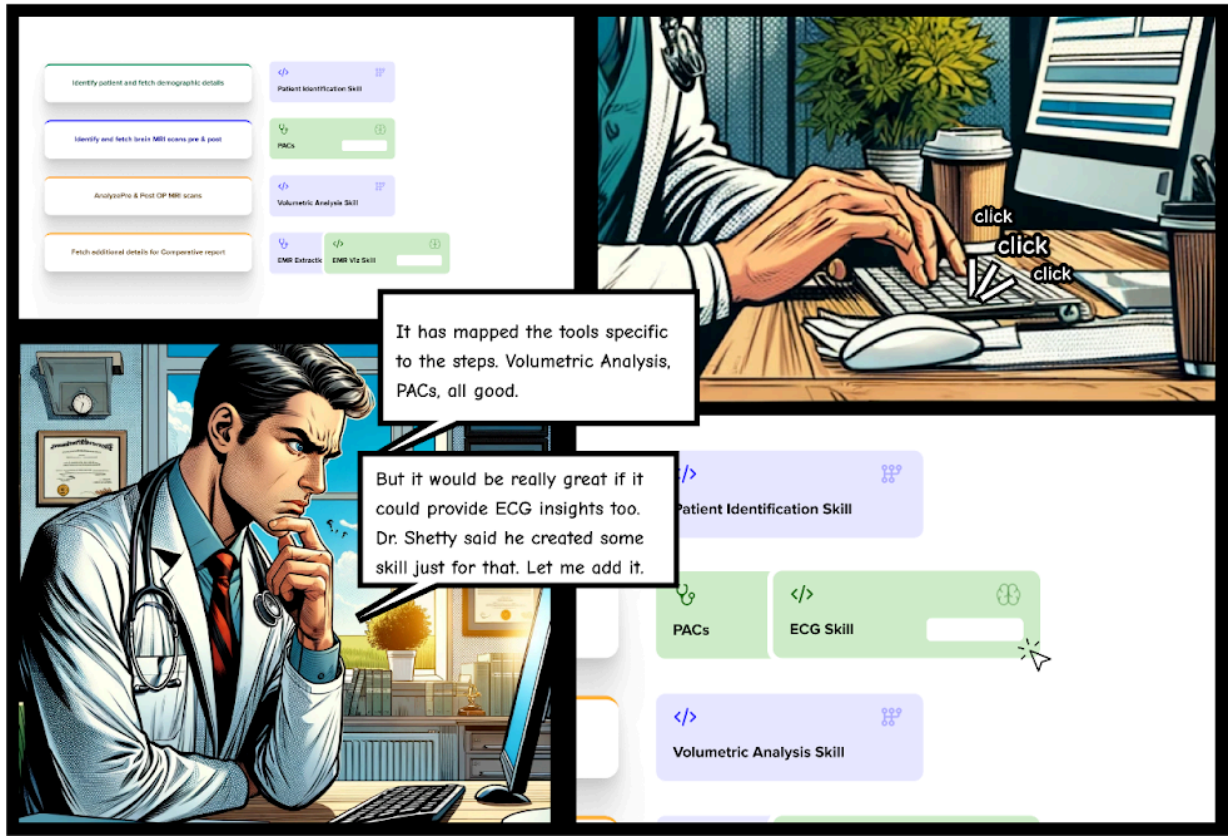
A junior doctor wants to get help regarding a case he has been working on



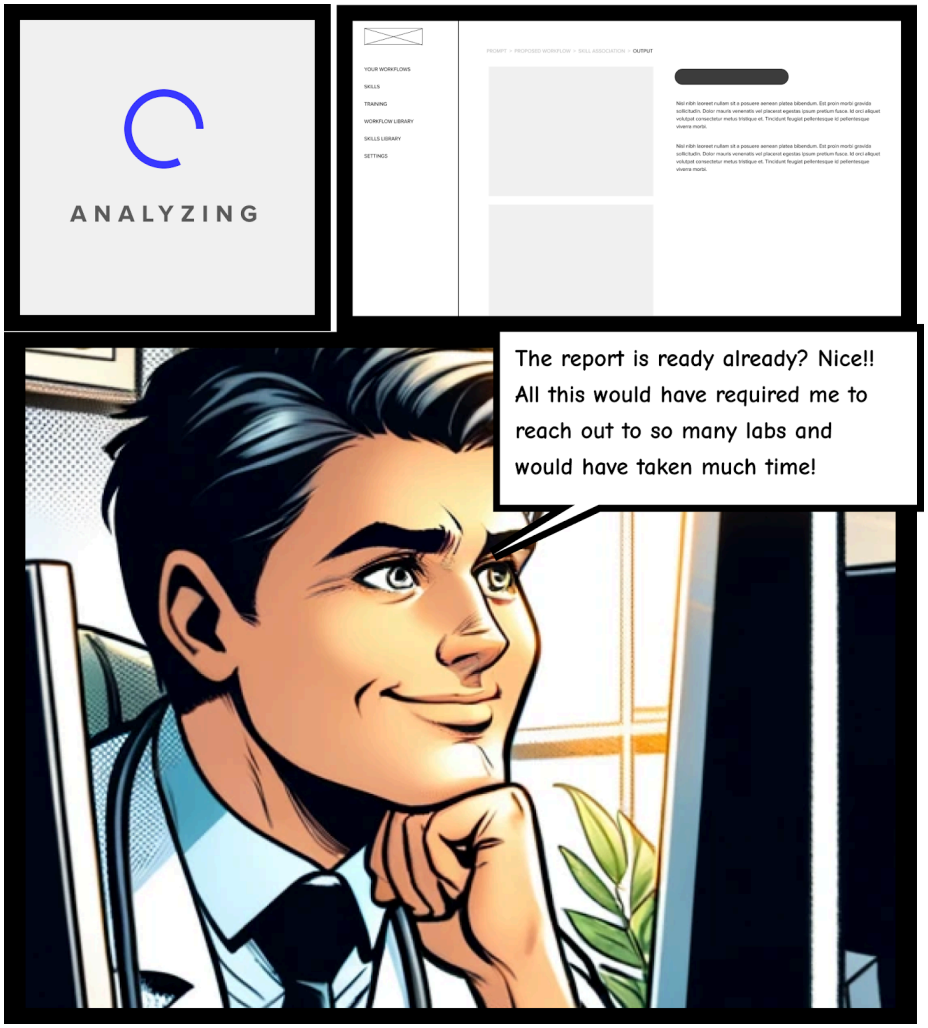


He starts by giving a voice based prompt input to the platform

The prompt gets broken down into actionable step and is verified by the doctor



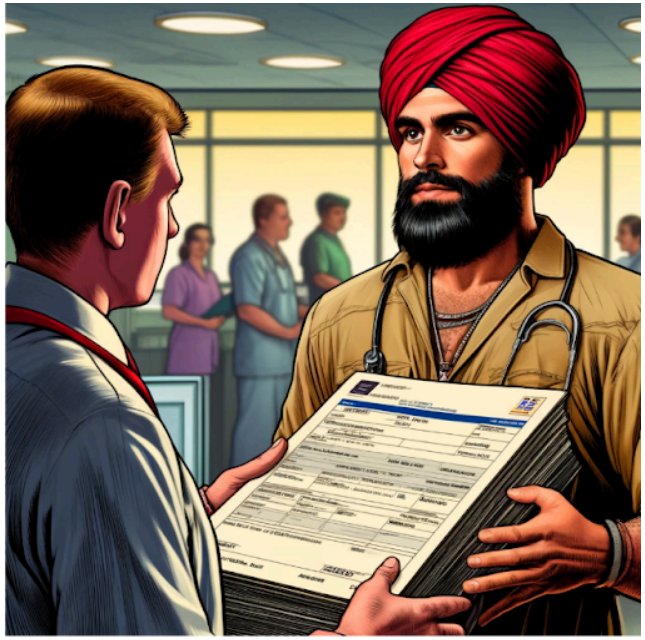
After customizing the approach of the AI according to his preferences, he proceeds to analysis



The platform delivers its analysis through an interface where the doctor can now question and suggest the AI system to reach a desirable outcome

Mr. Singh visits the OPD Department

He provides his ayushman bharat card at the reception while telling which department he wants to consult

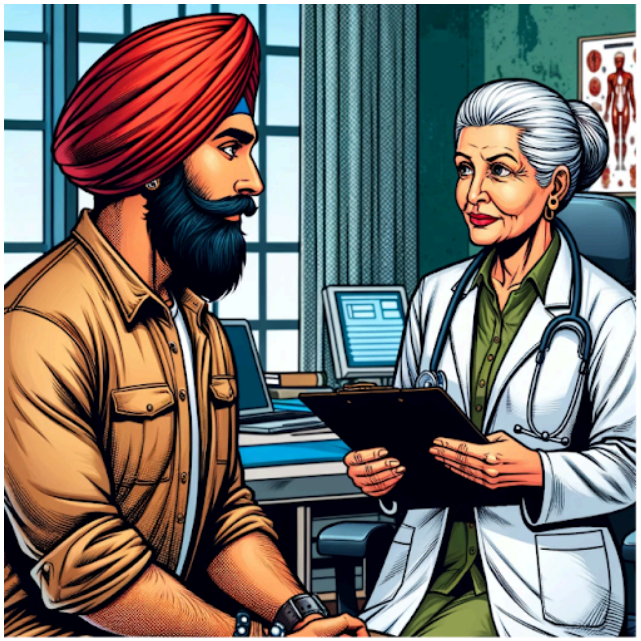


He gets his file handled to him at the reception

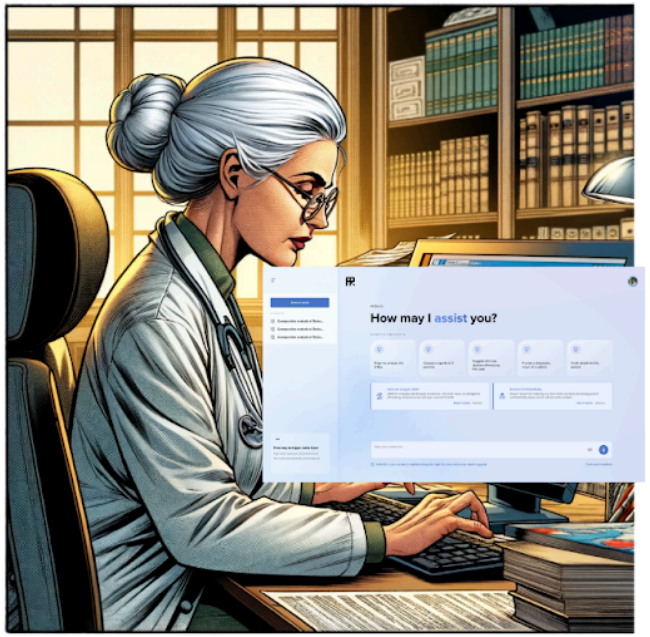
He goes to OPD

Submits file to OPD nurse, and waits for call

Mr. Singh gets called by the nurse for consultation



Doctor: So, Mr. Singh, what happened to you.
Mr. Singh: I have been feeling....
provides symptoms

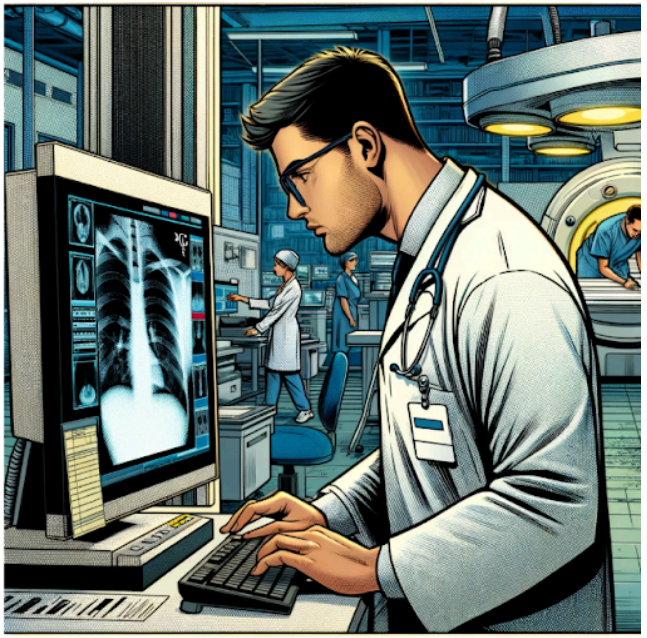


Doctor inputs the symptoms in the system

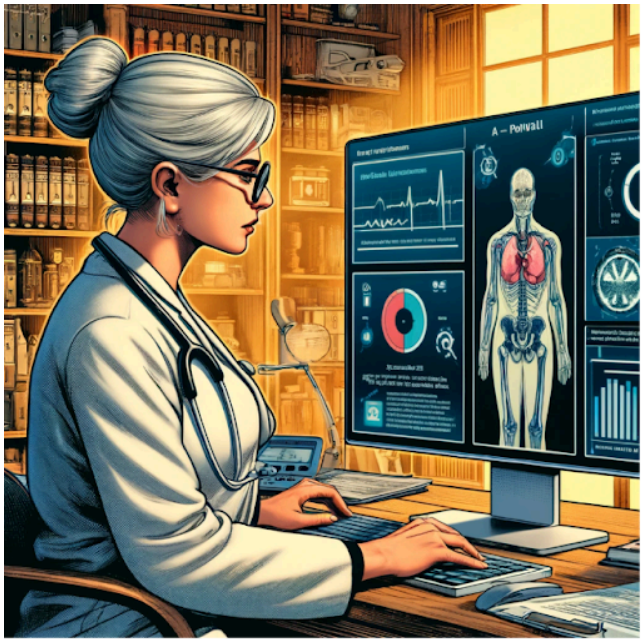
Doctor: Mr. Singh, you will have to get an X-ray of your chest, I have created a ticket.

Goes to X-Ray Department

*Gets X-ray"



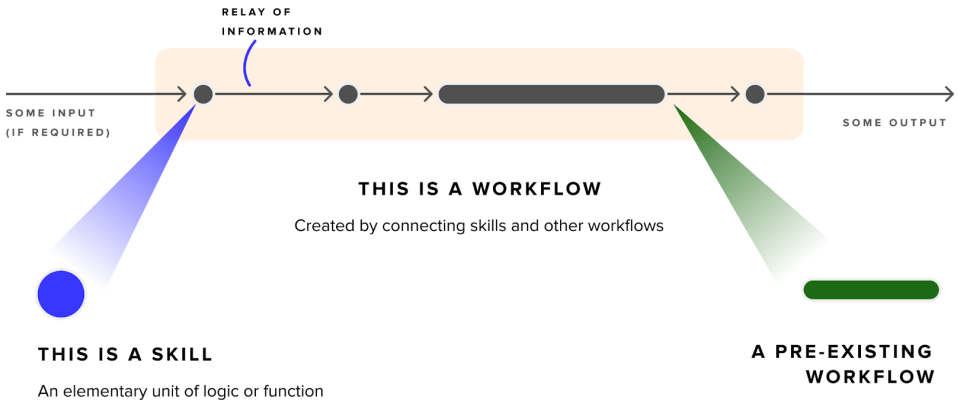
Uploads X-Ray and closes the ticket



Doctor looks at the scan while using it coupled with symptoms as inputs for AI

Doctor provides a consultation on the basis of analysis done with the system

Glossary



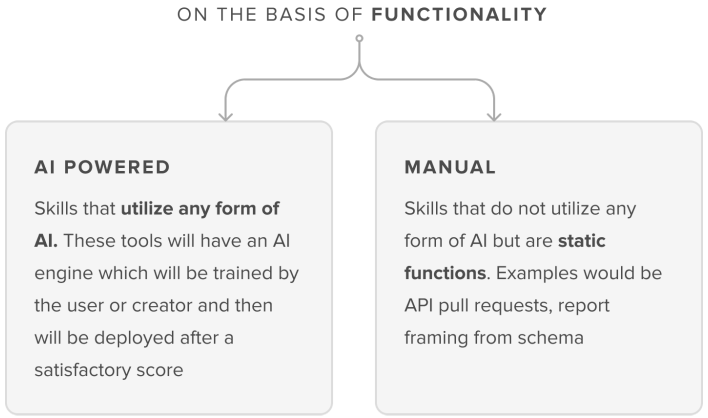
What are Workflows?

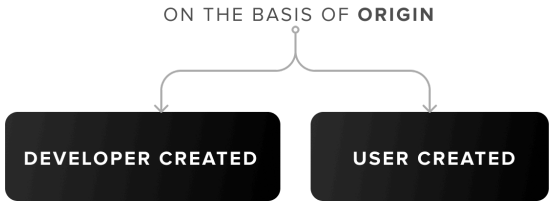
Workflows are sequences of connected skills, or even other workflows that automate or streamline a comprehensive process or task within the medical practice. They represent a structured arrangement of individual skills, each contributing its function, to achieve a specific outcome or goal.
Workflows are customizable and can be created, modified, and shared by doctors, allowing for tailored solutions that fit specific clinical needs or preferences

What are Skills?

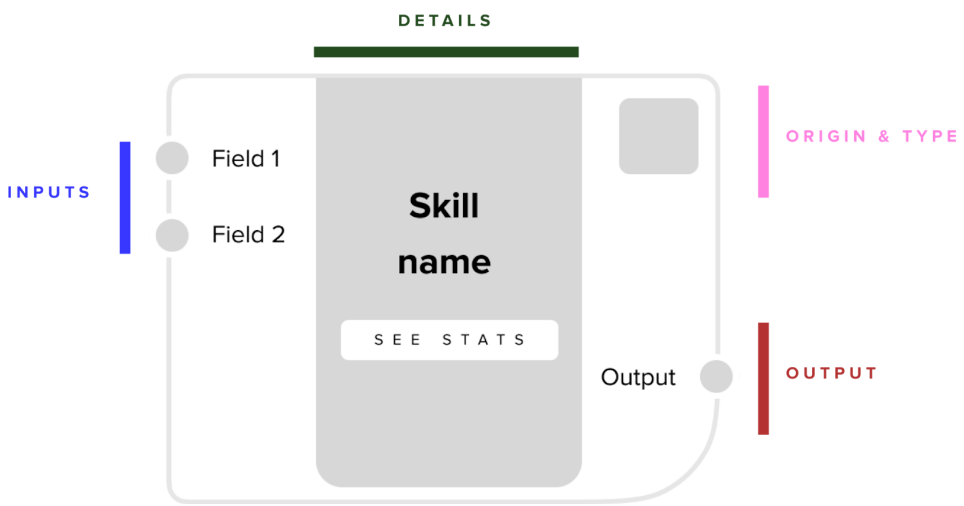
Skills are specialized, modular functions designed within the AI platform that automate specific tasks or provide targeted insights based on inputs received. “Skills” are also the most elementary component in the context of the proposed system, which can be used to replicate any workflow ground up.

Classification of skills

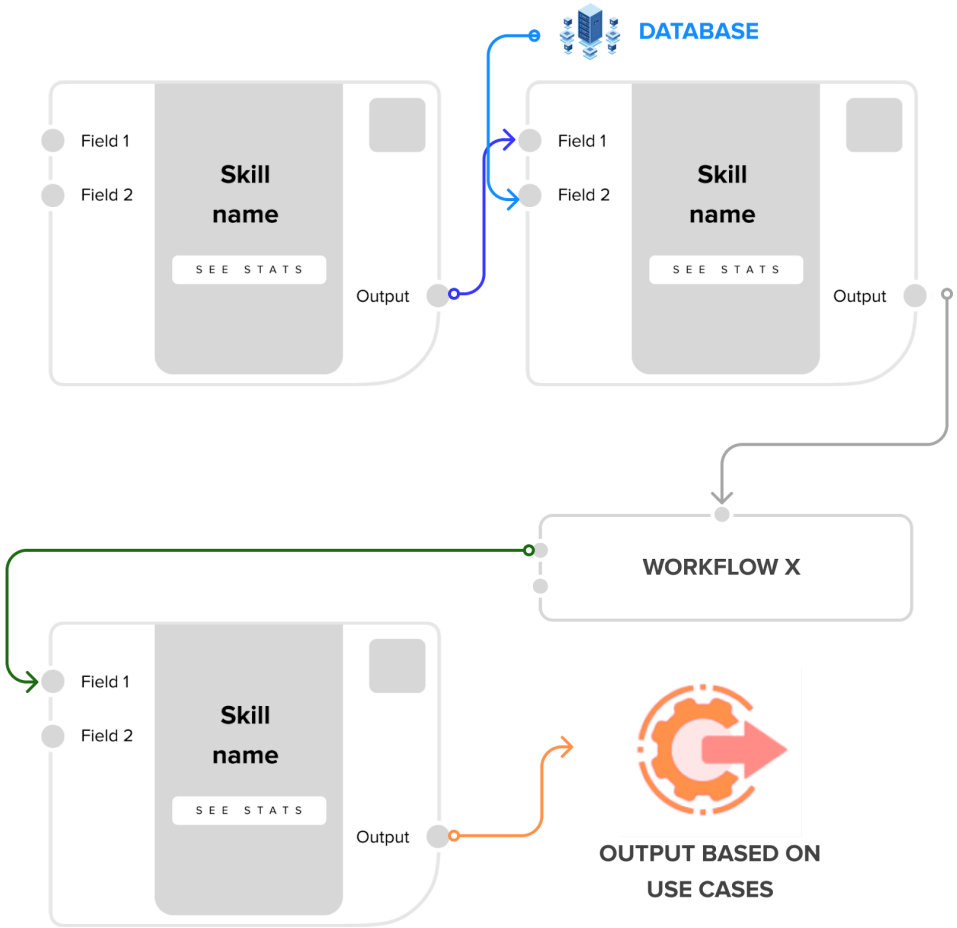




Anatomy of Skills



Anatomy of Workflows



Reflecting back to objective

(Referring to Project Positioning)
As I stated earlier, my objective was to investigate techniques where I can elucidate trust through experiences, meanwhile building a solution in the context of digital healthcare. Although the project will require me to design interfaces for all the use cases I mentioned in Simplistic use-case-based overview, my focus for this project would be documenting the interventions I did for trust.

Rescoping the Project

In Scope

- AI prompting

- Prompt breakdown and editing

- Additional inputs to prompt

- Analysis of an image input through AI

- Workflow Library

- Accessing workflows

Out Scope

- Workflow Creation (Visual Coding)

- Skill Library

- AI Skill Training

- Viewing Patient History (Utilizing Ayushman number)

Although, I will be documenting and demonstrating all of them in the final report and presentation

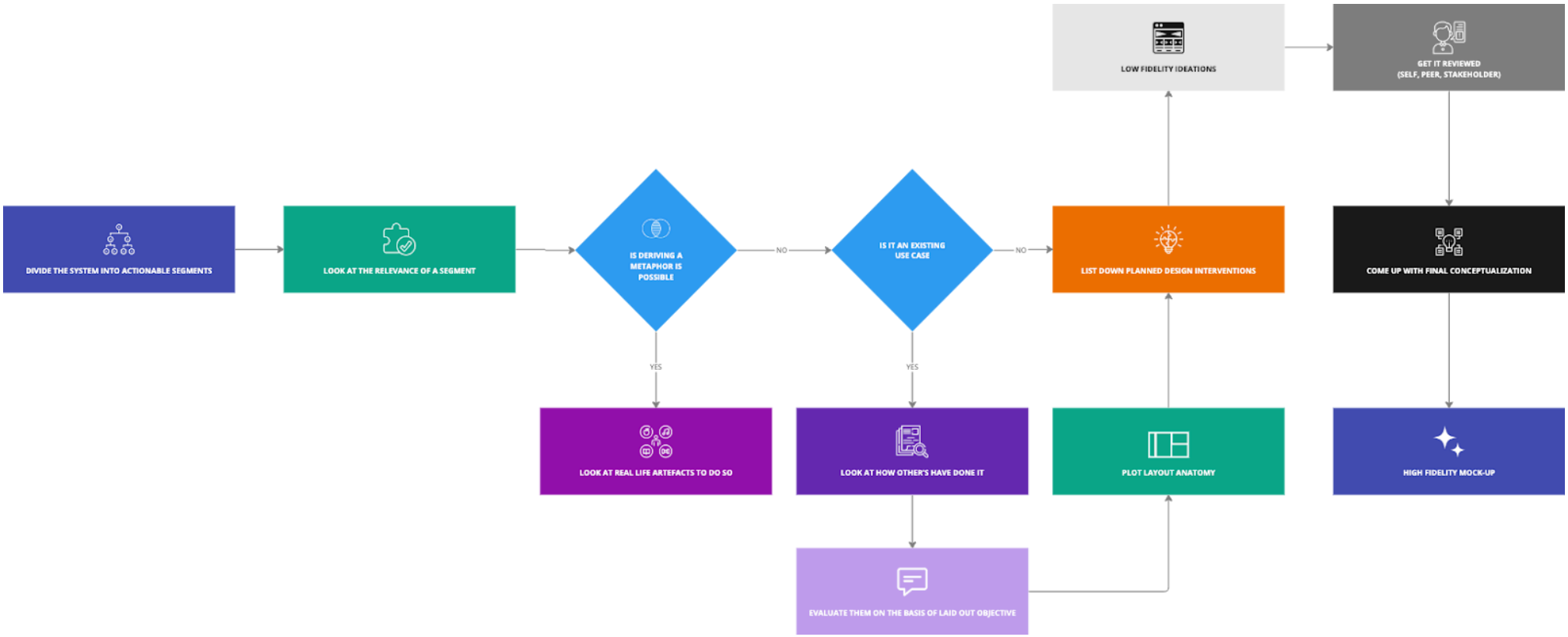
Methodology

The methodology that I try to employ starts with breaking down the conceptualized platform into **actionable sections** (like prompt input, x-ray analysis, workflow library being separate sections). Next we articulate what is their relevance in the proposed system.

After that we try to look at if there is a way we can derive some **metaphorical reference** while designing the interactions, if yes, then we look at the physical artefacts which are associated with the section.

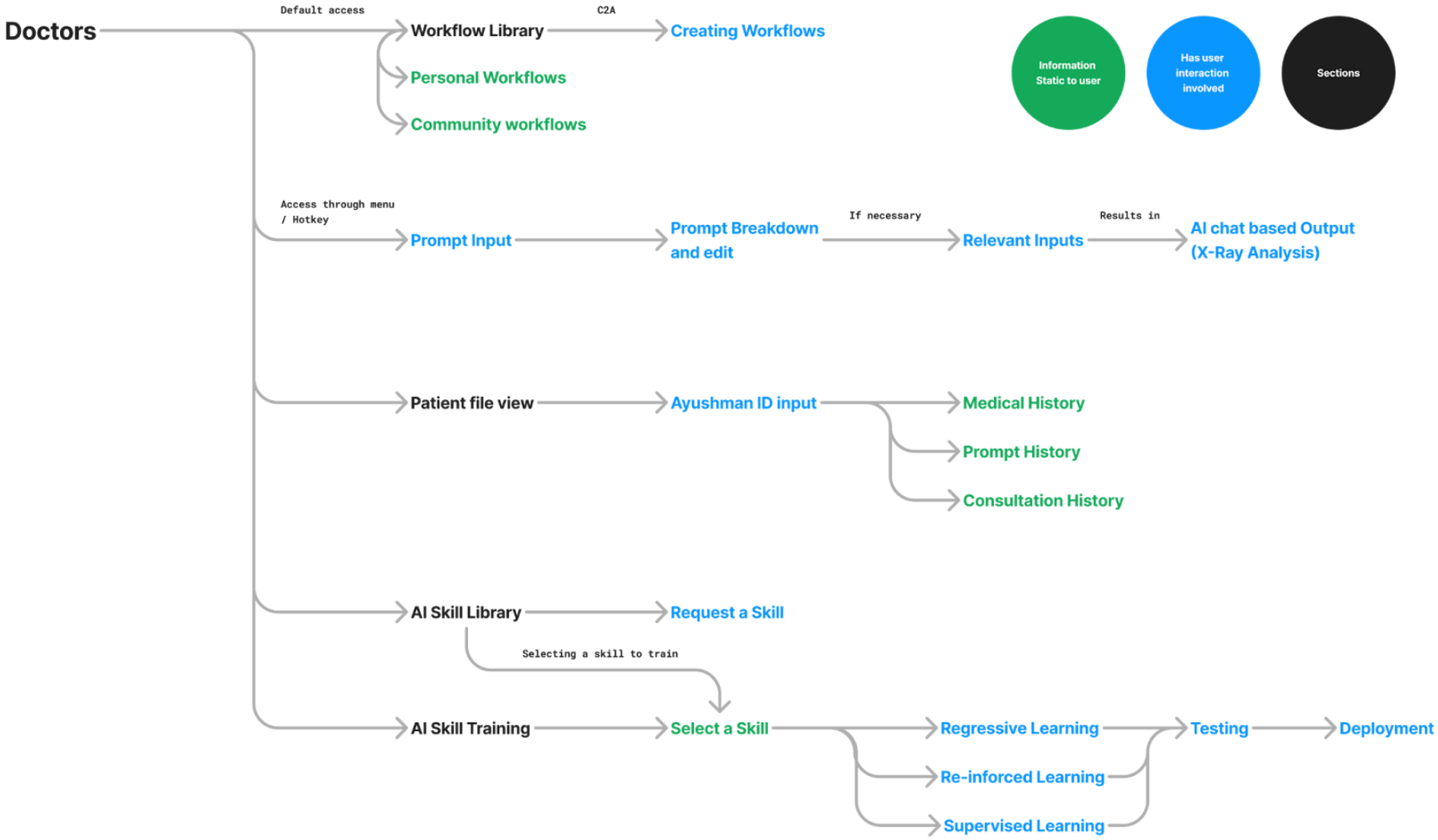
Then we look at if a similar thing is already applied by any other application in the space. If yes, then we look at **how they have done it**, and comment on how they stand when looked through the lens of trust.

Then we finally get to the **low fidelity ideations,** which include **iterations on the design with feedback for every round**. We then finally **synthesize all the ideas to a final conceptualization** of the section and then design **high fidelity prototypes.**



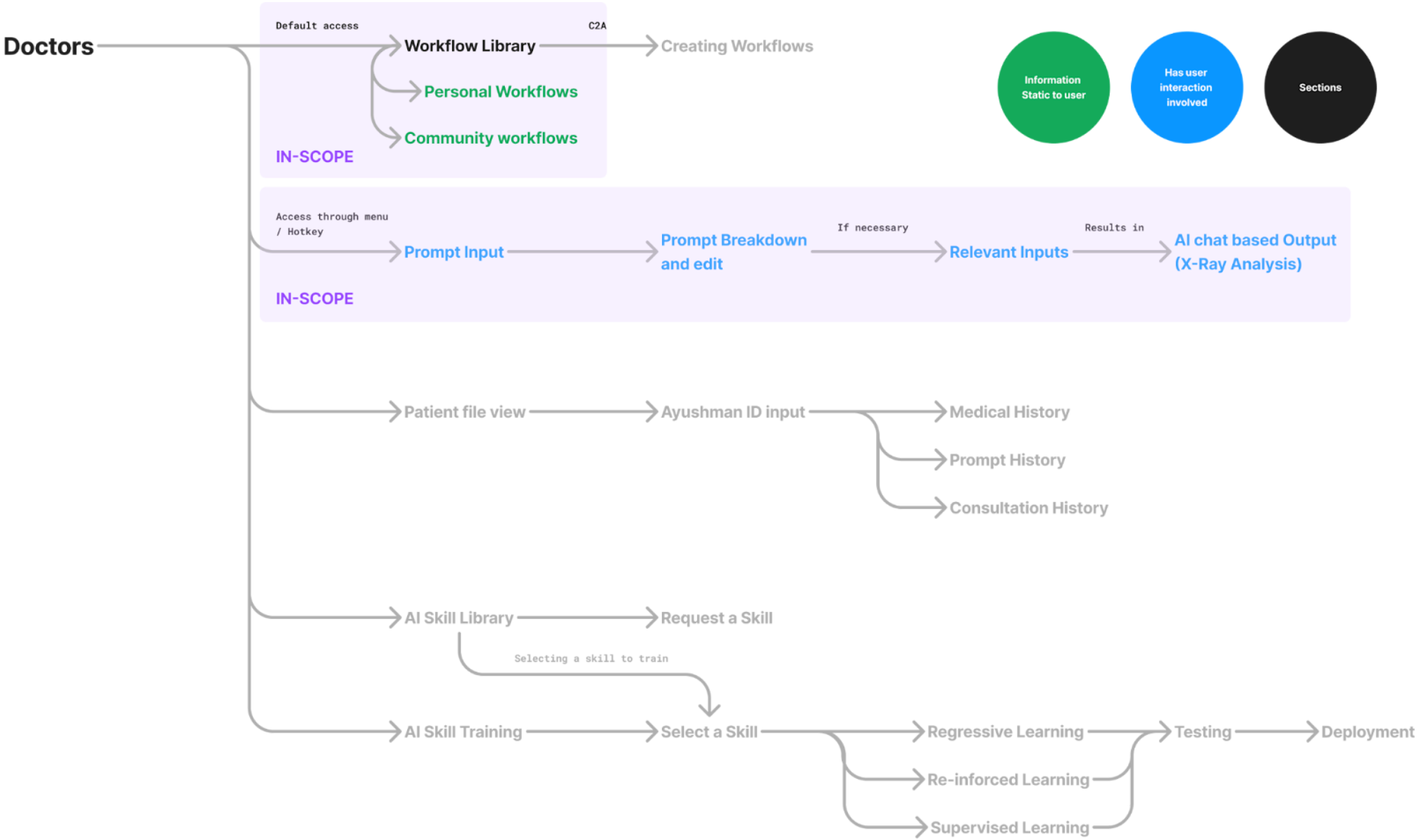
In-scope Designs

User Journeys



A use case of this is shown above in [Simplistic use-case based overview]

In-scope Sections



Navigation Model

Alternatives

Drawer Navigation (Navigation Drawer/Side Menu)

A hidden panel that slides in from the side of the screen, typically the left, to reveal navigation options.

Pros

1. Saves valuable screen space when not in use.
2. Can accommodate a large number of navigation items.
3. Ideal for complex dashboards with deep hierarchies.
4. Can include additional content like user profiles or settings.

Cons

1. Requires an extra interaction (click/swipe) to open and close.
2. Can be hidden from view, requiring users to discover it.
3. May not be suitable for smaller screens where space is limited.

Tabbed Navigation (Top or Bottom Tabs)

Content is organized into tabs that are easily accessible from the top or bottom of the screen.

Pros

1. Clear visual separation of content.
2. Easy to understand and navigate.
3. Ideal for frequently used sections with shallow hierarchies./
4. Bottom tabs are easily reachable on mobile devices.

Cons

1. Limited to a smaller number of tabs to avoid clutter.
2. Not suitable for complex hierarchies or large amounts of content.

3. Top tabs may be less accessible on larger screens.

Why Drawer Navigation?

1. The portal is exclusively for desktop devices, hence the drawer can support extra screen real estate by being collapsible.

2. The hierarchy of sections is complex.

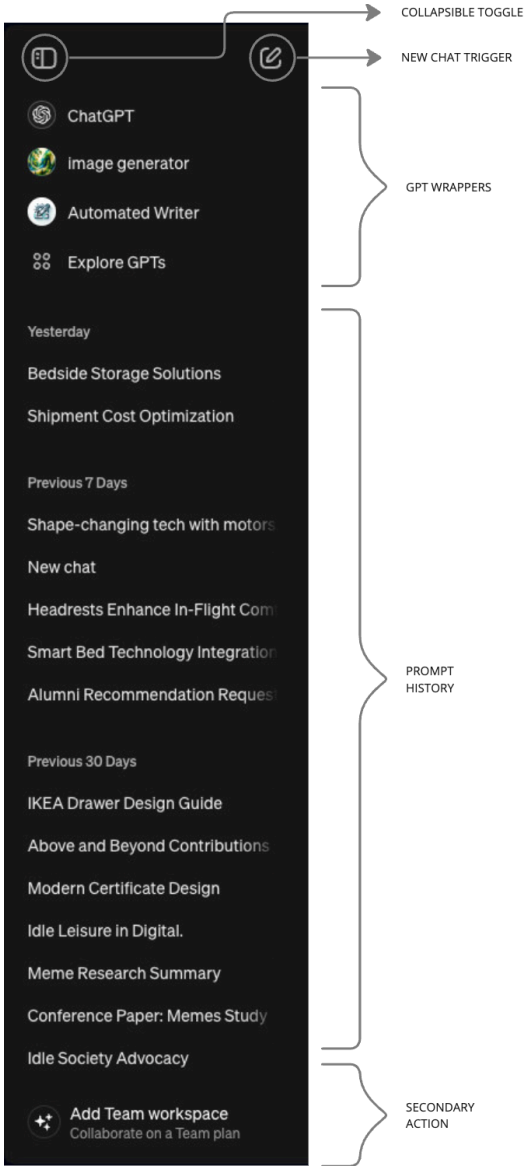
3. Can support secondary actions like creation of new prompt session as well as navigation

4. Can support cues and hints.

How do other platforms in similar space use drawers?

Analyzing different platforms ensures a familiar user experience across devices, aligning with platform-specific design conventions, and maintaining a consistent look and feel. This promotes familiarity and makes the drawer navigation intuitive for users. Additionally, studying existing implementations on various platforms can reveal successful workarounds for potential limitations, allowing you to deliver the best possible value and functionality across all devices.

ChatGPT



Elements / comments

Action button to collapse and expand menu- Icon used is ambiguous, isn't intuitive enough for the purpose it serves.

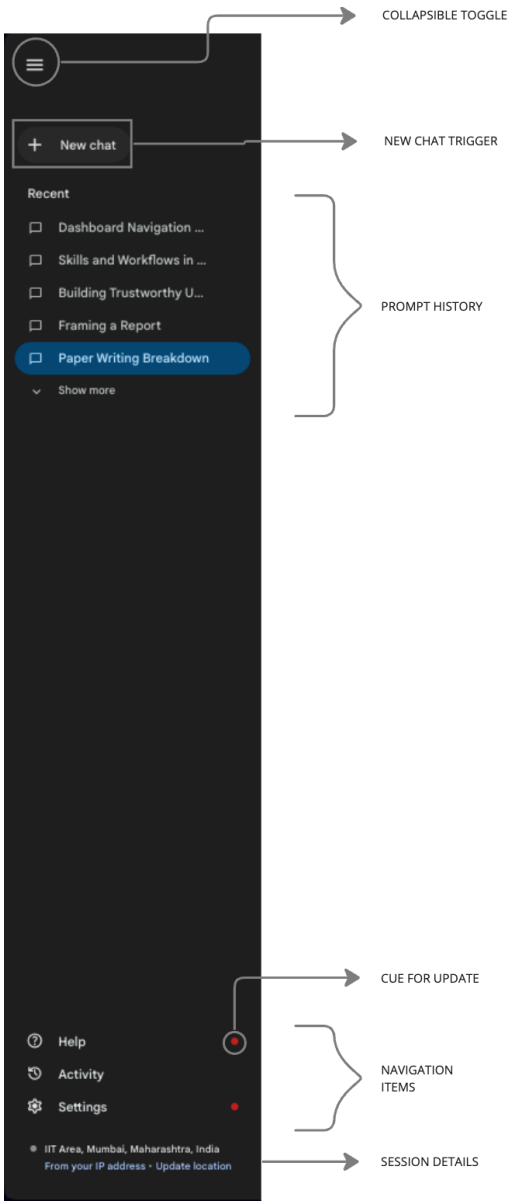
Action button for new chat- Icon used is more commonly used as edit, and its visibility is compromised due to its size.

GPT Wrappers- Provides a list of commonly used GPT wrappers and apps.

Prompt history- Chats grouped and sorted by recency.

Secondary Action- To add multiple collaborators, although the discoverability is low. Its discoverability being higher than creating a new chat doesn't make sense.

Google Gemini



Elements / comments

Action button to collapse and expand menu- Icon used is traditionally used in this context.

Button for new chat- Discoverability is better than ChatGPT.

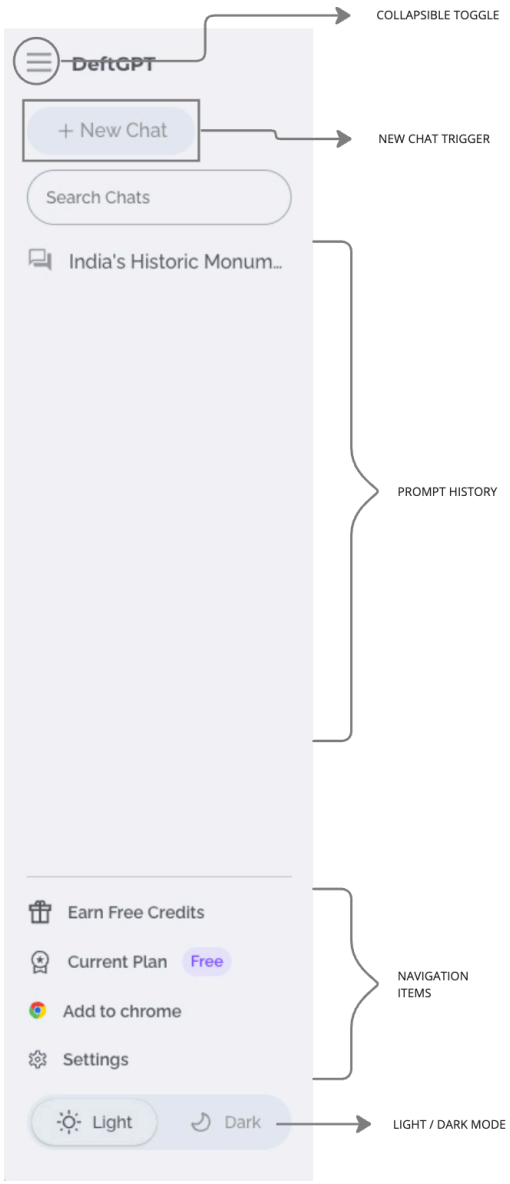
(Collapsed) Prompt history- Chats grouped and sorted by recency.

Navigation- Navigation has been segregated from the rest of the actionables in the layout.

Update cues- To add attention to the navigation items, in case there is an update.

Session Details-Details like location of access and IP are visible, not sure if they are necessary though.

DeftGPT



Elements / comments

Action button to collapse and expand menu- Icon used is traditionally used in this context.

Button for new chat- Discoverability is better than ChatGPT.

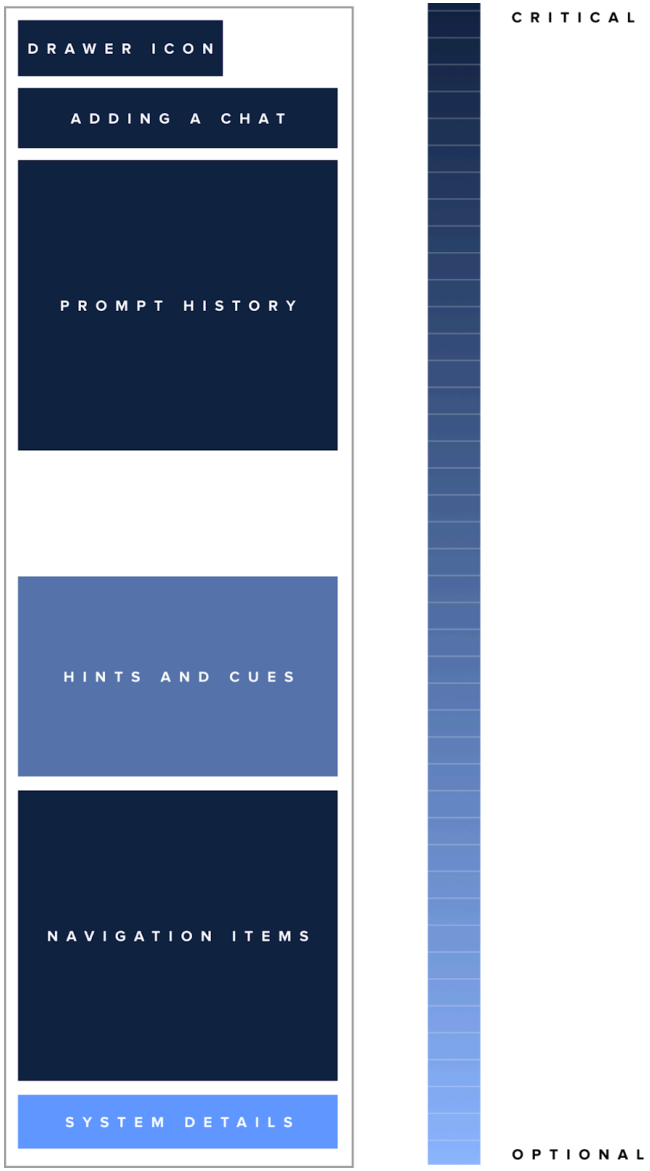
Search for chats

Prompt history- Chats sorted by recency.

Navigation- Navigation has been segregated from the rest of the actionables in the layout.

Secondary action (Dark/Light mode)- Its given precedence, but unsure if it comes that high up in hierarchy

Layout Anatomy



Design Considerations

Prioritize Hierarchy: Establish a clear hierarchy among elements within drawers, ensuring the most important items are visually prominent and easily accessible.

Foster Intuitive Navigation: Group related items together within drawers to streamline navigation and make finding specific items effortless.

Leverage User Familiarity: Employ well-established drawer design patterns and conventions to capitalize on user experience and minimize the learning curve.

Design Pre-requisites/ Constraints

On discussion, the following were to be included and considered while designing the drawer-

Navigation Items, which takes the user to different parts of the system

Branding

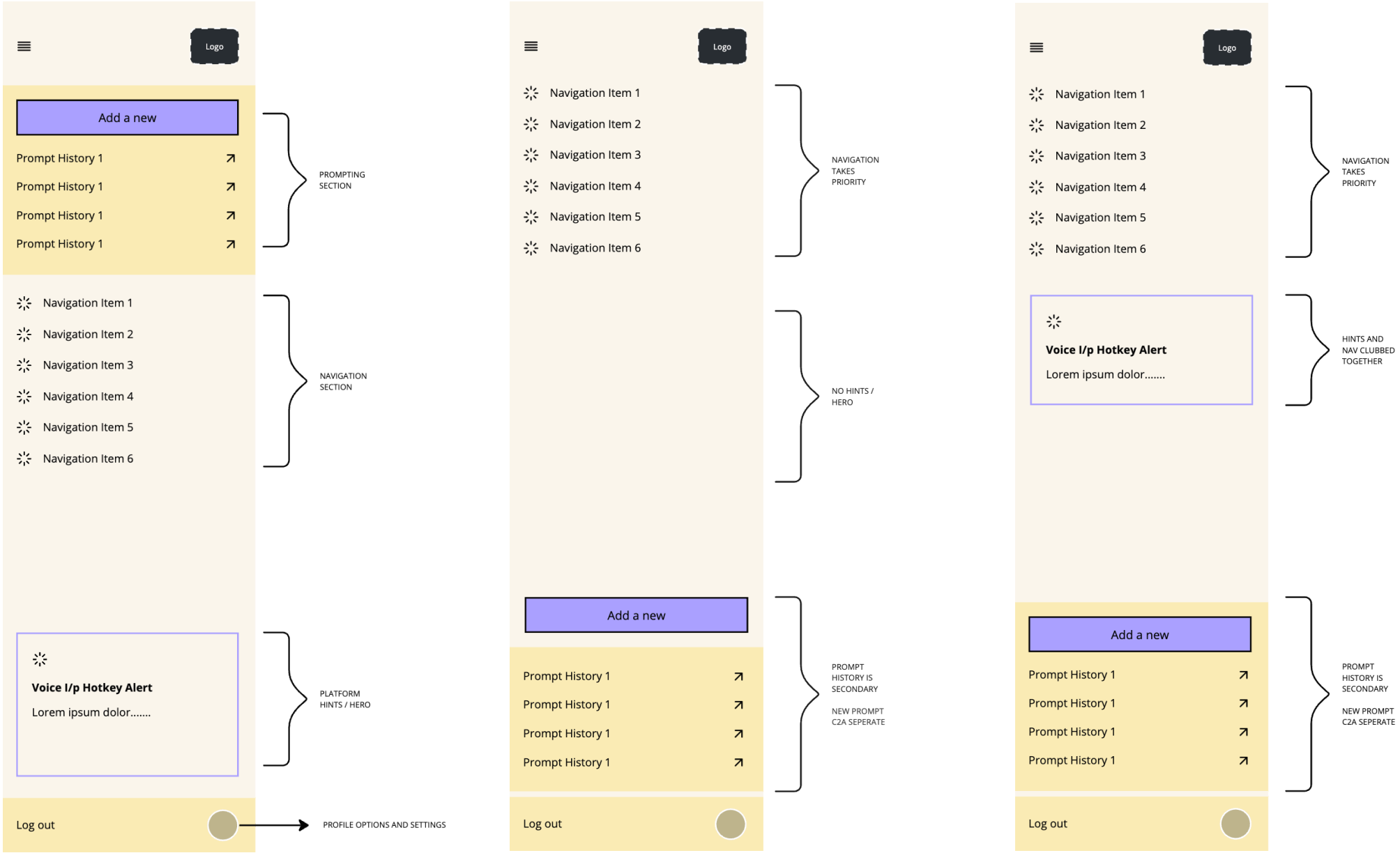
Profile options and settings

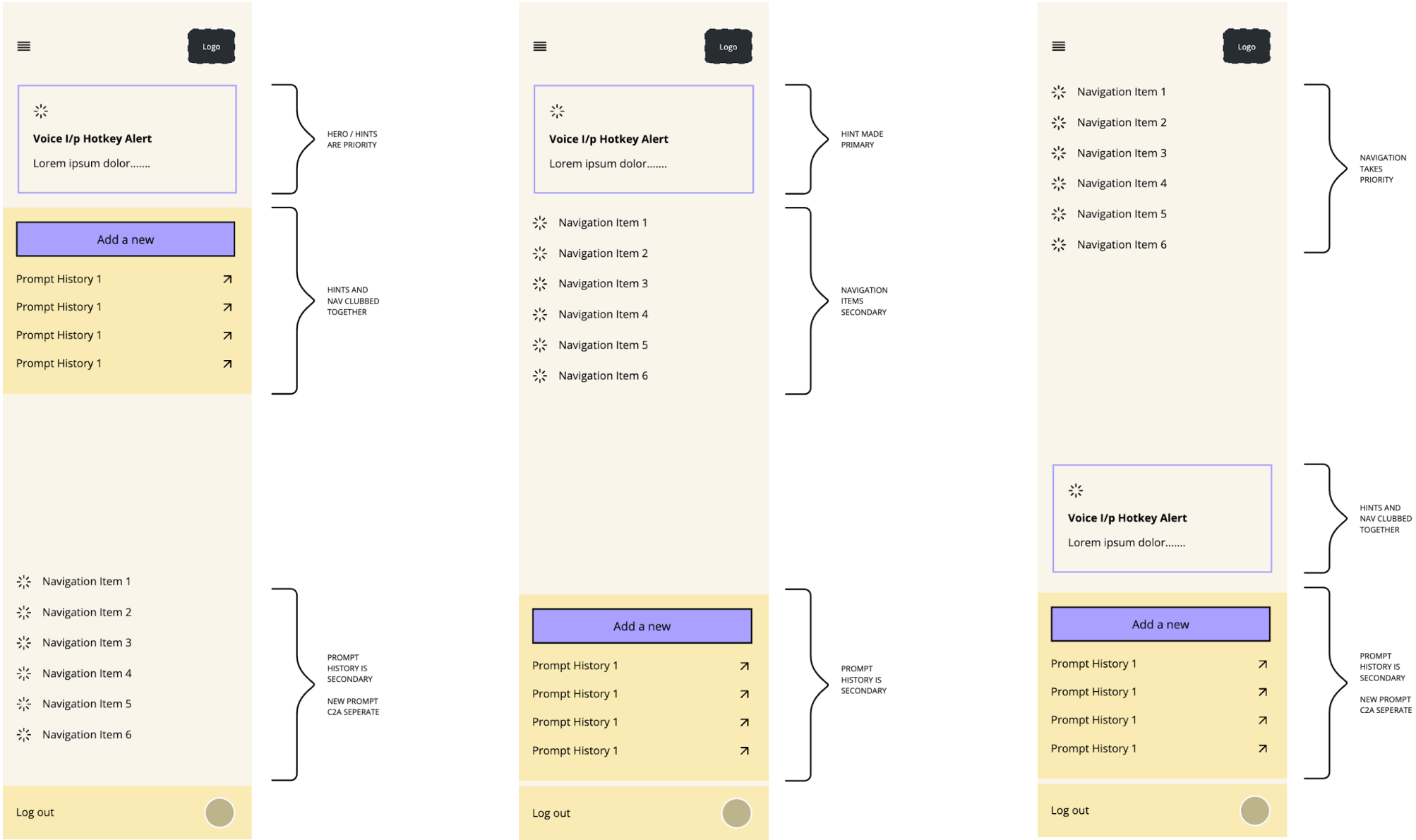
Prompt History

Adding a new chat

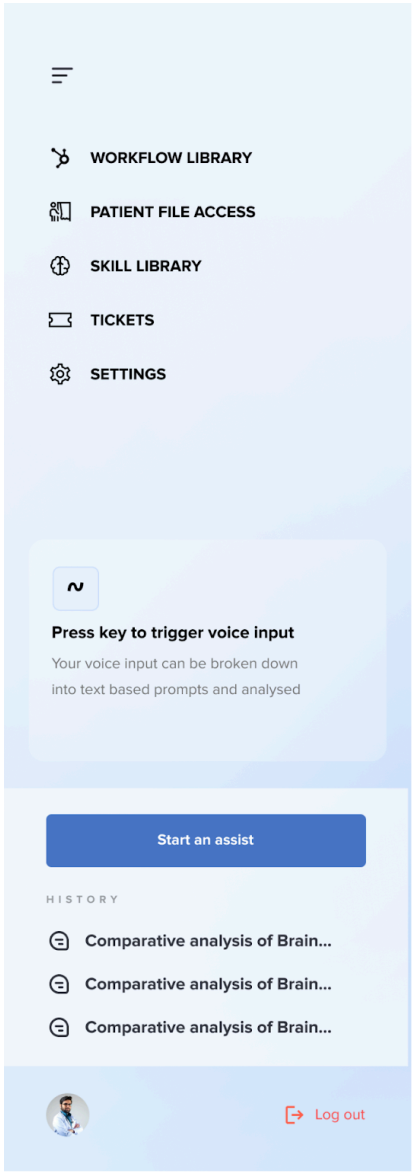
Hint and Cues (if necessary)

Low fidelity Concepts




Logo
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
HERO / HINTS ARE PRIORITY
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
HINTS AND NAV CLUBBED TOGETHER
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
PROMPT HISTORY IS SECONDARY
NEW PROMPT C2A SEPERATE
Log out
Logo
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
HINT MADE PRIMARY
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
NAVIGATION ITEMS SECONDARY
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
PROMPT HISTORY IS SECONDARY
Log out
Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
NAVIGATION TAKES PRIORITY
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
HINTS AND NAV CLUBBED TOGETHER
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
PROMPT HISTORY IS SECONDARY
NEW PROMPT C2A SEPERATE
Log out

High Fidelity

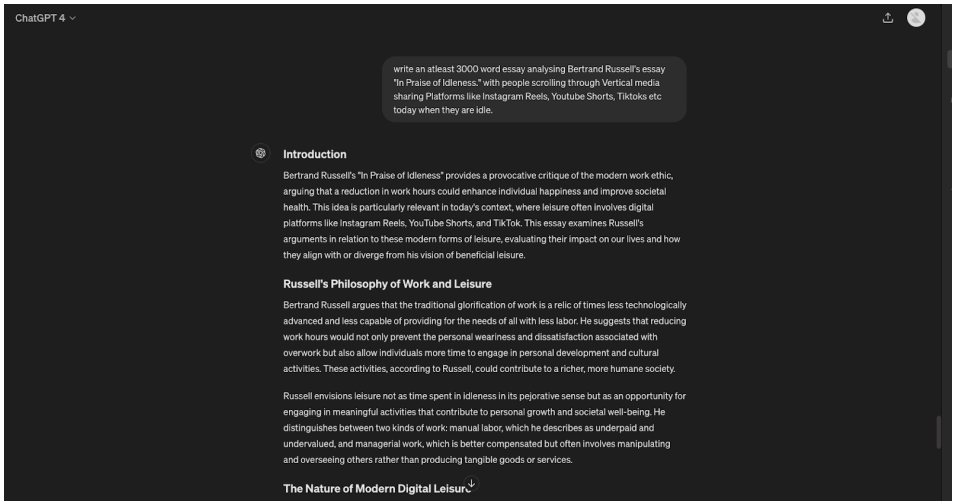


Expanded View

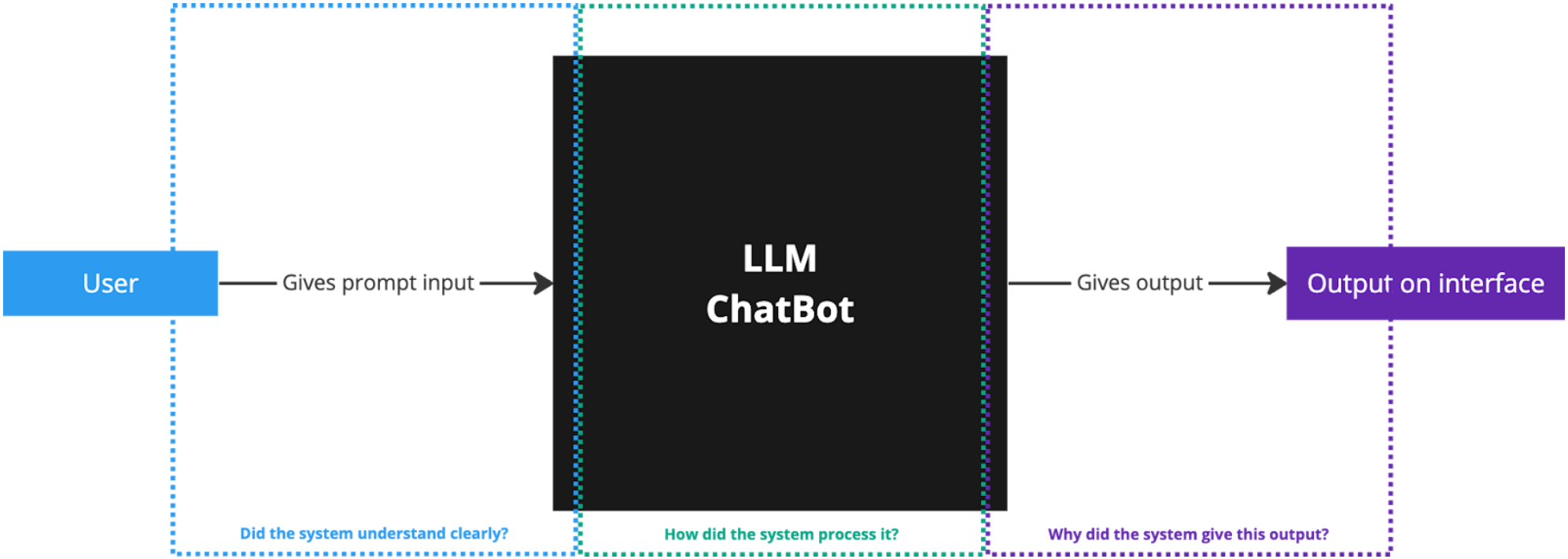
Collapsed View

AI prompt Input- How can we make it trustworthy

The most common application of AI nowadays is through LLM based AI chat-bots. Various AI platforms, like chatGPT and Gemini, take input in the form of a prompt given by the user and give an answer based on that specific prompt.



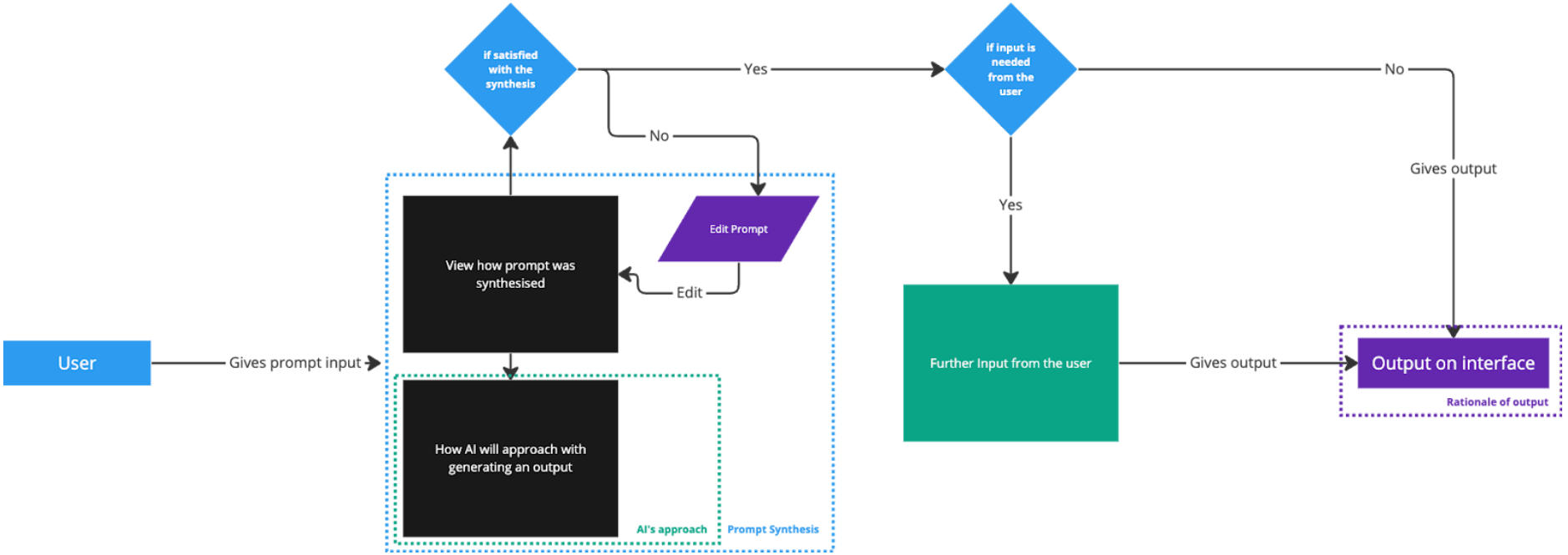
But this makes AI look just like a magic box, in which you give an input and expect an output. This is the black-box problem we discussed in the secondary research. While in literature, it has been discussed that black-box lack explainability or rationale behind an output, I think there is more to it. I feel it's not only about the rationale behind the output, but also assurance of clear and correct understanding of the input.



Since our objective is to build trust in the system, the system should be able to answer these questions for the user:

1. **Did the system understand the prompt clearly and correctly?**
2. **How did the system process it?**
3. **Why did the system give this output?**

Design Suggestion- Segmentation of input into Prompting, Prompt processing and Missing Inputs



How does it exhibit trust?

By providing explanation/transparency

1. Showing how the prompt was broken down into tokens
2. Showing how AI is going to proceed with the synthesis
3. Showing rationale for its output

By providing control

1. Allowing users to edit prompt breakdown
2. Allowing users to eliminate or add certain steps to the approach.

Ramifications of the approach

The major ramifications of this approach would be the increased time taken for a user to get from an input to an output. But looking at the criticality of the context, and that accuracy outweighs quickness. I went ahead with this approach

Prompt Input Screen

In artificial intelligence (AI) systems, "prompt input screen" usually refers to the area or interface where users enter the questions or prompts they want the AI to answer. Depending on the particular AI tool, these screens may differ in appearance and functionality, but they typically operate as the first interface for communicating with the AI.

Text boxes for users to type their prompts, checkboxes or dropdown menus for choosing alternatives, and buttons to submit the input and start the AI's response are examples of prompt input screens. More sophisticated input techniques like uploading files or photographs or even voice input may be supported by certain AI technologies.

Prompt input screen design is essential to allow consumers to express their requirements clearly and get desired responses from the AI system.

In the context of our project, where we look at ensuring trust in interactions. The objective is to come up with interface elements which translate the same.

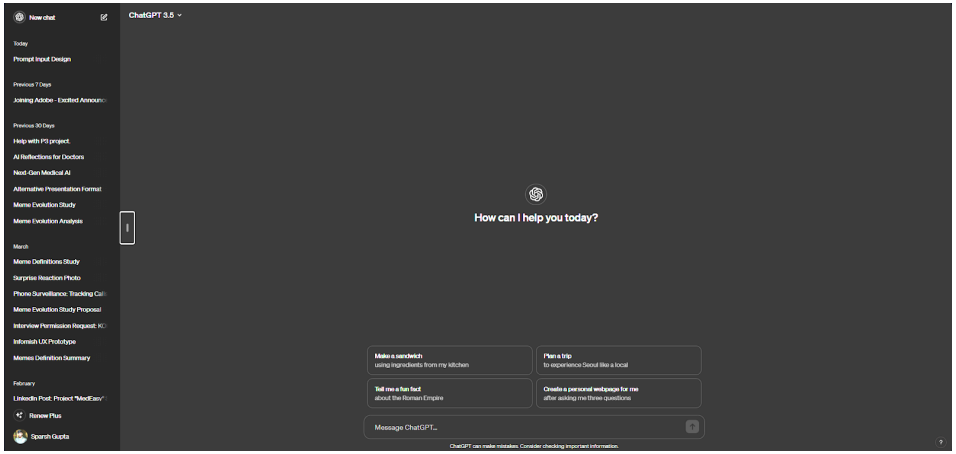
According to literature, there are two ways to motivate trust in systems.

- Explainability
- Control

We start by analysing various platforms which offer the same utility.

How do other platforms employ prompt input?

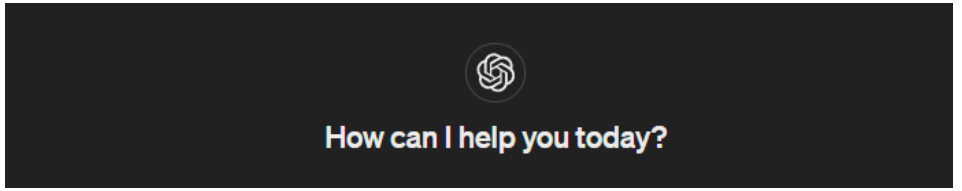
ChatGPT



Elements/comments

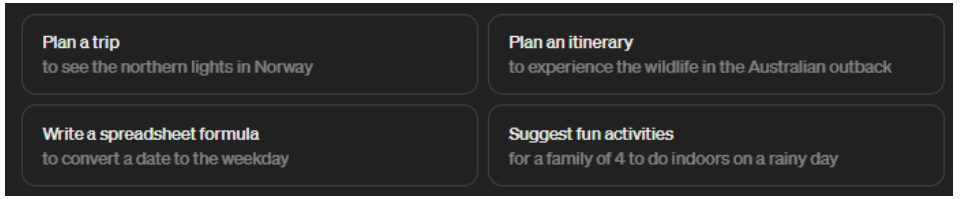
1. Prompt input field

- Hint Text
- Send Button
- Comments:
    - Single Mode of input
    - Hint text isn't able to explain the capability of the system



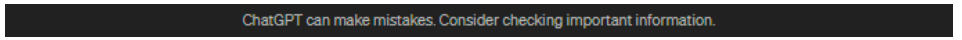
2. Greet Text

- Icon
- "How can I help you today?"



3. Prompt Hints

- 4 in number
- Title implying the main objective of the prompt
- Subtitle implying the constraints
- Comments:
    - A great way to communicate the capabilities of the system, while giving the users an idea of how can they get started with

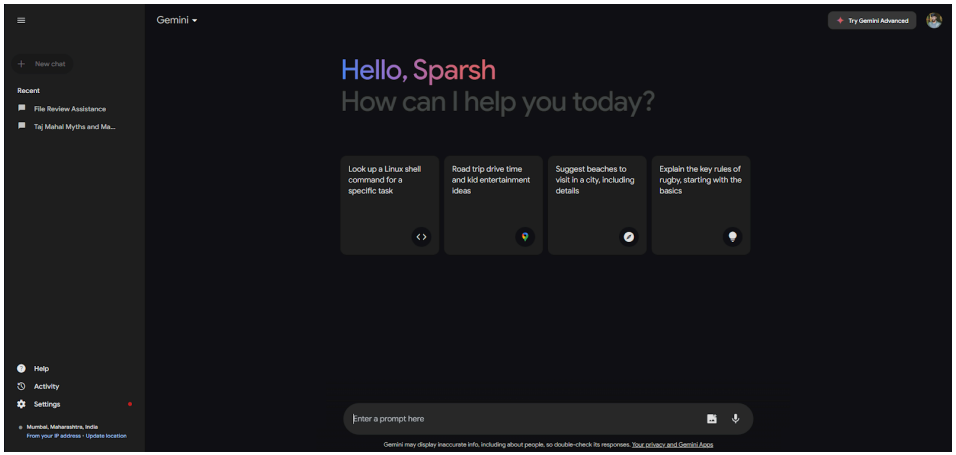


4. Disclaimer hints

- Text (Disclaimer)

- Comments:
    - System acknowledges its limitation
    - Playing further on the trust trope by explicitly advising the users to take advices by the system with a grain of salt

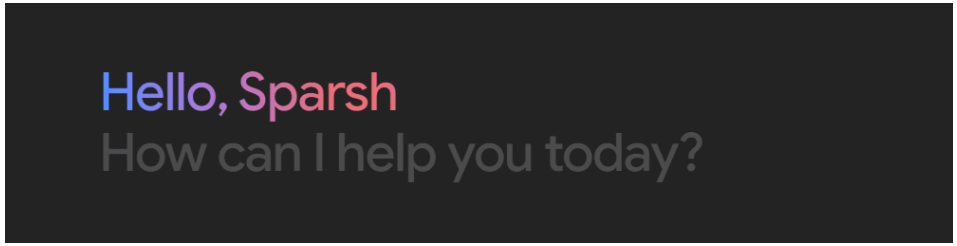
Google Gemini



Elements Identified

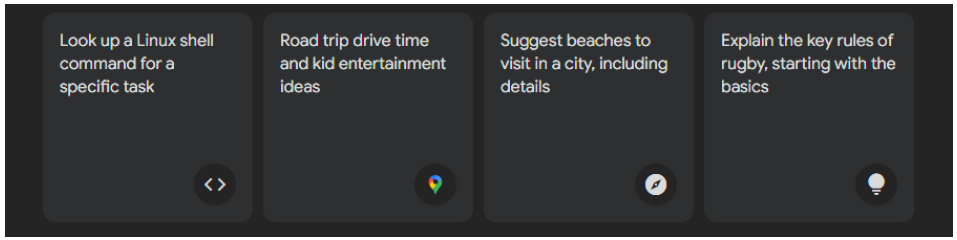
1. Prompt input field

- Hint Text
- Image add icon, suggesting file input
- Mic icon, suggesting audio input
- Send Button appears only if prompt is typed
- Comments:
    - Multiple modes of input
    - Hint text isn't able to explain the capability of the system
    - Send isnt apparent from the get go, the hierarchy is levelled with other input options



2. Greet Text

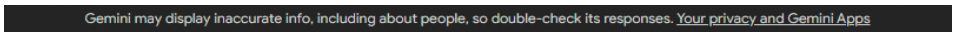
- Personalised Greeting
- "How can I help you today?"
- Comments:
    - The System acts portrayed like a magic box, hence ambiguity regarding the capability of the system, same as ChatGPT



3. Prompt Hints

- 4 in number
- Word to word prompts (No segregation of Intent and Constraint)
- Respective icons, to show the space in which the prompt deals
- Comments:

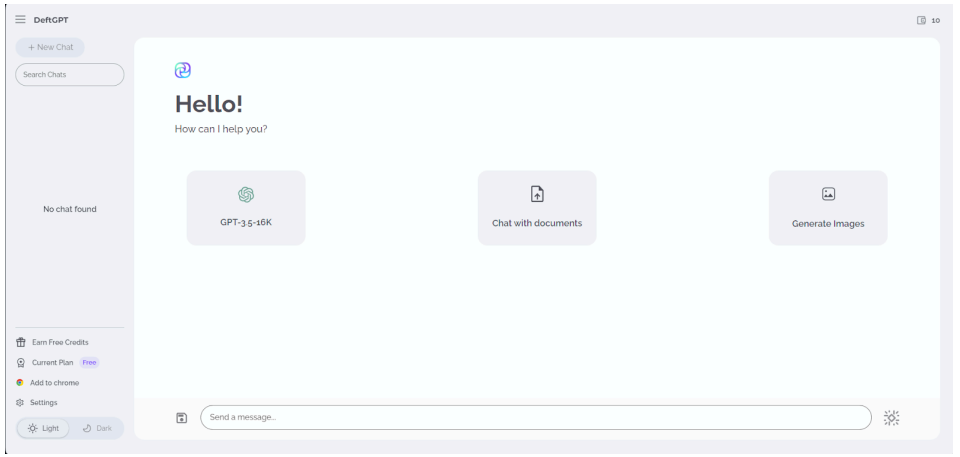
- A great way to communicate the capabilities of the system, while giving the users an idea of how can they get started with



4. Disclaimer hints

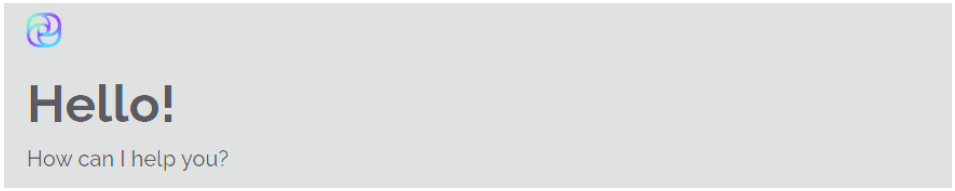
- Text (Disclaimer)
- Privacy policy
- Comments:
    - System acknowledges its limitation
    - Playing further on the trust trope by explicitly advising the users to take advices by the system with a grain of salt

DeftGPT

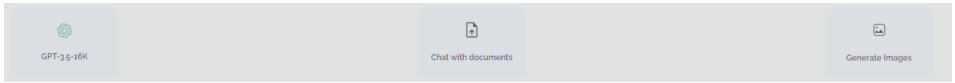


1.2.1 Elements Identified

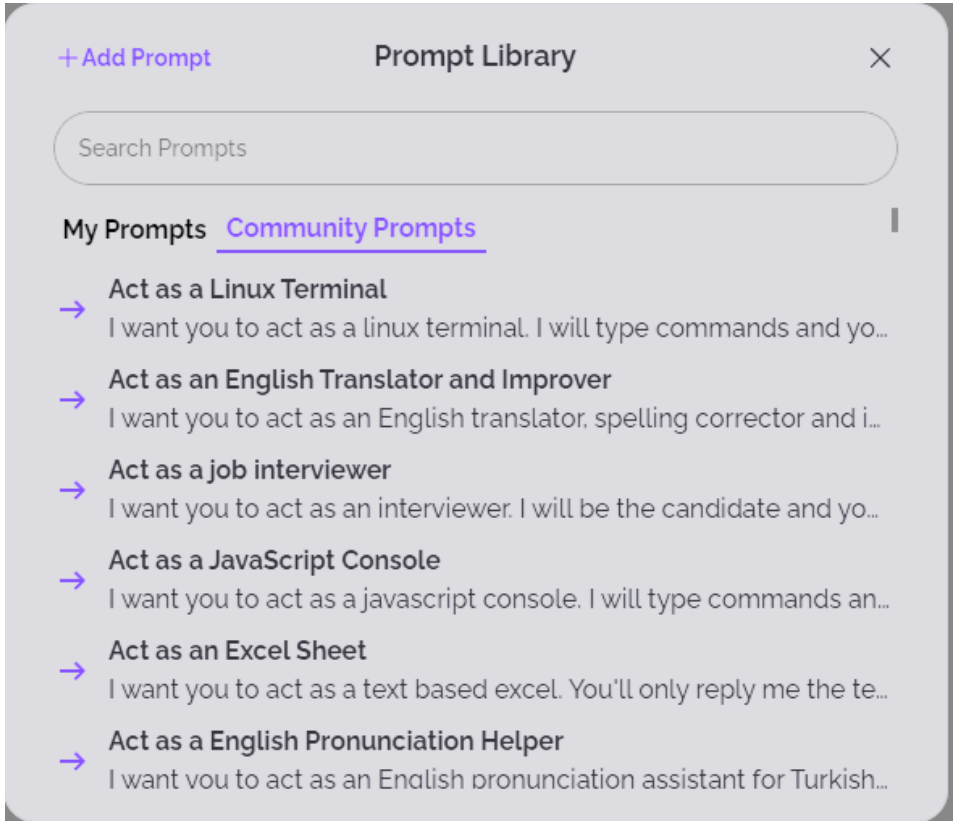
1. Prompt input field
    - Hint Text (General)
    - Save icon to access prompt library
    - Send icon is some custom icon, which is not intuitive
    - Comments:
        - Single mode of input suggested in the field
        - Hint text isn't able to explain the capability of the system
        - Send isnt apparent, a different icon or button can be used



2. Greet Text
   - Hello
   - “How can I help you today?”
   - Comments:
     - The System acts portrayed like a magic box, hence ambiguity regarding the capability of the system, same as ChatGPT

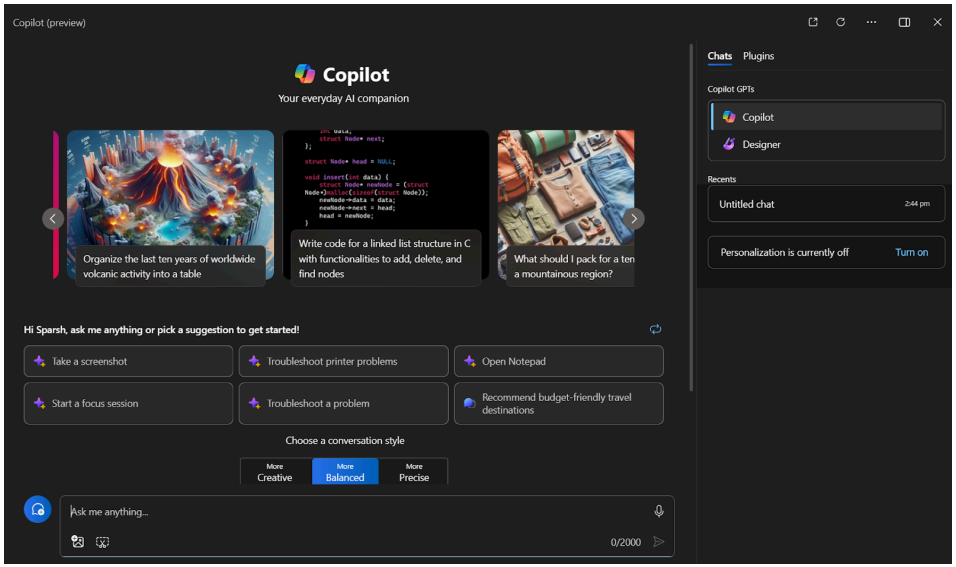


3. Separate options
   - Option to switch engine
   - Modes of input like document
   - Image generation
   - Comments:
     - Hierarchy of options is unlike competitors, challenging the user behavior.

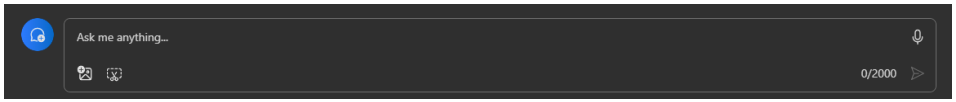


4. Prompt library
   - Searching prompts
   - Add prompt (Personalised)
   - Classification of personalised and community prompts
   - Comments:
     - Could have been a good way to draw boundaries of capability of system, if it was visible from the go.

Microsoft Copilot

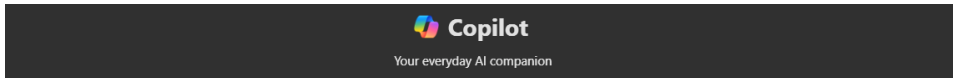


Elements Identified



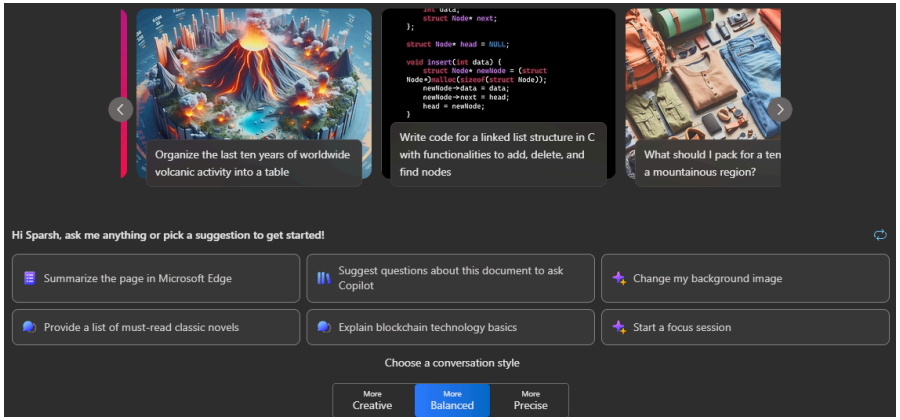
1. Prompt input field

- Hint Text
- Image add icon, suggesting file input
- Snip icon, suggesting direct screenshot input
- Prompt length cap
- Mic icon, suggesting audio input
- Blue button with chat icon, suggesting creation of new chat
- Send Button active only if prompt is typed
- Comments:
    - Multiple modes of input
    - Hint text isn't able to explain the capability of the system
    - Send isnt apparent from the get go, the hierarchy is levelled with other input options
    - Inputs can be grouped together



2. Greet Text

- Logo
- "Your everyday AI Companion"
- Comments:
    - The System acts portrayed like a magic box, hence ambiguity regarding the capability of the system



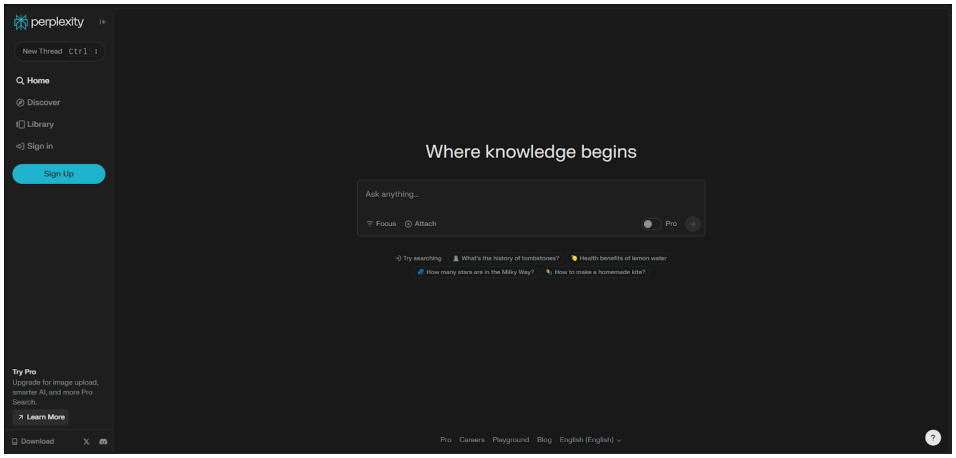
3. Prompt Hints and Tone of voice

- Carousel of prompts accompanied with relevant visuals (3 visible at a time).
- Segregated system related prompt (6 in number), accompanied with icon
- Option for conversation style, operationalising tone of the system.
- Comments:
    - Copilot is a general AI, what makes it different is its integration with the system, hence segregation of system prompts is helpful
    - Operationalising tone is a great way to garner trust by providing control over the system

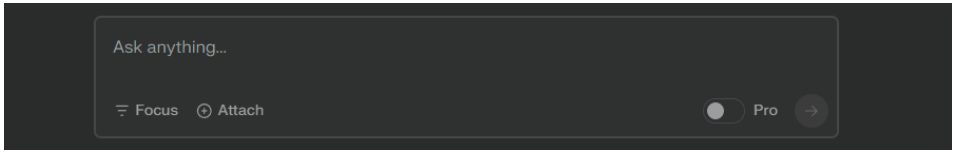
4. Disclaimer hints

- Text (Disclaimer)
- Terms and Conditions and Privacy policy
- Comments:
    - System acknowledges its limitation
    - Playing further on the trust trope by explicitly advising the users to check for inaccuracies.

Perplexity



Elements Identified

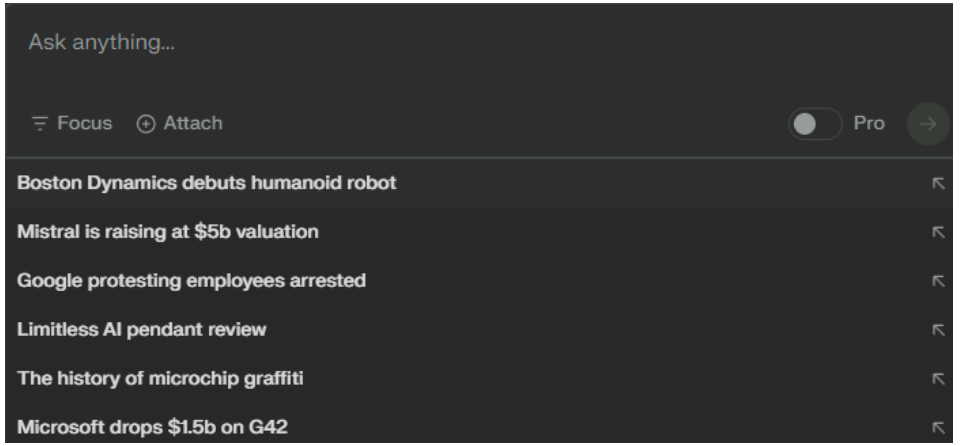


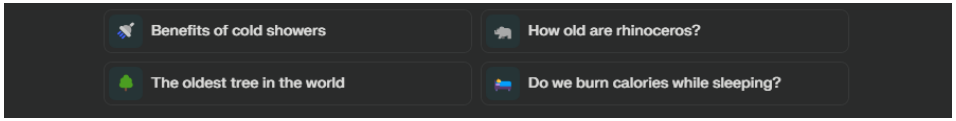
1. Prompt input field

- Hint Text “Ask Anything”
- Switch for toggling with pro
- Send Button appears only if prompt is typed
- Comments:
    - Single Mode of input
    - Hint text isn’t able to explain the capability of the system
    - Send is apparent after typing, the hierarchy is elevated wrt with other input options

2. Greet Text

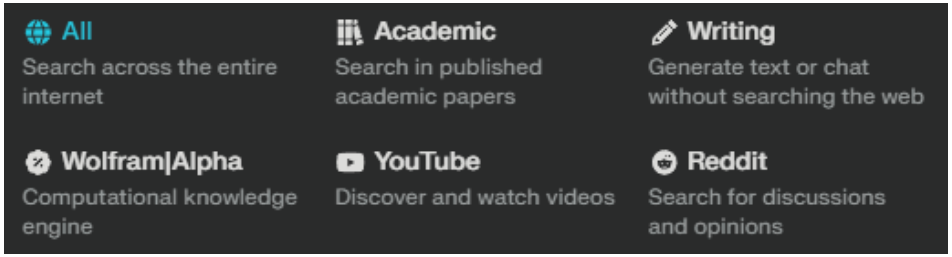
- “Where knowledge begins”
- Comments:
    - There is ambiguity regarding the capability of the system. Difference is with the usage of the word knowledge which provides some context to the capabilities





3. Prompt Hints

- 2 distinct modes of hints
- One mode shows trending or most used prompts, there is a knowledge centric theme to it. Pops up when user starts typing prompt
- Other being sample prompts (4 in no.), which are more general in nature
- Word to word prompts (No segregation of Intent and Constraint)
- Respective icons, to show the space in which the prompt deals
- Comments:
    - A great way to communicate the capabilities of the system, while giving the users an idea of how can they get started with
    - Knowledge still pops up as the key context



4. Tone of Voice

- 6 different options, giving control over the system.
- There is an attached description of exactly how each option works
- Comments:
    - Transparency in function is provided, trust established.
    - Operationalising tone is a great way to garner trust by providing control over the system

Design Considerations for trust

1. Clarity and Communication

Key Insight: The interface should clearly communicate what the AI can and cannot do.

How to Implement:

- Use hint texts effectively to guide users on what questions to ask or actions to perform.
- Include examples or suggestions right at the prompt input to help users understand the types of queries that will yield meaningful responses.

2. Multimodal Interaction

Key Insight: Offering multiple ways to interact with the AI caters to different user preferences and needs, enhancing accessibility and ease of use.

How to Implement:

- Besides text input, incorporate options like voice commands, photo uploads, or document inputs, which can make the AI more accessible to users with different abilities or preferences.
- Clearly label these options with icons and tooltips to ensure users understand how to use them.

3. Intuitive Elements (Looking at affordances)

Key Insight: The input interface should be responsive and intuitive, providing feedback when users type or interact with the AI.

How to Implement:

- The send button or submission cue should be prominently displayed and should react when users enter text (e.g., change color, become clickable).
- Offer real-time suggestions or autocomplete options based on what the user types.

4. Establish Expectations

Key Insight: Setting the right expectations can prevent confusion and build trust.

How to Implement:

- Use greeting texts or initial messages to briefly describe what the AI can help with.
- If the AI has limitations (like language restrictions, topic expertise), mention these upfront.

5. Disclaimers and Transparency

Key Insight: Being transparent about the AI's functionality and data handling policies builds trust.

How to Implement:

- Include a brief, visible disclaimer about the limitations of the AI.
- Provide easy access to privacy policies and terms of use.

6. User Control and Customization

Key Insight: Allowing users to control their interaction styles and how they receive responses can make the interface more user-friendly.

How to Implement:

- Let users choose the tone of responses (formal, casual, etc.), especially in customer service settings.
- Allow users to toggle settings such as verbosity of AI's responses or themes.

Design/System Constraints

Studying the context of the project, I was able to eliminate what was not necessary or supported by the project. The constraints to work around were:

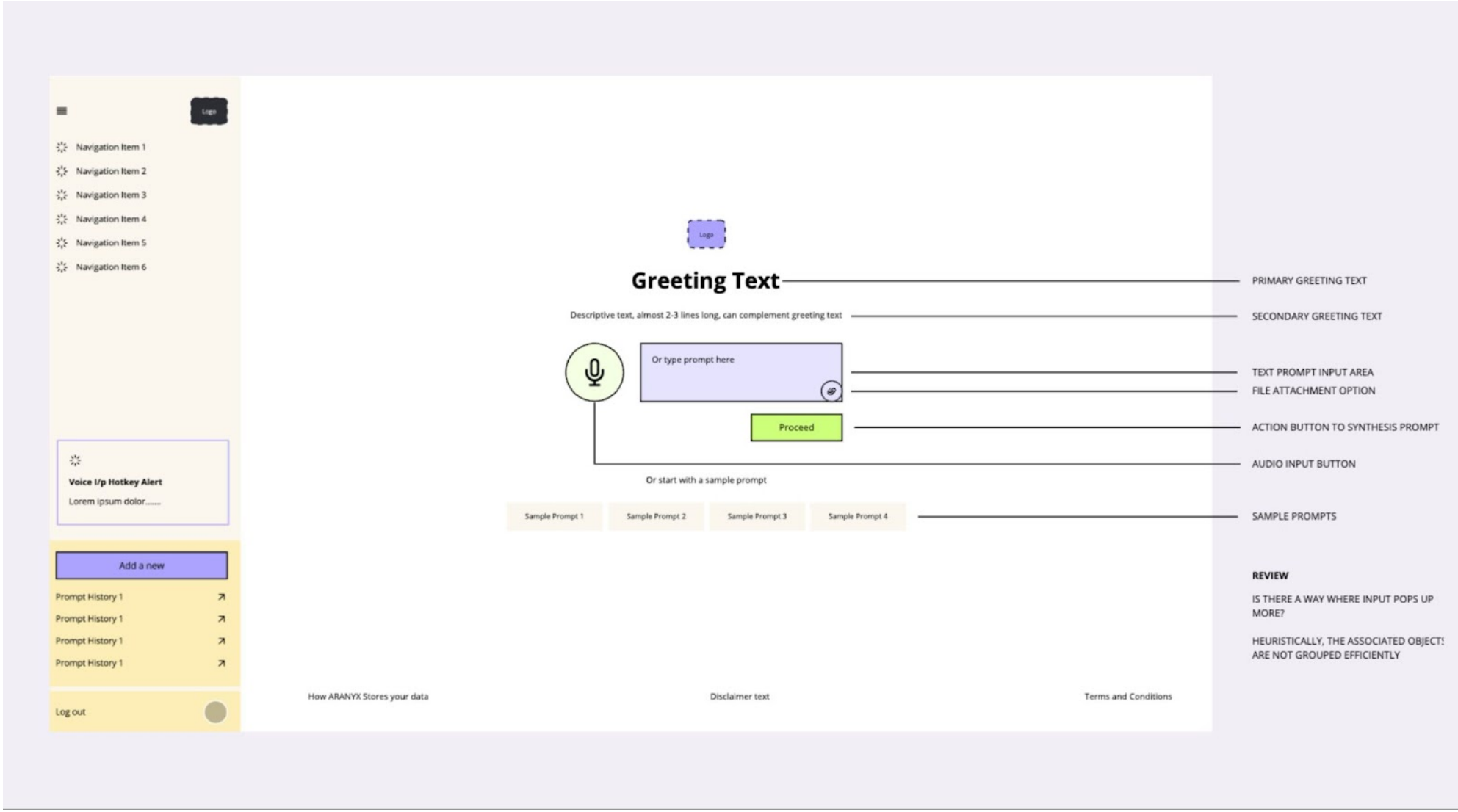
- **3 modes of input**, text, voice, file

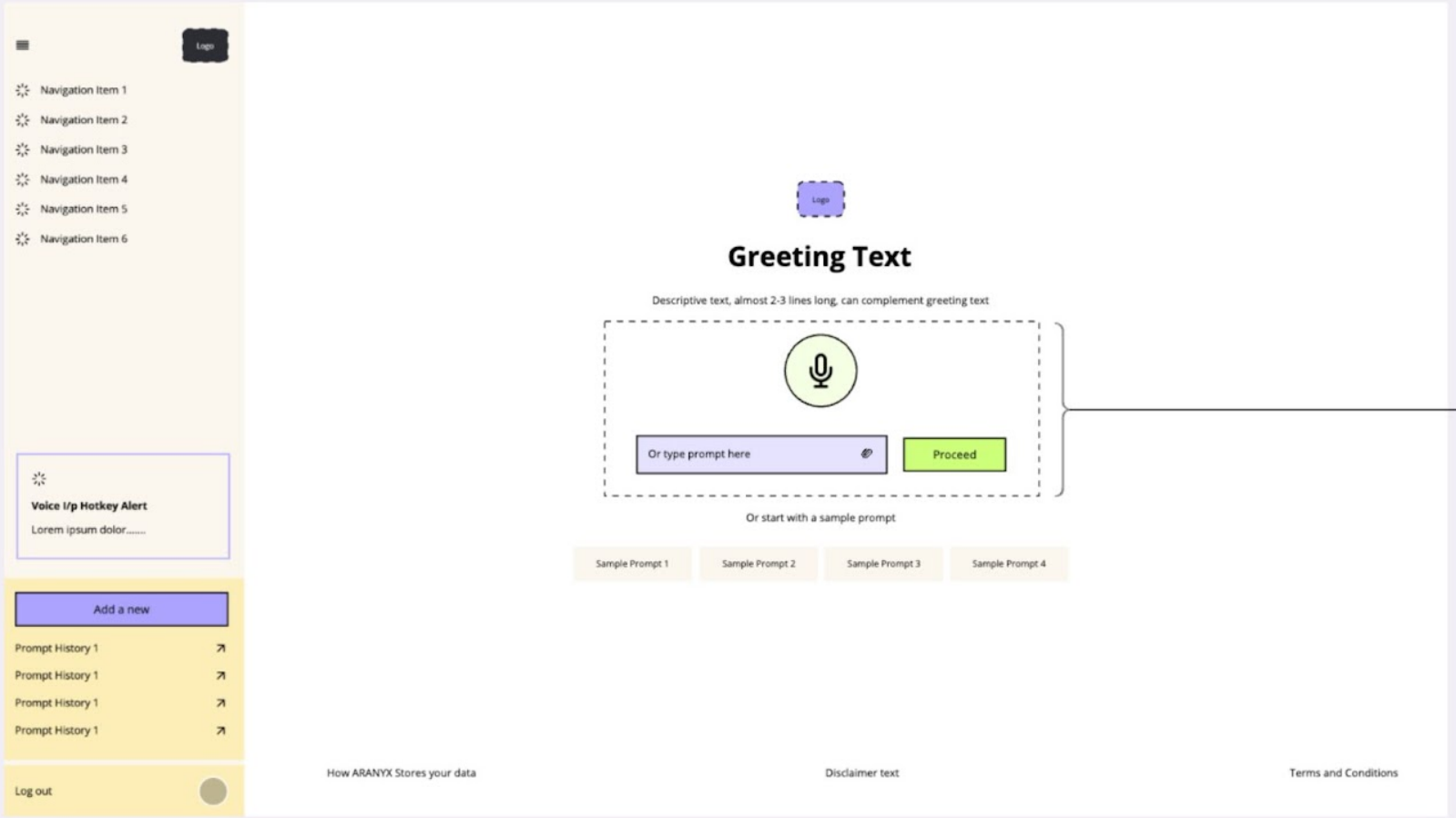
- There are **no other modes of operation** other than the base

- A middle stage of workflow suggestion, so the output isn't displayed directly.

Layout Anatomy

Low Fidelity Screens





CHANGE IN LAYOUT OF INPUTS, WHERE AUDIO INPUT TAKES PRECEDENCE OVER TEXT INPUT

REVIEW

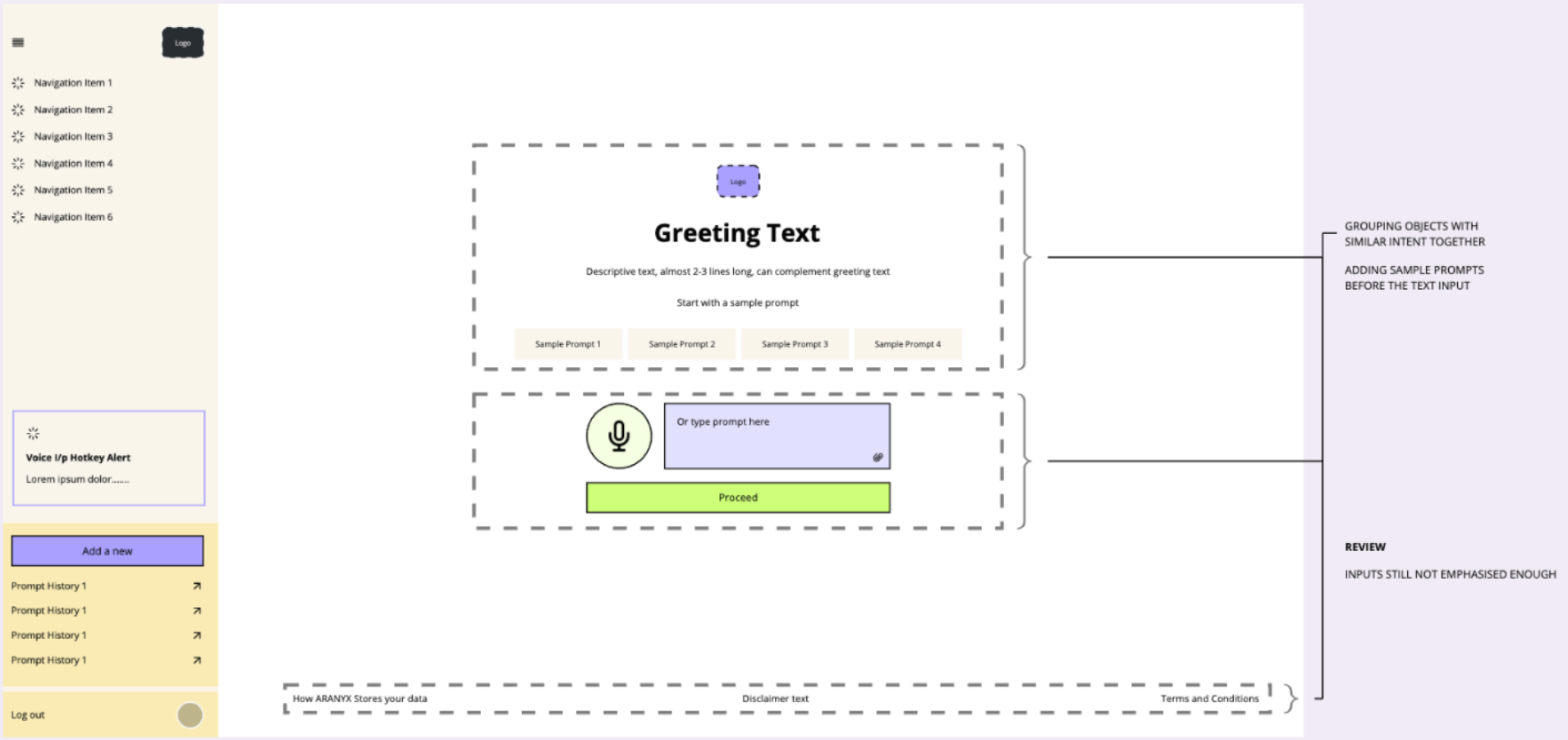
GIVING AUDIO INPUT PREFERENCE MIGHT SEEM PROMISING, BUT GIVEN THE USE CASE OF THE SYSTEM IS LESS RELEVANT. TEXT INPUT WILL MOST LIKELY BE USED MORE OFTEN

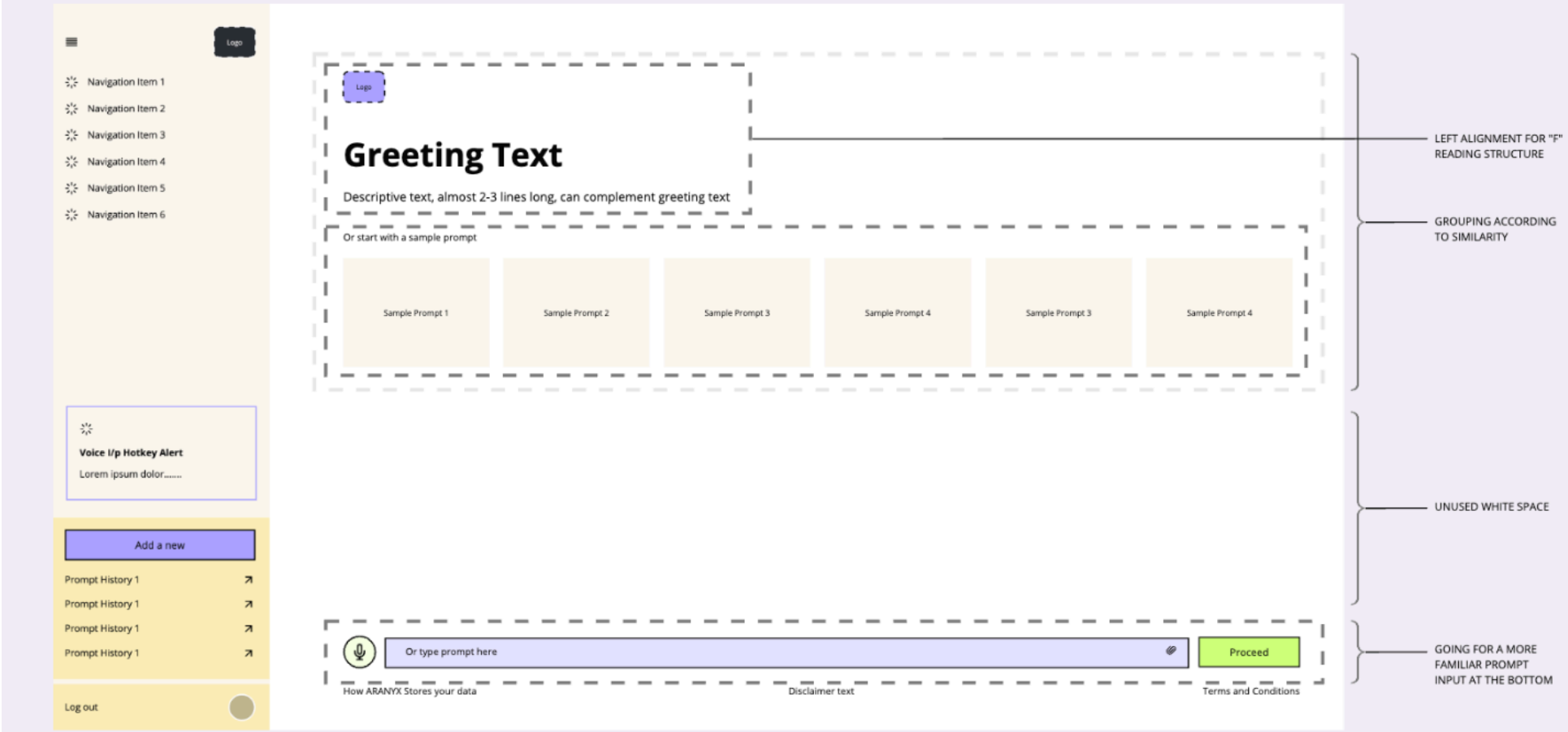
HEURISTICALLY, THE ASSOCIATED OBJECTS ARE NOT GROUPED EFFICIENTLY

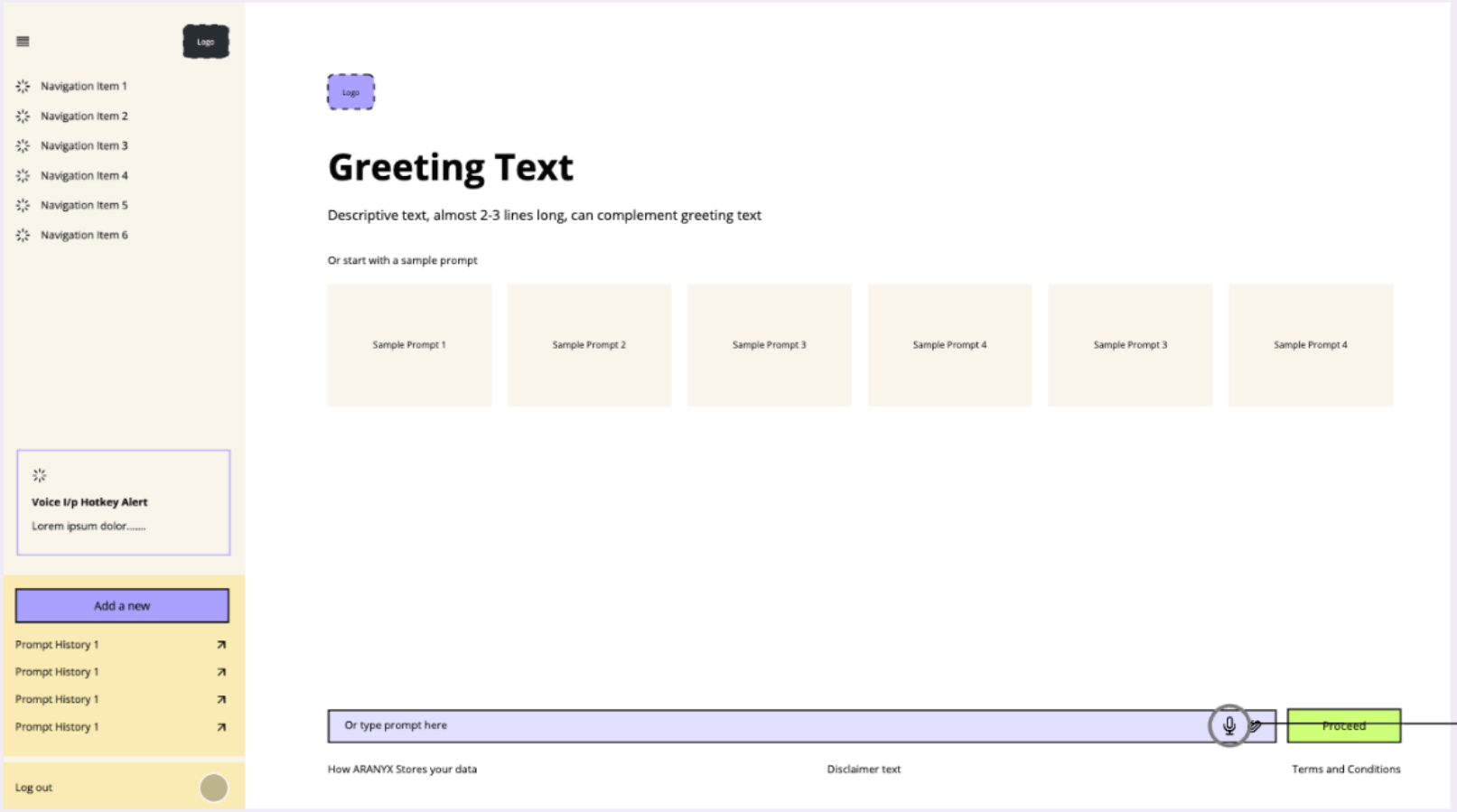
COMMENT TO SELF

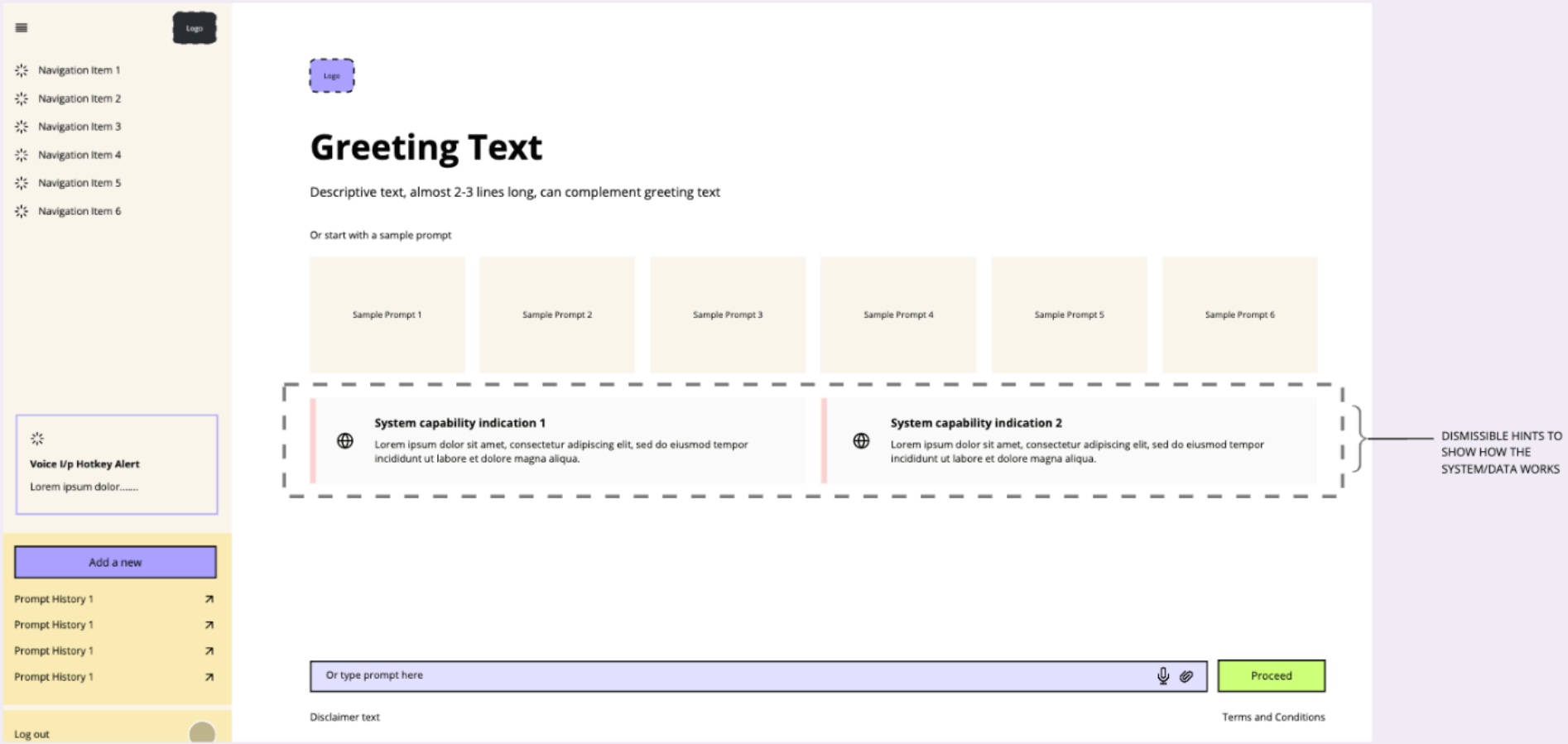
GIVING AUDIO INPUT, REALISTICALLY IS MUCH HARDER (ATLEAST RIGHT NOW).

WHAT IF THE SYSTEM COULD AMBIENTLY LISTEN TO CONVERSATION BETWEEN A PATIENT AND A DOCTOR?

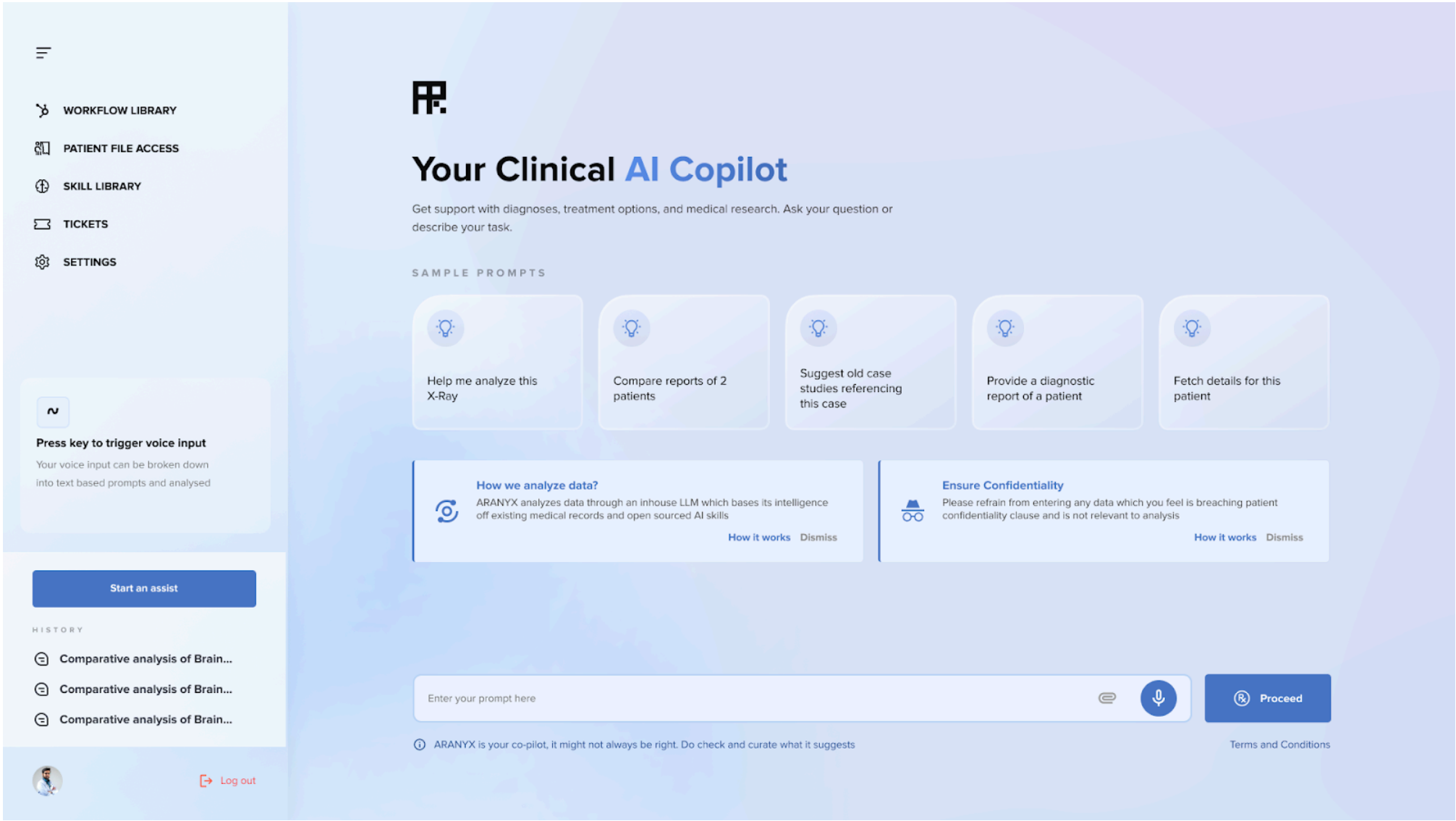

Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Logo
Greeting Text
Descriptive text, almost 2-3 lines long, can complement greeting text
Start with a sample prompt
Sample Prompt 1
Sample Prompt 2
Sample Prompt 3
Sample Prompt 4
Or type prompt here
Proceed
How ARANYX Stores your data
Disclaimer text
Terms and Conditions
GROUPING OBJECTS WITH SIMILAR INTENT TOGETHER
ADDING SAMPLE PROMPTS BEFORE THE TEXT INPUT
REVIEW
INPUTS STILL NOT EMPHASISED ENOUGH

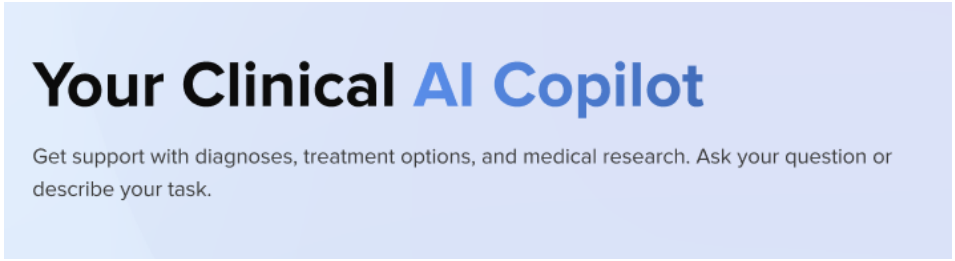

Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Logo
Greeting Text
Descriptive text, almost 2-3 lines long, can complement greeting text
Or start with a sample prompt
Sample Prompt 1
Sample Prompt 2
Sample Prompt 3
Sample Prompt 4
Sample Prompt 3
Sample Prompt 4
Or type prompt here
Proceed
How ARANYX Stores your data
Disclaimer text
Terms and Conditions
LEFT ALIGNMENT FOR "F" READING STRUCTURE
GROUPING ACCORDING TO SIMILARITY
UNUSED WHITE SPACE
GOING FOR A MORE FAMILIAR PROMPT INPUT AT THE BOTTOM


Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Logo
Greeting Text
Descriptive text, almost 2-3 lines long, can complement greeting text
Or start with a sample prompt
Sample Prompt 1
Sample Prompt 2
Sample Prompt 3
Sample Prompt 4
Sample Prompt 3
Sample Prompt 4
Or type prompt here
Proceed
AUDIO INPUT INCLUDED IN THE INPUT BAR
How ARANYX Stores your data
Disclaimer text
Terms and Conditions


Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Logo
Greeting Text
Descriptive text, almost 2-3 lines long, can complement greeting text
Or start with a sample prompt
Sample Prompt 1
Sample Prompt 2
Sample Prompt 3
Sample Prompt 4
Sample Prompt 5
Sample Prompt 6
System capability indication 1
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
System capability indication 2
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
DISMISSIBLE HINTS TO SHOW HOW THE SYSTEM/DATA WORKS
Or type prompt here
Proceed
Disclaimer text
Terms and Conditions

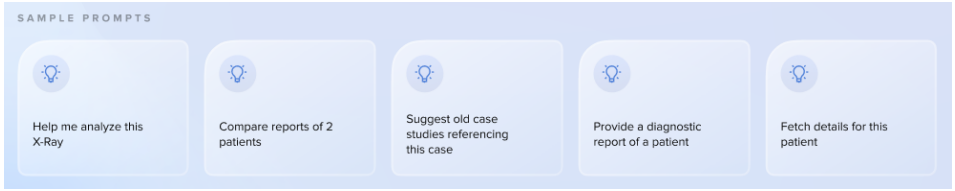
High Fidelity Design





Greet Text and description:

"Your clinical AI co-pilot", clearly illustrates the role and the context of the system for the user. The description "Get support with diagnoses, treatment options, and medical research. Ask your question or describe your task." not only tries to illustrate the capabilities of the system, but also acts as a call-to-action for the users.



Sample prompts:

Sample prompts not only provide explainability to the system, but also provide a starting point for the user to get familiar with the capability of the system.

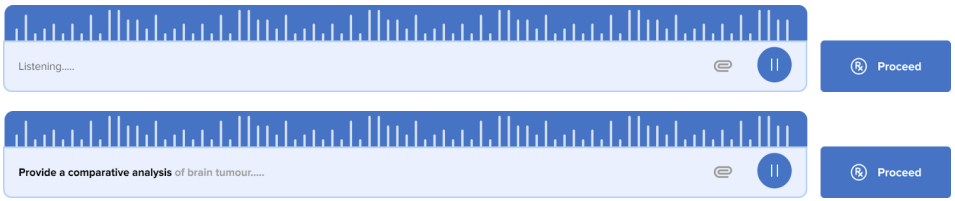
Platform hints to illustrate transparency and good intent:

Cues like "How we analyse data?" gives the users agency to investigate further into how the platform works and ensures transparency.

Cues like "Ensure confidentiality" portrays good intent of the platform and shows that the system wants the best outcome for the user.

Multimodal input:

Text, file and audio input are supported.



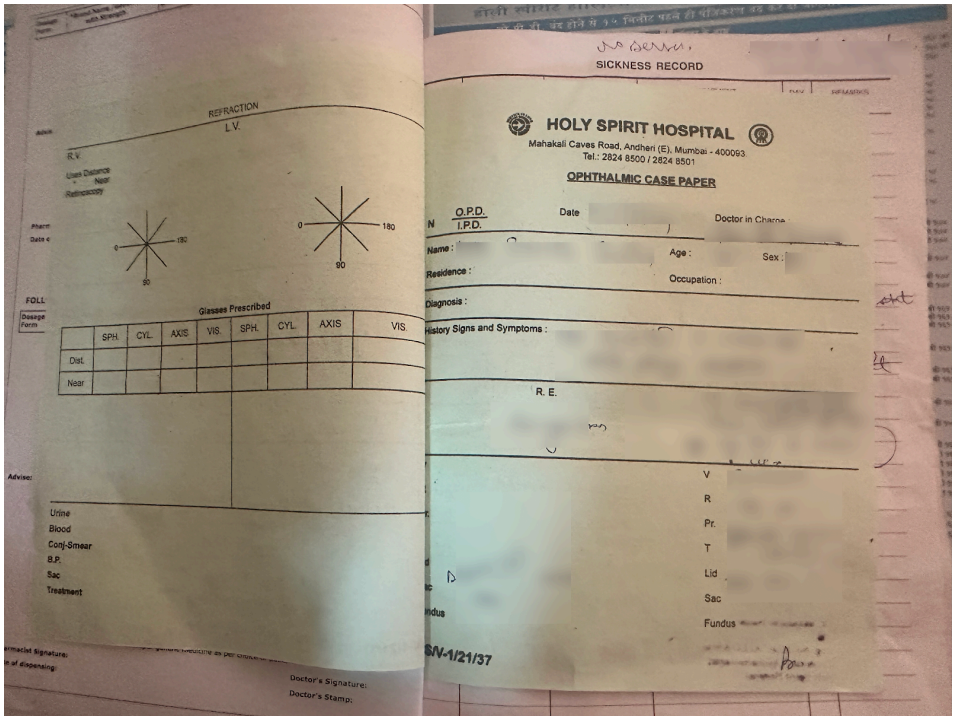
Real Time voice to text feedback:

Interpreted text for voice is visible at any time and the input can be paused and edited.

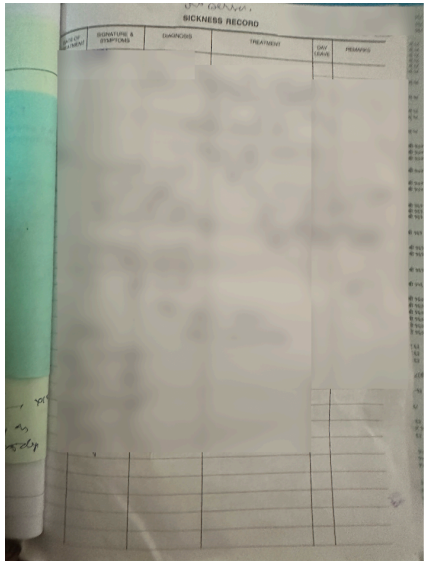
Prompt Processing

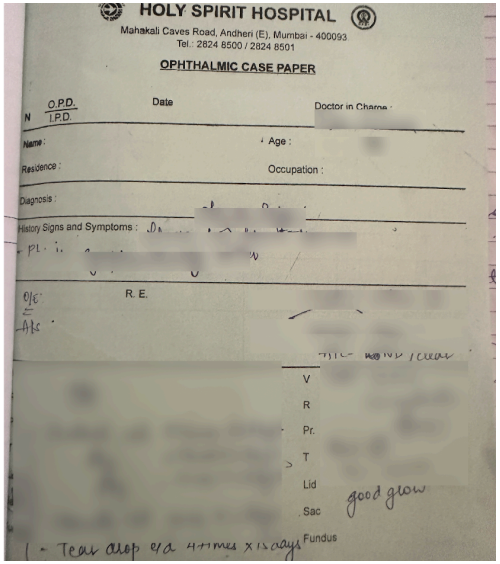
How do doctors fill in details while consulting in real-life

The intention of this step was to look for metaphors to derive interactions and layouts from. This involved me investigating how doctors interact with reports and other paperwork in a patient's file.



Files where everything relevant to medical history is chronologically arranged. An affordance to look at here is the **viewer's action to flip over to the next page** to dive deeper into the patient's history.





Doctors are **adept in filling forms,** or assigning certain values to certain specific columns or values.

Layout Anatomy

How do LLMs work

Transformer Architecture: The heart of modern LLMs. Transformers excel at processing sequences (like words in a sentence) by considering their relationships to each other. This is crucial for understanding context.

Step-by-Step Process

1. Prompt Input: You provide a text prompt, such as "Explain how LLMs work."

2. Tokenization: The LLM breaks your prompt into tokens. For instance, "Explain" might be one token, "how" another, etc.

Example: "Explain how LLMs work" -> ["Explain", "how", "LLMs", "work"]

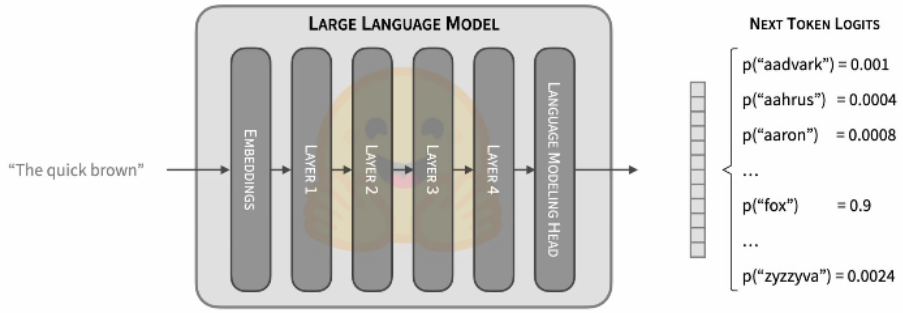
3. Embedding: Each token is converted into a numerical representation (a vector) that captures its meaning and relationships to other tokens. These vectors live in a high-dimensional space where similar words are closer together.

4. Transformer Encoding: The transformer layers process the sequence of token embeddings. They attend to different parts of the input, weighing their importance, and exchange information to build a rich understanding of the prompt's meaning.

5. Transformer Decoding: The model generates a sequence of output tokens (the response) one at a time. At each step, it considers the previously generated tokens and the encoded prompt representation.

- **Example:** ["LLMs", "are", "powerful", "language", "models"]

5. Response Output: The final sequence of decoded tokens is presented to you as the LLM's response.



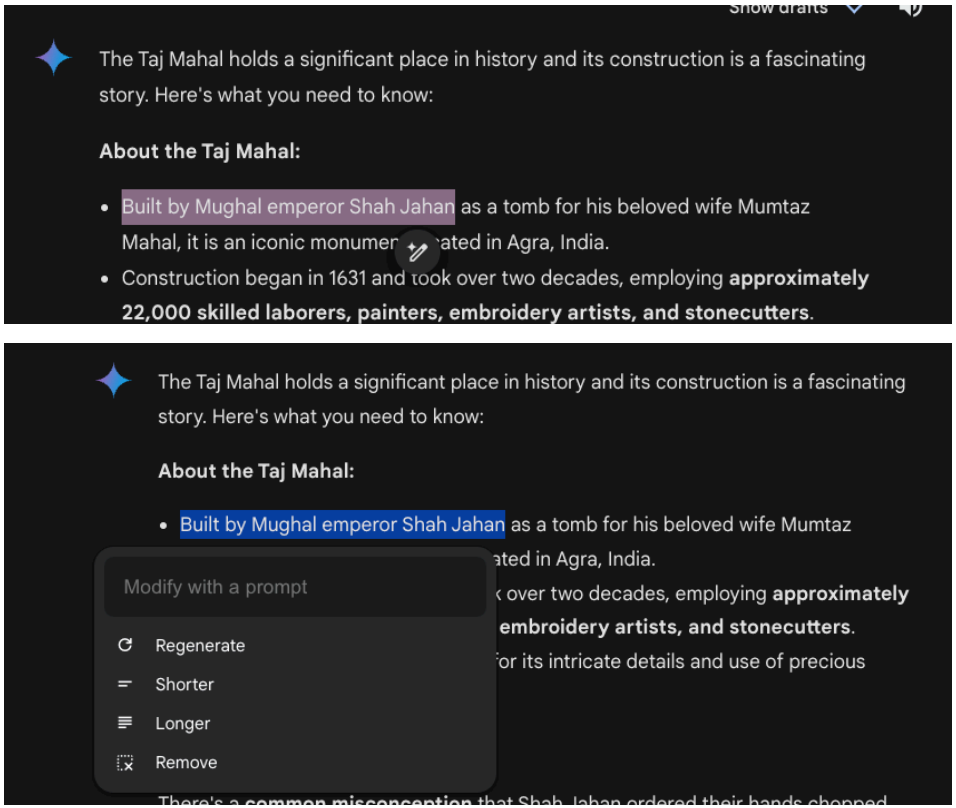
(add reference of the diagram)

How can we change the breakdown of the prompt

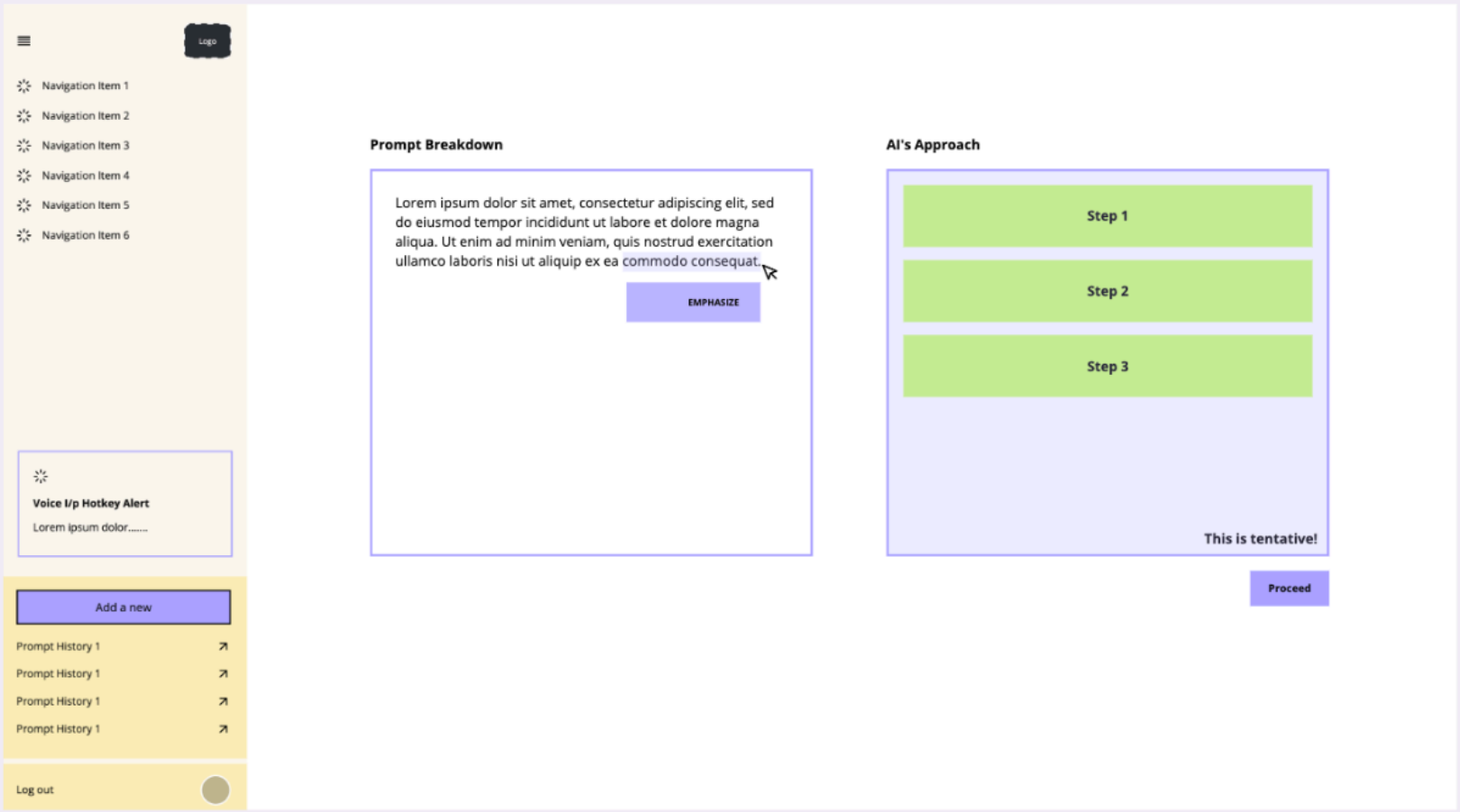
Looking at how prompts are first tokenized, then embedded with weight. There are 2 ways of altering the breakdown of a prompt.
1- By adding weight to token/s.
2- By removing weight from token/s

How have other platforms done it

Although Gemini, just like most other platforms, doesn't support prompt editing (Apart from simple text edit). It has a functionality of selecting certain portion of output and mutating it.

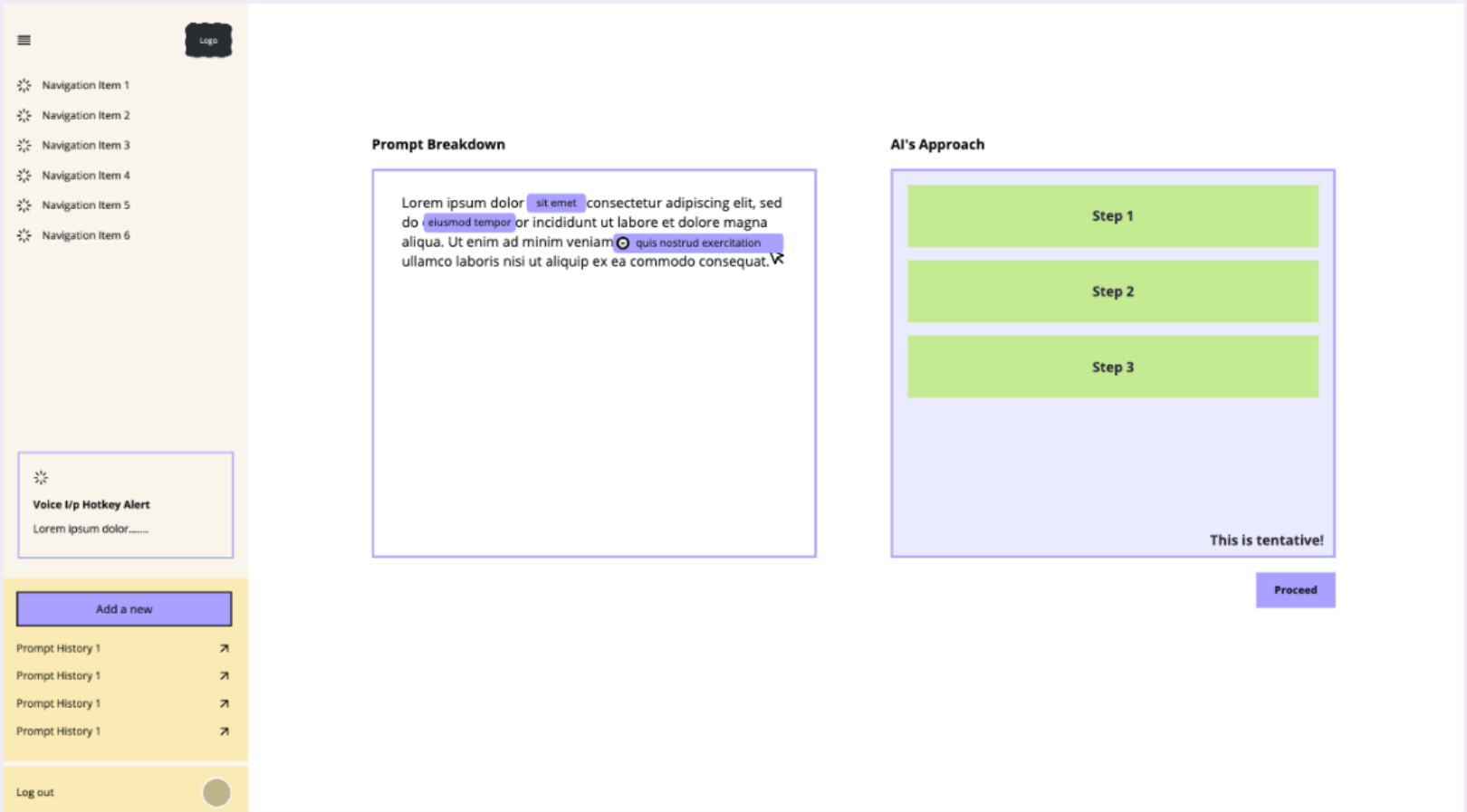


Low Fidelity Ideations



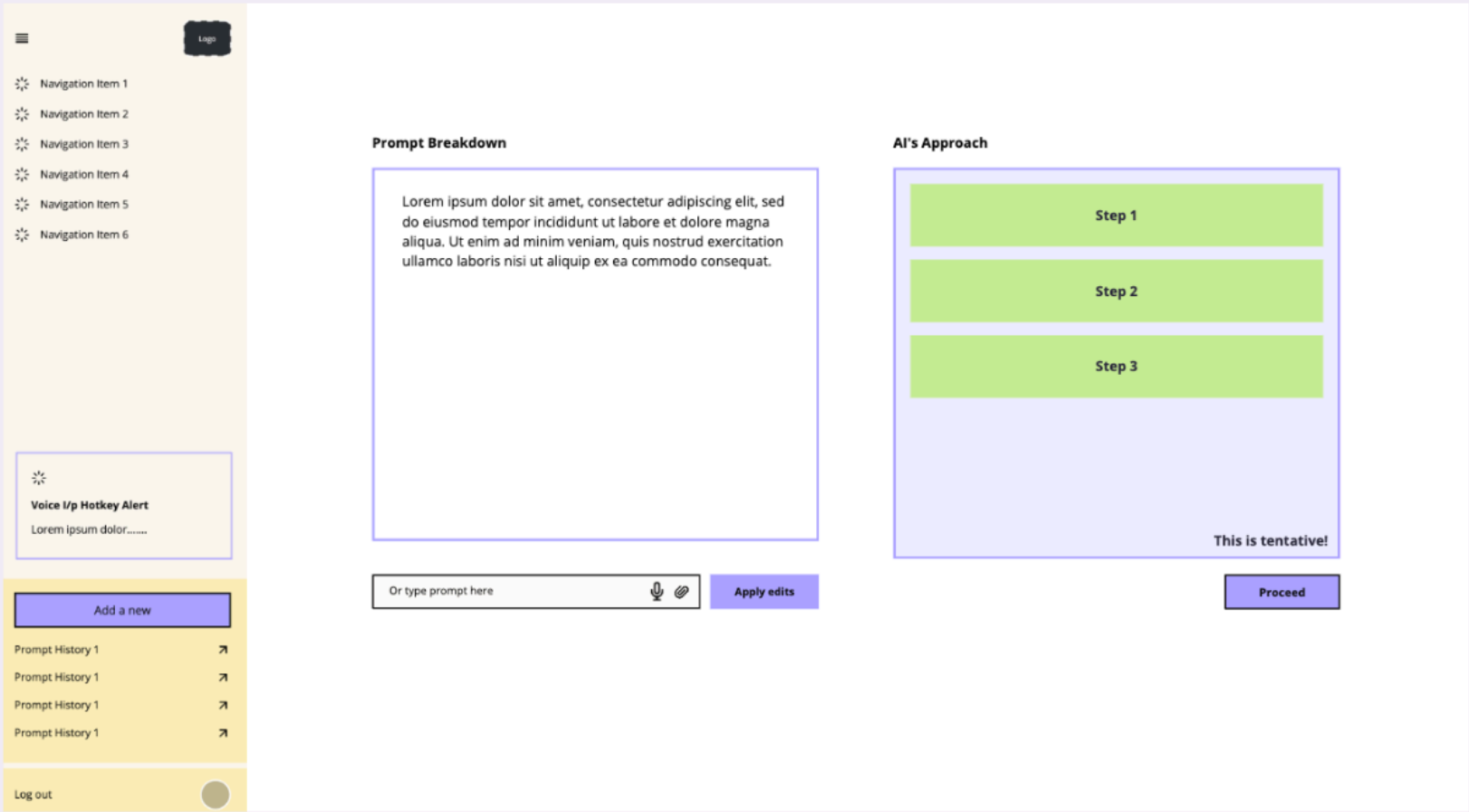
SELECT AND RIGHT CLICK TO OPEN A DROPDOWN THROUGH WHICH YOU CAN EMPHASIZE ON CERTAIN PART OF PROMPT, WHICH ACCORDING TO YOU WAS NOT COVERED WELL ENOUGH

COMMENTS
THIS ADDS A BIT MORE CONTROL FOR THE USER BY ALLOWING THE USER TO ADD WEIGHT TO CERTAIN TOKEN/S



WEIGHTED TOKENS ARE SHOWN TO THE USER. USER CAN HOVER OVER A TOKEN TO REMOVE IT.

COMMENTS
THIS ADDS A BIT MORE CONTROL FOR THE USER BY ALLOWING THE USER TO DEDUCT WEIGHT TO CERTAIN TOKEN/S



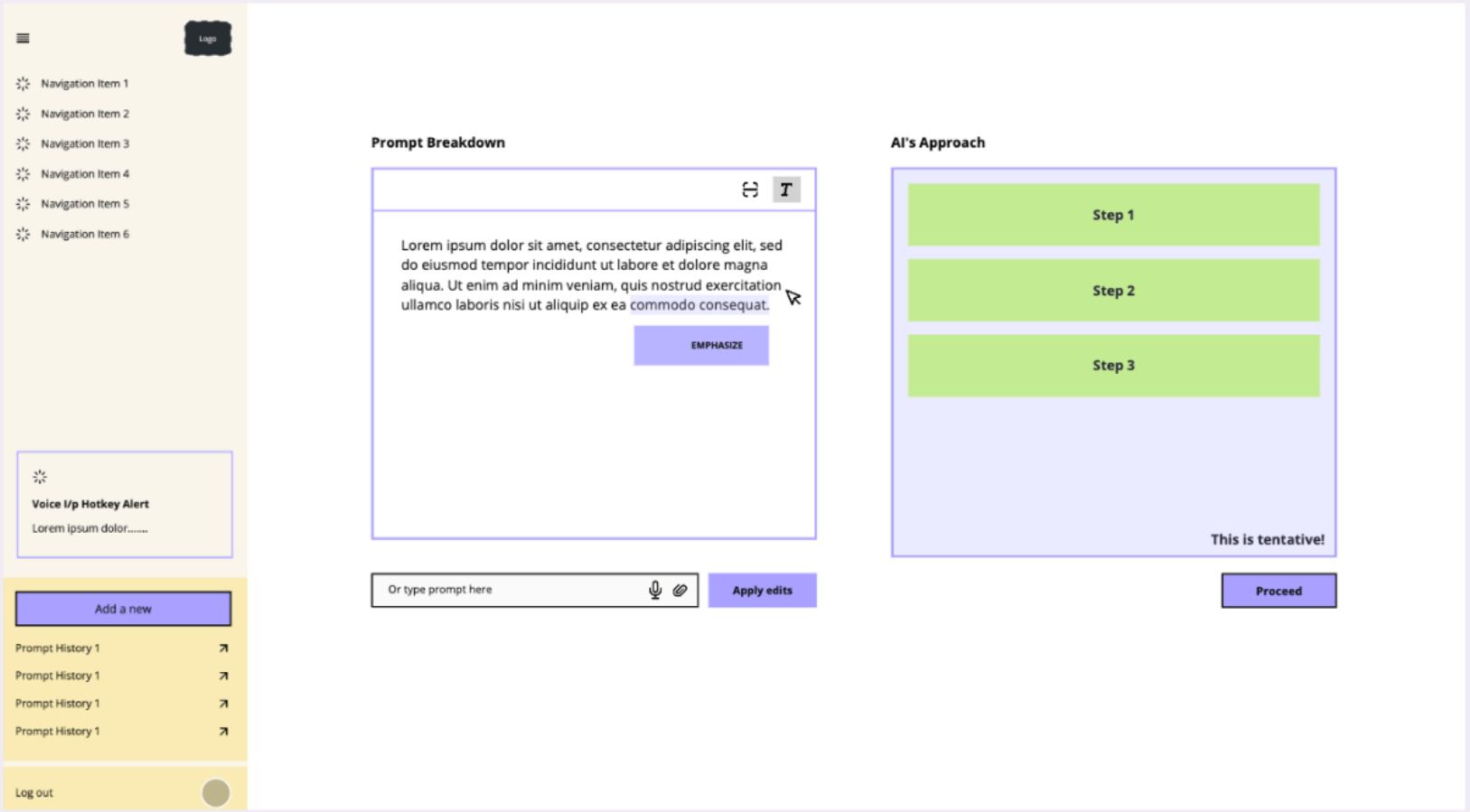
PROMPT TO EDIT PROMPT BREAKDOWN

COMMENTS

FULL CONTROL TO THE USER BY ALLOWING BOTH ADDITION AND SUBTRACTION TO THE WEIGHTS

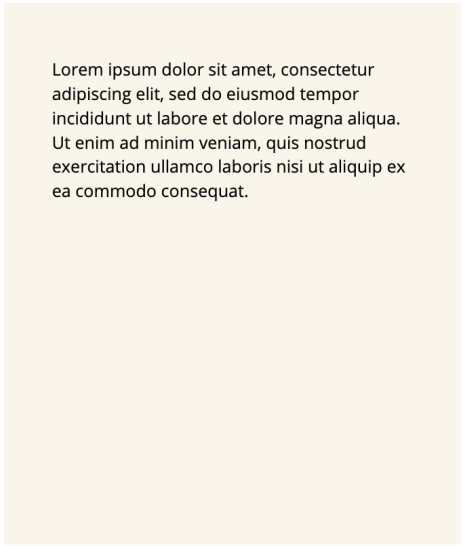
ALTHOUGH SINCE IT ALSO RELIES ON AI, IT MIGHT NOT BE A GOOD OPTION STANDALONE

Finalised concept

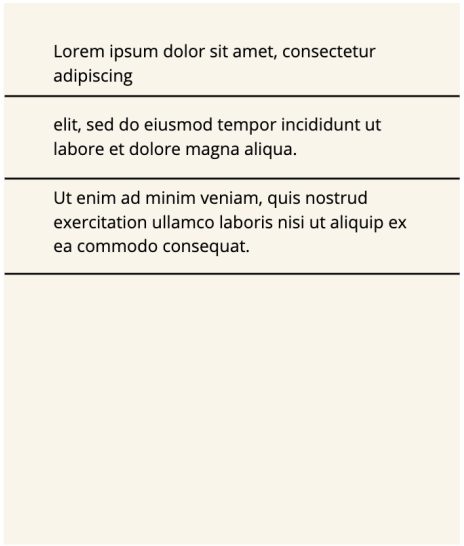

Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Prompt Breakdown
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
EMPHASIZE
Or type prompt here
Apply edits
AI's Approach
Step 1
Step 2
Step 3
This is tentative!
Proceed
CURRENTLY IN PLAIN TEXT MODE
THE FUNCTIONALITY OF PLAIN TEXT EDIT AND EMPHASIZE CAN BE ACCESSED FROM HERE

How do display approach of AI

Approach of AI, or in simple terms how AI is going to give the output to the prompt can be done in two ways.



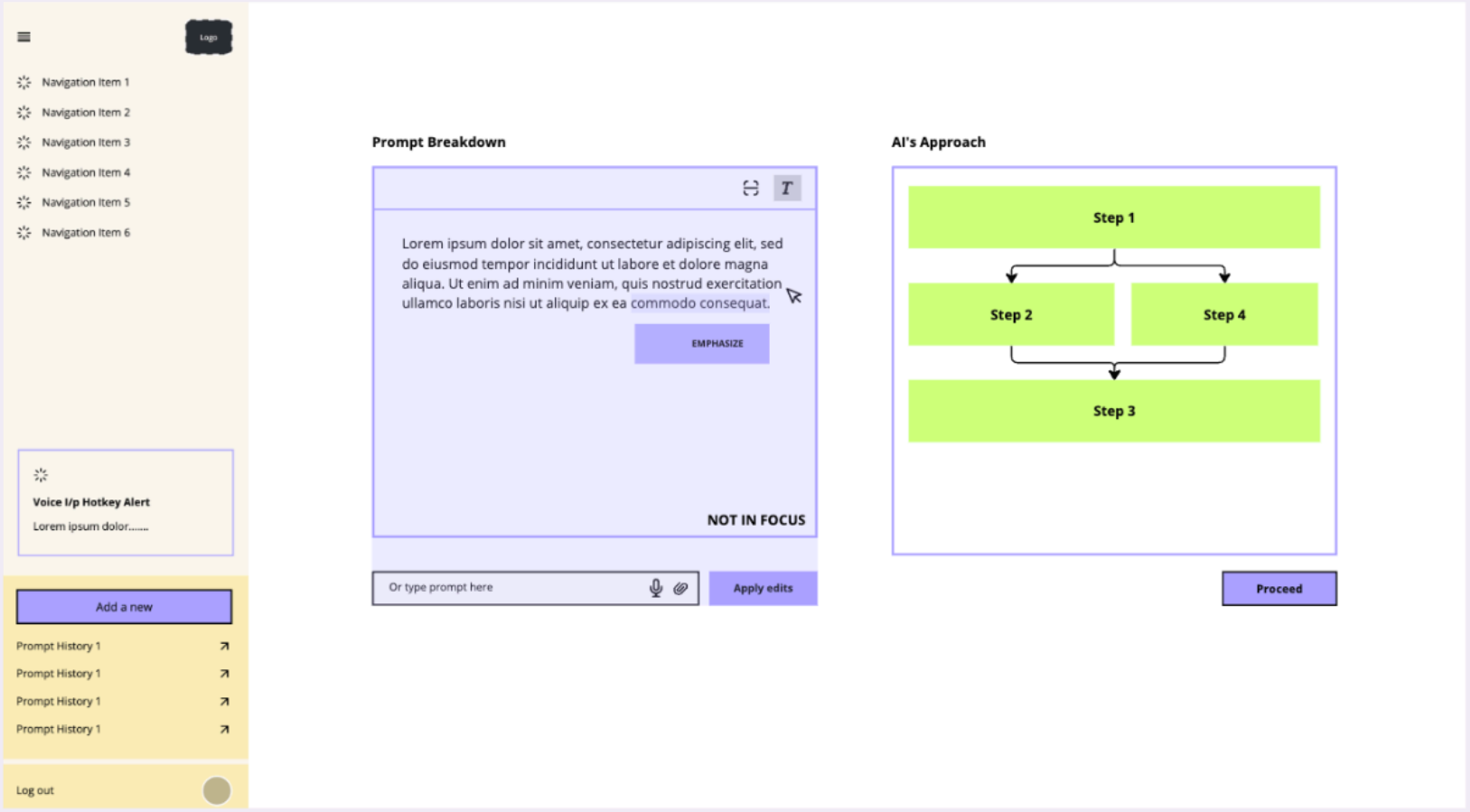
IN PLAIN TEXT



IN STEPS

After looking at the real life artefacts and the better readability, I decided to proceed with “Steps”

Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Prompt Breakdown
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
EMPHASIZE
NOT IN FOCUS
Or type prompt here
Apply edits
AI's Approach
Step 1
Step 2
Step 3
Proceed
PRESENTING APPROACH AS A LINEAR WORKFLOW
EXPLAINING THE USER HOW STEPS WILL FOLLOW ONE AFTER THE OTHER
REVIEW / COMMENTS
THE APPROACH MIGHT NOT ALWAYS BE LINEAR, THERE MIGHT BE PARALALITY.
THERE MIGHT BE STEPS WHICH LEAD UP TO MULTIPLE STEPS



PRESENTING APPROACH AS A BRANCHED WORKFLOW

EXPLAINING THE USER HOW STEPS WILL FOLLOW ONE AFTER THE OTHER. THIS ACCOUNTS FOR PARALLELITY

REVIEW / COMMENTS

MAIN ISSUE WITH THIS IDEA IS SCALABILITY AND THE AMOUNT OF INFORMATION BEING DISPLAYED.
ALTHOUGH IT MAXES OUT THE TRANSPARENCY, IT ALSO MAKES THE SECTION VERY COMPLEX TO TRAVERSE THROUGH

PRESENTING APPROACH AS JUST PLAIN STEPS

EXPLAINING THE USER JUST WHAT STEPS WOULD BE FOLLOWED. NO SEQUENCE ILLUSTRATED

REVIEW / COMMENTS

ALTHOUGH IT HAS A LACK OF TRANSPARENCY COMPARED TO THE LAST 2 IDEAS. THE QUESTION TO BE ASKED IS HOW MUCH TRANSPARENCY DO WE WANT THE SYSTEM TO HAVE IN THIS SEGMENT.

ALTHOUGH THE OTHER IDEAS PROVIDE MORE TRANSPARENCY, THE COMPLEXITY AND FRICTION OUTWEIGHS IT.

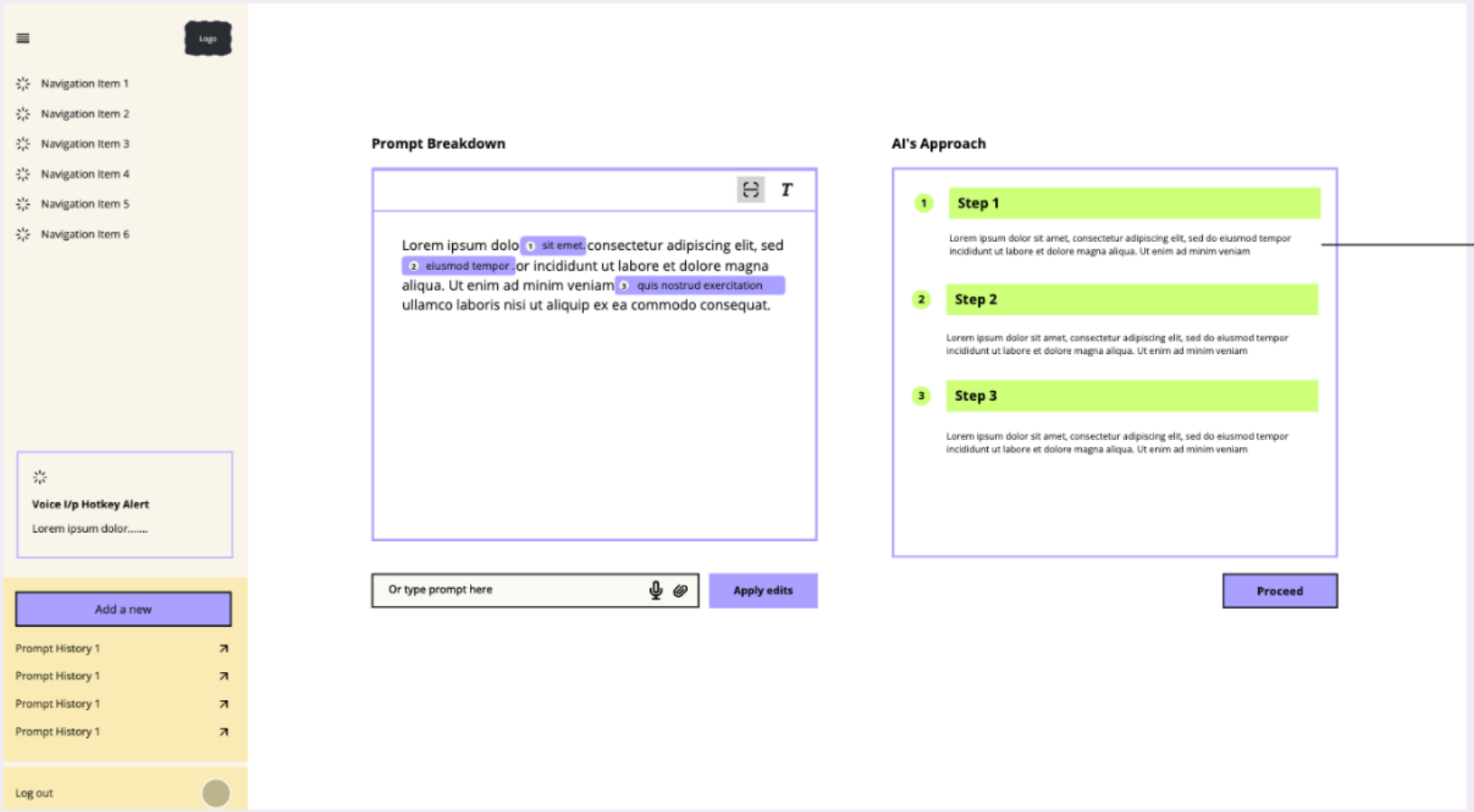
EXPLAINABILITY IS NOT COMPROMISED

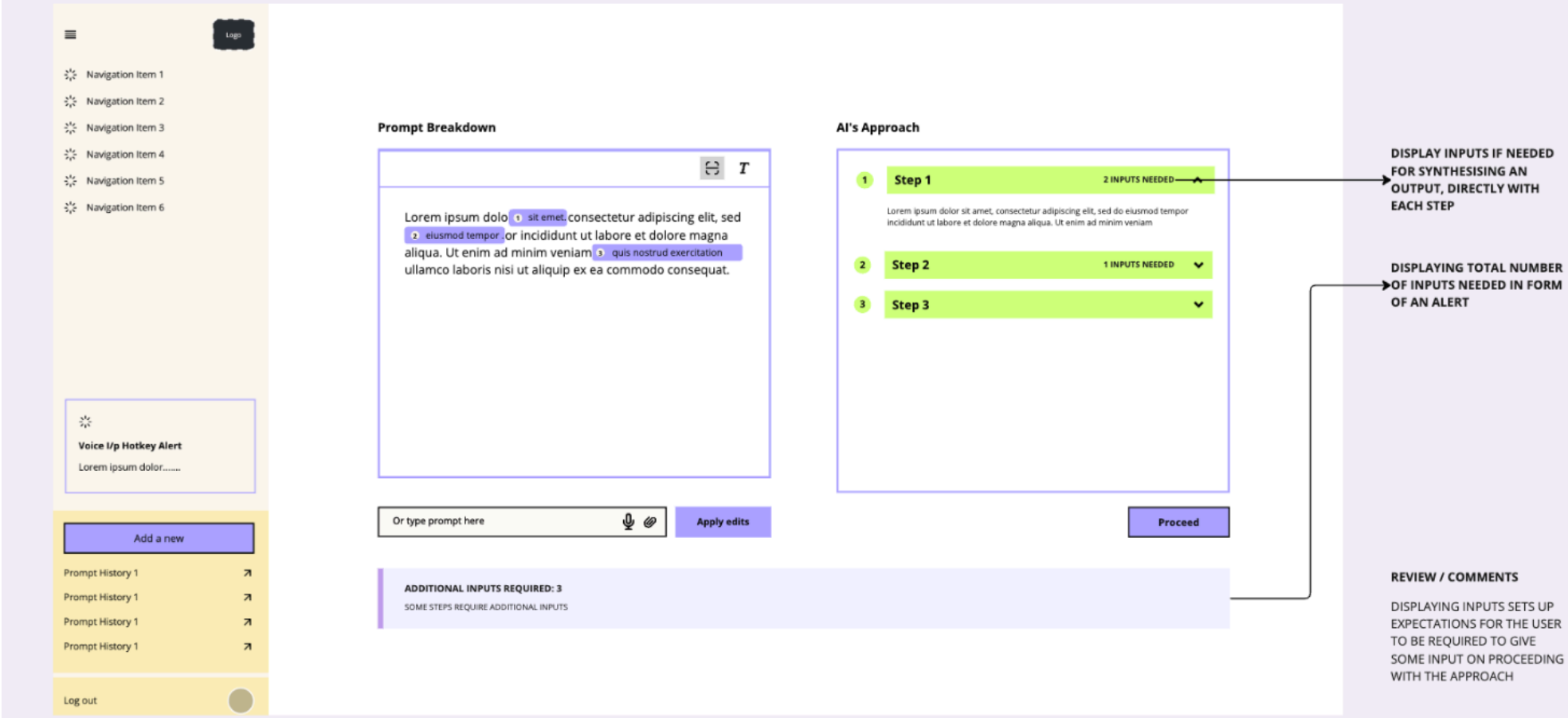
Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Prompt Breakdown
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
EMPHASIZE
NOT IN FOCUS
Or type prompt here
Apply edits
AI's Approach
Step 1
Step 2
Step 3
Proceed
ADDING AN EDIT OPTION TO AI'S APPROACH
THIS GIVES AGENCY TO THE USER TO CONTROL THE APPROACH.
REVIEW / COMMENTS
AS EXPLAINED IN LAST IDEA, EXPLAINABILITY OF THE SYSTEM IS NOT COMPROMISED. ADDING THE OPTION TO EDIT APPROACH MAKES A 2-WAY FEEDBACK LOOP BETWEEN PROMPT BREAK DOWN AND THIS SECTION, THIS IS ABSOLUTE CONTROL.
WHY NOT THIS IDEA?
2-WAY FEEDBACK LOOP TO ADD CONTROL MIGHT SEEM LIKE A LUCRATIVE IDEA. BUT PROVIDING THIS OPTION, WE CREATE A WINDOW FOR THE USER TO MAKE ERRORS IN ADDING OR DELETING CERTAIN STEPS.
THIS IS BECAUSE OF POSSIBLE INTERDEPENDENCY OF STEPS. DELETING A PARENT STEP CAN RENDER A CHILD STEP NON FUNCTIONAL.
HENCE WE WILL SACRIFICE ABSOLUTE CONTROL, AND LET THE USER EDIT THE APPROACH BY JUST EDITING THE PROMPT BREAKDOWN.

ADDING NUMERATION TO IDENTIFY WHICH STEP WAS TAKEN AFTER ANALYSING WHICH TOKEN

REVIEW / COMMENTS

THIS INCREASES THE EXPLAINABILITY OF THE SYSTEM AND ALSO PROVIDES MORE CONTROL IN THE SENSE THAT USERS NOW KNOW WHICH TOKEN TO ELIMINATE TO REMOVE CERTAIN STEP


Logo
Navigation Item 1
Navigation Item 2
Navigation Item 3
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Prompt Breakdown
Lorem ipsum dolo 1 sit emet, consectetur adipiscing elit, sed 2 eiusmod tempor or incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam 3 quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
Or type prompt here
Apply edits
AI's Approach
1 Step 1
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam
2 Step 2
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam
3 Step 3
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam
Proceed
ADDING EXPLANATION TEXT ON WHY WAS A TOKEN ASSOCIATED WITH A STEP
REVIEW / COMMENTS
POSITIVE IMPACT ON THE EXPLAINABILITY OF THE APPROACH


Logo
Navigation Item 1
Navigation Item 2
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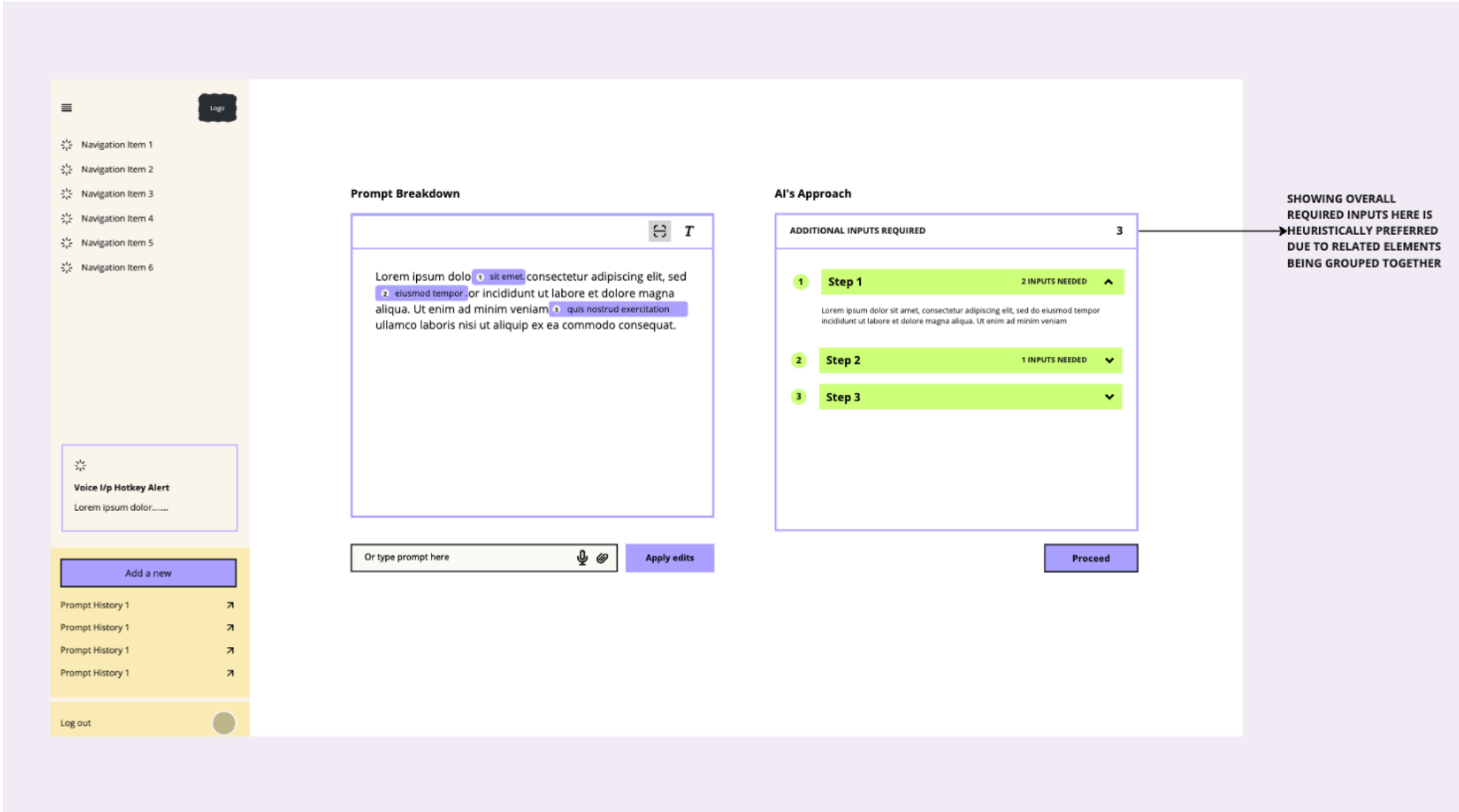
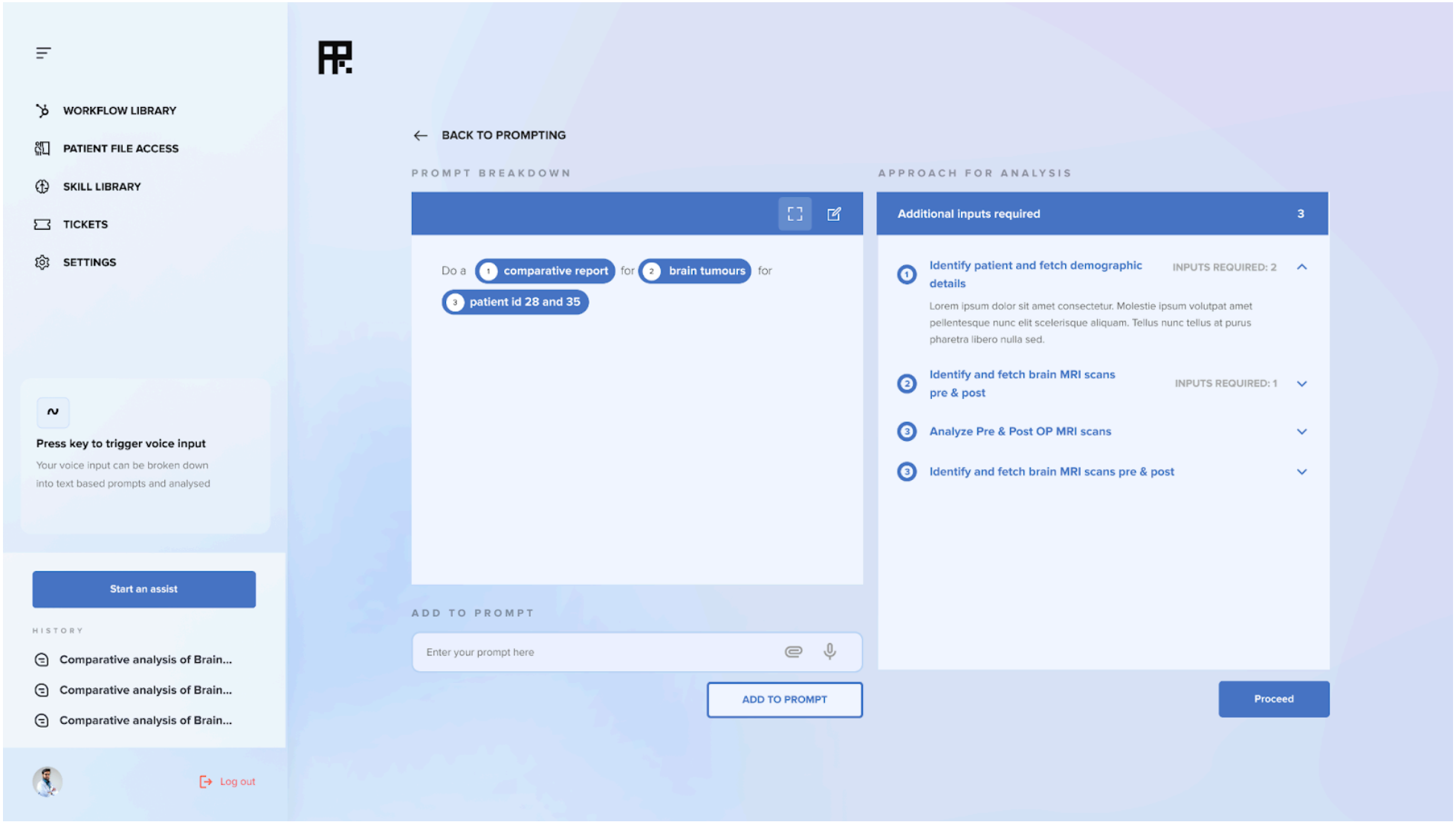
Navigation Item 4
Navigation Item 5
Navigation Item 6
Voice I/p Hotkey Alert
Lorem ipsum dolor.....
Add a new
Prompt History 1
Prompt History 1
Prompt History 1
Prompt History 1
Log out
Prompt Breakdown
Lorem ipsum dolo 1 sit emet, consectetur adipiscing elit, sed 2 eiusmod tempor or incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam 3 quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
Or type prompt here
Apply edits
AI's Approach
1 Step 1 2 INPUTS NEEDED
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam
2 Step 2 1 INPUTS NEEDED
3 Step 3
Proceed
ADDITIONAL INPUTS REQUIRED: 3
SOME STEPS REQUIRE ADDITIONAL INPUTS
DISPLAY INPUTS IF NEEDED FOR SYNTHESISING AN OUTPUT, DIRECTLY WITH EACH STEP
DISPLAYING TOTAL NUMBER OF INPUTS NEEDED IN FORM OF AN ALERT
REVIEW / COMMENTS
DISPLAYING INPUTS SETS UP EXPECTATIONS FOR THE USER TO BE REQUIRED TO GIVE SOME INPUT ON PROCEEDING WITH THE APPROACH

Overall Finalised concept

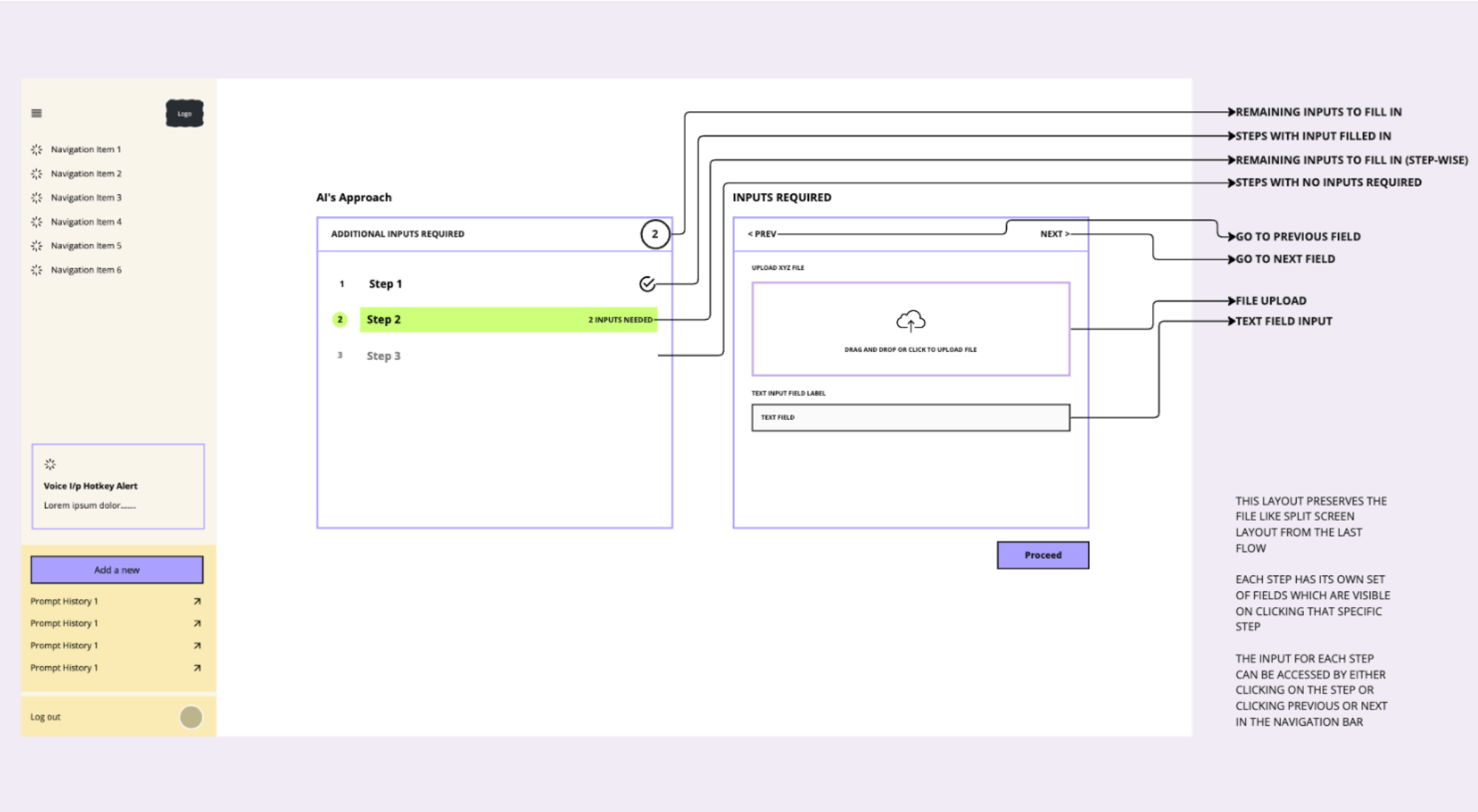


High Fidelity

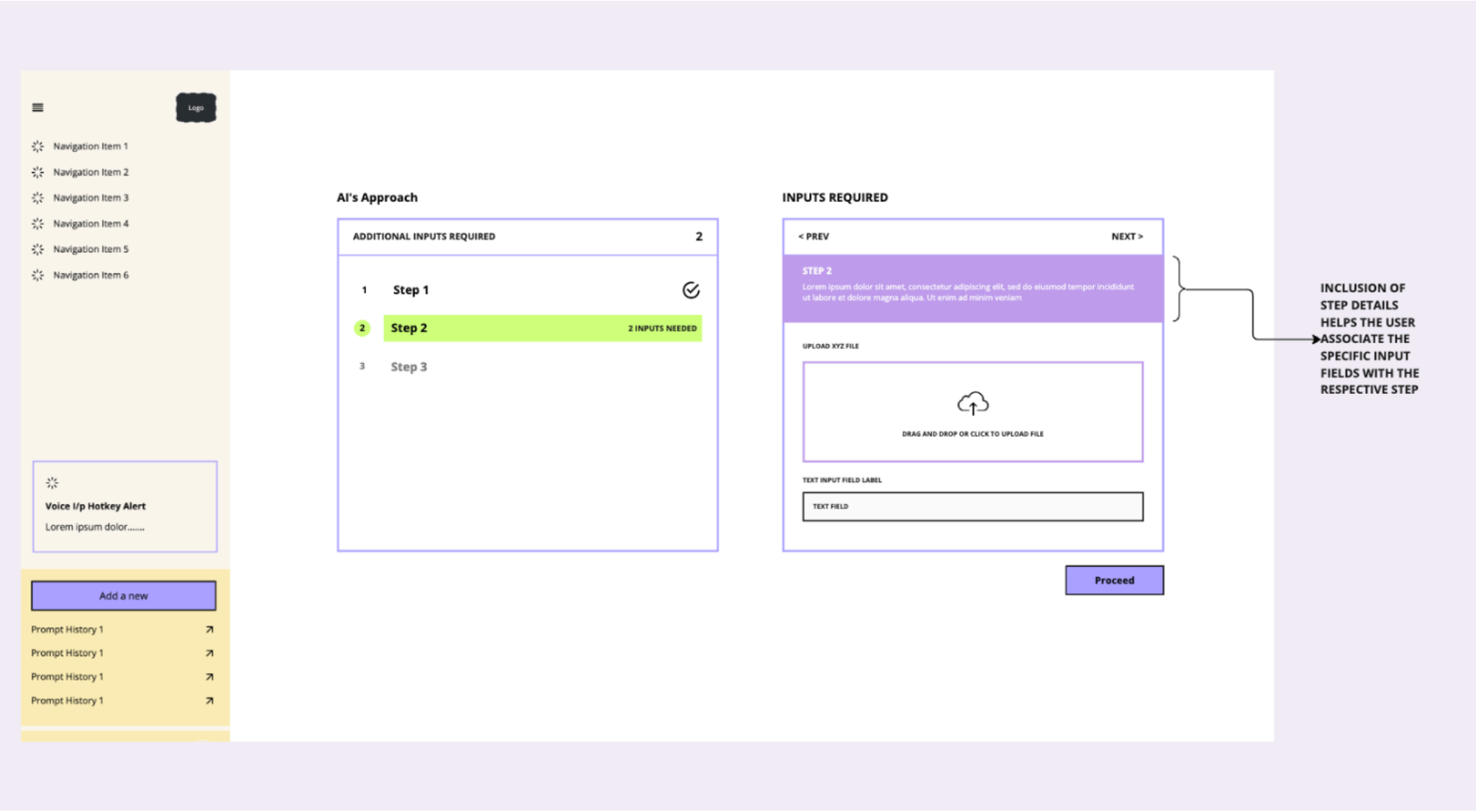


Missing Inputs

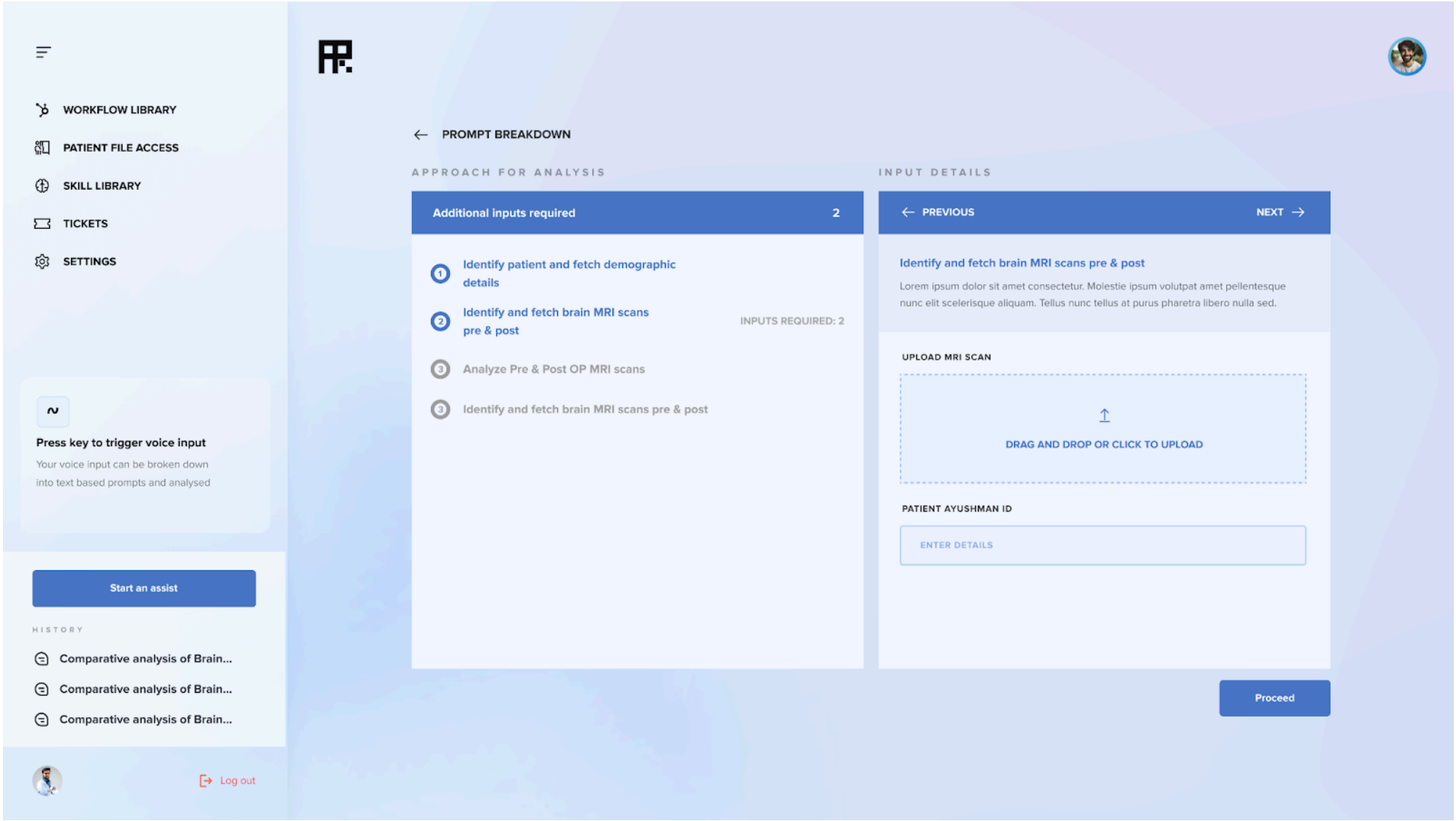
Low Fidelity



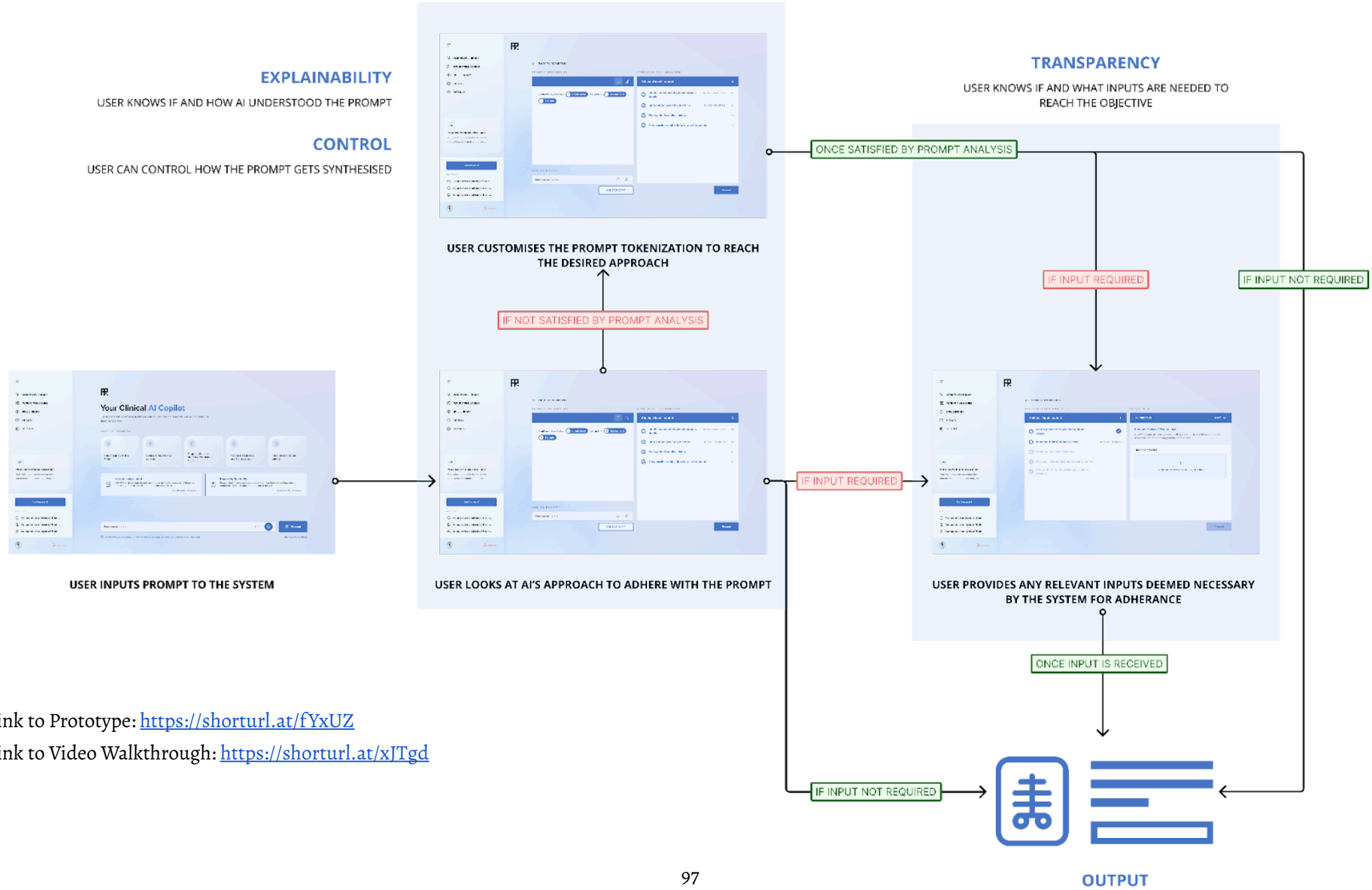
Final Conceptualization



High Fidelity



User Flow of prompt input



Link to Prototype: https://shorturl.at/fYxUZ

Link to Video Walkthrough: https://shorturl.at/xJTgd

Output from AI- Analysis of an X-Ray

The proposed system can have various types of outputs, depending on their use case. These might be referred to as pipelines for the system. These pipelines can be broadly classified into these 3 types based on their application.

Classification of Pipelines

Fig. Input-Output mapping of Informational Pipelines

Informational Pipelines:

These pipelines are focused on providing information, insights, and knowledge.

1. **Summarization:** Condenses lengthy medical texts (reports, articles) into concise summaries.
    - **Prompt Example:** "Summarize the key findings of this patient's discharge summary."
2. **Question Answering:** Directly answers clinical questions using evidence-based medical knowledge.
    - **Prompt Example:** "What are the recommended treatment options for a 65-year-old patient with type 2 diabetes and hypertension?"
3. **Text Generation:** Creates human-readable reports, summaries, or educational materials from structured data.
    - **Prompt Example:** "Generate a patient discharge summary for a 40-year-old female who underwent appendectomy."
4. **Translation:** Accurately translates medical texts between languages, facilitating communication and access to information.
    - **Prompt Example:** "Translate this patient's medical history from English to Marathi."

Fig. Input-Output mapping of Analytical Pipelines

Analytical Pipelines:

These pipelines leverage AI algorithms to analyze and interpret complex data, aiding in diagnosis, prognosis, and treatment planning.

1. **Image Analysis:** Processes medical images (X-rays, CT scans, MRIs, etc.) to detect abnormalities, classify images, or segment regions of interest.
    - **Prompt Example:** "Analyze this chest X-ray for signs of pneumonia."
2. **Risk Assessment:** Predicts the likelihood of disease progression or complications based on patient data and medical history.
    - **Prompt Example:** "Assess this patient's risk of developing cardiovascular disease within the next five years."
3. **Decision Support:** Provides evidence-based recommendations for diagnosis, treatment, or risk management.
    - **Prompt Example:** "Recommend a treatment plan for a patient with newly diagnosed breast cancer."

Fig. Input-Output mapping of Actionable Pipelines

Actionable Pipelines:

These pipelines focus on automating tasks and triggering actions based on specific events or conditions.

1. **Alerts and Notifications:**
    - **Prompt Example:** "Alert: Patient X's blood pressure is critically high (180/110 mmHg)."
2. **Workflow Automation:**
    - **Prompt Example:** "New Patient Admitted: John Doe, DOB: 1980-05-15."
3. **Data Management:**
    - **Prompt Example:** "Error: Missing allergy information for Patient Y."

Scope

For the context of this study, we will exclusively focus on an "Analytical Pipeline" where the user wants to analyse an X-Ray.

This use case revolves around how a three-way interaction happens between the medical professional, an AI system and the image.

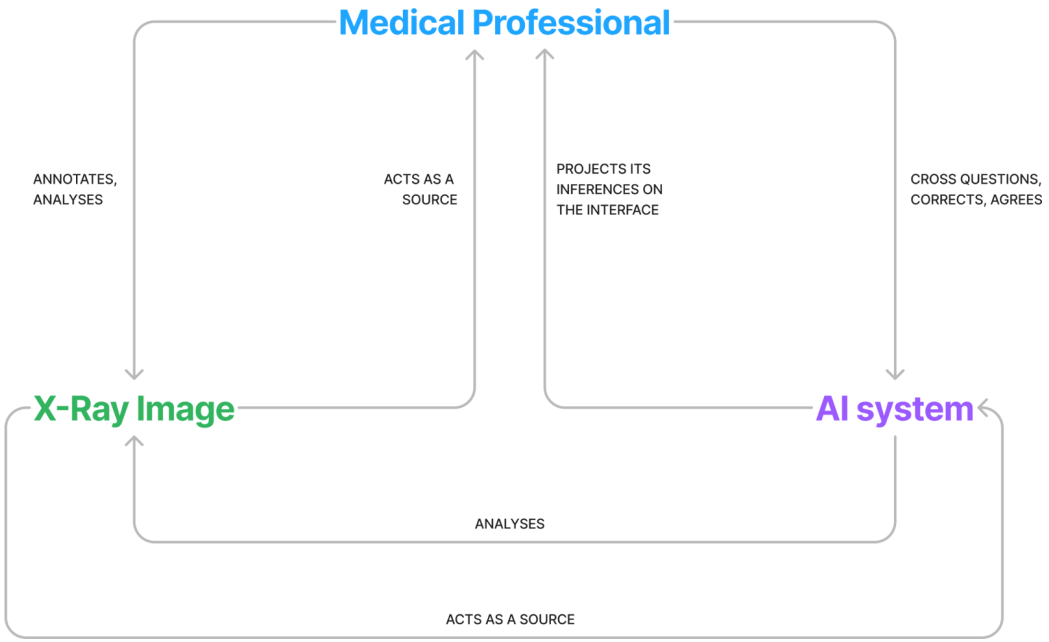


Fig. 3-way interaction mapping of a medical professional, an X-Ray file and the AI system

Looking at real artefacts

Disclaimer: Details have been blurred out since it contains medical diagnosis and private information.

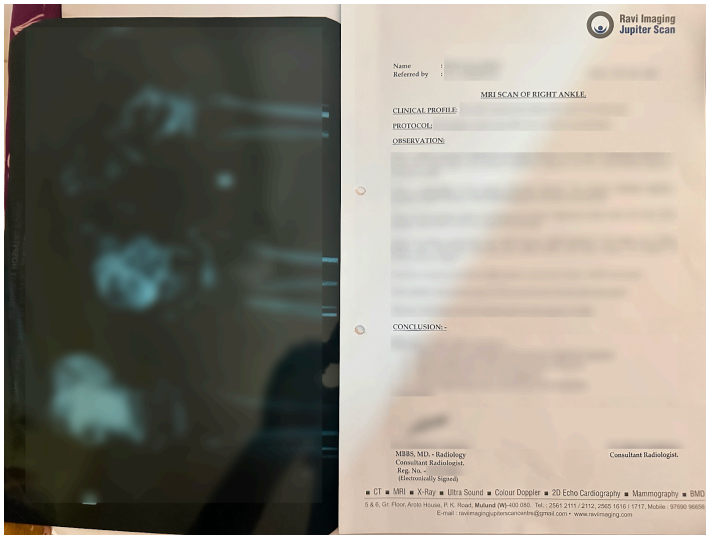


Fig. X-Ray and a combined diagnostic report.

Here we can observe 3 key things which are there in the report.

Protocol- A step-wise breakdown of how the diagnosis process takes place. This is very similar to the expectation from the AI suggested approach (Refer, last section)

Observations- The report has mentions of coordinates (not very specific) and the visual observations at those points. These are also coupled with possible reasoning and diagnosis.

Conclusion- This is a summary of the final diagnosis made by the medical professional.

Interaction of a medical professional with a report:

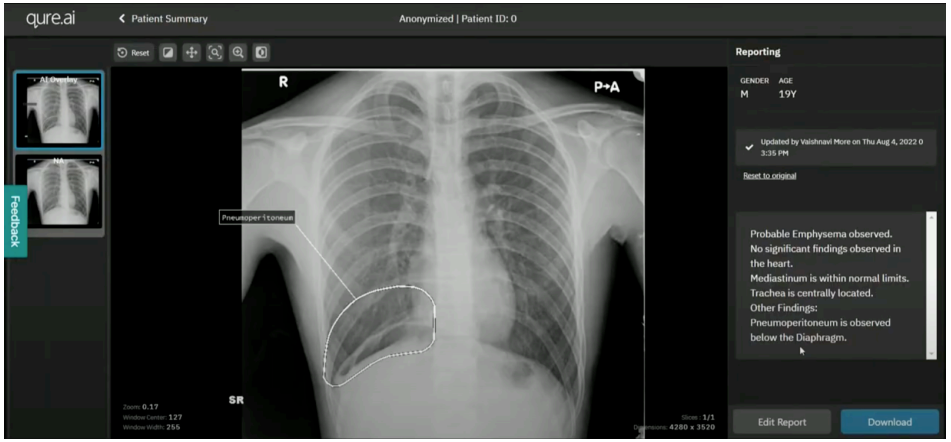
Upon analyzing primary research and going through real-life artefacts, a consistent pattern emerged in how medical professionals interact with X-rays during report creation. This pattern can be summarized as a three-step process:

1. **Identification:** The professional visually scans the X-ray to pinpoint specific areas or abnormalities of interest.
2. **Annotation:** They mark and label these areas on the image, providing context and highlighting relevant features.
3. **Inference:** Based on their observations and annotations, the professional derives conclusions about the underlying medical condition or pathology.

How others platform employ this use case

Qure.AI

Disclaimer: Qure.AI is a closed tool, inferences made are just by looking at video demos and tutorials, and not hands on.



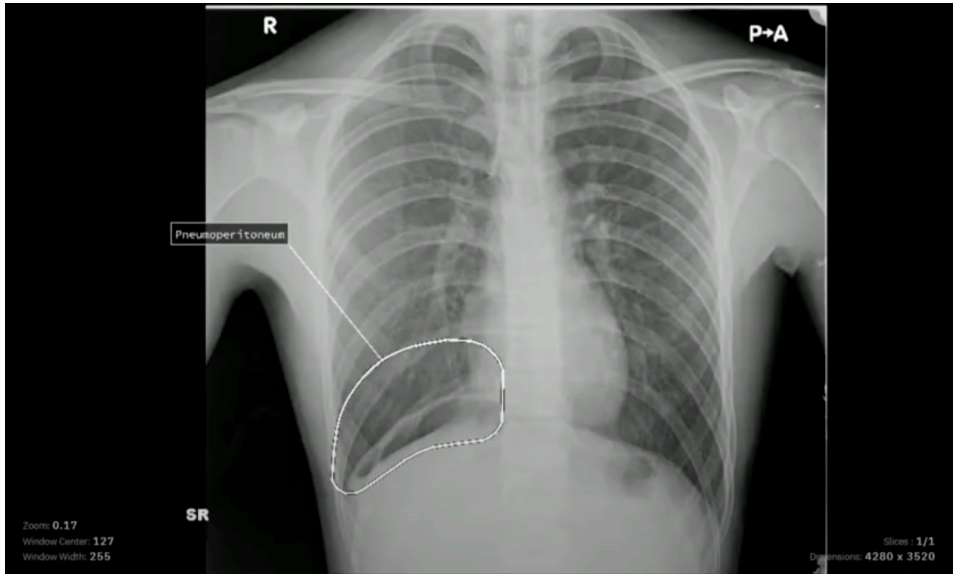
Elements Identified

1. Image list view

Users can glance over and select from list of uploaded files through this panel.

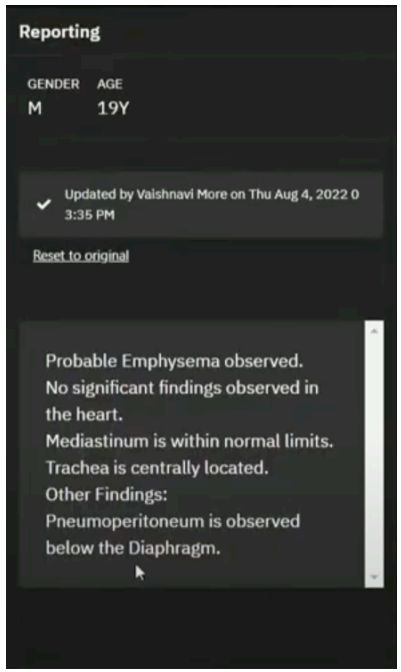
2. Toolbar

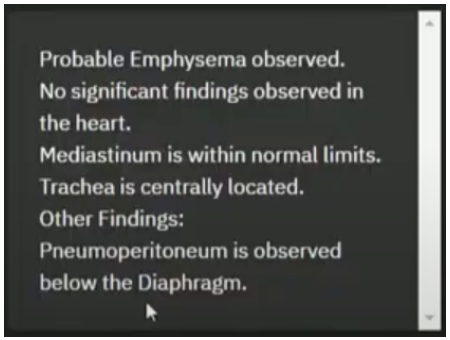
Which contains various tools for the user to traverse through the file and also view it in multiple modes

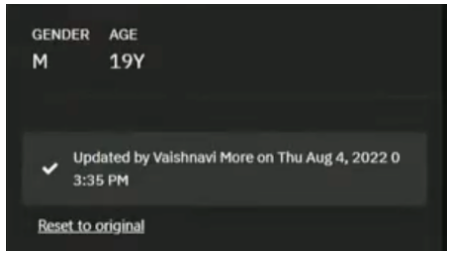


3. File View

The respective file is viewed in the centre of the screen, with a status of current tool or view specifications

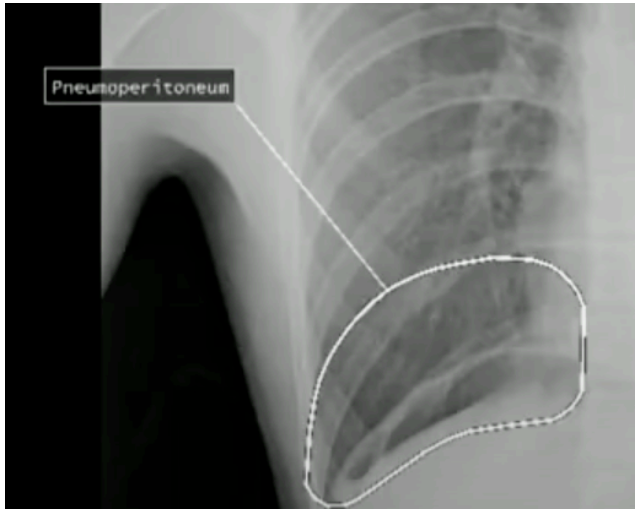






3. AI Suggestion Panel

AI Suggestions & Patient details with last update are visible



4. Annotations made by the system

Freeform Annotations made by AI are illustrated on the image viewed. Also it is labelled with the possible diagnostics by the system.

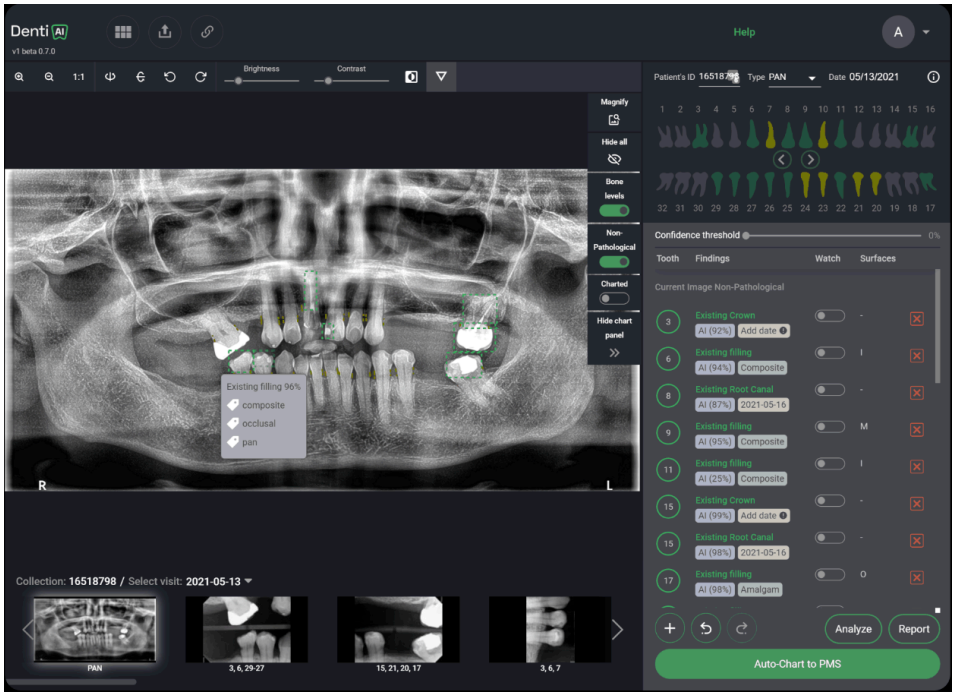
5. Option to edit and download report

The system generates a report based on the suggestions, the user is given the control to edit the report and download it locally

Comments

Although I couldn't access the tool, it seems that there is no way to question/suggest anything to the system.

Denti.AI

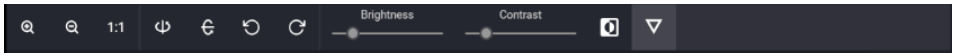


1. Image list view

Users can glance over and select from a list of uploaded files through this panel.

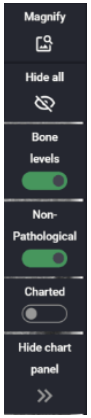
2. App Bar

Options to export and share the diagnosis is visible along with signed in profile.



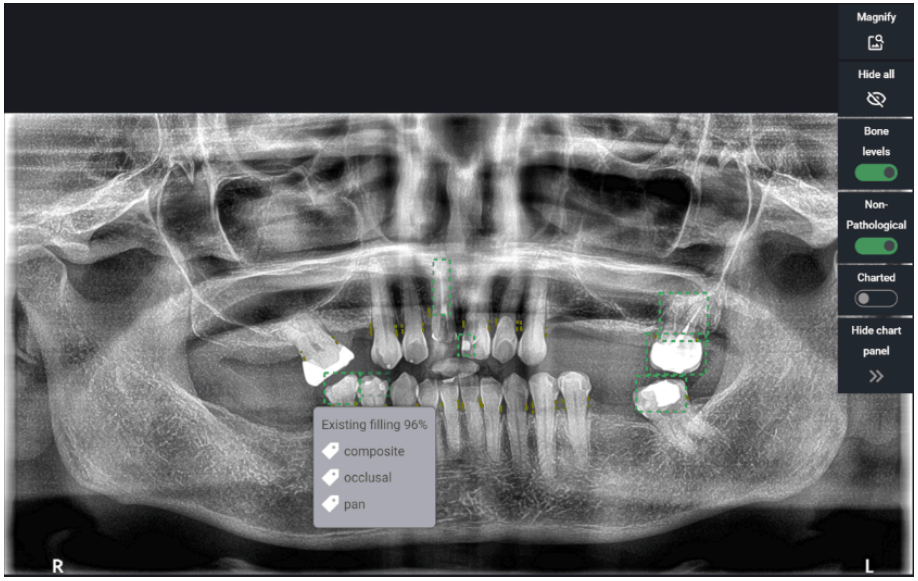
3. Toolbar

Which contains various tools for the user to traverse through the file and also view it in multiple modes



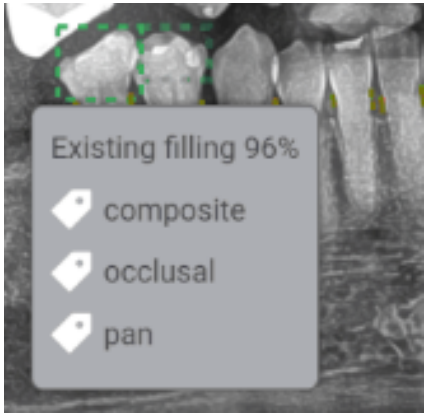
4. Status Bar

Status of current tool or view specifications are visible, users can switch between the settings on the go



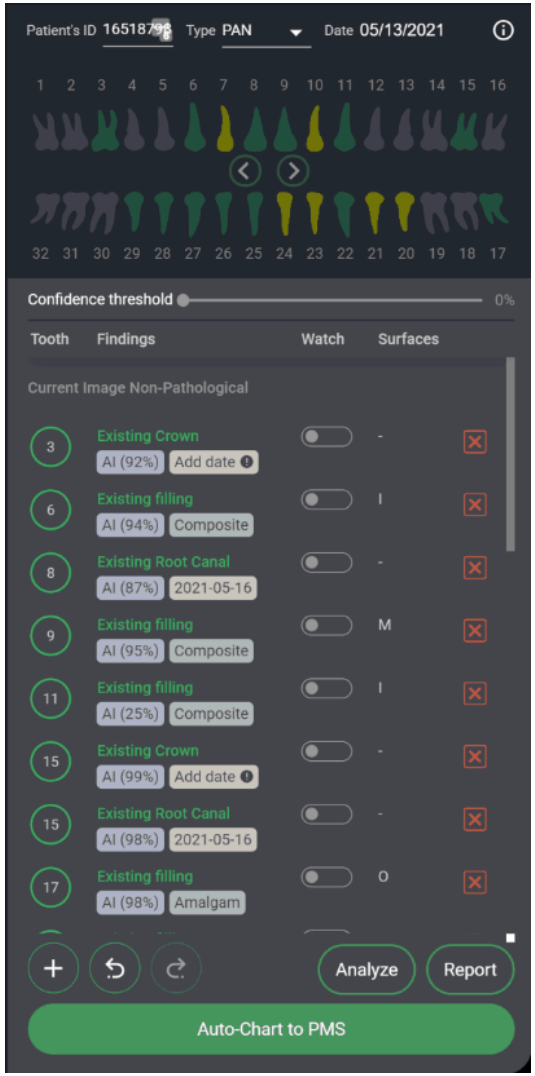
5. File View

The respective file is viewed in the centre of the screen, with a status of current tool or view specifications



4. Annotations made by the system

Multiple rectangular annotations made by AI are illustrated on the image viewed. Also it is labelled with the possible diagnostics by the system, with the quantification of probability.

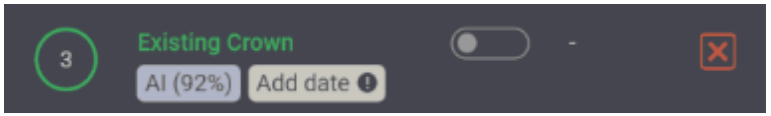


6. AI Diagnostic Panel

Patient details, with visualisation and quantified probability of diagnostics are visible, along with options to analyze and report.

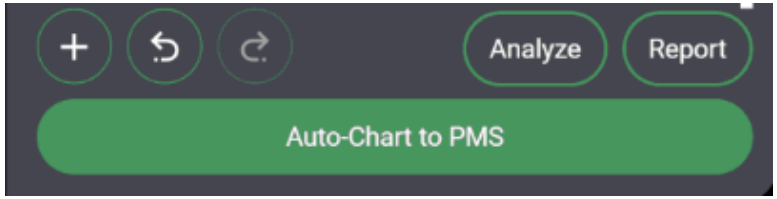
7. Visualization of diagnosis

System made diagnosis wrt every tooth is visible with color coding wrt confidence in diagnosis



8. System observations

Observations made for each teeth is visible with confidence score, visibility toggle is also available.



9. Analysis and report options

Options to add to the list, and to do textual and visual analysis are also made available.

10. Adjusting confidence threshold

Users can adjust confidence thresholds to filter out suggestions and observations by the system according to their score.

Comments

This system offers a lot of control and transparency about its findings to the user. Seemingly there are ways where users can make a suggestion to the system and adjust the viewing of information by the system according to their personal preferences.

Design considerations for trust

Visualize AI Analysis: Show users how the AI arrived at its conclusions. Annotations coupled with visualizations can be a way to achieve that.

Confidence Scores: For each AI-generated finding, displaying a confidence score or a relevant KPI indicating how certain the AI is about its assessment. This will help users gauge the reliability of the AI's output.

Reasoning/Rationale: Offering brief explanations or justifications for the AI's findings, citing relevant medical literature or guidelines.

Adjustable Thresholds: Allowing users to adjust the sensitivity of the AI's detection algorithm or the confidence threshold for displaying findings. This gives users more control over the information presented.

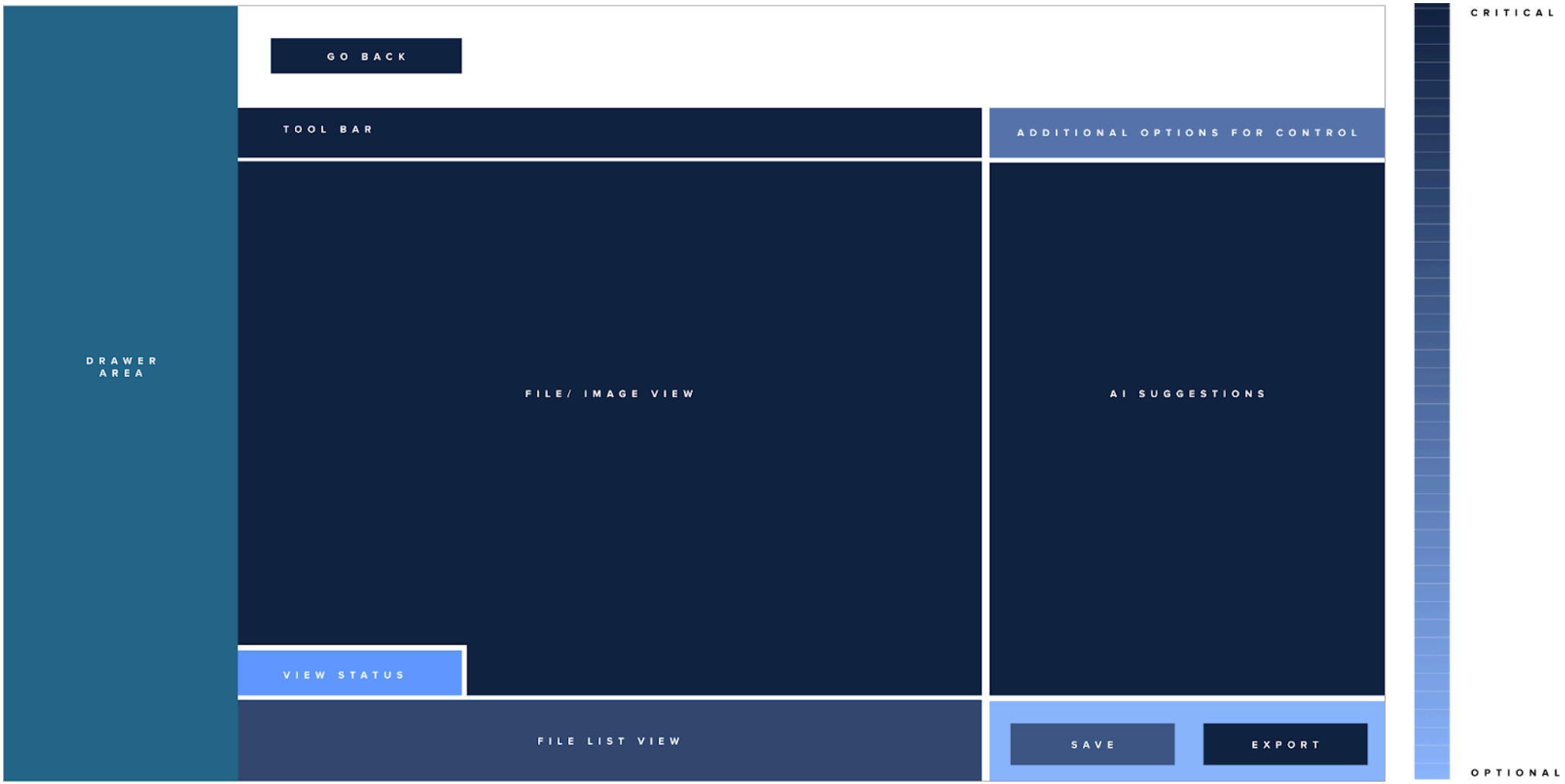
Annotation Tools: Providing robust annotation tools that allow users to add their own markings, measurements, or comments to the X-ray image.

Feedback Mechanism: Some way for users to provide feedback on the AI's performance, which can be used to improve the system over time.

Design constraints

- The interface would be contextualized to X-ray analysis only.
- The performance KPI used would be confidence score, for annotations.
- Incorporate a page view, but there will be no options to add another file for now, hence this interface will exclusively focus on analysis of single image.
- Currently there is no technical feasibility of adjusting confidence, so we will not include it in this round of ideation.

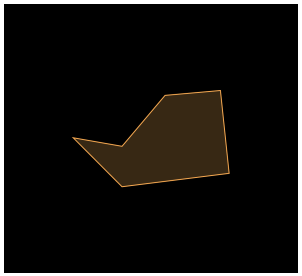
Layout Anatomy



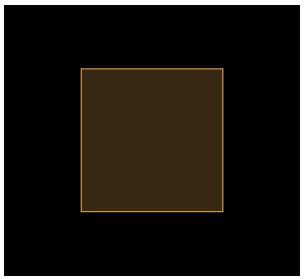
Possible Selection tools

Upon looking at various platforms supporting image manipulation, these modalities for selection were found.

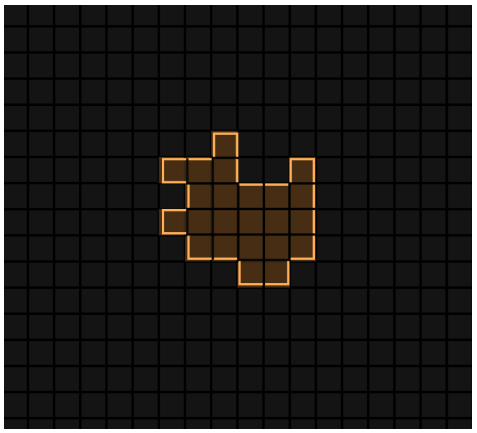
Freeform Selection
Pros: Flexibility
Cons: Usability with mouse



Polygonal Selection
Pros: Flexibility, Usability
Cons: Unfamiliarity



Shape Selection
Pros: Usability, Familiarity
Cons: Flexibility



Grid Selection
Not a traditionally used selection tool, the idea of coming up with this interaction was to make it easy to use and flexible at the same time.

Cons: Unfamiliarity, Intuitiveness (depends on evaluation)

Section Selections
AI tools work on identifying patterns, what if all the detected patterns (low confidence ones too) were visible out of which the users can select one to focus on.

Cons: Unfamiliarity, Flexibility

How does a user interact with the AI tool?

There are three broad possible ways through which the interaction between the user and the system happens.

1- Annotations- Selecting a portion of the image and commenting on it.

2- Questions- Asking the system a case relevant question.

3- Suggestion/ Feedback- Providing the system with suggestions or feedback regarding its output in the given context.

How does AI explain the outcomes?

There are two possible ways to do so.

1- References from old cases- Selecting a portion of the image and commenting on it.

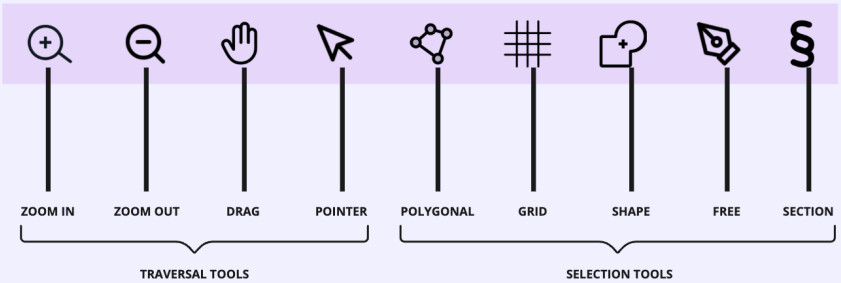
2- AI Generated explanations- Asking the system a case relevant question.

Quantification of AI's performance

Although the KPI's to judge an AI's response is still under discussion, for the sake of the project I will choose to go with a confidence score.

Toolbar

Low Fidelity

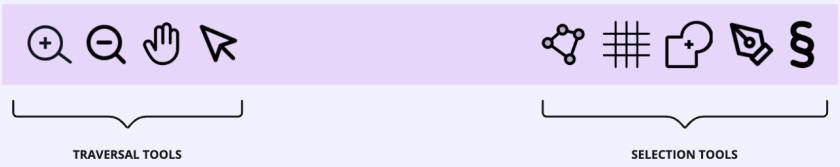


COMMENTS

THE ICONS WON'T BE ENOUGH FOR CLEAR COMMUNICATION FOR SELECTION TOOLS

ADDING LABELS WILL MAKE THE ALREADY SMALL LAYOUT EVEN MORE CLUTTERED

WILL NEED TO FIND A WAY TO GROUP ALL OF IT TOGETHER

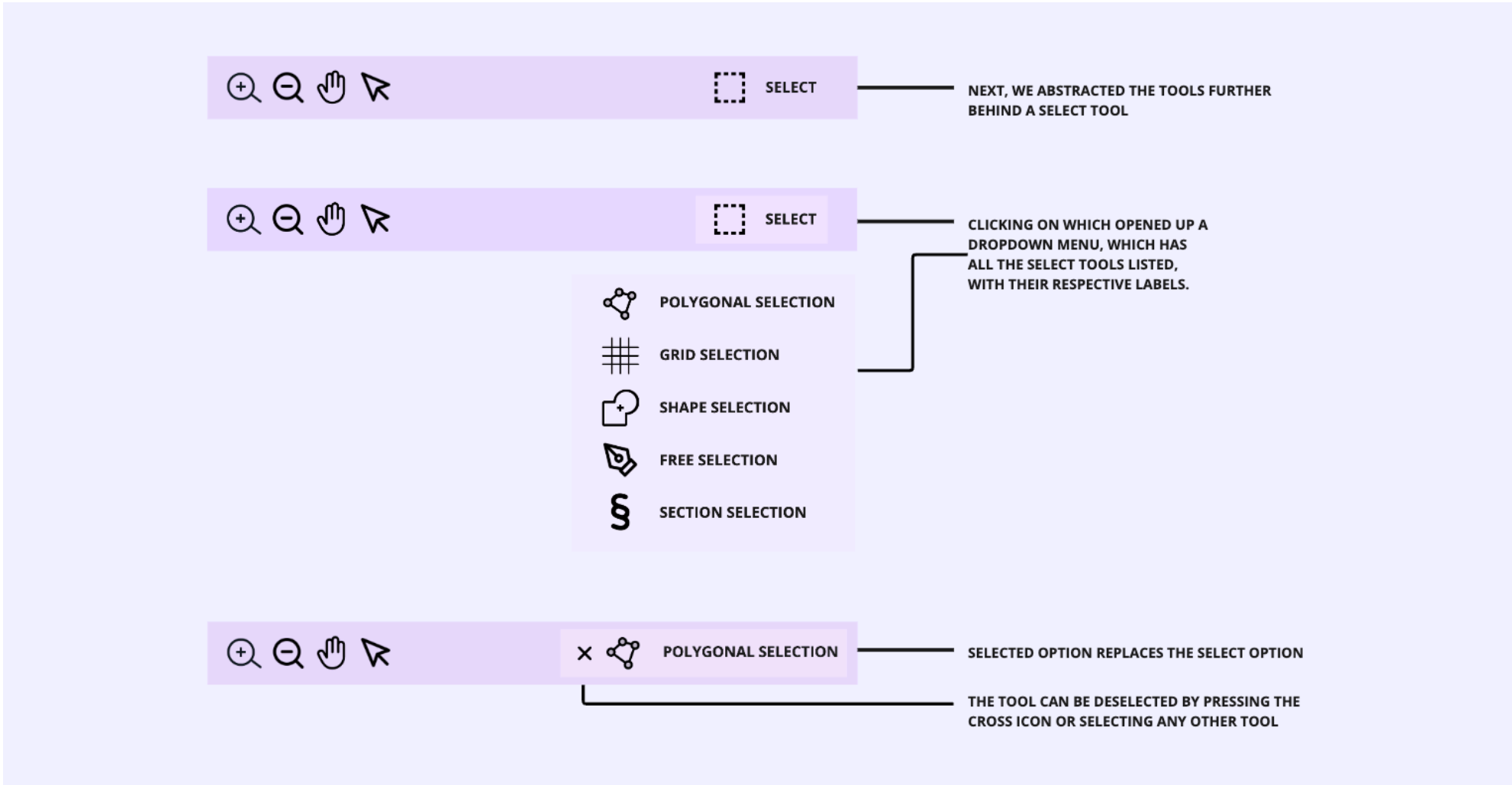


COMMENTS

FIRST STEP WAS TO GROUP AND SEPARATE THE OPTIONS ACCORDING TO FUNCTIONALITY

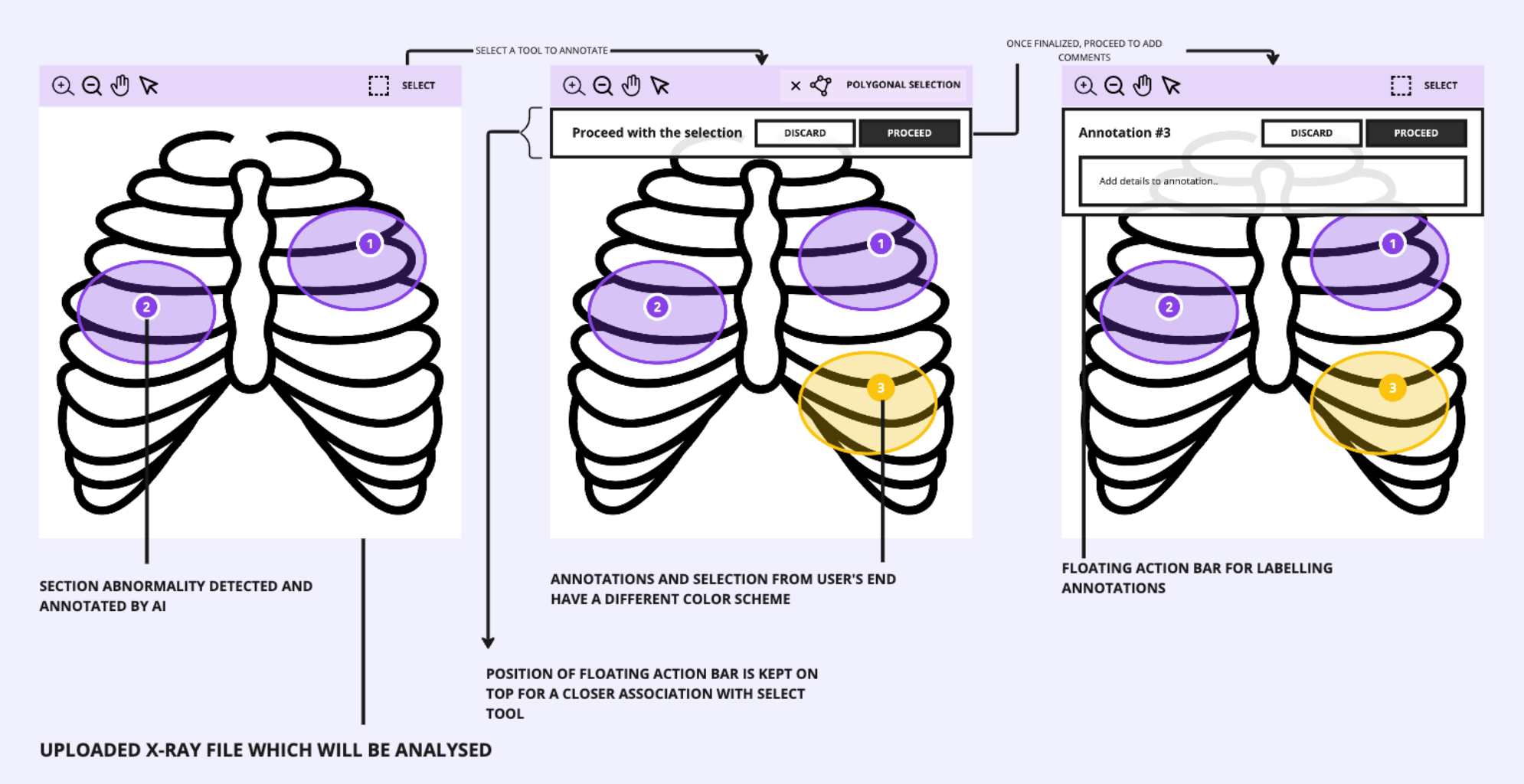
THIS ALIGNS WITH THE HEURISTIC PRINCIPAL OF SIMILAR ELEMENTS BEING GROUPED TOGETHER

STILL THE PROBLEM OF LABEL EXISTS


SELECT
NEXT, WE ABSTRACTED THE TOOLS FURTHER BEHIND A SELECT TOOL
SELECT
CLICKING ON WHICH OPENED UP A DROPDOWN MENU, WHICH HAS ALL THE SELECT TOOLS LISTED, WITH THEIR RESPECTIVE LABELS.
POLYGONAL SELECTION
GRID SELECTION
SHAPE SELECTION
FREE SELECTION
SECTION SELECTION
POLYGONAL SELECTION
SELECTED OPTION REPLACES THE SELECT OPTION
THE TOOL CAN BE DESELECTED BY PRESSING THE CROSS ICON OR SELECTING ANY OTHER TOOL

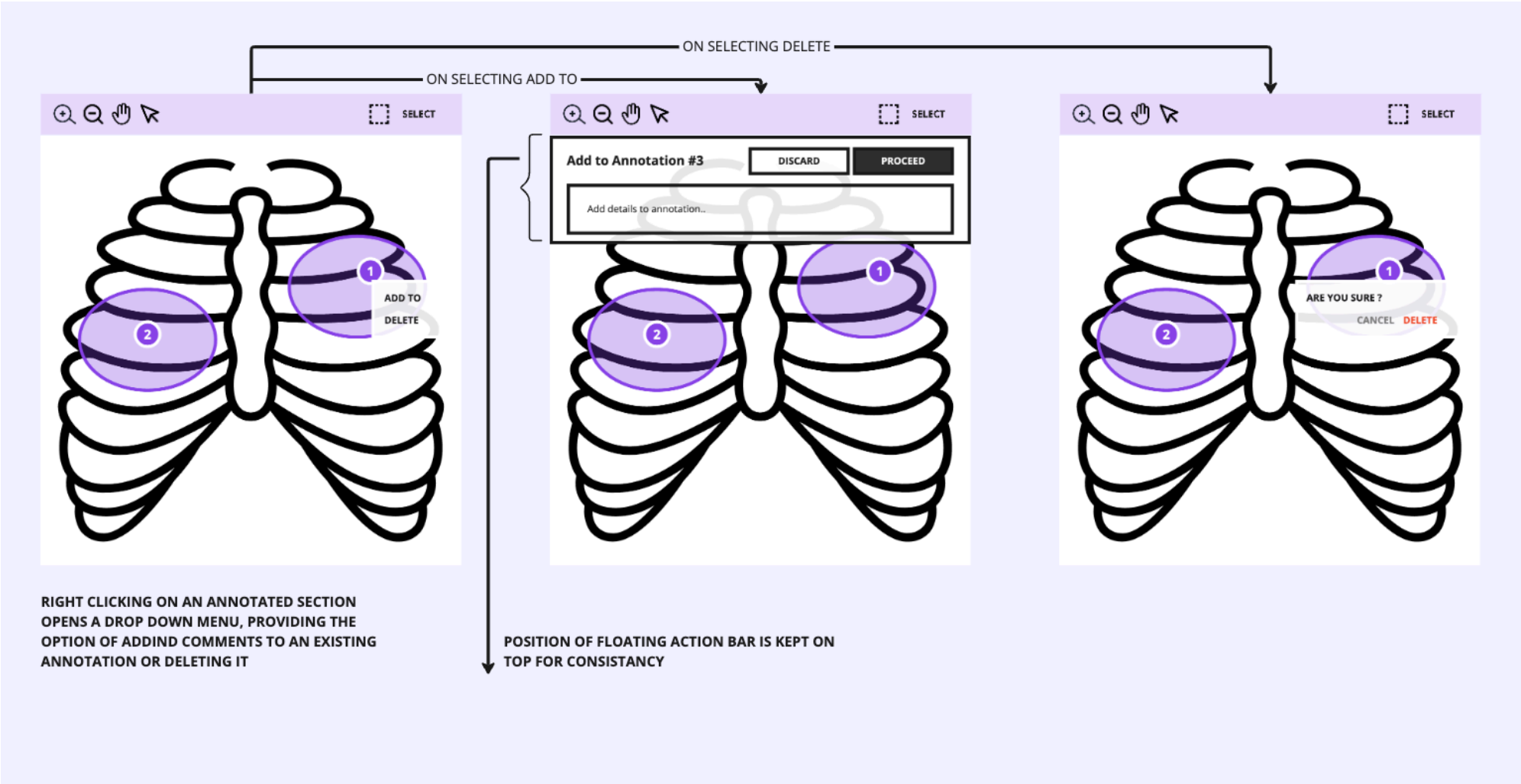
File View Area

This is the part of screen where the users can view/ add annotations and visualize ai references



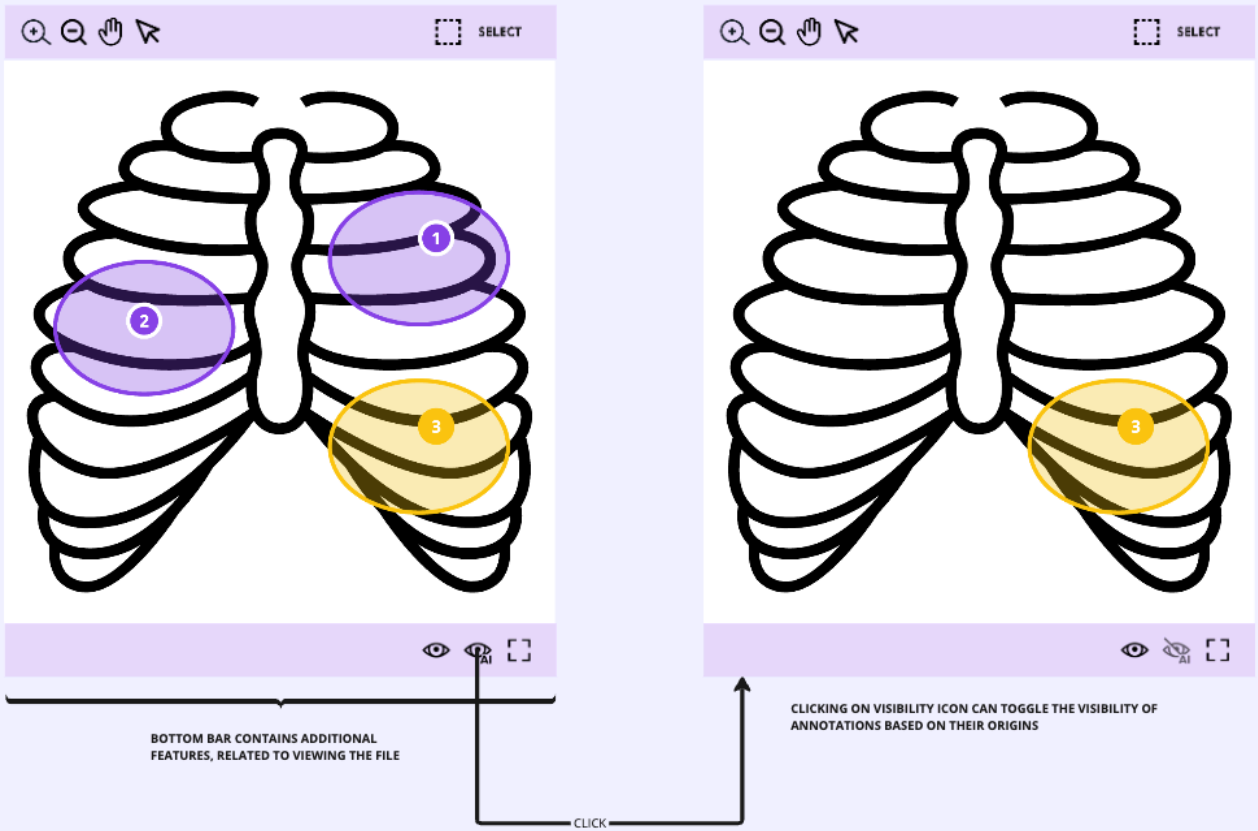
Annotation Actions

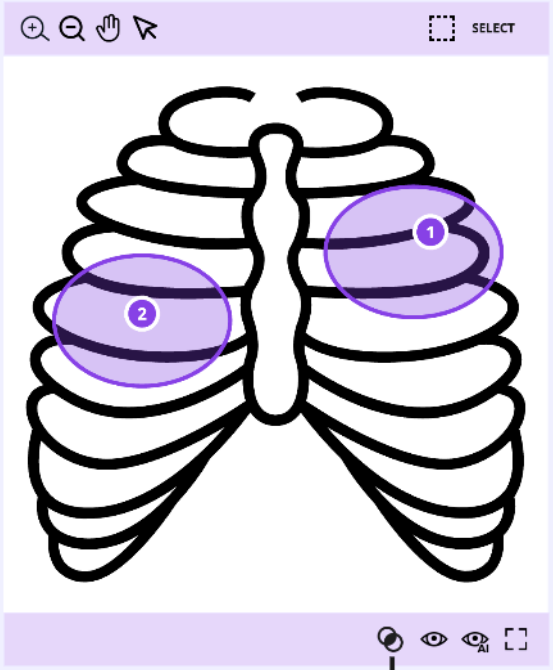
AI annotations can be viewed by hovering over the selected area. Right clicking on the area gives you options to add your insights/ delete an annotation.



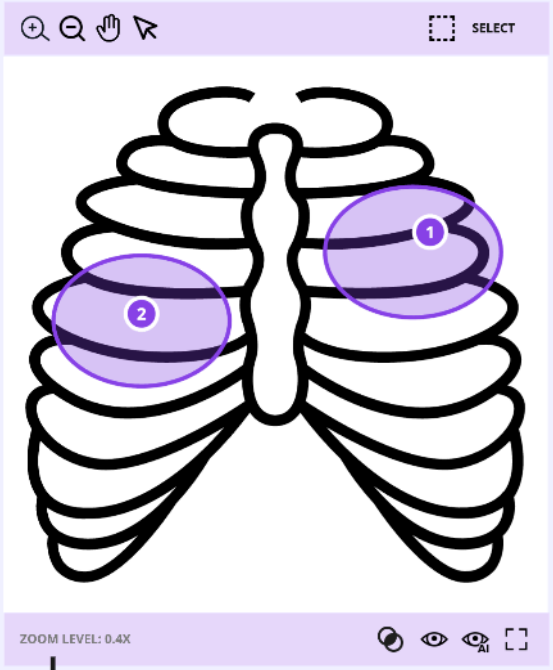
Bottom Bar

Bottom bar is intended to have view/ status related options (Refer [How others platform employ this use case]())



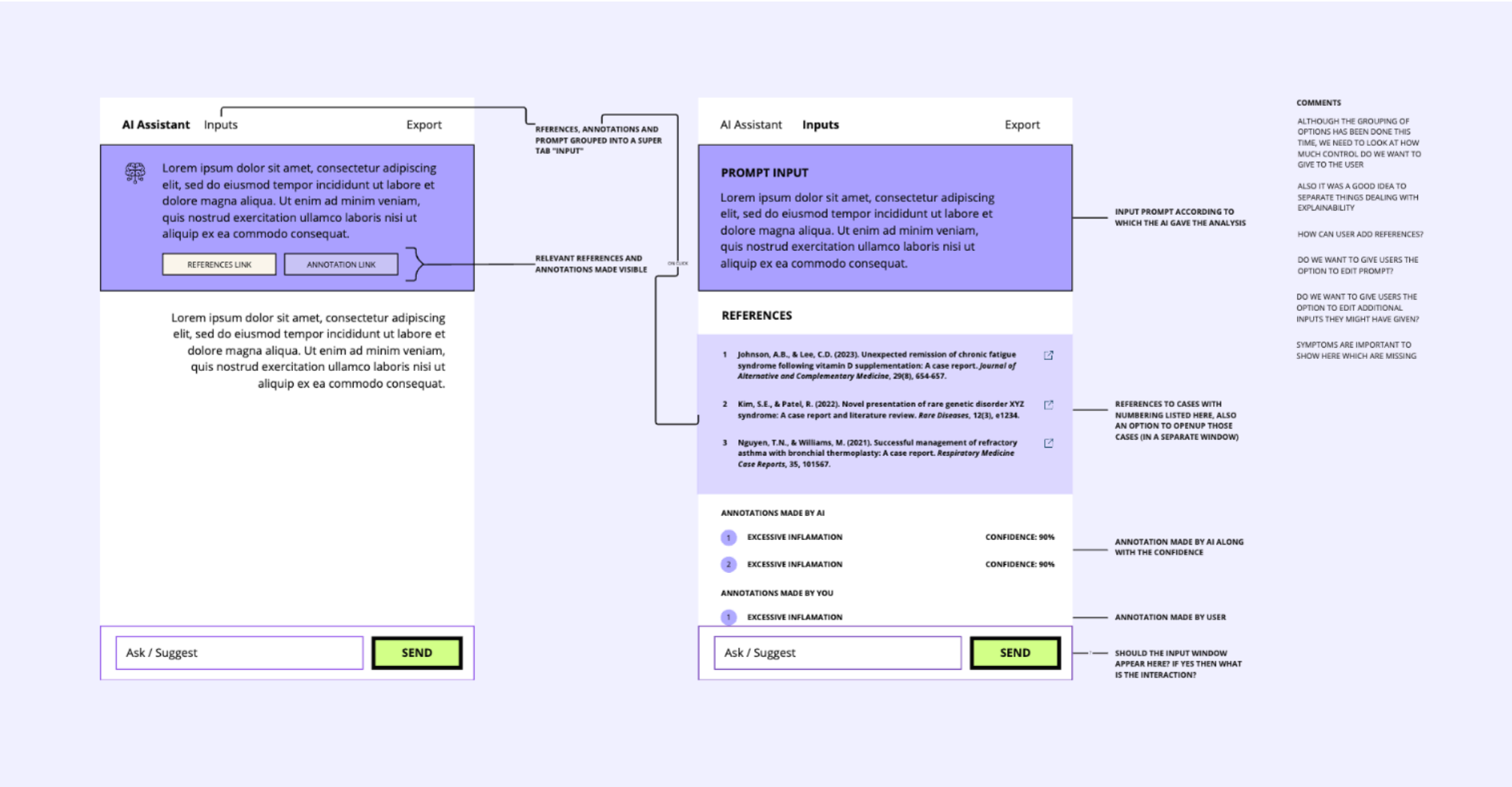


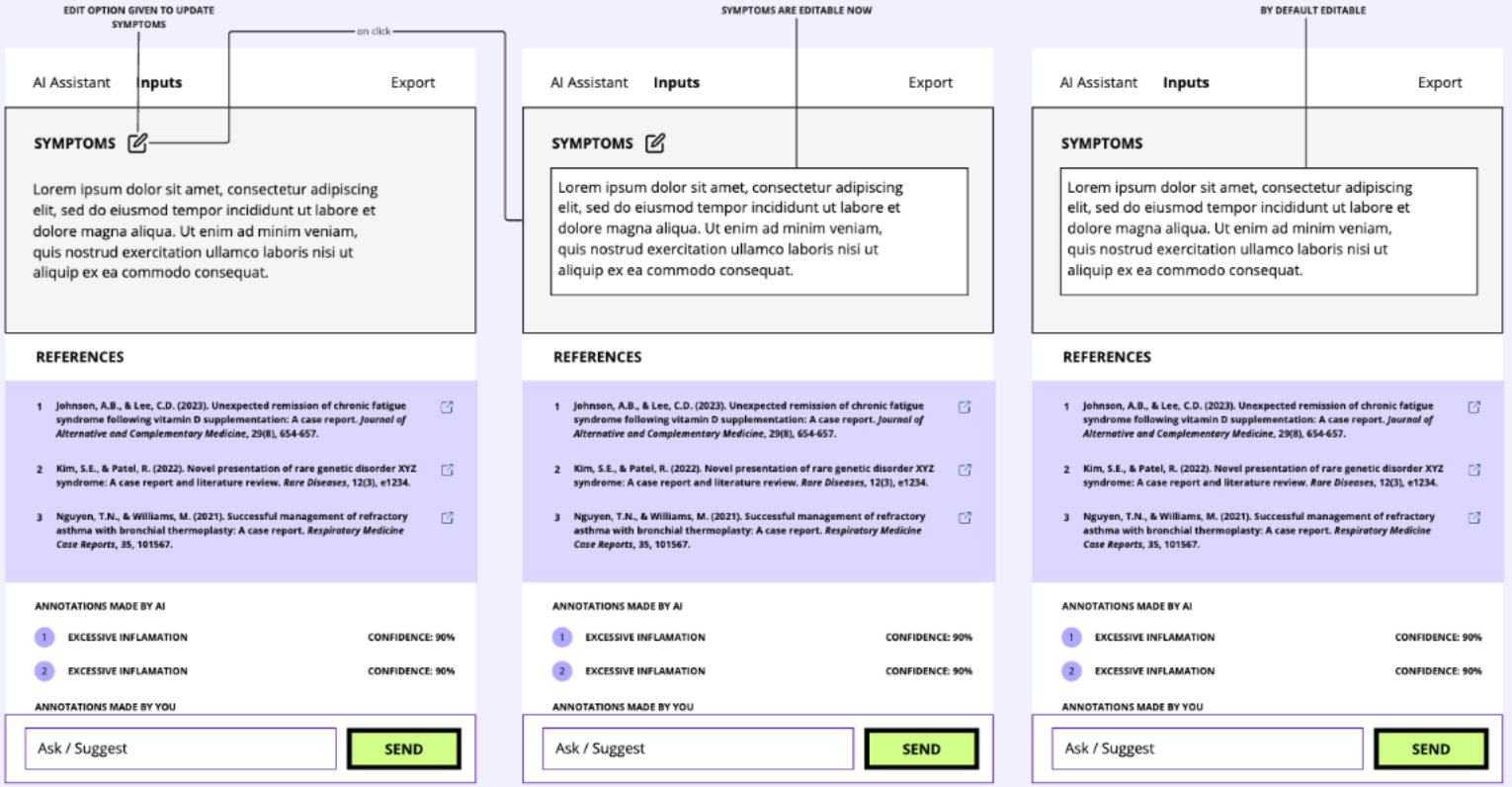
CLICKING ON FILTERS, USER CAN ACCESS VARIOUS VISUAL FILTERS TO VIEW THE IMAGE IN MULTIPLE WAYS



VIEW SPECIFICATIONS ARE MENTIONED SEPARATE FROM THE REST OF THE VIEW OPTION AS THAT IS STATIC INFORMATION

AI Prompting window


AI Assistant
Inputs
Export
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
REFERENCES LINK
ANNOTATION LINK
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
Ask / Suggest
SEND
RFERENCES, ANNOTATIONS AND PROMPT GROUPED INTO A SUPER TAB "INPUT"
RELEVANT REFERENCES AND ANNOTATIONS MADE VISIBLE
ON CLICK
AI Assistant
Inputs
Export
PROMPT INPUT
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
REFERENCES
1 Johnson, A.B., & Lee, C.D. (2023). Unexpected remission of chronic fatigue syndrome following vitamin D supplementation: A case report. Journal of Alternative and Complementary Medicine, 29(8), 654-657.
2 Kim, S.E., & Patel, R. (2022). Novel presentation of rare genetic disorder XYZ syndrome: A case report and literature review. Rare Diseases, 12(3), e1234.
3 Nguyen, T.N., & Williams, M. (2021). Successful management of refractory asthma with bronchial thermoplasty: A case report. Respiratory Medicine Case Reports, 35, 101567.
ANNOTATIONS MADE BY AI
1 EXCESSIVE INFLAMATION CONFIDENCE: 90%
2 EXCESSIVE INFLAMATION CONFIDENCE: 90%
ANNOTATIONS MADE BY YOU
1 EXCESSIVE INFLAMATION
Ask / Suggest
SEND
INPUT PROMPT ACCORDING TO WHICH THE AI GAVE THE ANALYSIS
REFERENCES TO CASES WITH NUMBERING LISTED HERE, ALSO AN OPTION TO OPENUP THOSE CASES (IN A SEPARATE WINDOW)
ANNOTATION MADE BY AI ALONG WITH THE CONFIDENCE
ANNOTATION MADE BY USER
SHOULD THE INPUT WINDOW APPEAR HERE? IF YES THEN WHAT IS THE INTERACTION?
COMMENTS
ALTHOUGH THE GROUPING OF OPTIONS HAS BEEN DONE THIS TIME, WE NEED TO LOOK AT HOW MUCH CONTROL DO WE WANT TO GIVE TO THE USER
ALSO IT WAS A GOOD IDEA TO SEPARATE THINGS DEALING WITH EXPLAINABILITY
HOW CAN USER ADD REFERENCES?
DO WE WANT TO GIVE USERS THE OPTION TO EDIT PROMPT?
DO WE WANT TO GIVE USERS THE OPTION TO EDIT ADDITIONAL INPUTS THEY MIGHT HAVE GIVEN?
SYMPTOMS ARE IMPORTANT TO SHOW HERE WHICH ARE MISSING



THIS EXPLORES 2 MODALITIES OF EDITING/ADDING SYMPTOMS.

WHILE CLICKING ON EDIT BUTTON IS A WAY WHICH HAS A BIT OF FRICTION INTRODUCED TO DO IT

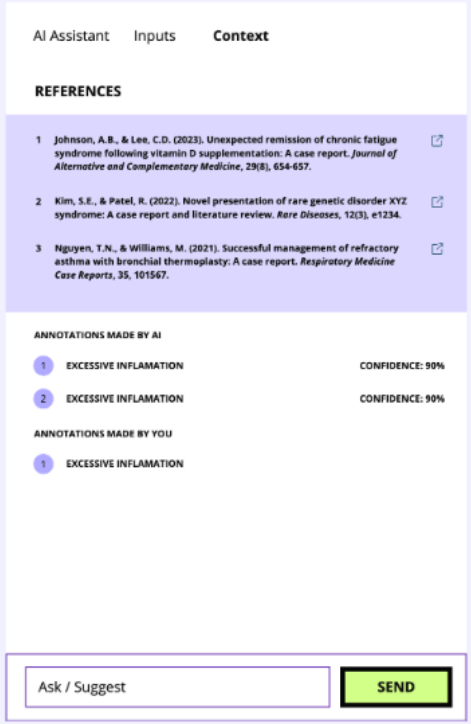
THE SECOND OPTION KEEPS THE SYMPTOMS EDITABLE BY DEFAULT

A THIRD WAY IS TO DO THAT EXCLUSIVELY BY PROMPTS

COMMENTS

INTRODUCING THIS ADDS A LOT OF ACTIONS TO ONE TAB

WE MIGHT NEED TO LOOK AT WAYS OF FURTHER SEGREGATION OF ACTIONS

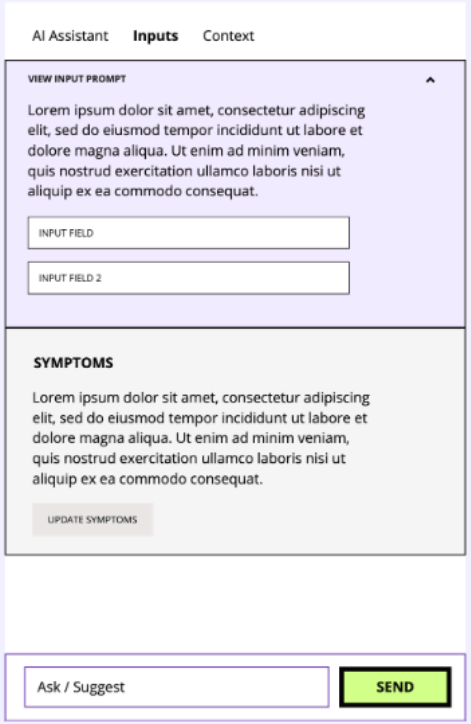


THE ITEMS FROM INPUTS ARE NOW SEGREGATED

PROMPTS AND SYMPTOMS, 2 EDITABLE THINGS FROM THE USER THEMSELVES ARE KEPT IN INPUTS

REFERENCES AND ANNOTATIONS WHICH **MAY OR MAY NOT BE ADDED BY THE USER ARE UNDER CONTEXT TAB**

EXPORTS ARE MOVED OUT OF THIS SECTION AS THEY ARE A HIGHER LEVEL ACTION



HERE WE DONT ALLOW EDIT OF THE PROMPT ITSELF

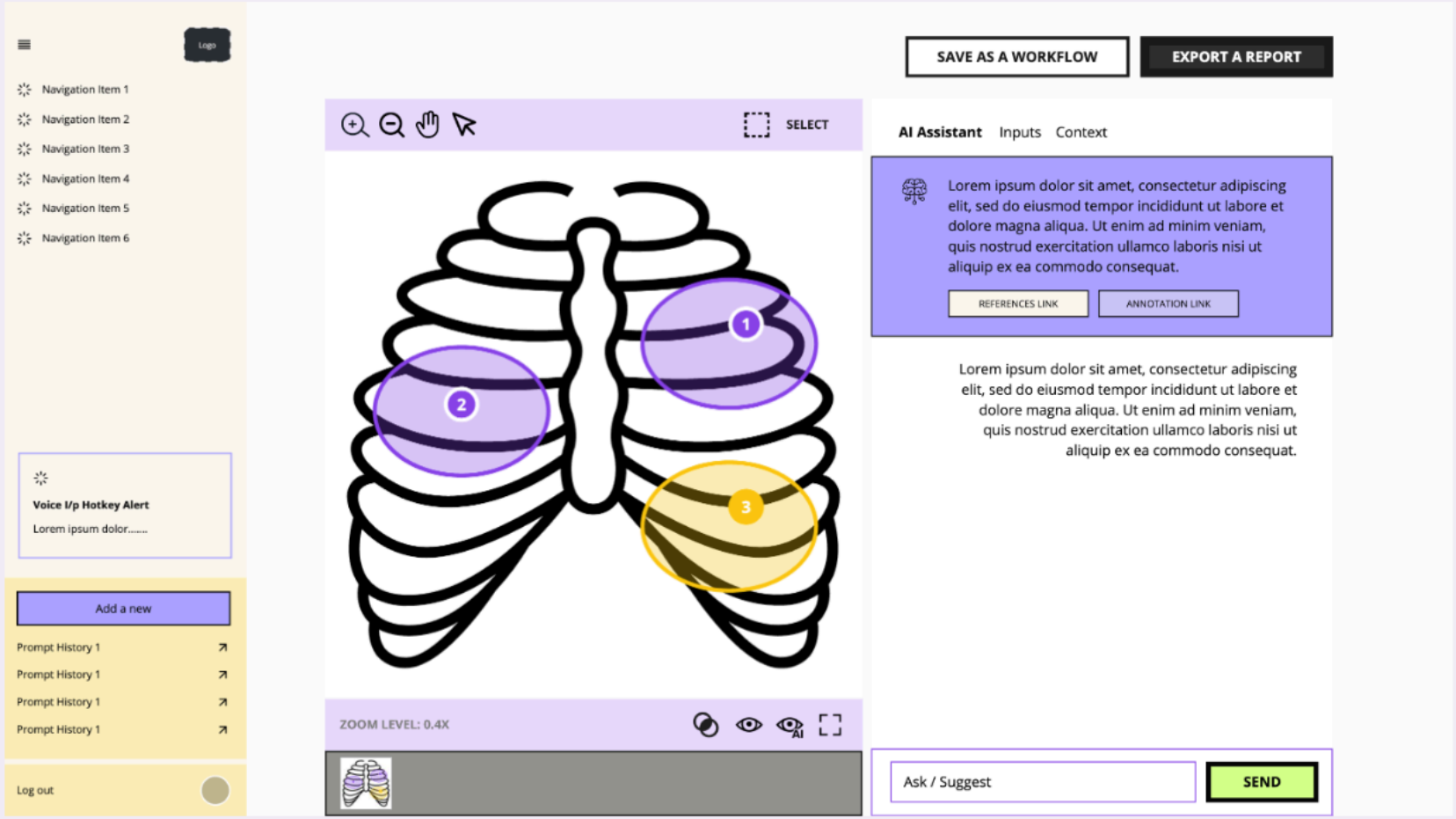
THE INPUT FIELDS ARE EDITABLE THOUGH

COMMENTS

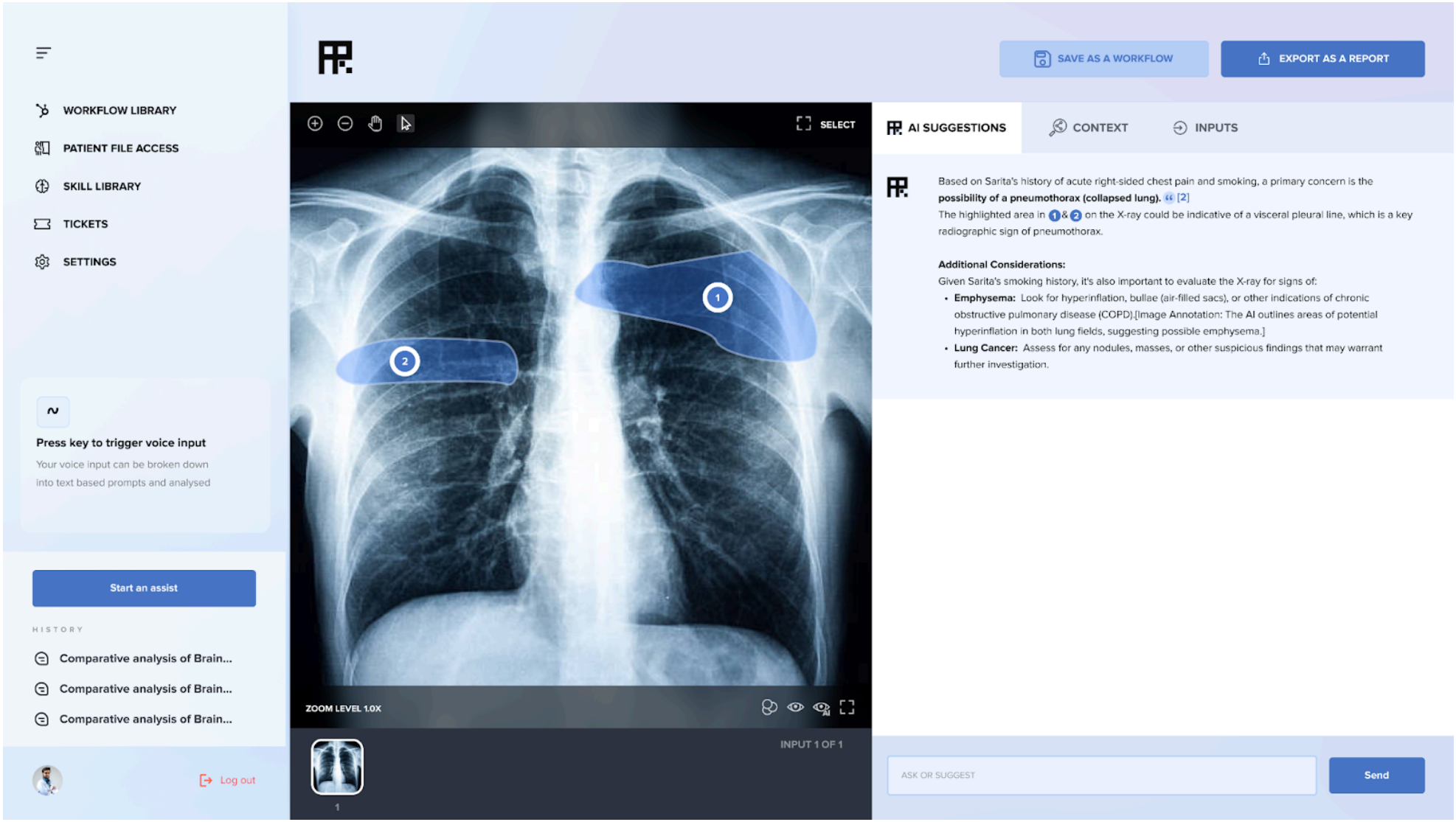
SEGREGATION HELPED A LOT MORE WITH EASE OF NAVIGATION

GROUPING ITEMS WITH SIMILAR INTENT MAKES MUCH SENSE HEURISTICALLY

Final Conceptualization



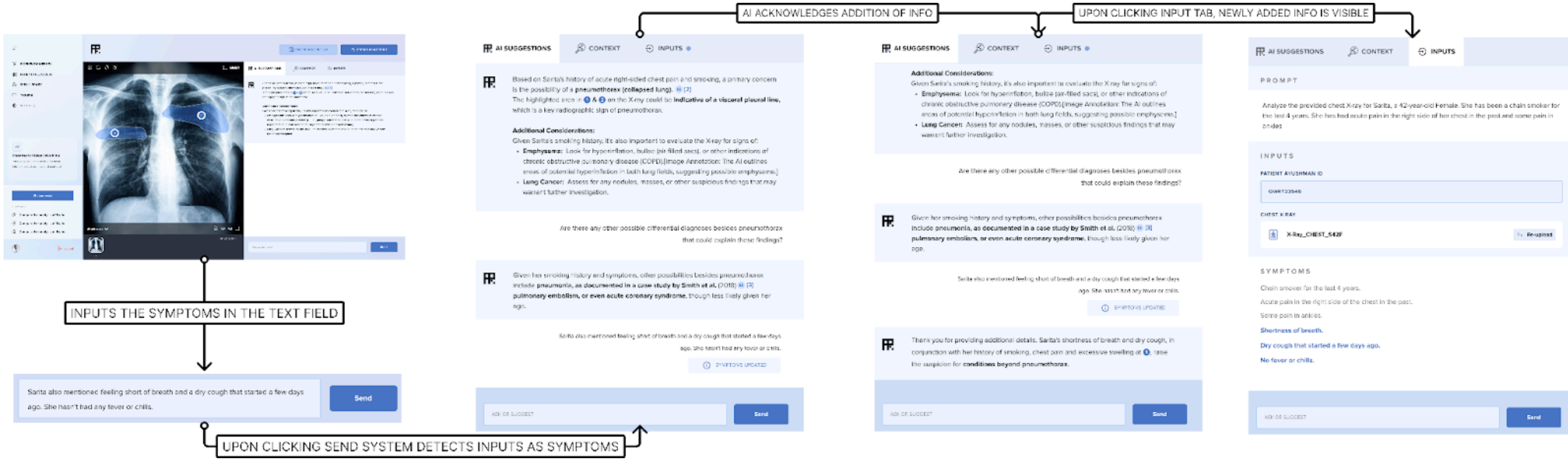
High Fidelity



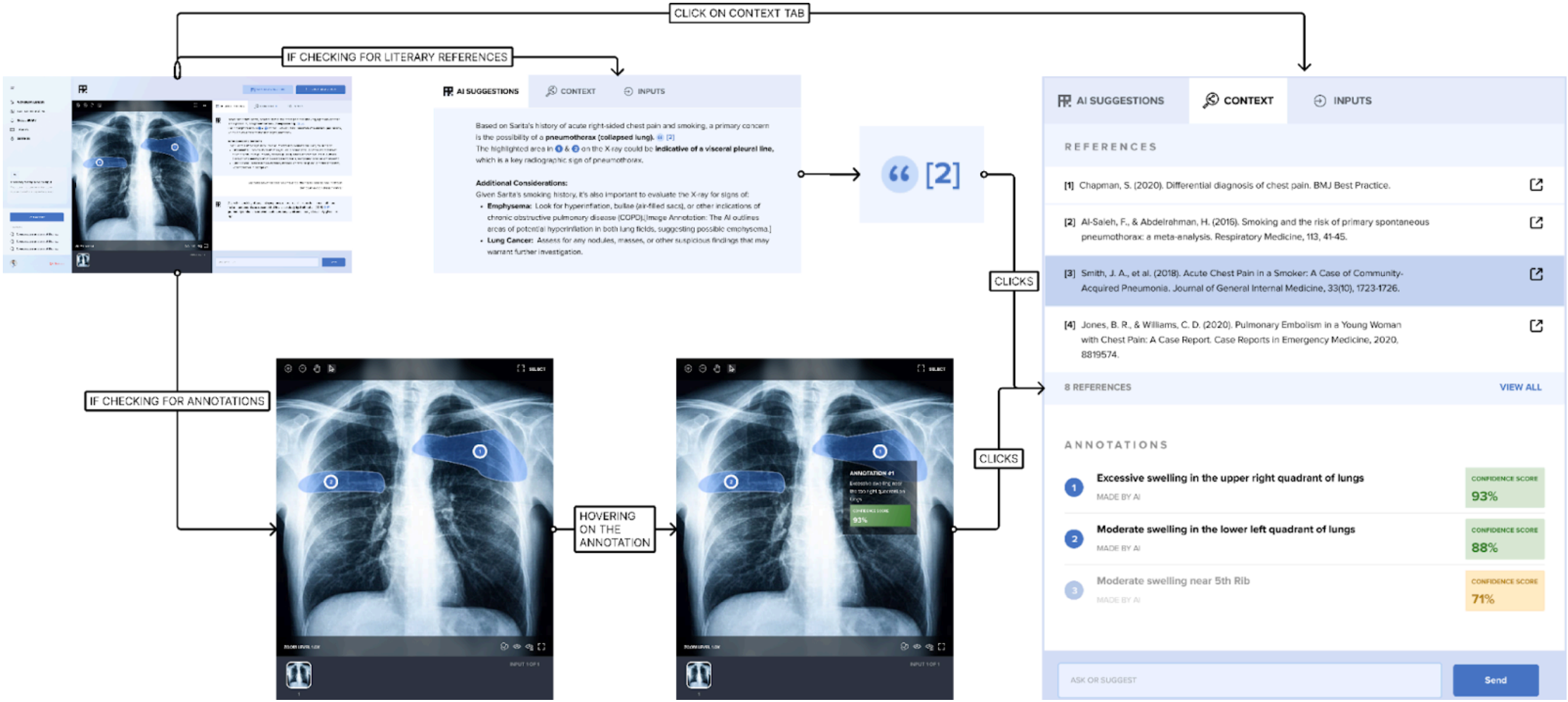
User Flows for interacting with the AI assistant

User wants to ask AI a question

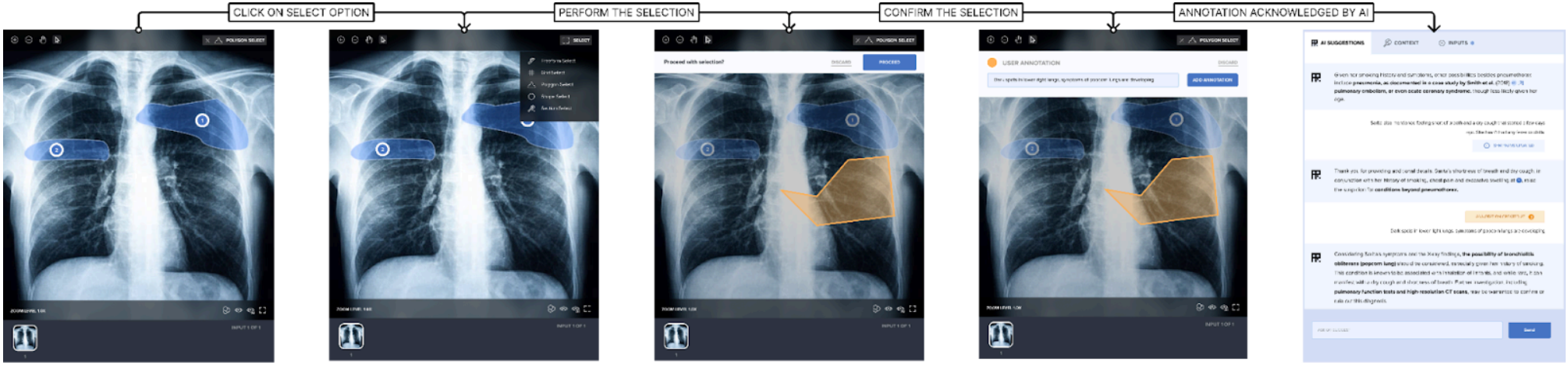
User wants to add Symptoms



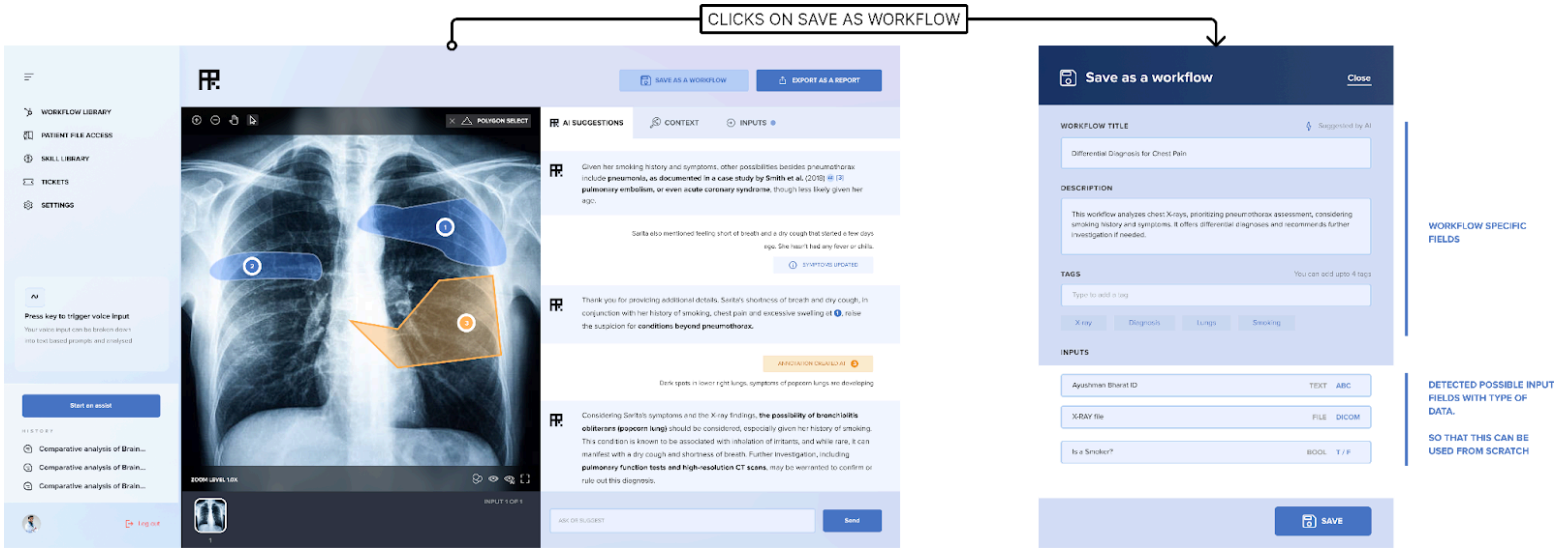
User wants to check for context



User wants to annotate



Saving a session as a workflow



Link to Prototype:
https://shorturl.at/mvxZV

Link to Video Walkthrough:
https://shorturl.at/xJTgd

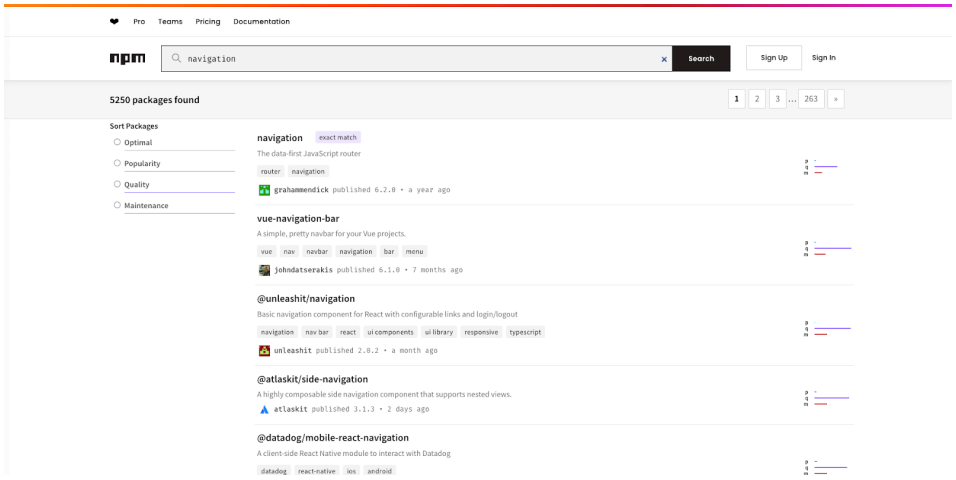
Workflow Library

A workflow library serves as a centralized repository for storing, organizing, and accessing pre-built, community created and user-created automations. This would be the first point of contact between the user and the system, where the user can access pre-build workflows, provide necessary inputs and repeat over a set of multiple data points.

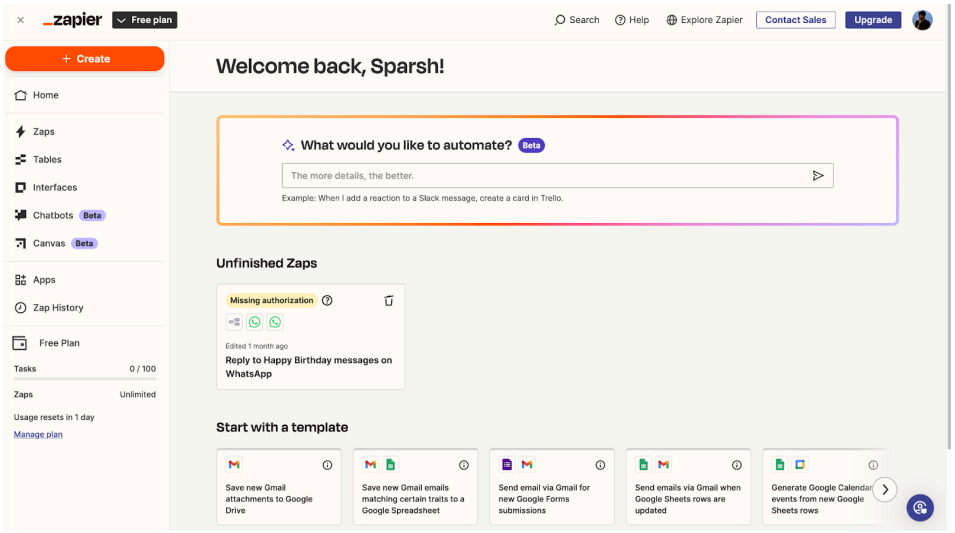
Similar Applications

These applications were analysed in a similar way as done in last sections. Relevant design interventions are mentioned.

NPM



Zapier



KPI's and their prioritization

1. Effectiveness/Outcome KPIs:

- **Success Rate:** The percentage of times a routine successfully completes its intended task.
- **Error Rate:** The frequency with which a routine encounters errors or fails to complete.
- **Accuracy:** For AI abilities, how often the output or prediction aligns with ground truth or expert judgment.
- **Precision & Recall:** For classification tasks, measuring how well the routine identifies relevant items (precision) and captures all relevant items (recall).
- **Customer Satisfaction:** If applicable, feedback from users on how well the routine meets their needs and expectations.
- **Time Saved:** The amount of time saved compared to performing the task manually.

2. Efficiency KPIs:

- **Execution Time:** The average time taken for a routine to complete from start to finish.
- **Resource Utilization:** The amount of computing resources (CPU, memory, storage) consumed by the routine.
- **Cost:** The financial cost associated with running the routine (e.g., cloud computing charges).

3. Usability KPIs:

- **Adoption Rate:** The percentage of users who actively use the routine.
- **Ease of Use:** Feedback from users on how intuitive and user-friendly the routine is to set up and execute.
- **Customization Rate:** How often users modify or adapt the routine to their specific needs.

Of Course, we can't show all the KPIs at an instance, so we will have to prioritize what KPIs to be shown. Dividing the discussed KPIs into tiers, seeing then with the lens of

Primary KPIs: Success Rate, Time Saved (Execution time), Adoption (Usage per week)
Secondary KPIs: Error Rate, Number of Customizations
Filterable KPIs: Resource Consumption (for technical users)

Design Considerations

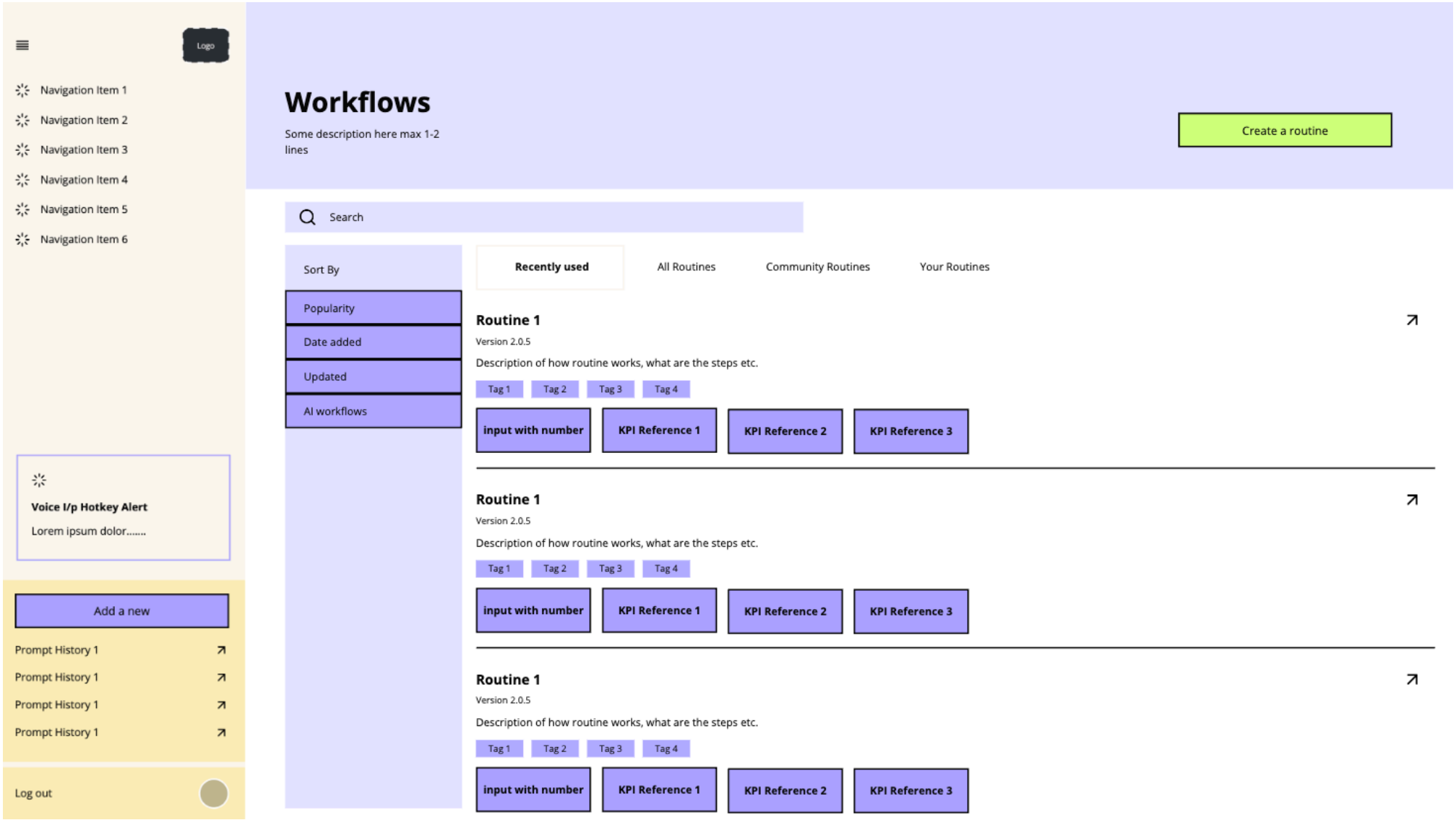
When designing the Workflow Library page keeping trust, explainability, control, and transparency in mind is crucial. Here are some design considerations to achieve these goals:

1- Relevant KPI's being made visible to the user on the go. (Explainability)

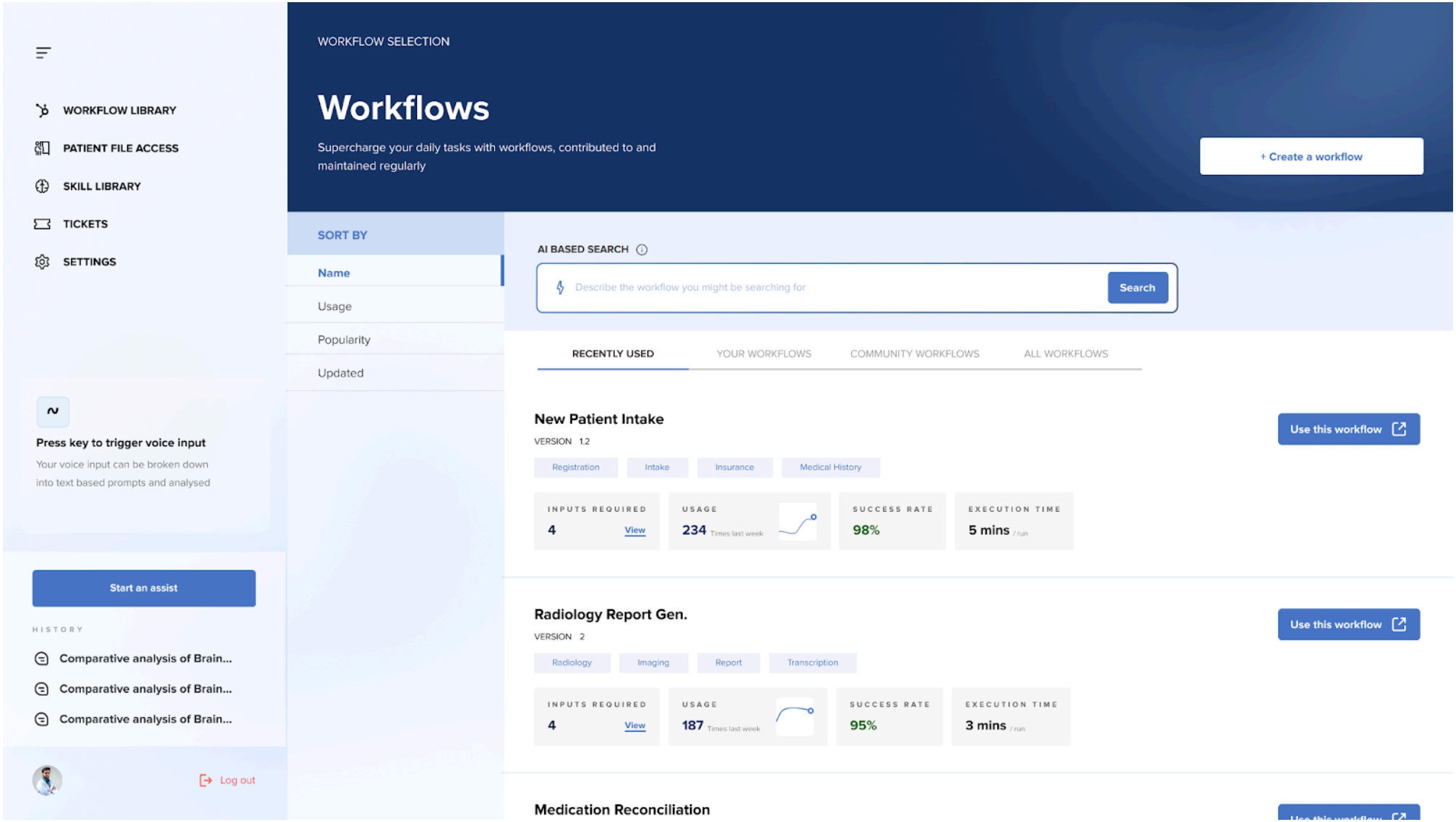
2- Revealing what the workflow is about at a glance. (Transparency)

3- Effective ways of segregating and sorting workflows according to the KPIs (Control)

Low Fidelity



High Fidelity



Evaluation

Evaluation Protocol

Peer Review

Participants: Fellow design students, colleagues, or individuals with a basic understanding of AI and healthcare workflows.
Methods:

- **Usability Testing:** Participants will be asked to complete specific tasks using the prototype and provide feedback on the interface, ease of use, and overall experience.
- **UX Review:** A non-structured review of the conceptualised user flows and UX decisions once the whole protocol is executed.

Focus Areas:

- Clarity and intuitiveness of the user interface
- Ease of traversal
- Effectiveness of the proposed input flow
- Ease of use for suggested interventions
- Overall user experience and satisfaction

Expert Review

Participants: Industry professionals, who have worked in similar space and have expertise in it.

Methods:

- **Usability Testing:** Similar to peer review.
- **Segmented Critique:** Experts are allowed to digress from the proposed tasks and question the decisions taken at any stage and give their feedback.

Focus Areas:

- Evaluation of interventions and their capabilities to elucidate trust.
- Relevance in the medical sphere.
- Potential impact on healthcare professionals and outcomes
- Ethical considerations
- Review of Conceptualization

Evaluation Results

Peer Review

Conducted with 4 people over 2 days. The general comments that were made were as follows.

Critiques:

1- "Why are there so many steps attached to this, won't we want to execute all of this with minimal effort and input?"
While I tried to defend through my position of how criticality of the context effects this decision (Refer Ramifications of the approach). Things did make sense as they agreed with the concept but were hesitant about the segmentation in the process.

2- "Approach of AI clubbed with Number of inputs remaining caused navigation issues"
Users thought that they were heading, due to their hierarchy being equal to one. What didn't help was the input count being visible right under it.

3- "Start of a doctor's journey should be accessing workflows"
While more of a fault of the order in which the prototype which was presented, this gave affirmation to the decision of keeping workflows as the landing of the doctor on the platform. (Refer User Journeys)

Positives

1- "The X-Ray interaction modalities have a lot of flexibilities"
Reviewers found it really easy to navigate and access different options of annotations and were able to anticipate the outcome of their actions.

2- "Instant workflow access with inputs that made sense "
Reviewers were able to form a segway between the workflow creation through prompt and then their usage by inputting in the relevant details.

3- "Explainability is illustrated well with every step"

Expert Review

Conducted with 1 industry expert, whose expertise is in designing AI-experiences in medical context and whose work I have referred for my literature review.

Critiques:

1- "Modals are strong actions, the segmentation of prompt input is giving a sense of each step carrying a value, which ideally shouldn't be the case"
Just like in the peer review, I tried to defend through my position of how criticality of the context effects this decision (Refer Ramifications of the approach). This critique fortified my views against my current approach.

2- "What if we start with the user credential inputs first?"
Not a review which align with the broader vision of the project, but this can come in really handy while designing for specific use cases.

3- "Support for iterations in the workflow access"
The expert gave me insights about batch processing of inputs and how a possible use case can be how sets of inputs get processed together my triggering a workflow.

4- "User of jargons should be avoided"
Certain jargons like prompt breakdown, tokenization might be irrelevant to a medical professional, is there a easy way to do so?

Positives

1- "The X-Ray AI interaction is great!"
The reviewer liked the explainability and transparency offered in this section and deemed it as an opportunity to include in general LLMs

2- "The platform is able to establish a context for itself"
The addition of elements like sample prompts and write ups made it possible.

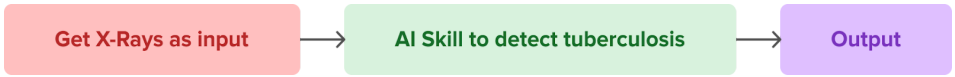
3- "Interventions for controls are promising"
Keeping the friction in mind, if we can elucidate control but by giving user an agency to do so, this might help the platform being more welcoming for a new user

Out-scoped Designs

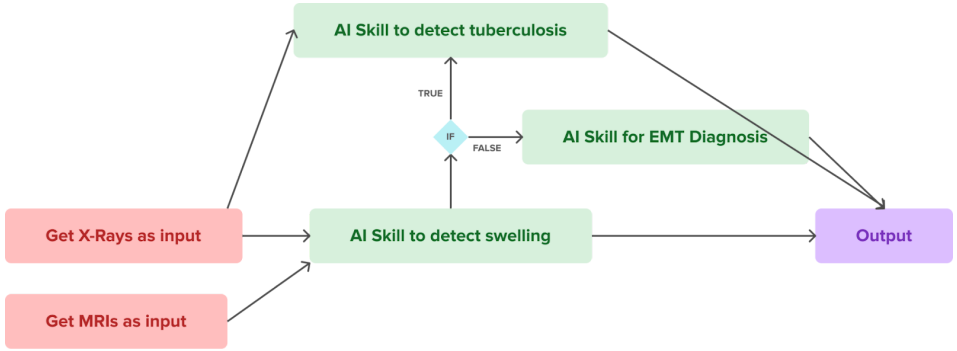
This section includes modules which were to be designed(or are yet to be designed) as a part of the project, but don't align with the positioning of the report. Although, these sections too, needed to delivered. Hence they won't exactly follow the same methodology I applied for the In-Scope Designs. Most of the sections are still in the conceptualization phase, so I will just document the insights I have drawn till now.

Conceptualization of Workflow Creation

A visual approach to workflow creation has been chosen due to its inherent advantages in promoting user comprehension and ease of use. This approach aligns with the cognitive models of medical professionals who are accustomed to interpreting visual information, thus reducing the learning curve. The visual representation of workflows facilitates a clearer understanding of complex processes and minimizing errors. Additionally, this intuitive design is expected to increase user engagement and simplify the creation of customized automations, even for those with limited technical expertise. For this we will have to understand the basic paradigms of logic building in programming. Initially I imagined the routines (or workflows) to be linear in nature.



But with further investigation, I realised that there can be complex use cases. In these cases, a linear approach might not be ideal.



While linear workflows served as a good starting point. There are alternative approaches which exist. In the context of workflows, they are:

Branching Workflows: These workflows allow for multiple paths based on specific conditions or user inputs. They provide more flexibility than linear workflows and can handle more complex logic.

Parallel Workflows: These workflows allow multiple actions to be executed simultaneously, improving efficiency for tasks that can be performed independently.

Event-Driven Workflows: These workflows are triggered by specific events or signals, making them more responsive to real-time changes in the environment.

Dynamic Workflows: These workflows can be modified or adapted on the fly, even while they are running. This allows for greater flexibility and responsiveness to changing circumstances.

For the scope of this project, we will stick to branched workflows. Parallelity of workflows (apart from separate workflows running independently), can be ensured to some extent.

Type of Blocks

Skill Block- A block which holds the functionality of a skill (AI or non AI)

Conditional Block- A block which can be used as conditional statements (similar to if else ())

Iteration Block- A block which can be used to iterate through multiple inputs.

Input Nodes: Commonly the starting points of your workflow. They can receive data from various sources, such as user input, external APIs, databases, or sensors.

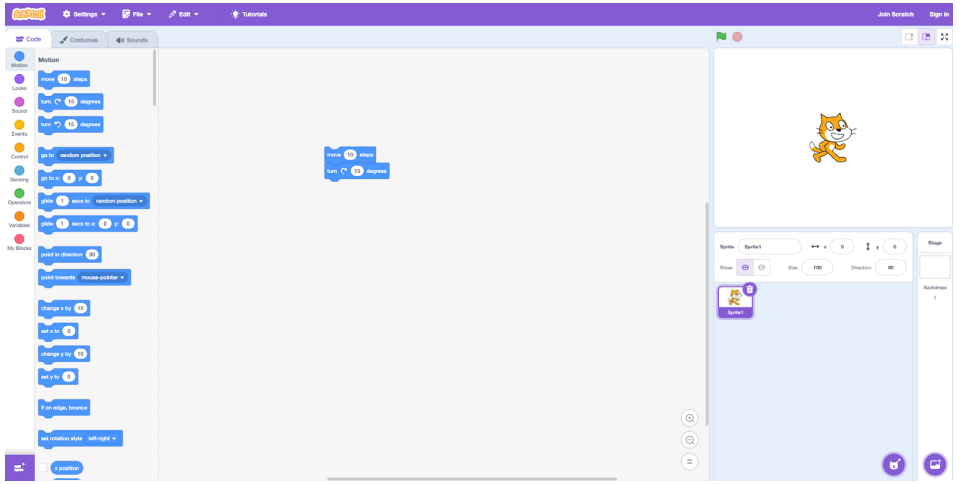
Output Nodes: These are the end points of your workflow. They can send data to different destinations, such as displaying it in the user interface, storing it in a database, triggering another workflow, or sending it to an external system.

Subworkflows: This block allows you to encapsulate a series of actions into a reusable subworkflow. This can simplify complex workflows and promote reusability.

Error Handling Nodes: These nodes allow you to handle errors or exceptions that may occur during workflow execution. They can be used to log errors, send notifications, or trigger alternative actions.

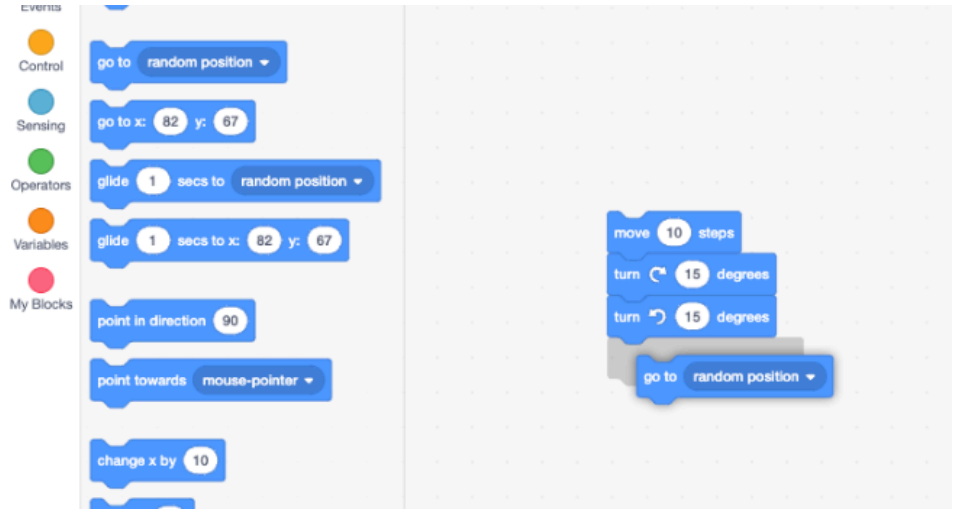
Similar existing Applications

Scratch



Scratch, developed by the MIT Media Lab, is a visual programming language and online community designed primarily for children and beginners. It utilizes a block-based interface where users can snap together colorful blocks to create interactive stories, games, and animations. This approach eliminates the need for complex syntax and typing, making coding accessible and engaging for learners of all ages.

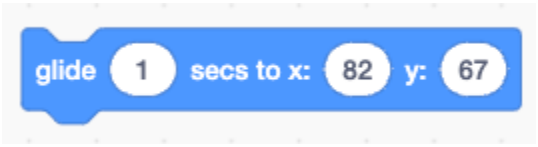
Elements Identified



1. Drag and Drop

Users can simply drag and drop blocks representing different commands, actions, or events to create their programs.

2. Affordance in block design

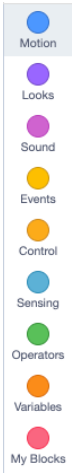


Blocks have indentations and protrusion which illustrates the affordance of puzzle pieces, meant to attach to each other

3. Use of simple english sentences

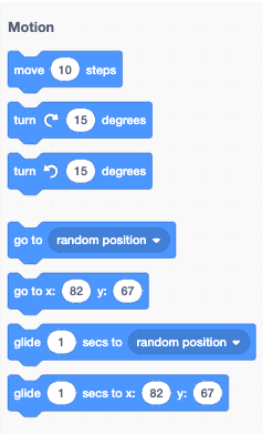
The blocks have simple english sentences with spaces for variables, so that they are easily interpretable.

4. Blocks are color coded wrt their functionality /type



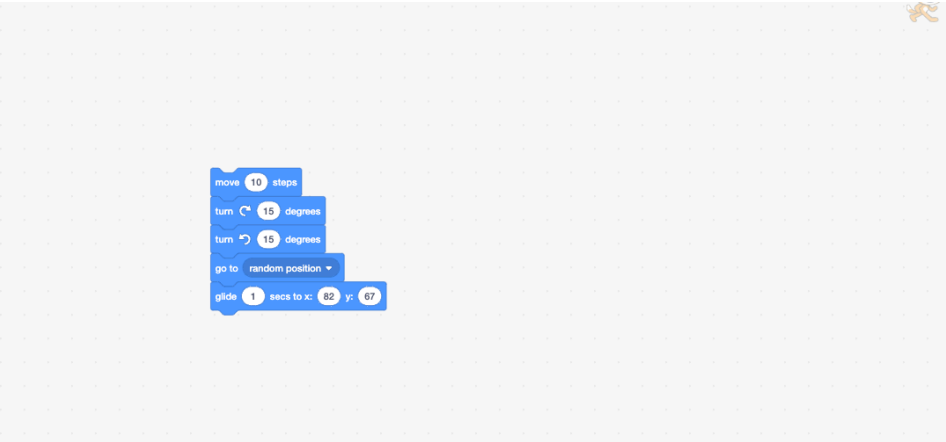
Blocks are color coded according to their functionality and origin, this makes it visually easy to segregate, identify and filter

5. Panel where all the blocks are visible



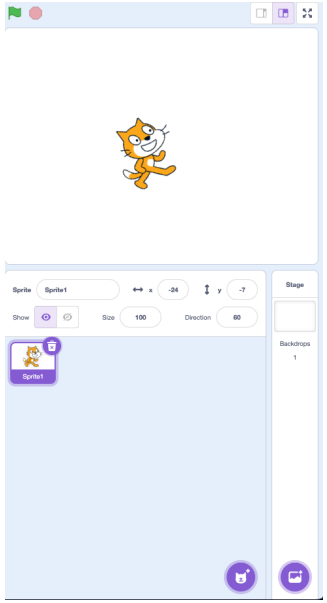
Its a scrollable board on the right side of the screen, from where you can drag and drop blocks into the work area.

6. Actionable area / Workbench



An area in the middle of the screen where you connect different blocks to mimic logic and create workflows.

7. Output



A panel on left hand side of the screen, where you can see the output of your made logic in real-time and debug accordingly.

Personal Reflections

This project has been an incredibly enriching journey, pushing the boundaries of my understanding of AI's potential in healthcare and its profound implications for UX design.

The most compelling aspect was delving into the complexities of trust in AI. It became clear that building trust isn't just about creating accurate algorithms; it's about designing transparent, explainable systems that empower users and respect their expertise. The "black box" problem remains a significant hurdle, but exploring solutions like explainable AI (XAI) has opened up new possibilities for creating AI tools that are both powerful and trustworthy.

The doctor-centric design approach was another highlight. Interviewing and observing healthcare professionals in their work environments provided invaluable insights into their unique needs and challenges. It reinforced the importance of creating tools that seamlessly integrate into existing workflows, enhance decision-making, and ultimately improve patient care.

This project has not only expanded my technical skills but also deepened my understanding of the social and ethical implications of AI. It has solidified my passion for designing human-centered AI systems that prioritize trust, transparency, and empowerment, and I am excited to continue exploring this rapidly evolving field.

The project has been a great opportunity for me to test out almost everything that I learned here, which served as a great closure for my time here.

Future Steps

- Iteration on insights received from reviews.
- Conducting reviews of the new idea.
- Looking at frameworks on how do we deem a system to be trustworthy.
- Continuation of the project to look at even complex sections like workflow creation and skill training.
- Documentation and submission of design guidelines.
- Shipping final designs to developers to get the project off ground.

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