



# Vital Point

An Accessible Electroacupuncture System  
for Home-Based Chronic Care



## MOTIVATION

Chronic disease patients often **lack accessible and affordable options for ongoing treatment at home**. Although electroacupuncture is clinically effective, it typically requires **specialized equipment and in-person supervision**, making long-term care costly and inconvenient. Existing consumer health tools fail to integrate **acupoint guidance, treatment feedback, and condition tracking** into a unified home-based solution.

## AIM

Vital Point proposes an **end-to-end electroacupuncture system** for safe and guided home use. By combining **a wearable stimulator**, embedded sensors, and **a mobile app** supporting acupoint localization, real-time feedback, and chronic disease tracking, the project translates traditional acupuncture knowledge into an accessible and sustainable digital care experience.

## TYPE

Individual Project | Healthcare Technology | Wearable Systems | HCI

## TOOLS

Mobile App Design | Sensor Integration | Wearable Hardware

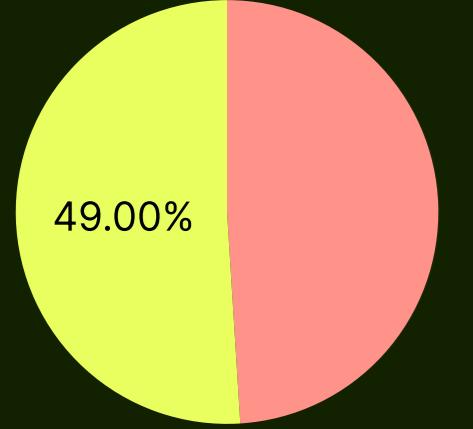
## TIME

2024

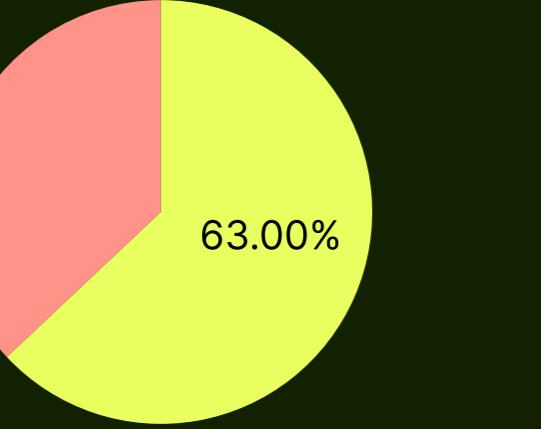
# Background

## Phenomenon

### Key Facts about the Uninsured Population

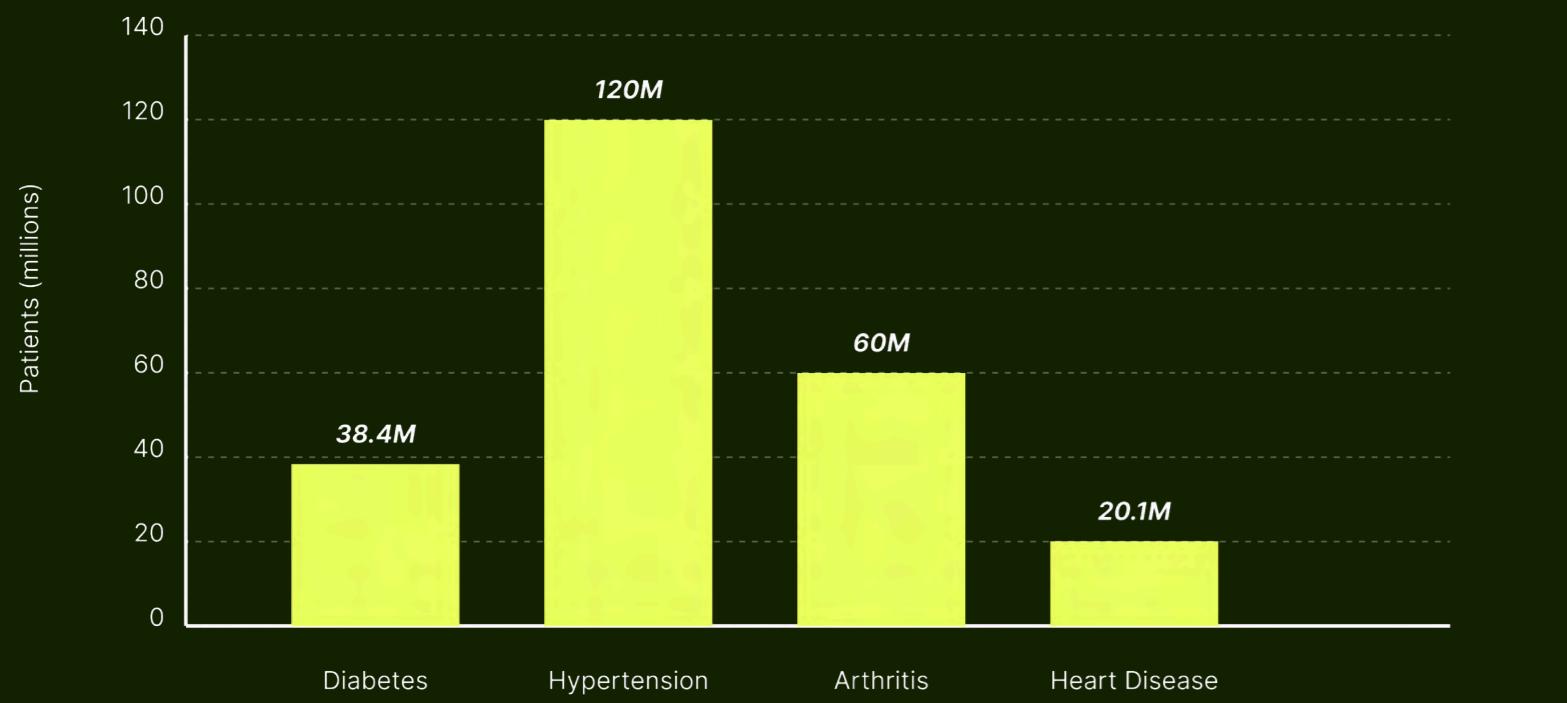


Uninsured people often face unaffordable medical bills when they do seek care. Nearly half (49%) of uninsured adults say they have difficulty affording health care costs.



Many uninsured people cite the high cost of insurance as the main reason they lack coverage. In 2023, 63% of uninsured adults ages 18-64 said that they were uninsured because the cost of coverage was too high.

### U.S. Common Chronic Disease Statistics



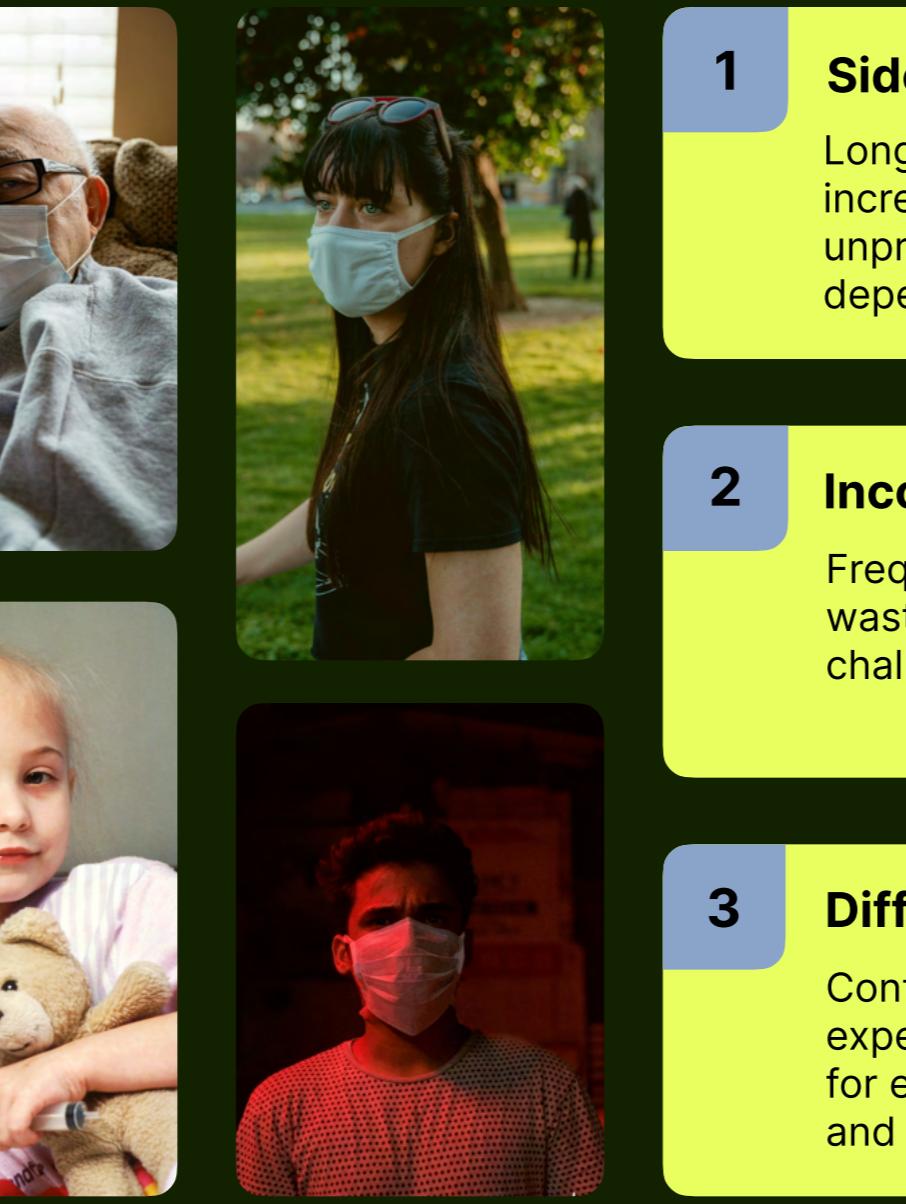
High prevalence of chronic diseases in the United States.

## Keywords

Uninsured individuals face greater needs for chronic disease care.

This lack of coverage presents a significant barrier to managing prevalent health issues.

## Pain Points



### Reasons

Commercialization of the healthcare system

Lack of effective price control mechanisms

Incomplete health insurance coverage

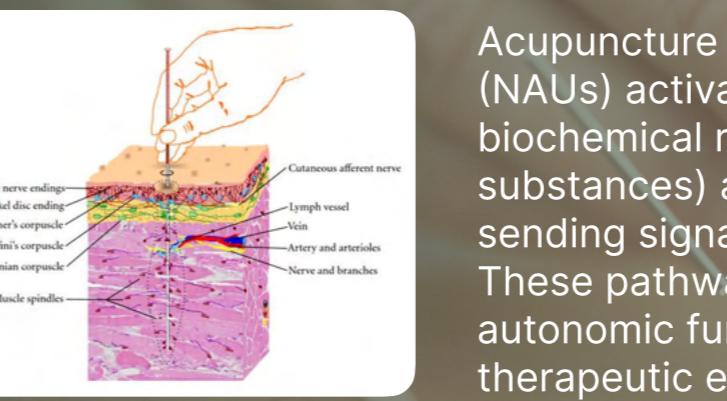
High administrative costs passed on to patients

Prescription drug prices remain high

## Summary

High healthcare costs create a **vicious cycle**—preventive care becomes unaffordable, chronic conditions worsen, and treatment costs rise along with poor health outcomes. The widespread prevalence of chronic disease in the U.S. also highlights the **limits of the traditional healthcare model** in prevention and management.

## The Principles of Acupuncture Therapy



Acupuncture works through "Neural Acupuncture Units" (NAUs) activated by needle insertion. This triggers both biochemical reactions (releasing pain-inhibiting substances) and mechanical stimulation of receptors, sending signals through neural pathways to the brain. These pathways modulate pain perception and autonomic function, explaining acupuncture's diverse therapeutic effects.



**Diabetes:** Stimulating acupuncture points such as Zusanzli (ST36) and Sanyinjiao (SP6) can assist in blood sugar management.



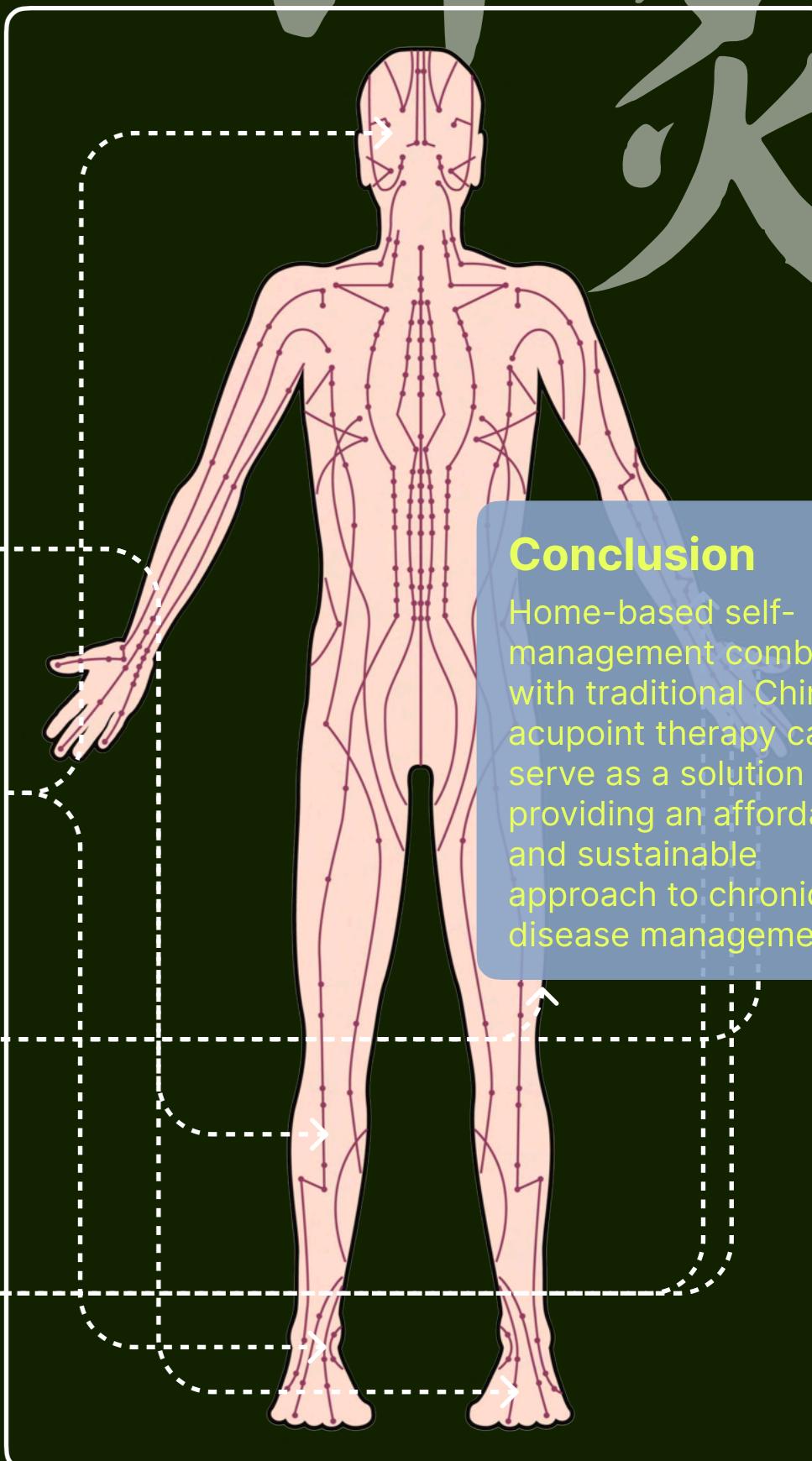
**Hypertension:** Stimulating acupuncture points such as Taichong (LR3) and Fengchi (GB20) can help support blood pressure control.



**Arthritis:** Stimulating acupuncture points such as Hegu (LI4) and Yanglingquan (GB34) can help relieve pain.



**Heart Disease:** Stimulating acupuncture points such as Neiguan (PC6) and Shenmen (HT7) can help regulate heart rate and reduce anxiety.



### Conclusion

Home-based self-management combined with traditional Chinese acupuncture therapy can serve as a solution by providing an affordable and sustainable approach to chronic disease management.

## Current Status of Acupuncture Therapy in U.S.

Public acceptance of acupuncture has grown, especially for pain management, opioid reduction, and partial Medicare/Medicaid coverage.

Acupuncture is increasingly recognized in the U.S. with better regulations, insurance coverage, and usage growth.

In 2023, about 33,364–34,524 licensed acupuncturists practiced mainly in California, New York, and Florida.

### Good

Varying state regulations create inconsistencies.

Inconsistent insurance coverage limits patient access.

### Bad

Difficulty integrating into mainstream healthcare systems.

# Case Study

## Competitive Analysis of Current Market Solutions

	IHT BioScan	Yuwell Therapy Device	Visual Acupuncture 3D	Acupuncture Master
Software + Hardware				
Usage Scenarios	Home/Hospital (For Professionals)	Home (For Individuals)	Home/Hospital (For Professionals)	Home (For Professionals)
Usage Cost	Expensive	Cheap	Expensive	Cheap
Key Features	GSR Technology Meridian Assessment Acupoint Analysis	Acupoint Stimulation Dual-Channel Therapy Heat Therapy	3D Acupoint Visualization Interactive Education Anatomical Precision	Intelligent Diagnosis Digital Patient Records Tailored Treatment
User Experience	Not user-friendly	User-friendly	Not user-friendly	User-friendly
<p><b>IHT BioScan</b> offers professional, personalized health assessments using GSR technology and TCM theory, ideal for clinical use. <b>Yuwell Therapy Device</b> is user-friendly, designed for home use with multiple therapy modes and adjustable intensity for daily pain relief and chronic disease support.</p> <p><b>Visual Acupuncture 3D</b> provides 3D visualization for acupuncture learning and planning, suited for education and reference. <b>Acupuncture Master</b> focuses on clinical use, offering intelligent diagnosis, electronic records, and personalized plans for chronic disease management.</p>				

# Primary Research

## Patients Interviews

### Empathy Map

#### Says

"I've heard acupuncture helps with pain relief, but I don't know much beyond that."

"If I try it at home, I'd want professional guidance to make sure it's safe."

"I'm not sure what other health benefits it offers."

Many follow through on multiple treatments after feeling an initial benefit.

A portion of patients book sessions for chronic pain or stress management.

Others avoid self-administered or home-based acupuncture out of safety concerns.

#### Does

Experiences relief (pain reduction) and improved relaxation after treatment.

Feels skeptical or uncertain about its broader health benefits and mechanism of action.

#### Thinks

Wonders how acupuncture actually works, given the lack of clear scientific explanations.

Feels that limited exposure to Traditional Chinese Medicine leaves them uncertain.

Believes that a trained practitioner is necessary to ensure both safety and effectiveness.

#### Feels

Comfort the Patient

Why Electro?

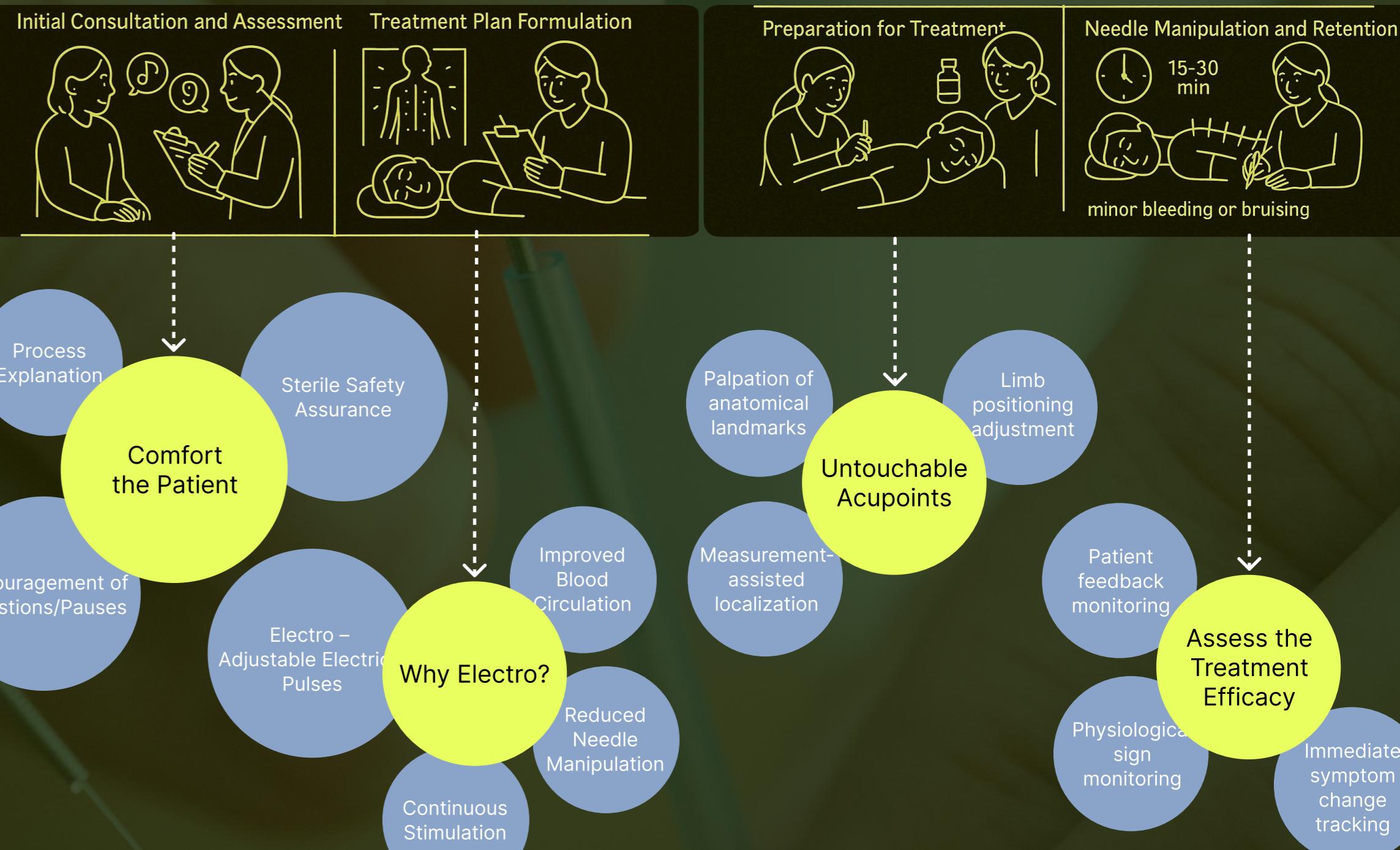
Assess the Treatment Efficacy

#### Key Features

#### User Experience

## Experts Interviews

### Acupuncture Therapy Process



Their vision of the ideal product.

Offers Guided Self-Care

Clearly Visualizes Acupoints

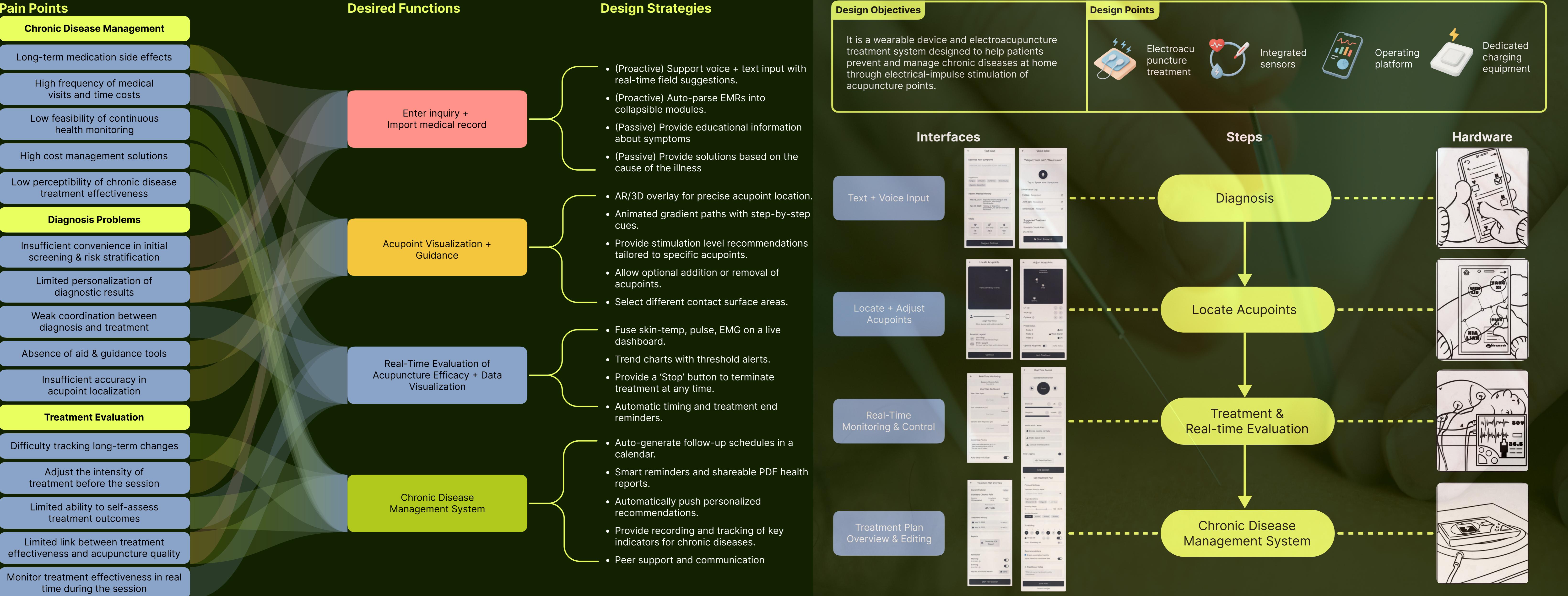
Progress Tracking

Personalized Plans

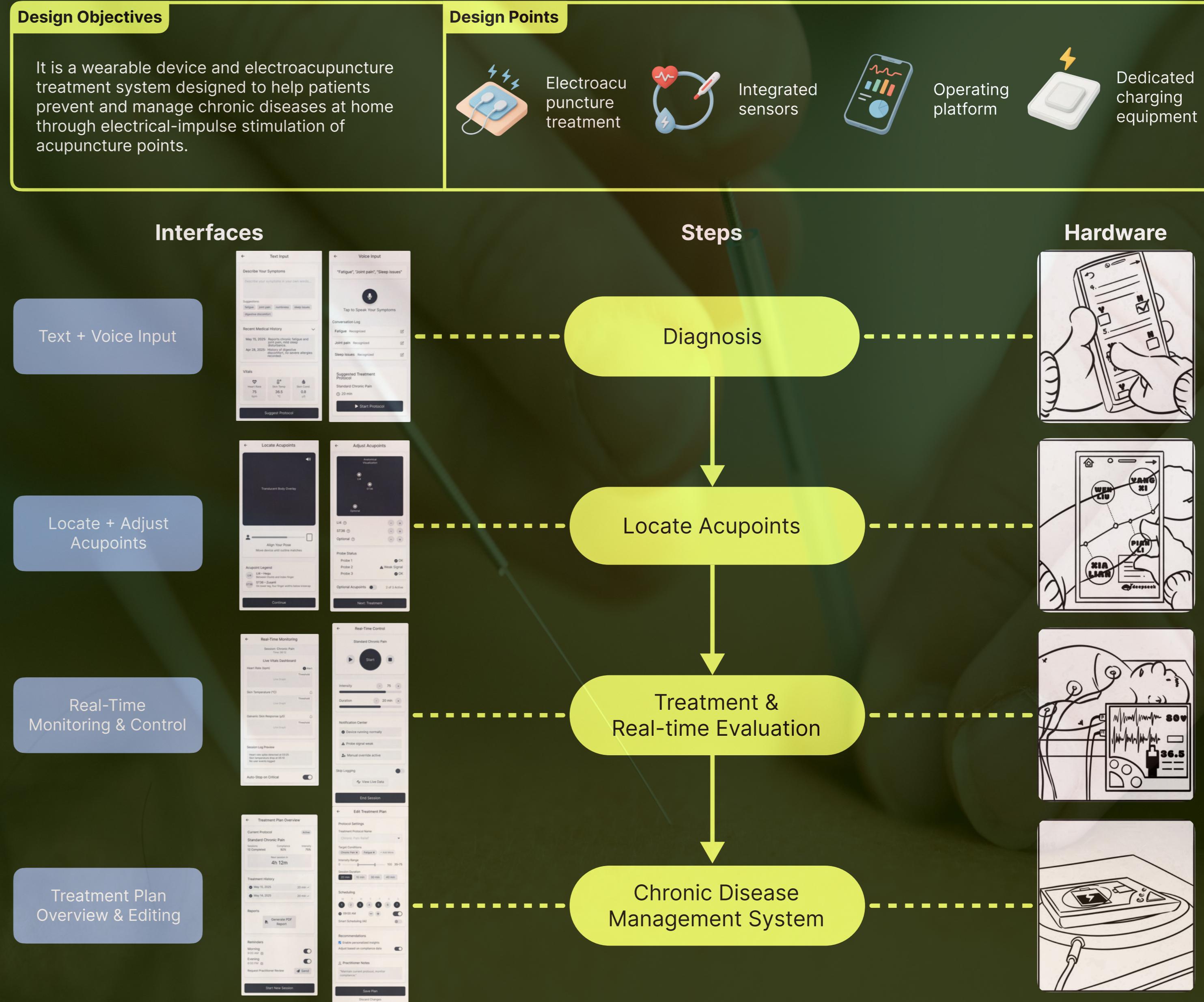
## Key Findings

1. For patients with a fear of pain, electroacupuncture can be used as a treatment option.
1. Electroacupuncture diagnosis involves assessing the patient's condition to determine if applying electrical stimulation through acupuncture needles can enhance therapeutic outcomes.
1. As long as the acupuncture points are accurately located, patients can perform self-treatment at home.
1. Patients can assess the effectiveness of electroacupuncture at home by monitoring improvements in symptoms, such as reduced pain, increased mobility, or enhanced overall comfort after treatment.

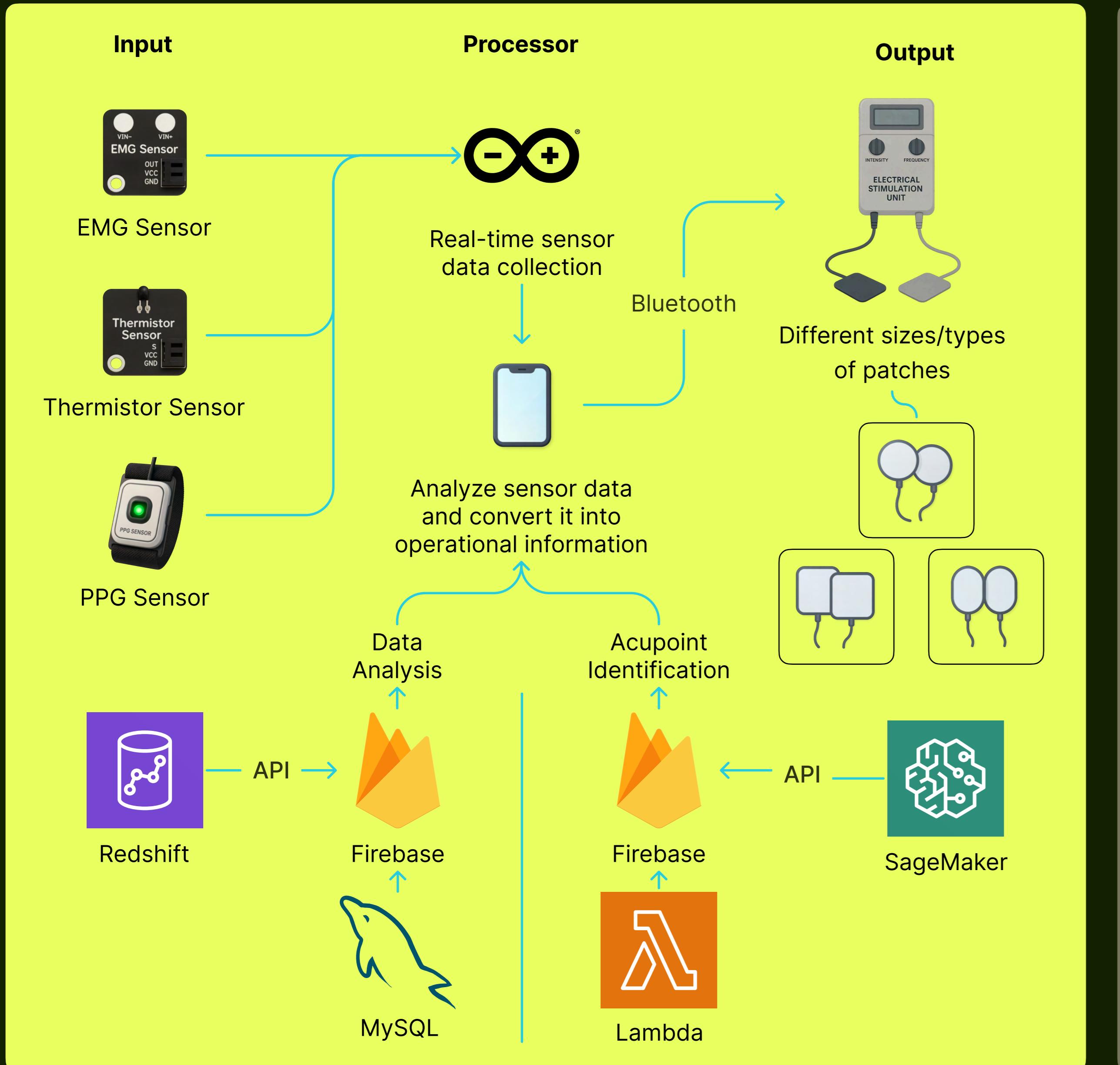
# Mind Mapping



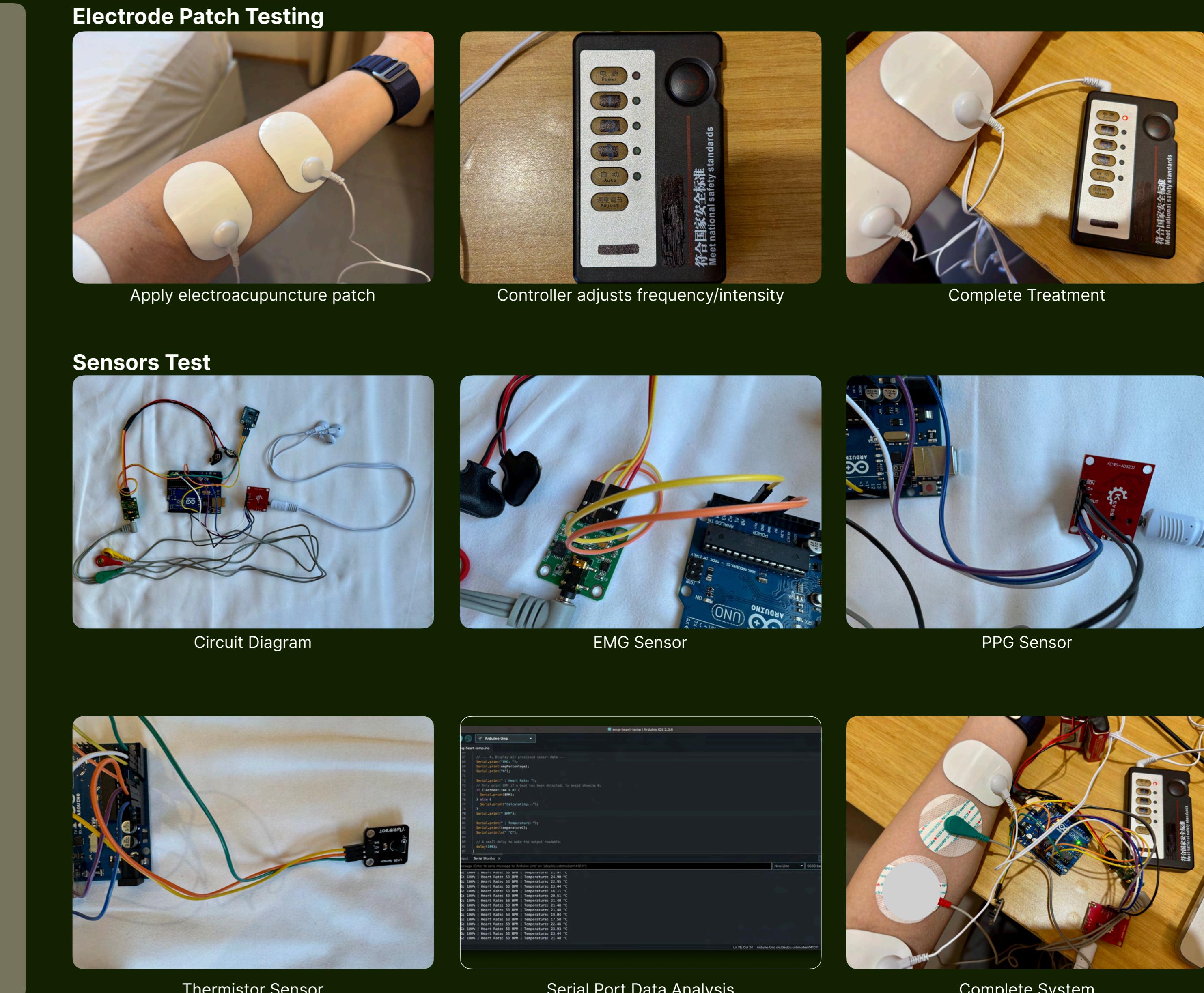
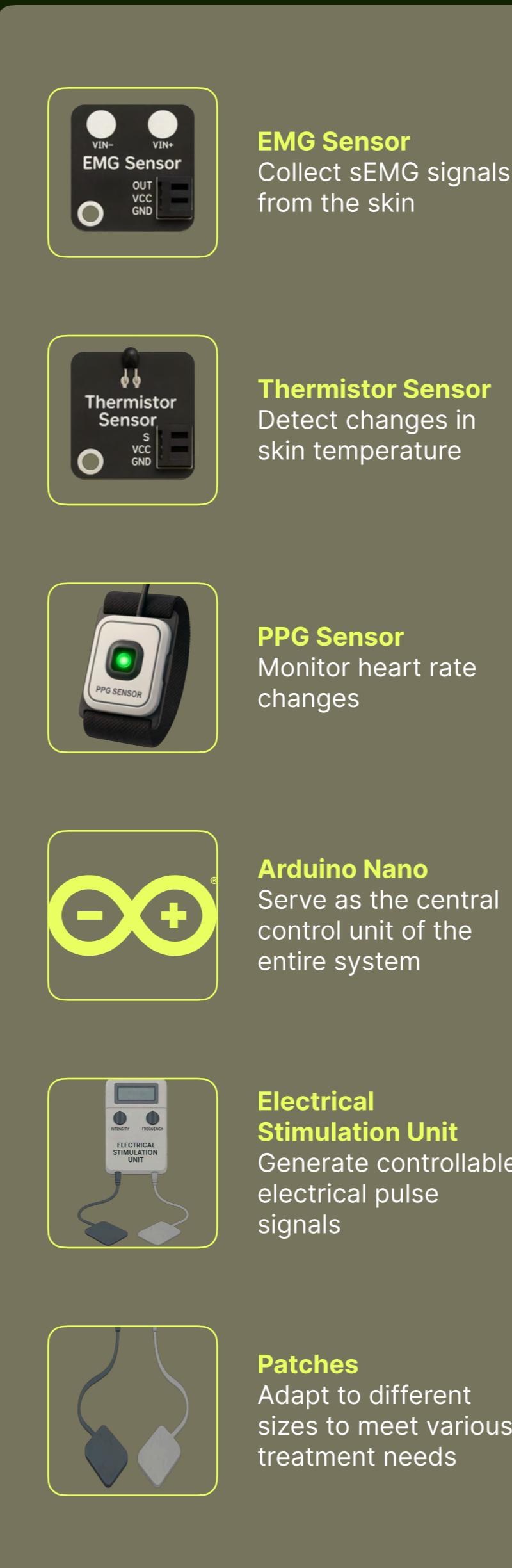
# Concept



# Technology Research



# Prototype and Coding



# Product Design



MoodBoard

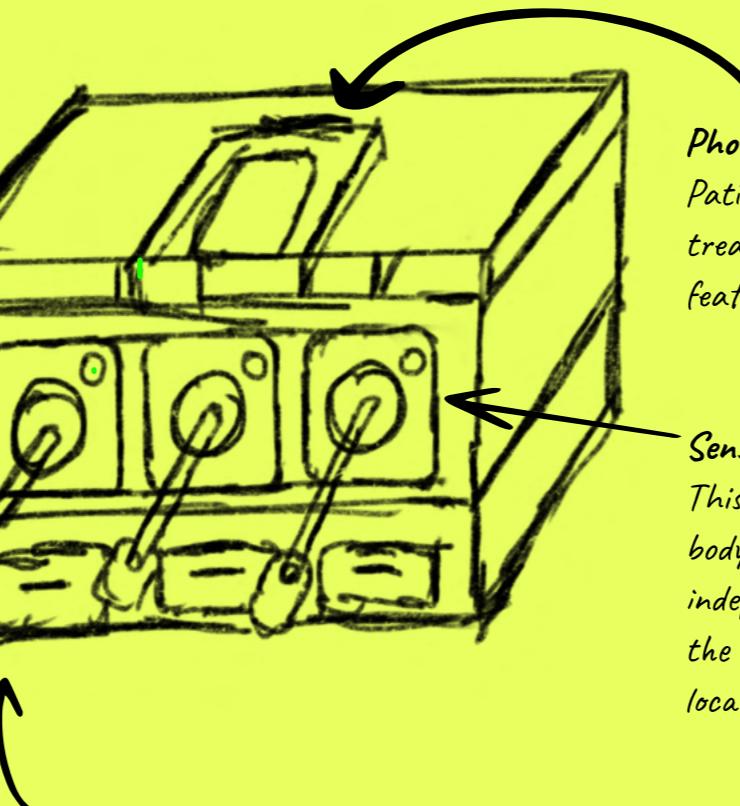
## Keywords

Calm    Healthcare    Minimal    Modular

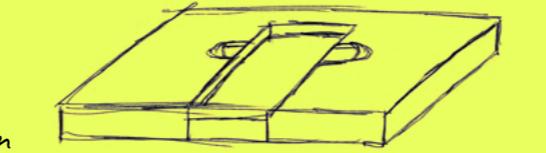


Sketches

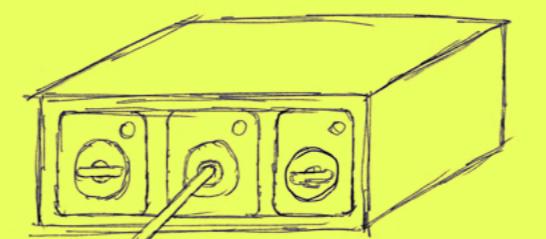
## Device Housing Sketch



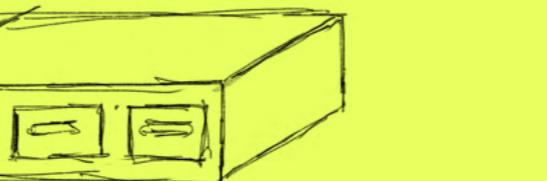
**Phone Stand**  
Patients can place their phone on it during treatment to use our AR acupoint localization feature, and this stand can also rotate forward.



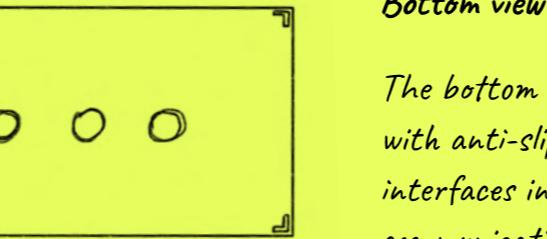
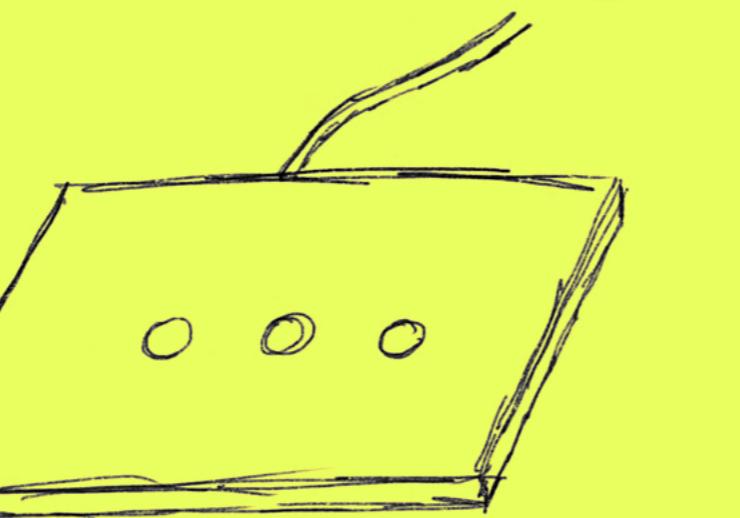
**Sensor Storage**  
This layer houses three different sensors: EMG, body temperature, and PPG. Each sensor has an independent opening, allowing patients to pull out the cables and retract them back through buttons located beside the openings.



**Patch Storage**  
This layer is responsible for storing different types of patches, with three pull-out storage structures arranged in a row, corresponding to the three types of sensors in the layer above, making it convenient for patients to access them.

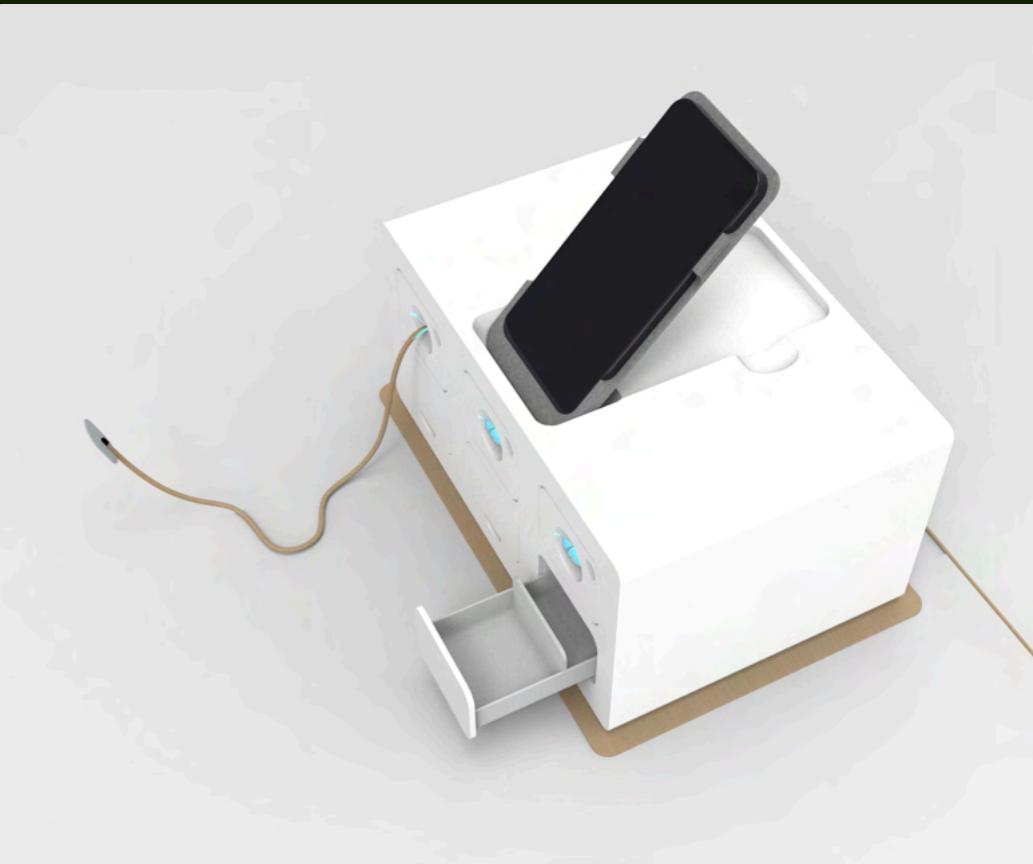


## Device Charger Sketch

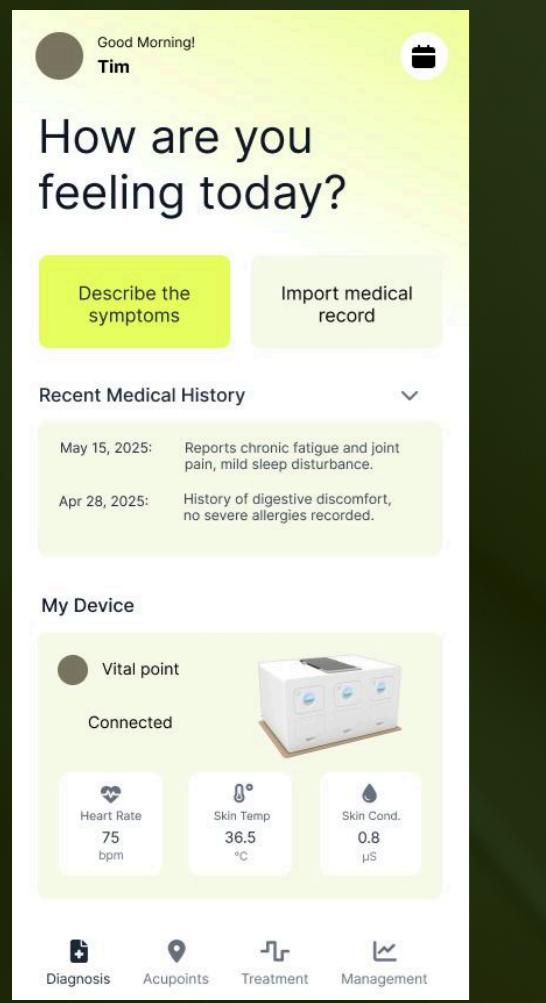


**Charging Dock**  
This charging dock features a magnetic connector design, allowing users to charge the device without needing to precisely align it. The overall design is made of plastic, but the surface that comes into contact with the therapy device uses a suede-like material. This not only protects the device from scratches but also adds a touch of elegance.

## Rendering

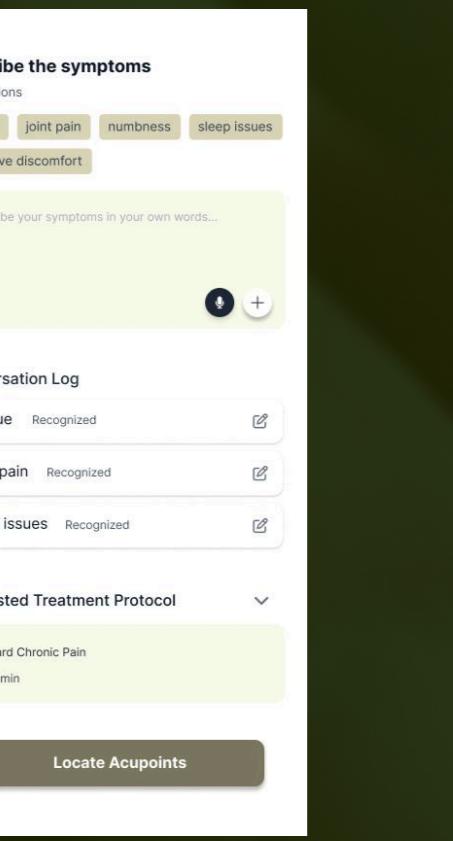


# Interface Design



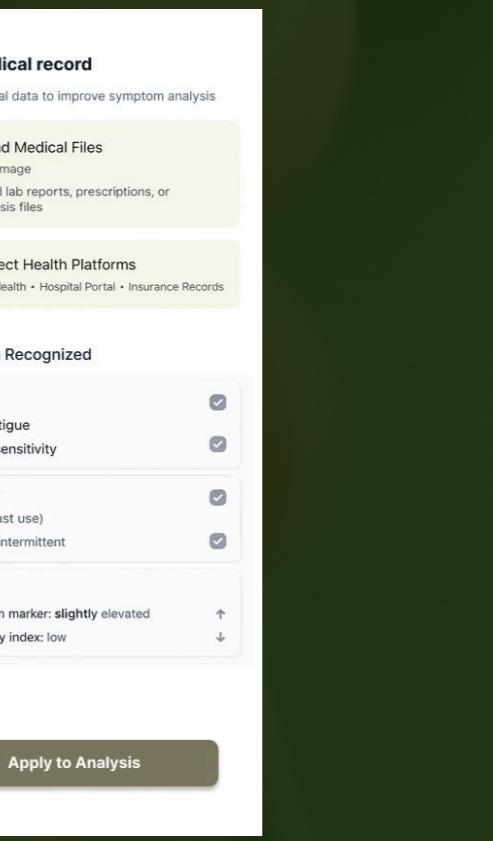
## Homepage

It allows users to check in on their health by reporting symptoms, reviewing recent medical history, and monitoring real-time vital data from a connected device.



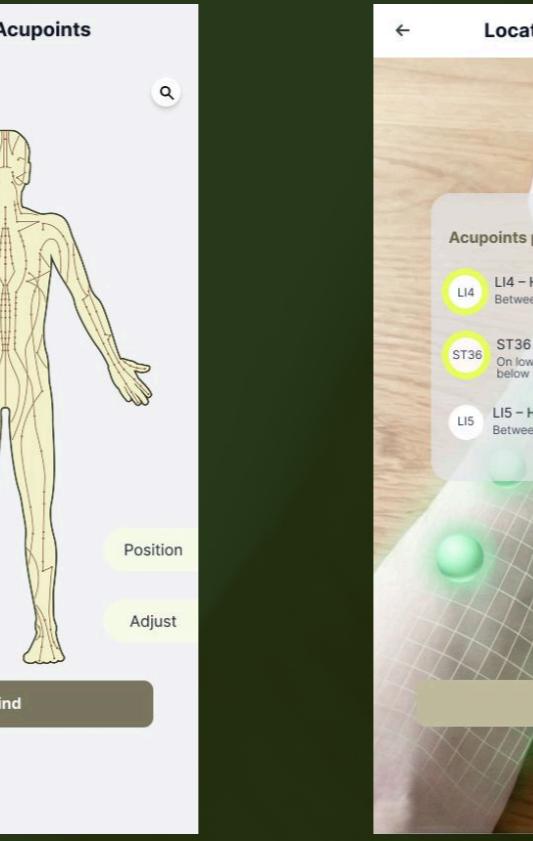
## Describe the symptoms

It lets users describe and log their symptoms through text or voice input, automatically recognizes key issues, and suggests an appropriate treatment protocol.



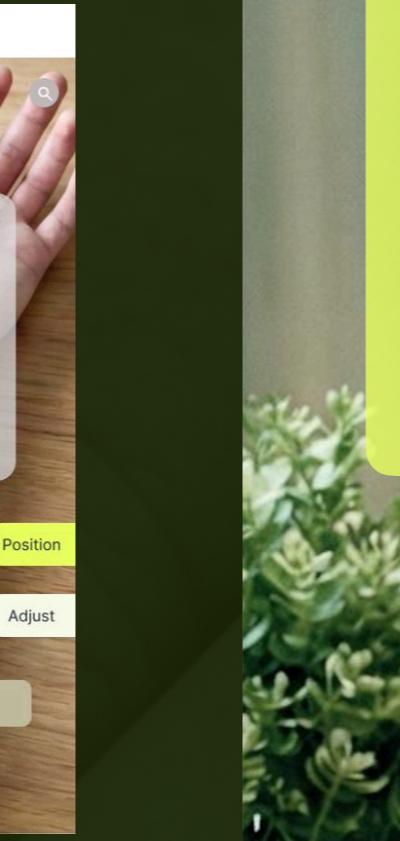
## Import medical record

This page allows users to import and analyze past medical records from files or connected health platforms to enhance symptom analysis and treatment recommendations.



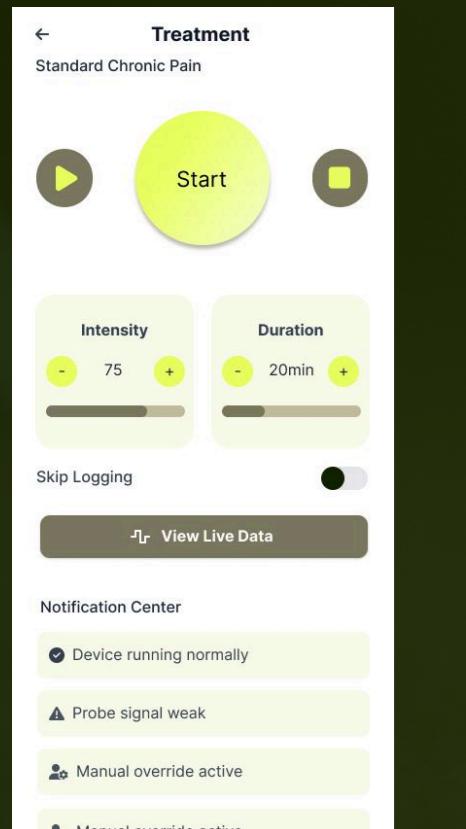
## Locate Acupoints

This page visualizes the human body to help users precisely locate recommended acupoints and adjust their positions for targeted treatment.



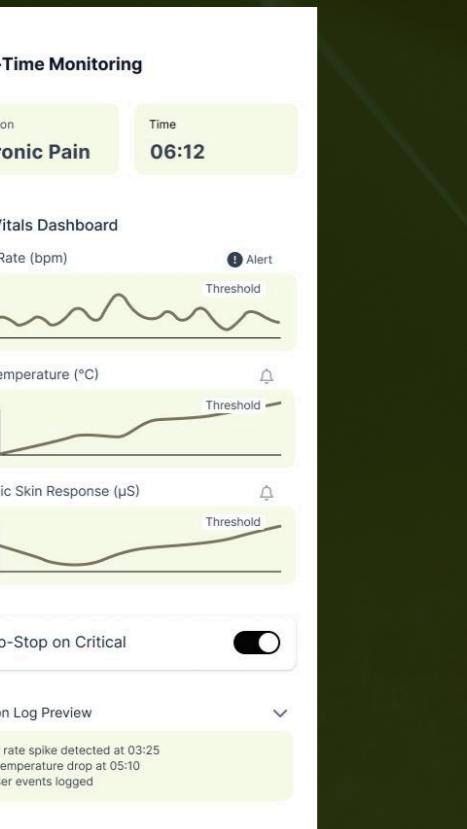
## Acupoints Position

This page uses an AR-style overlay on the user's body to guide accurate positioning of recommended acupoints before starting treatment.



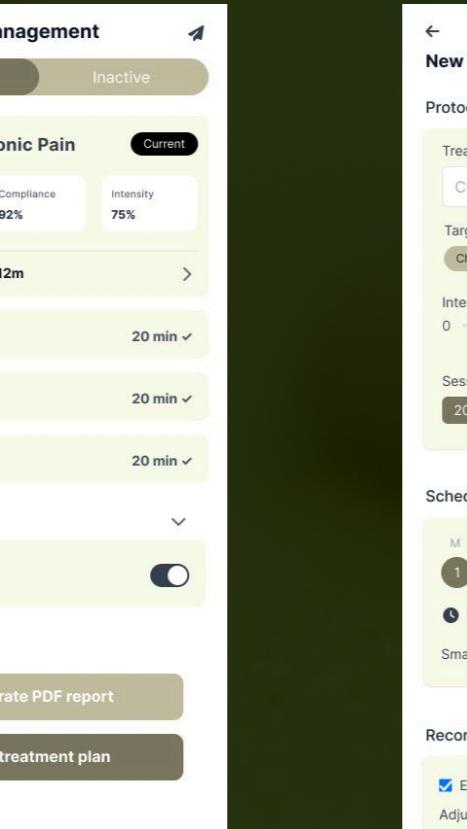
## Treatment

This page lets users start and control a treatment session by adjusting intensity and duration, while monitoring device status and live feedback in real time.



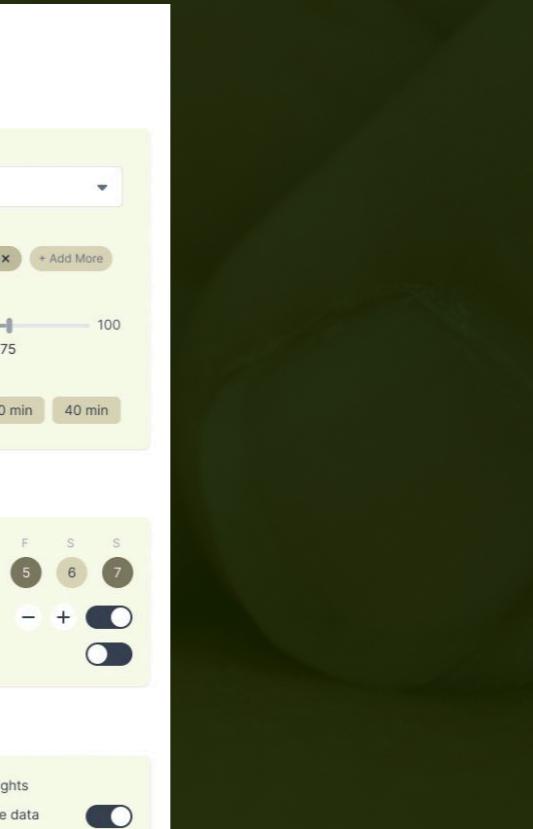
## Real-Time Monitoring

This page provides real-time monitoring of vital signs during a treatment session, with alerts, safety controls, and session logs to ensure safe and effective use.



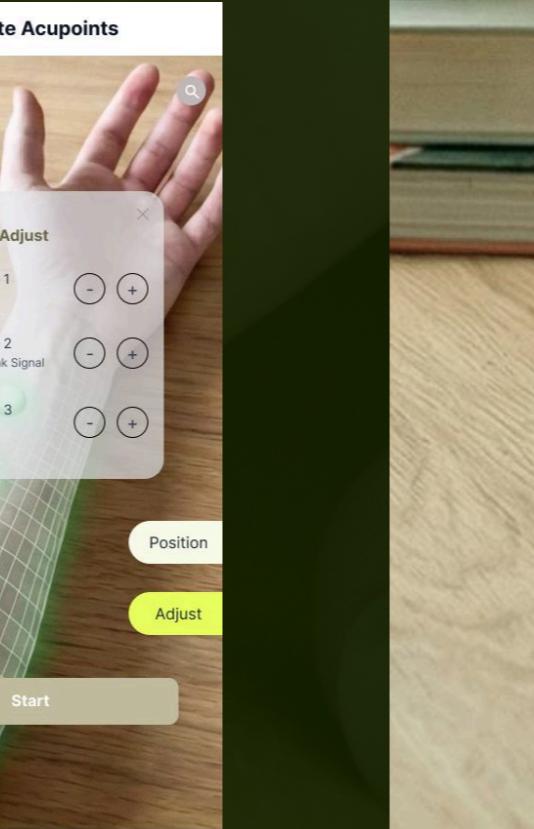
## Management

This page helps users manage ongoing treatment plans by tracking session history, compliance, reminders, and generating reports or new plans.



## New Treatment Plan

This page allows users to create a personalized treatment plan by configuring protocols, intensity, duration, scheduling, and AI-driven recommendations.



## Acupoints Adjust

This page lets users fine-tune acupoint probe positions in real time, check signal quality, and make precise adjustments before starting treatment.

# Feedback

## Goals Achieved:

1. The precision of electroacupuncture feedback sensors meets standards, enabling accurate multi-dimensional data detection and recording.
2. Quantifiable measurement and recording of treatment processes and outcomes in traditional acupuncture therapy have been achieved.
3. Potential users understand the product's usage methods and procedures.

## Limitations Encountered:

1. Precise acupoint detection has not yet been achieved.
2. Limited testing and interaction environment, lacking more realistic usage scenario testing.
3. No real treatment standard data has been obtained.

## Next Steps:

1. Introduce multi-dimensional data measurement and treatment standard data training, utilizing AI to optimize the treatment process/outcomes.
2. Achieve personalized diagnosis and treatment through AI.



# GlyphForge

Where Creative Code Meets Physical Form



## MOTIVATION

Traditional 3D printing workflows depend on **slicing software**, constraining creative coding and digital fabrication. GlyphForge **bridges this gap** by enabling **direct code-based control of 3D printers**, allowing artists and designers to explore algorithmic generation and seamlessly translate algorithms into physical objects.

## AIM

Develop GlyphForge, a **p5.js library** enabling creators to programmatically **generate toolpaths** and **directly control 3D printers**. With a **drawing interface** and **code editor** supporting visualization and real-time printing, the project **lowers digital fabrication barriers** and **empowers the creative coding community** to explore new manufacturing possibilities.

## TYPE

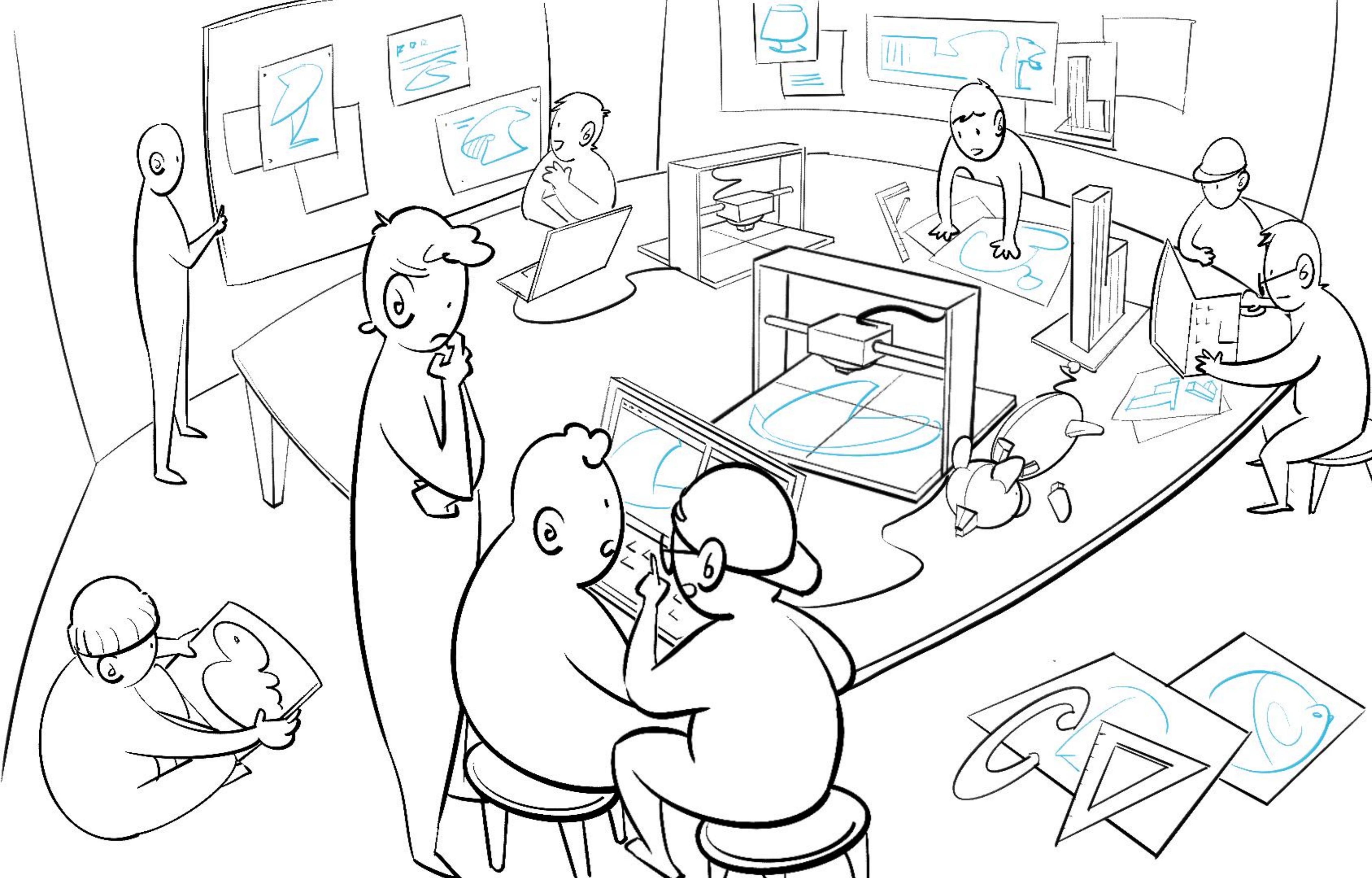
Individual Project | Creative Coding | Digital Fabrication | HCI

## FRAMEWORKS / TOOLS

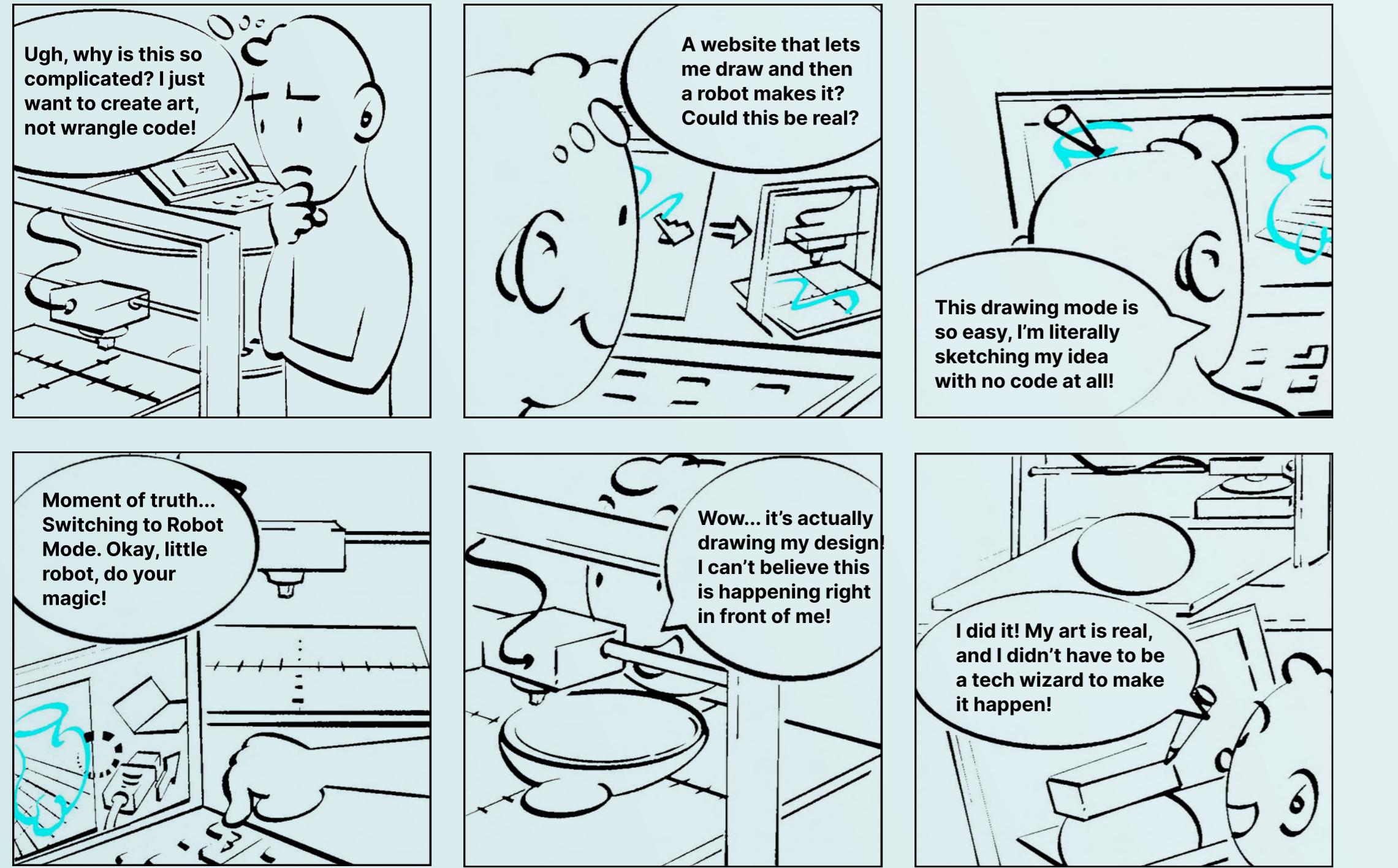
p5.js | JavaScript | Web Serial API | G-Code | Three.js | Paper.js

## TIME

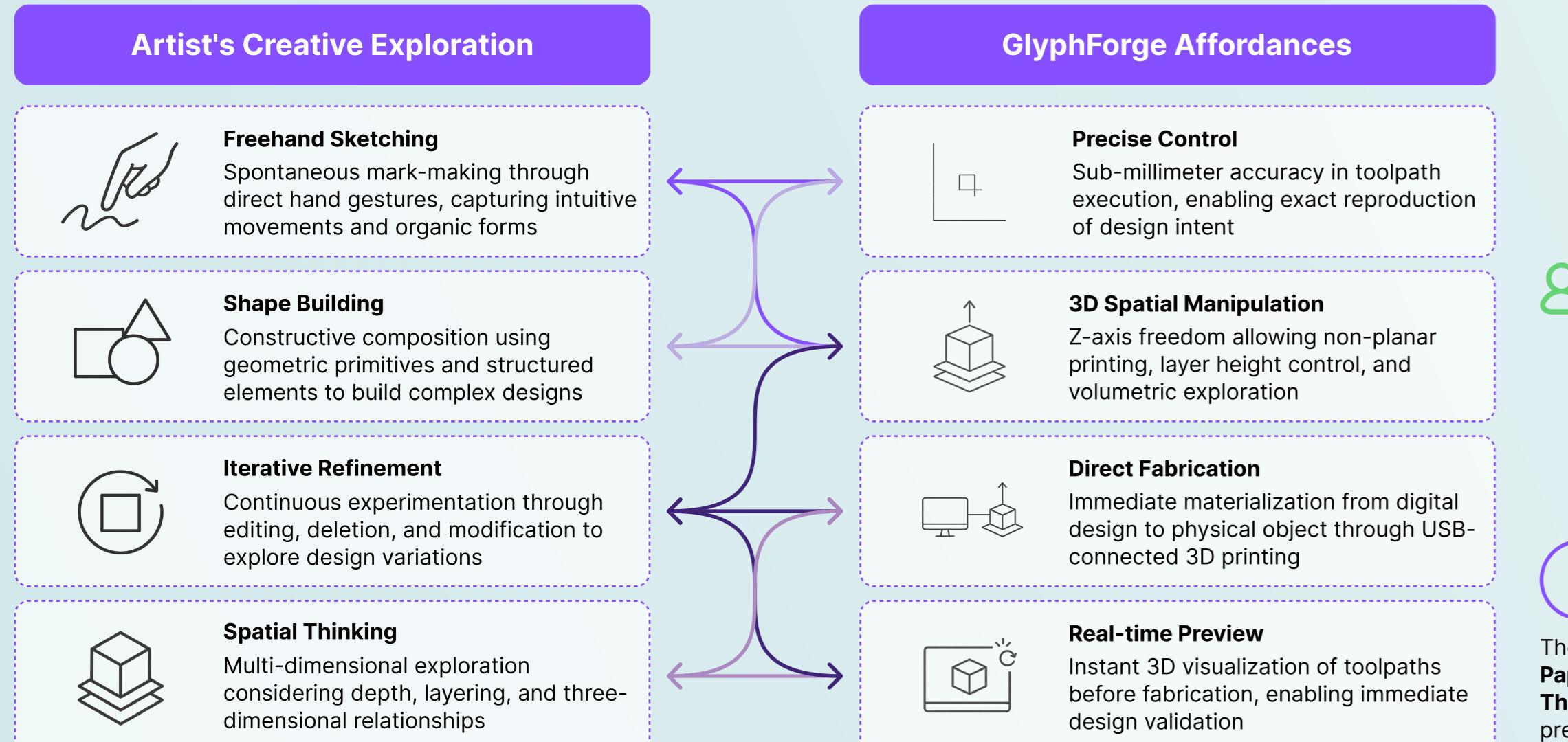
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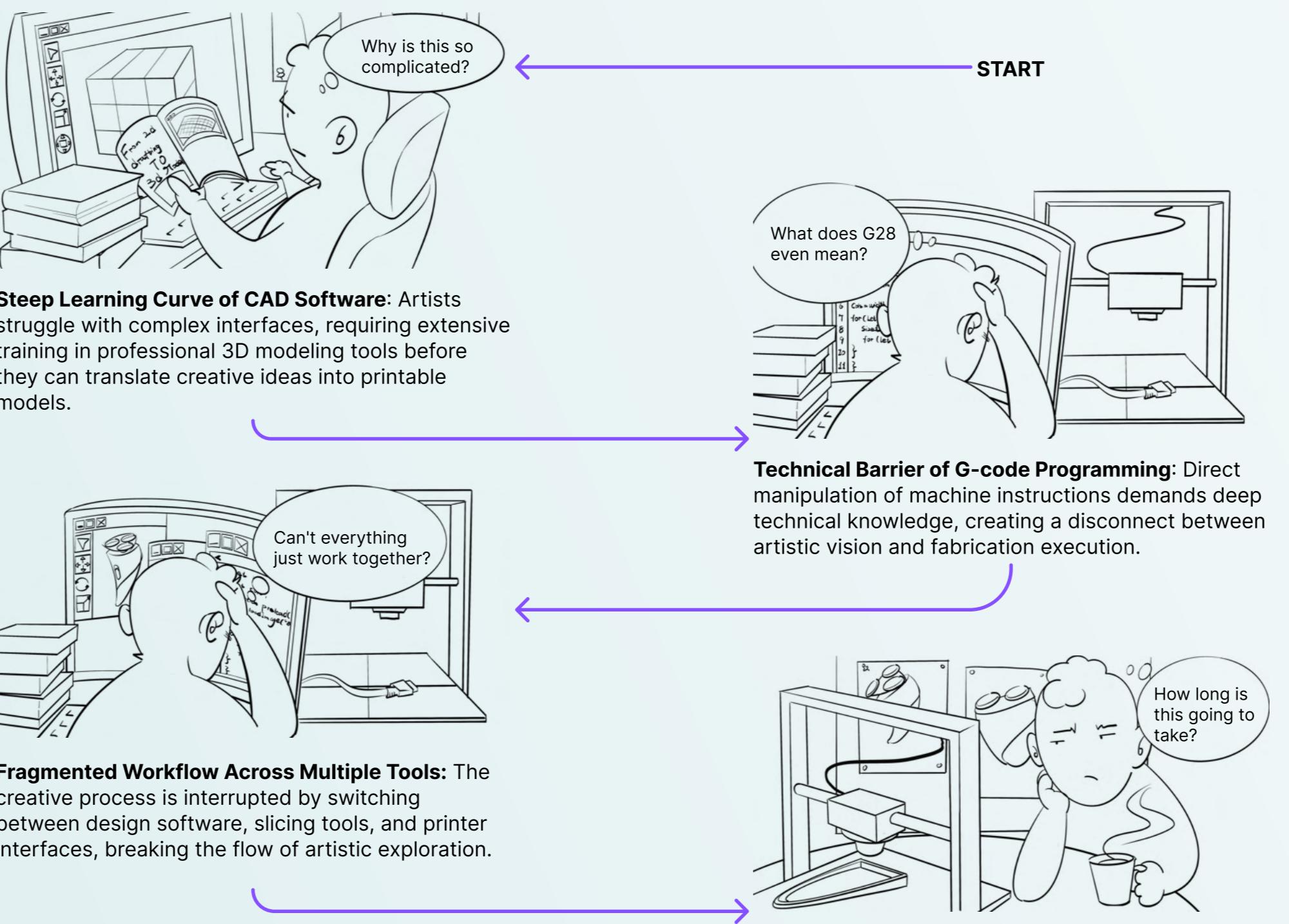
## Storyboard



## Creative Freedom Mapping

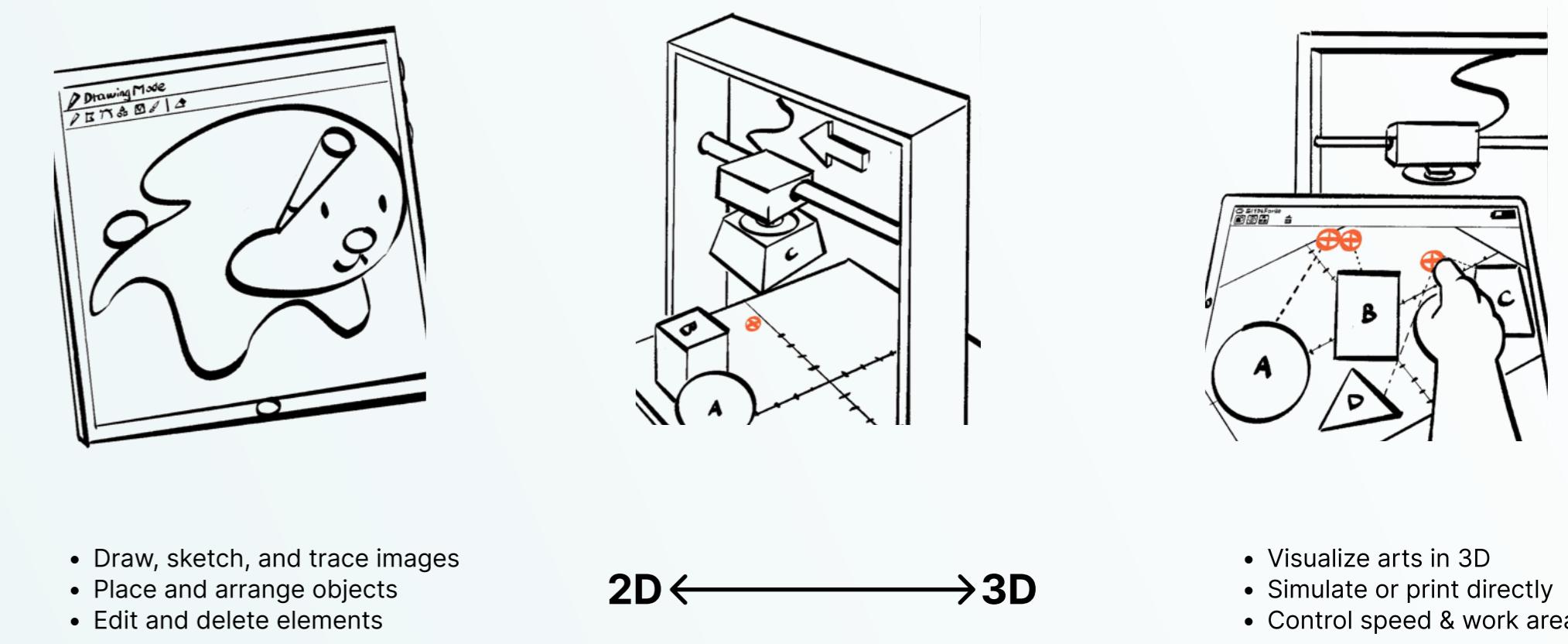


## Challenges in Traditional 3D Fabrication Tool for Artist Creative Creation



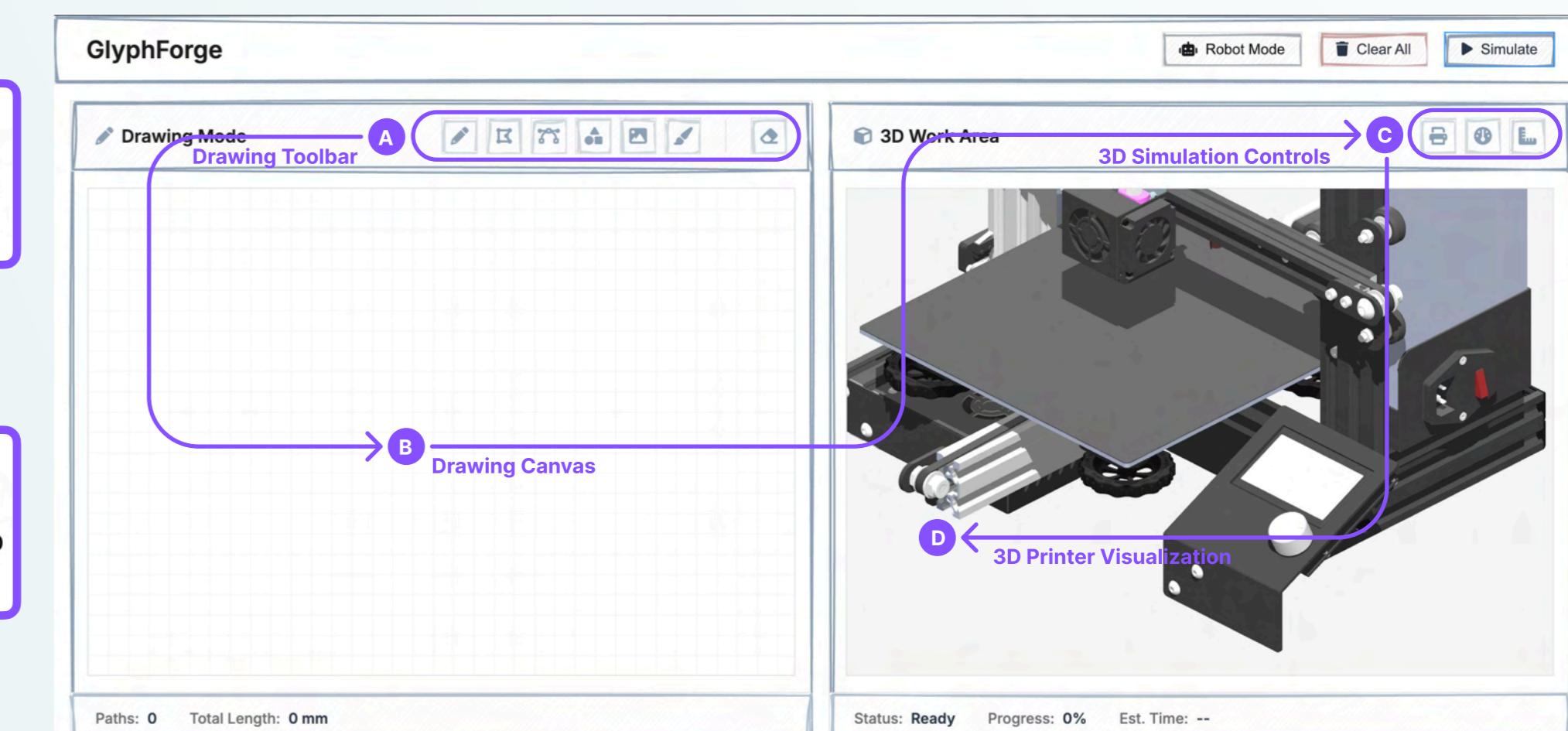
## Modes Overview

This interactive drawing interface converts **2D sketches** and **object placements** into **3D printer toolpaths**, offering both **artistic drawing modes** (freehand, shapes, image tracing) and **robotic object manipulation** capabilities. The platform features **real-time 3D simulation** of the printing process and supports direct fabrication through **USB-connected 3D printers**.



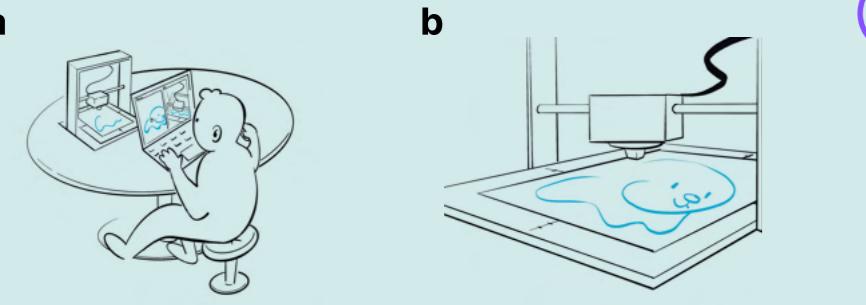
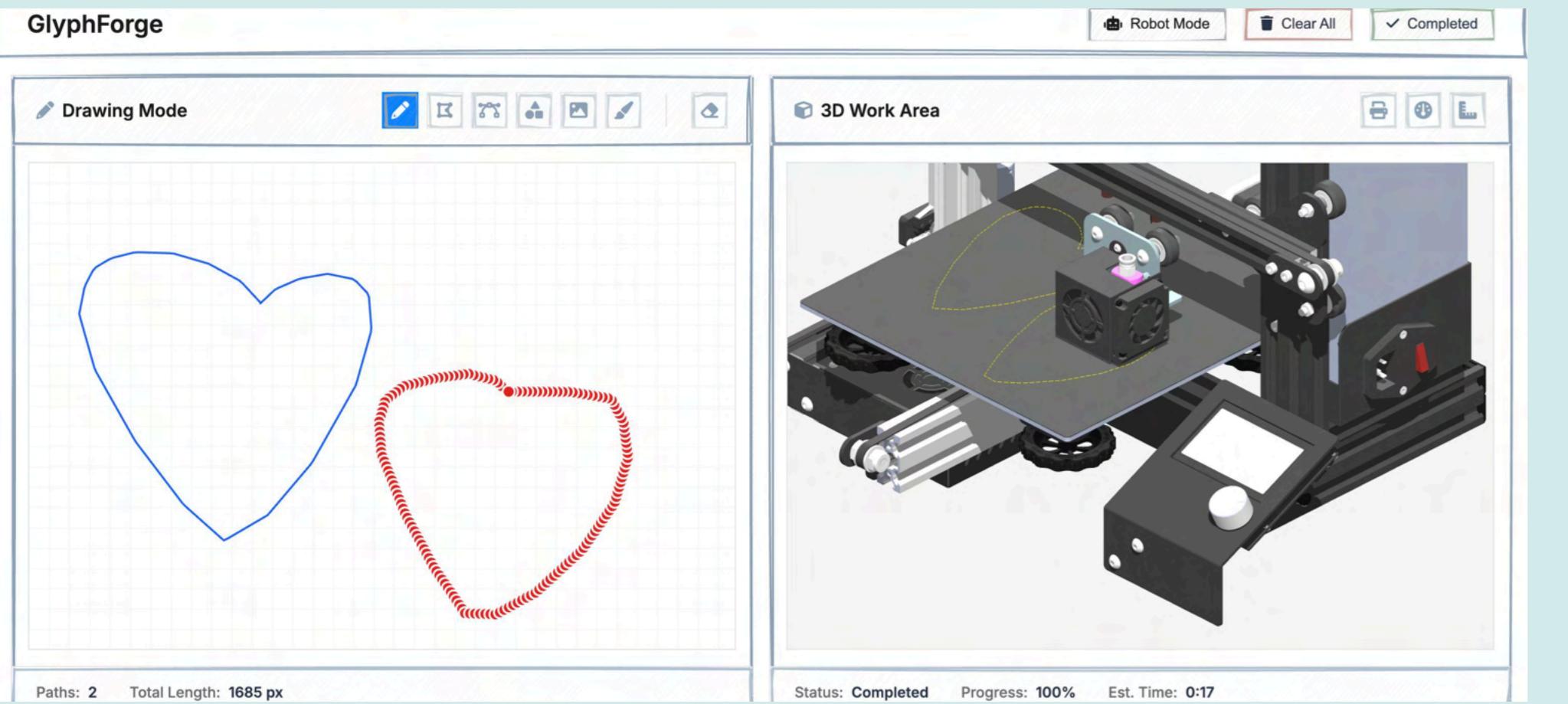
## Drawing Mode

It offers an intuitive **2D workspace** for creating printable designs with tools like **freehand sketching**, **shapes**, **bezier curves**, and **image tracing**. Drawn paths are instantly converted into **toolpath coordinates** and visualized in real time on a **3D printer simulation**, enabling a smooth transition from design to fabrication.



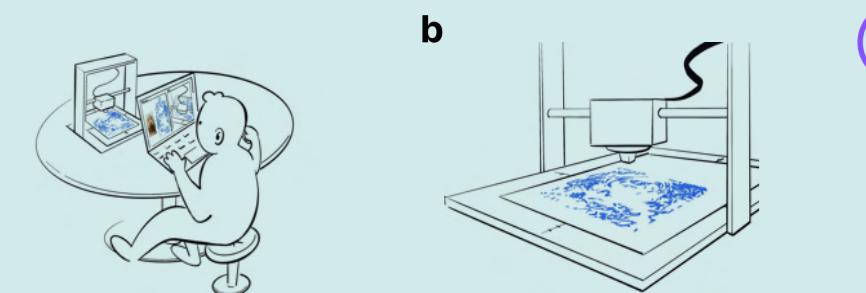
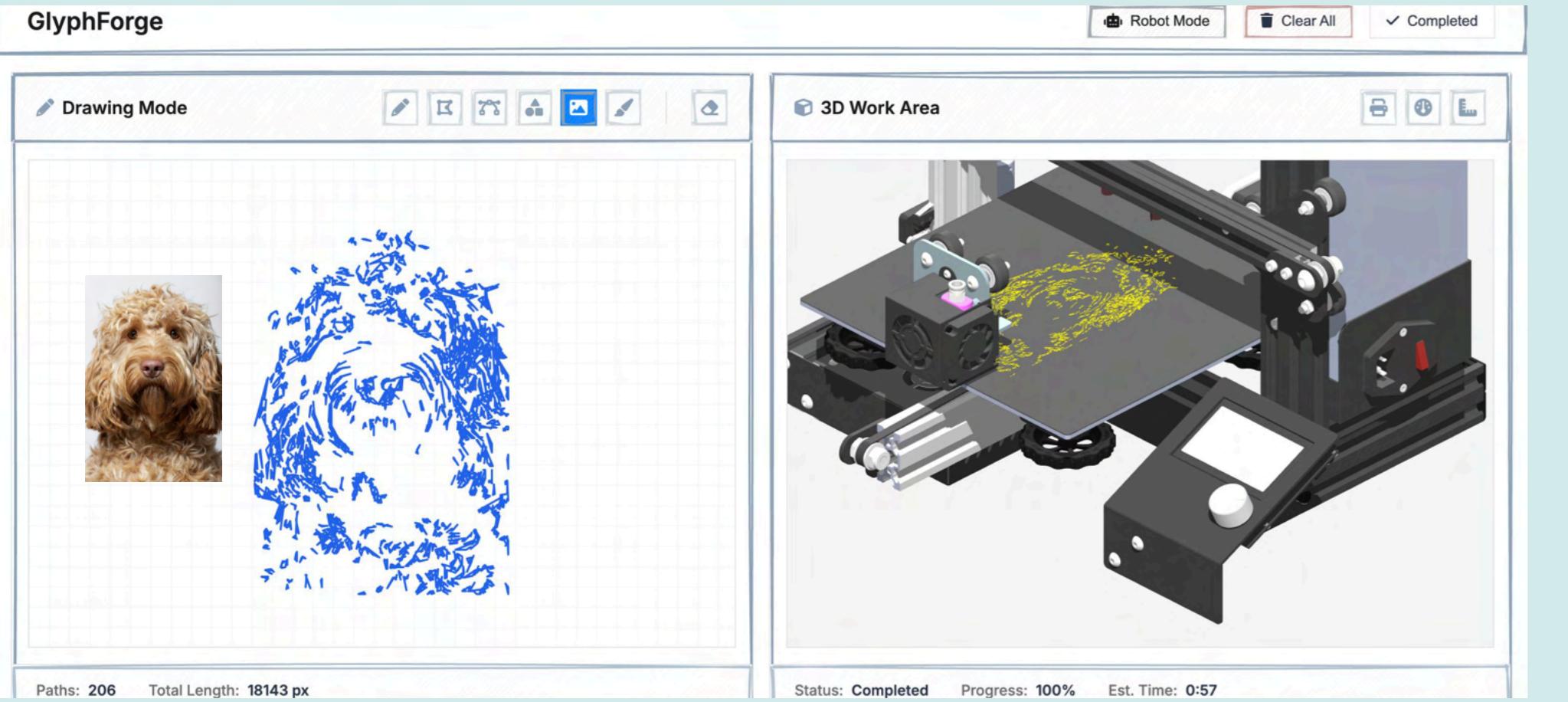
Users choose a tool from the Drawing Toolbar (A), create or edit paths on the Drawing Canvas (B), and instantly see those paths rendered as 3D printing previews in the 3D Printer Visualization (D).

## Drawing Mode



### Freehand Drawing

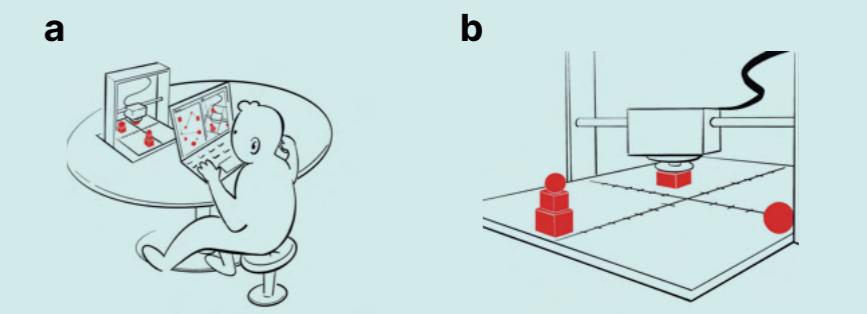
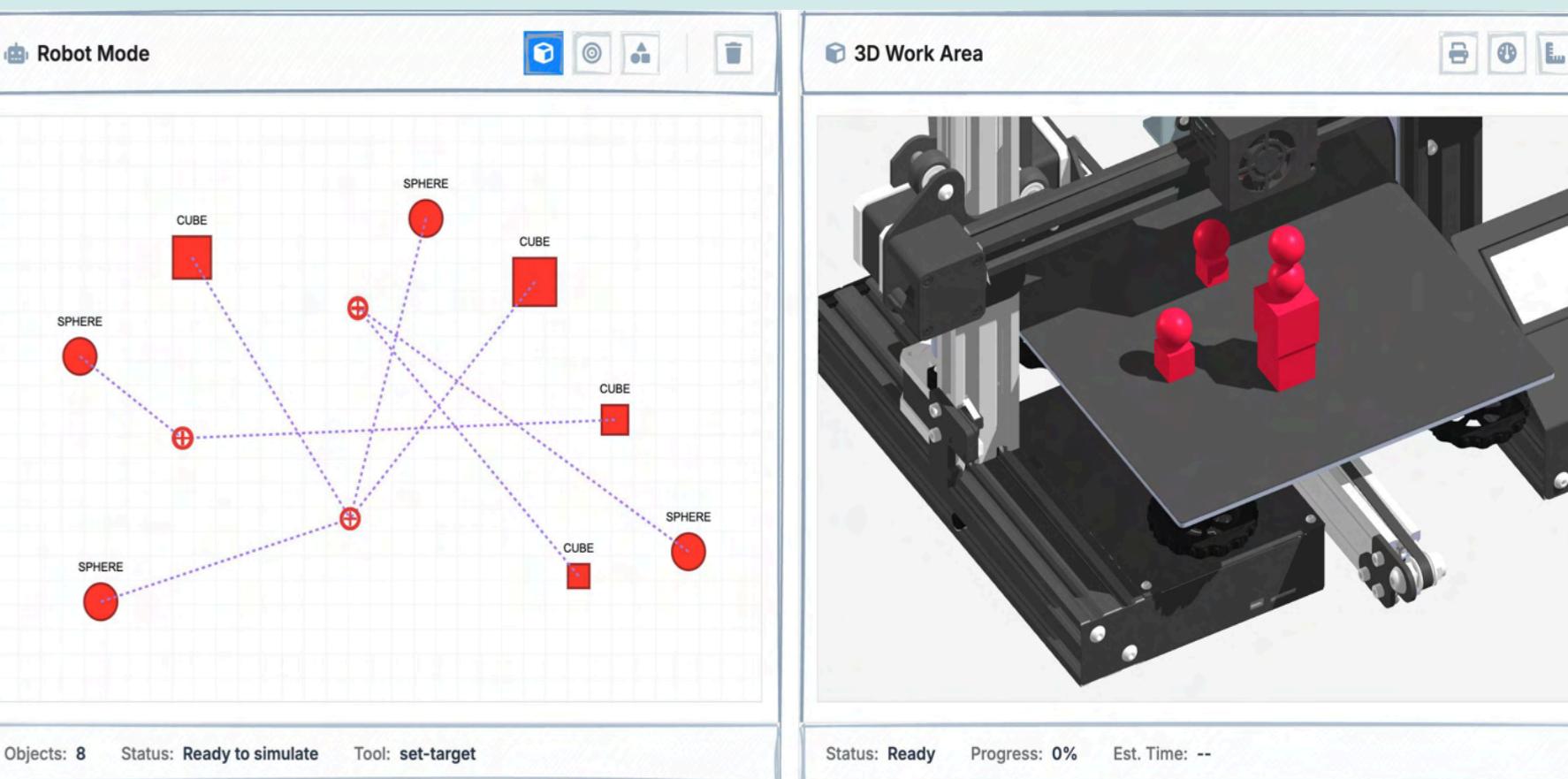
- a:** The artist sketches freely on the digital canvas, intuitively creating expressive organic shapes with natural hand gestures and fluid drawing strokes.  
**b:** The 3D printer then translates the digital sketch into tangible physical form, meticulously recreating each hand-drawn path in space.



### Image Trace

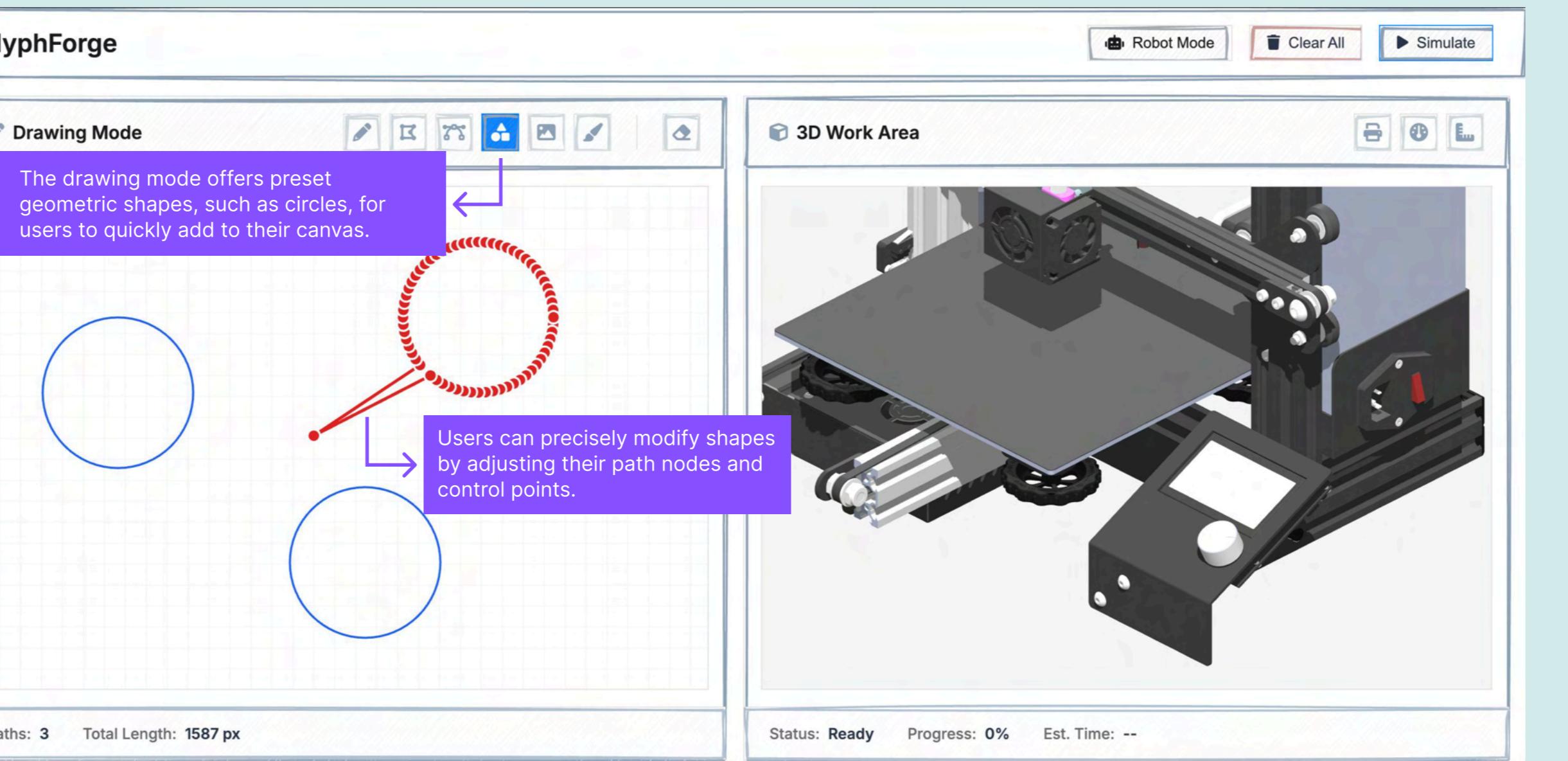
- a:** The user uploads a reference image to the canvas, where the system automatically traces and converts it into stylized vector paths.  
**b:** The 3D printer precisely follows the traced contours, transforming the digital image into physical form by faithfully recreating each vectorized line in space.

## Robot Mode

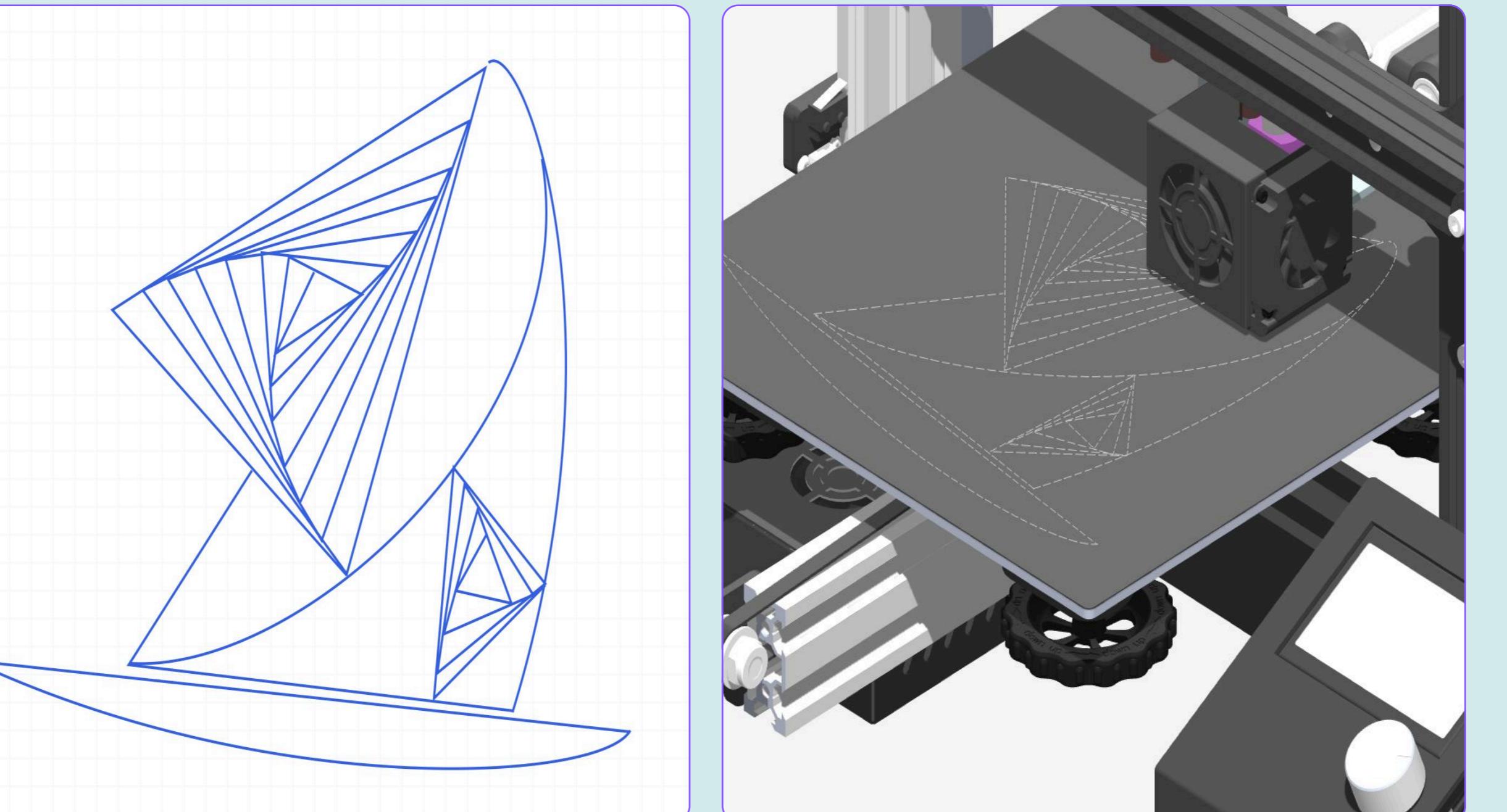


### Object Placement

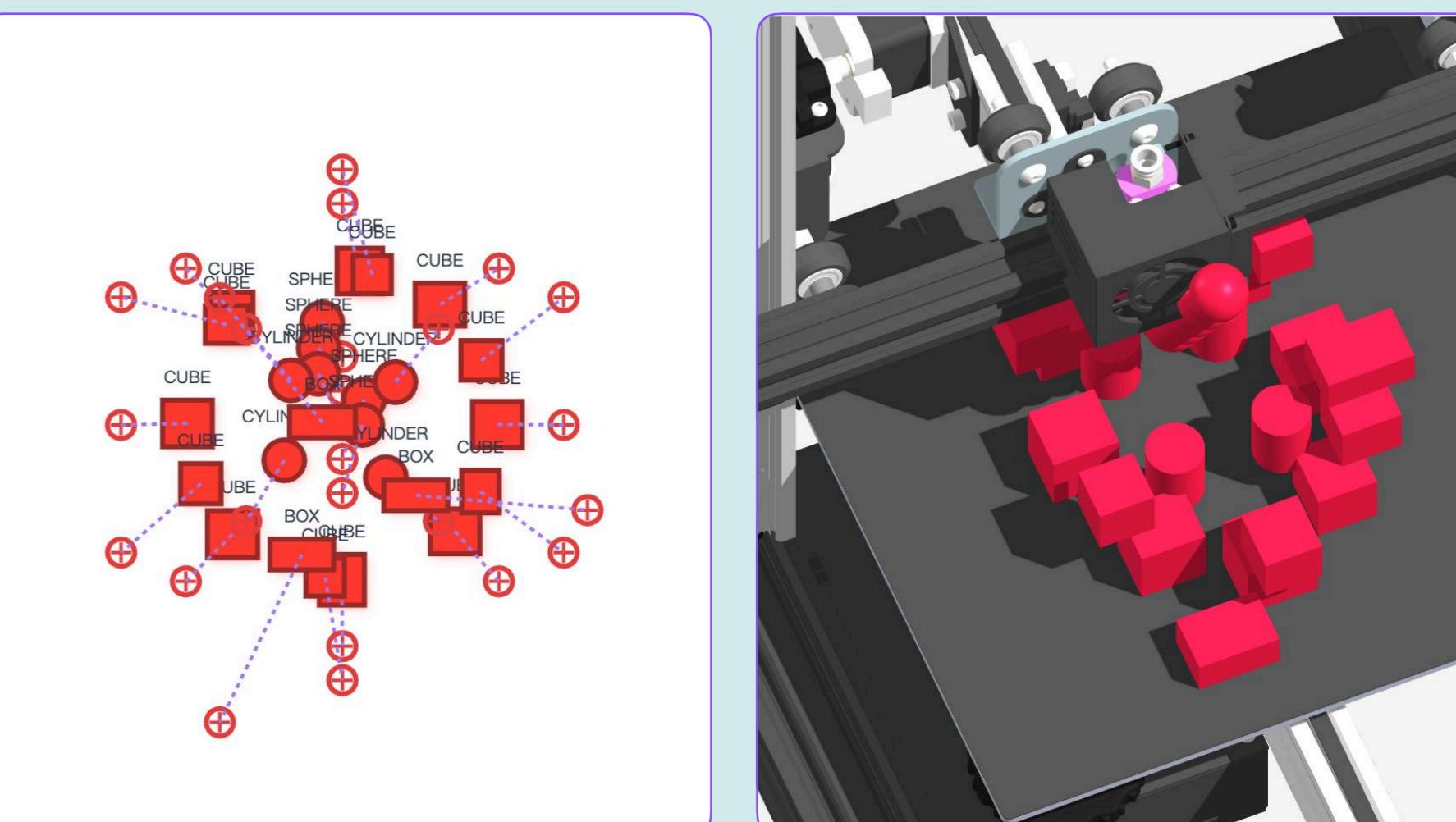
- a:** The user places and arranges multiple objects on the canvas, defining spatial relationships and target positions for the robotic fabrication sequence.  
**b:** The 3D visualization simulates the complete printing process, displaying optimized tool paths and previewing the robotic arm's precise movements before actual fabrication.



### Demo Artwork



### Demo Artwork



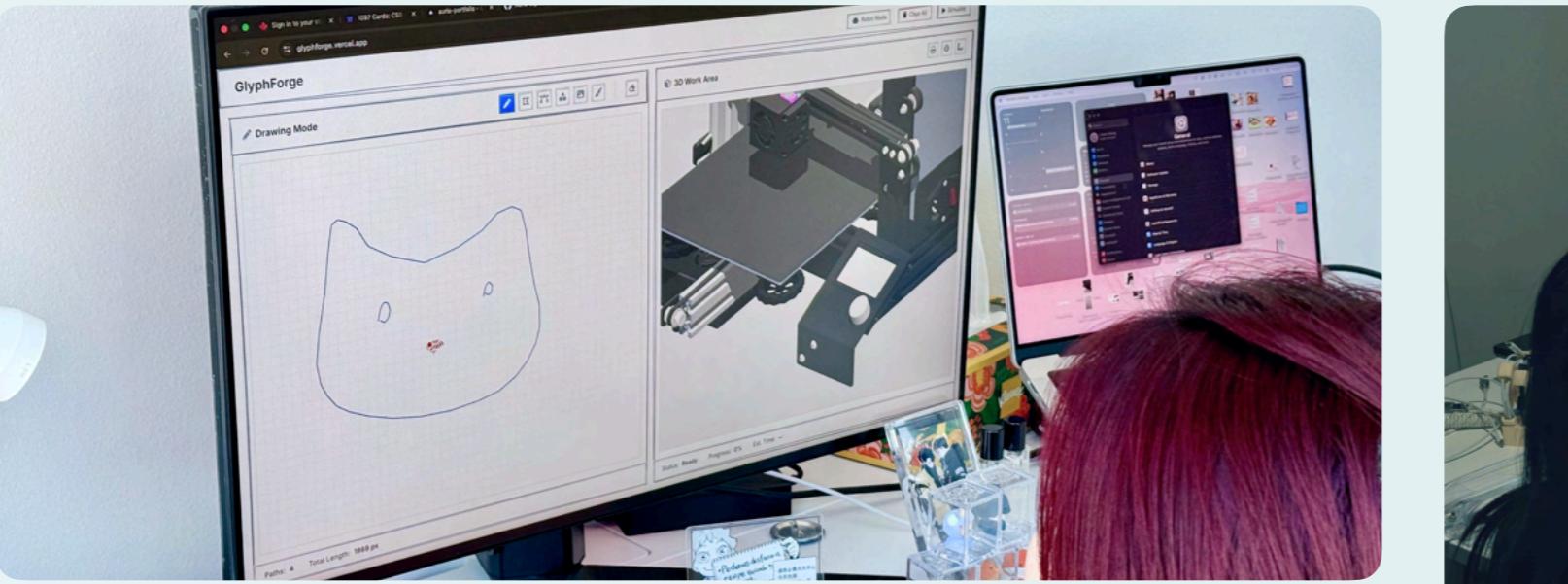
The Robot Mode demo presents a **"Geometric Bloom"** scene where objects are initially arranged in a spiral pattern and then moved by the robot arm to form a symmetrical geometric flower at the center, demonstrating **pick-and-place operations** and **layered stacking** in a visually striking pattern.

## Usability Testing

I conducted usability testing with **five participants** representing diverse backgrounds—a **non-technical artist**, an **industrial engineer**, a **programmer**, a **3D printing enthusiast**, and an **artist with basic modeling experience**. Each participant completed tasks covering art creation and object manipulation to evaluate the interface's accessibility across different skill levels.

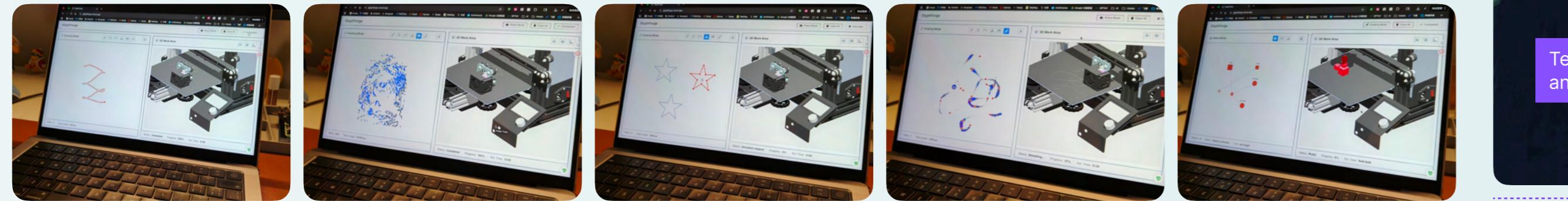
### Participants Info

- P1 Auria Freelance UI designer with five years of digital art practice.
- P2 Lucia Mechanical engineer with three years of industrial design experience.
- P3 Rick Maker and 3D printing hobbyist with personal printer ownership.
- P4 Lydia Software developer with two years of web development experience.
- P5 Eric Digital artist with basic Blender and Maya modeling experience.



### Test Plan

I designed five test scenarios covering core features: Freehand drawing, Image Trace, Preset Shapes, Dynamic Art, and Robot Mode. Each scenario evaluates different aspects of the interface, from basic drawing to advanced object manipulation and robot control.



#### Freehand

Participants draw a simple pattern using the freehand drawing tool to test basic drawing interaction.

#### Image Trace

Participants import an image and trace it to evaluate the image-to-path conversion workflow.

#### Preset Shapes

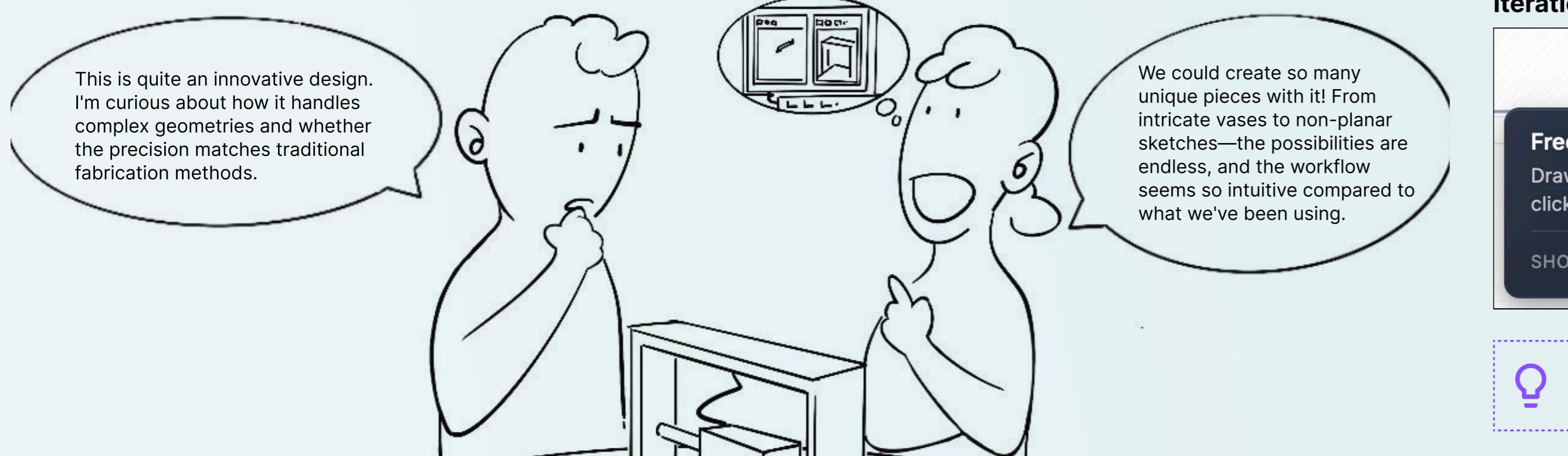
Participants select and place preset shapes from the library to assess shape selection and placement.

#### Dynamic Art

Participants generate a dynamic art pattern using algorithmic tools to test advanced creation features.

#### Robot Mode

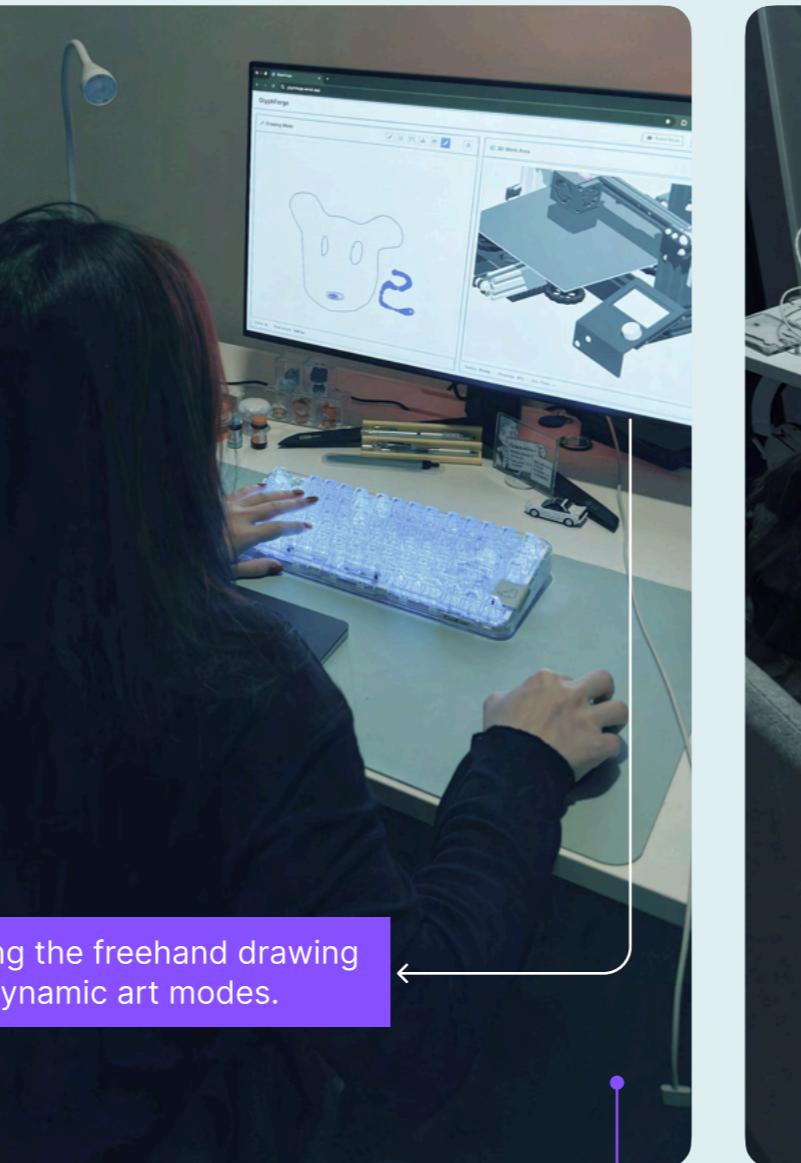
Participants place objects and set targets on the print bed to evaluate robot control and object manipulation.



## Testing Process

Although five participants were involved in the usability testing, **three representative testing processes** were selected to present the **most valuable insights and diverse perspectives**. Each selected process reveals distinct interaction patterns and usability challenges, collectively illustrating the interface's strengths and areas for improvement across different user scenarios.

### Auria

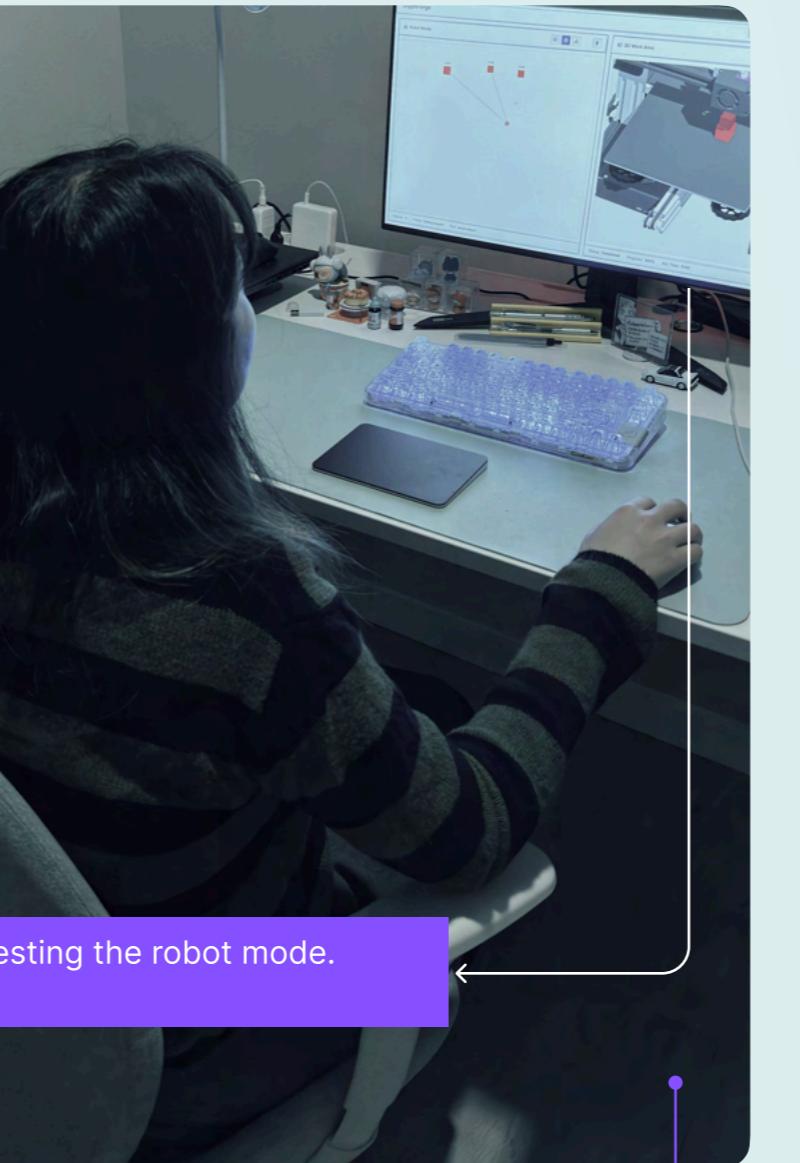


"I love how the 3D preview helps visualize the final result before printing."

"The drawing tools are easy to discover, though the icons could be more distinctive."

"The interface feels intuitive, but tool switching needs clearer visual feedback."

### Lydia

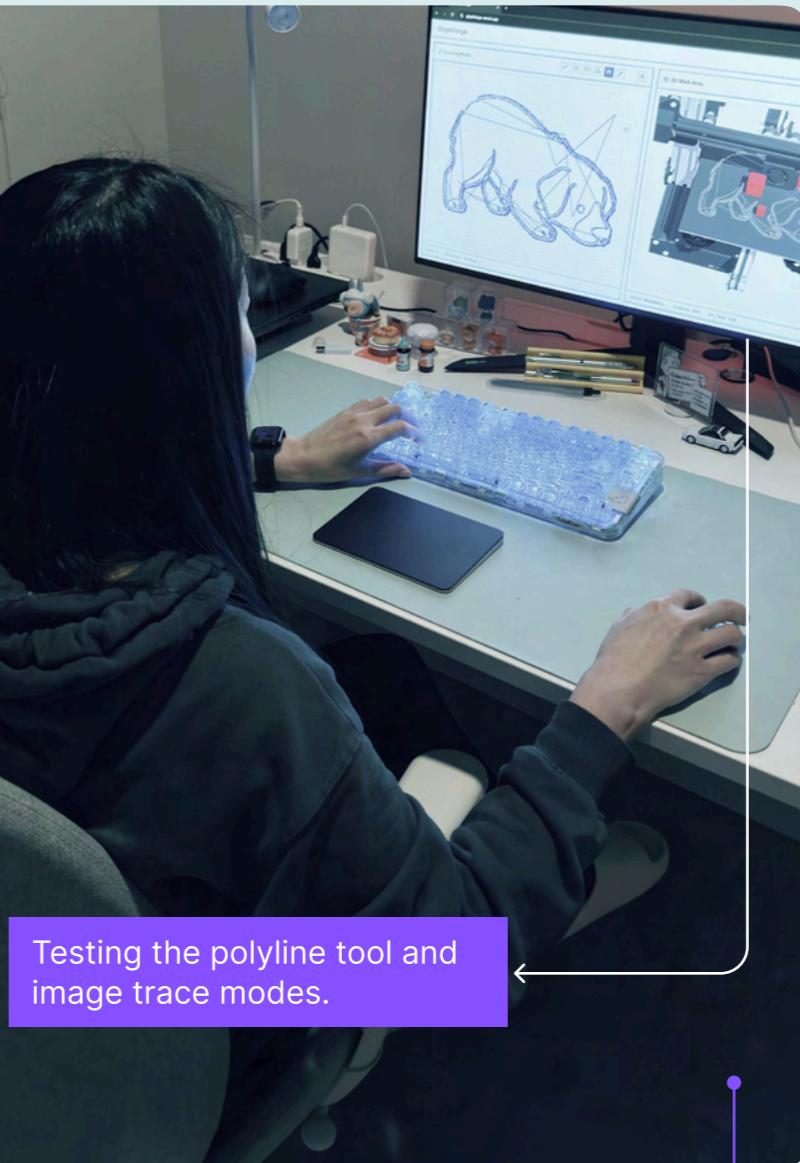


"Precision controls work well, but I need more detailed measurements."

"Object placement feels natural, though collision warnings would be helpful."

"This could streamline prototyping compared to traditional CAD workflows."

### Lucia



"The workflow is logical, but keyboard shortcuts would speed things up."

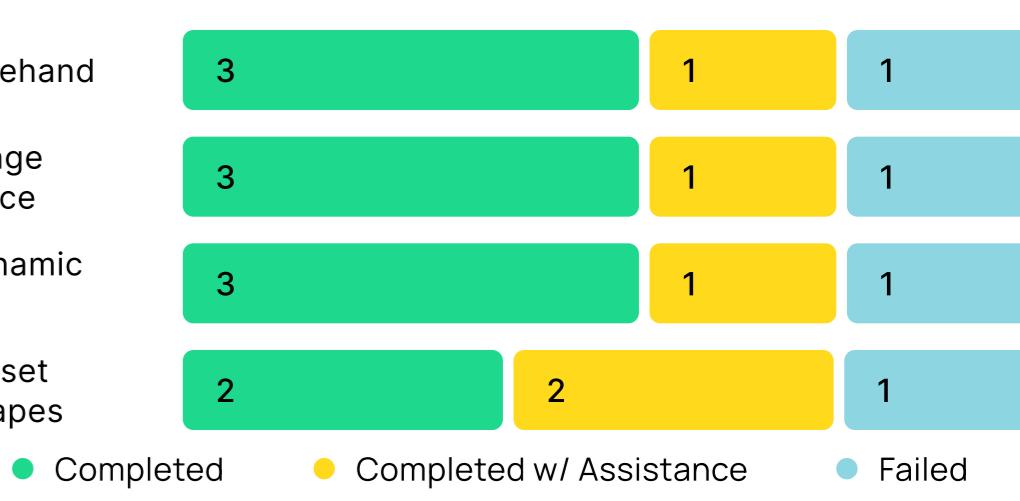
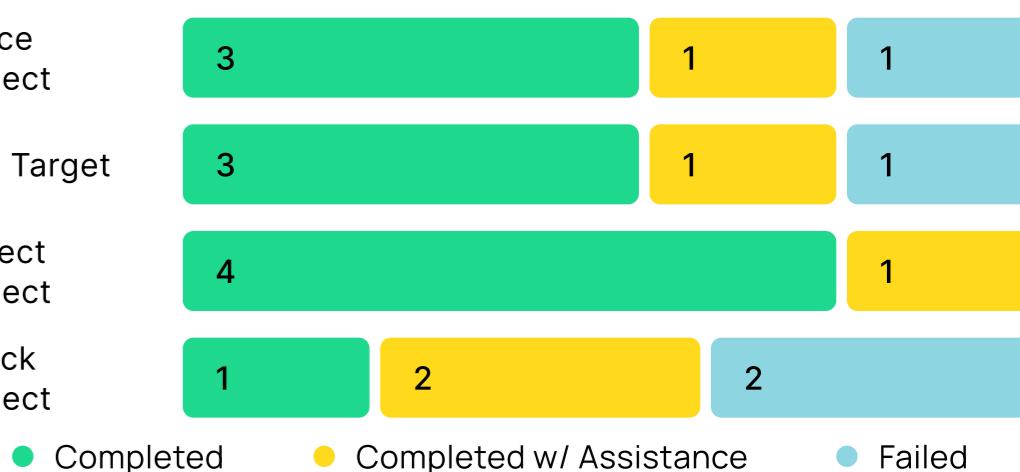
"The real-time simulation is impressive—curious about the optimization."

"Path processing handles complex geometries well, but edge cases need testing."

### Questionnaire

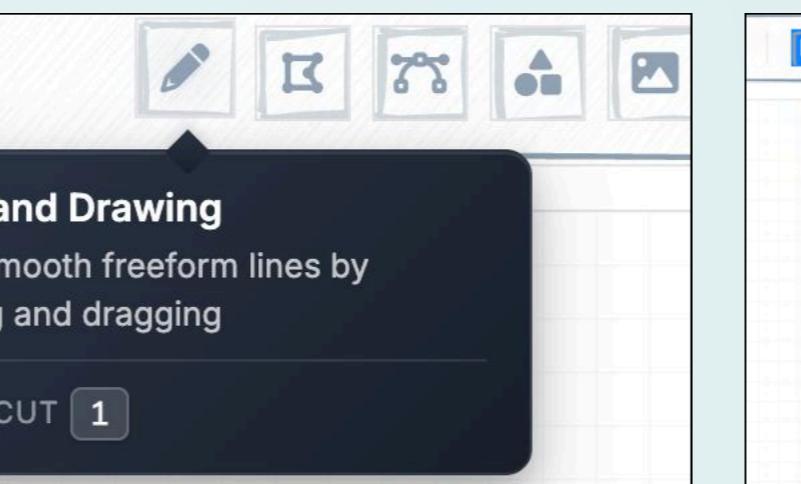
- Q1. I found the drawing tools (Freehand, Image Trace, Preset Shapes) easy to use.
- Q2. I found the object manipulation features (Place, Select, Stack) confusing.
- Q3. I could complete most tasks without assistance.
- Q4. I needed help understanding how to use advanced features.
- Q5. I would recommend this system to other artists or makers.
- After each task:**
- Completed independently** - I finished the task without help
  - Completed with assistance** - I needed guidance to complete the task
  - Failed** - I was unable to complete the task

### Conclusion

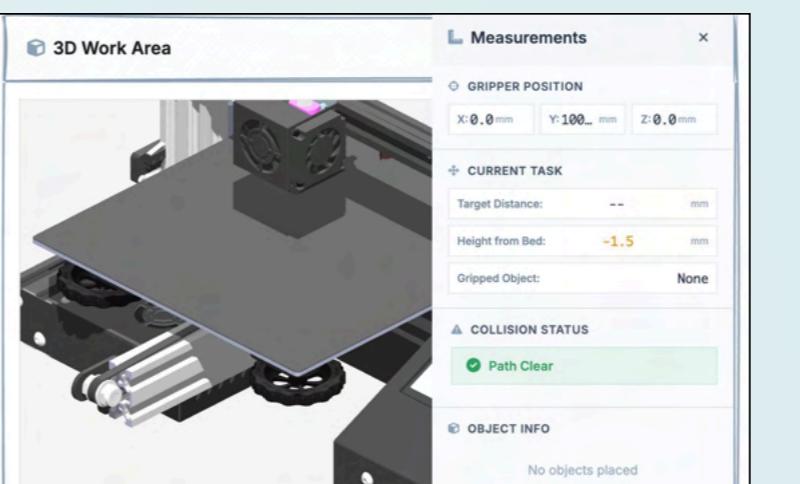


Total Completed: 22 - 55%  
Completed w/ Assistance: 10 - 25%  
Failed: 8 - 20%

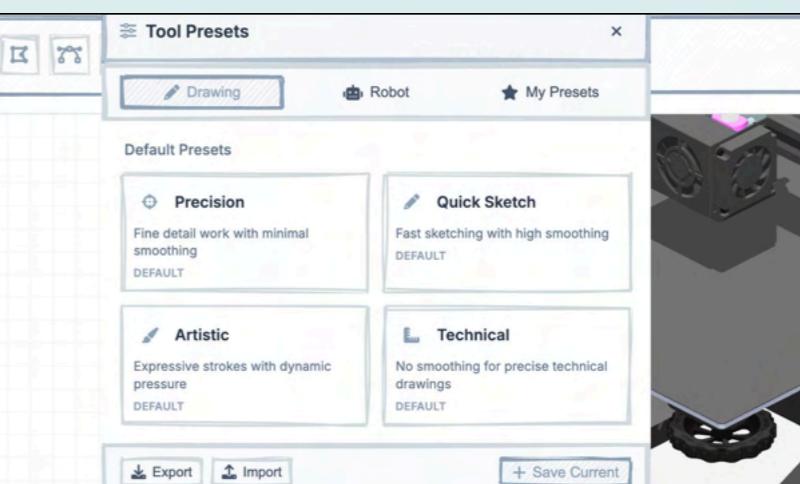
### Iteration



We can add visual tooltips and hover states to improve tool discoverability and user guidance.



We can add real-time measurement displays and collision detection warnings.



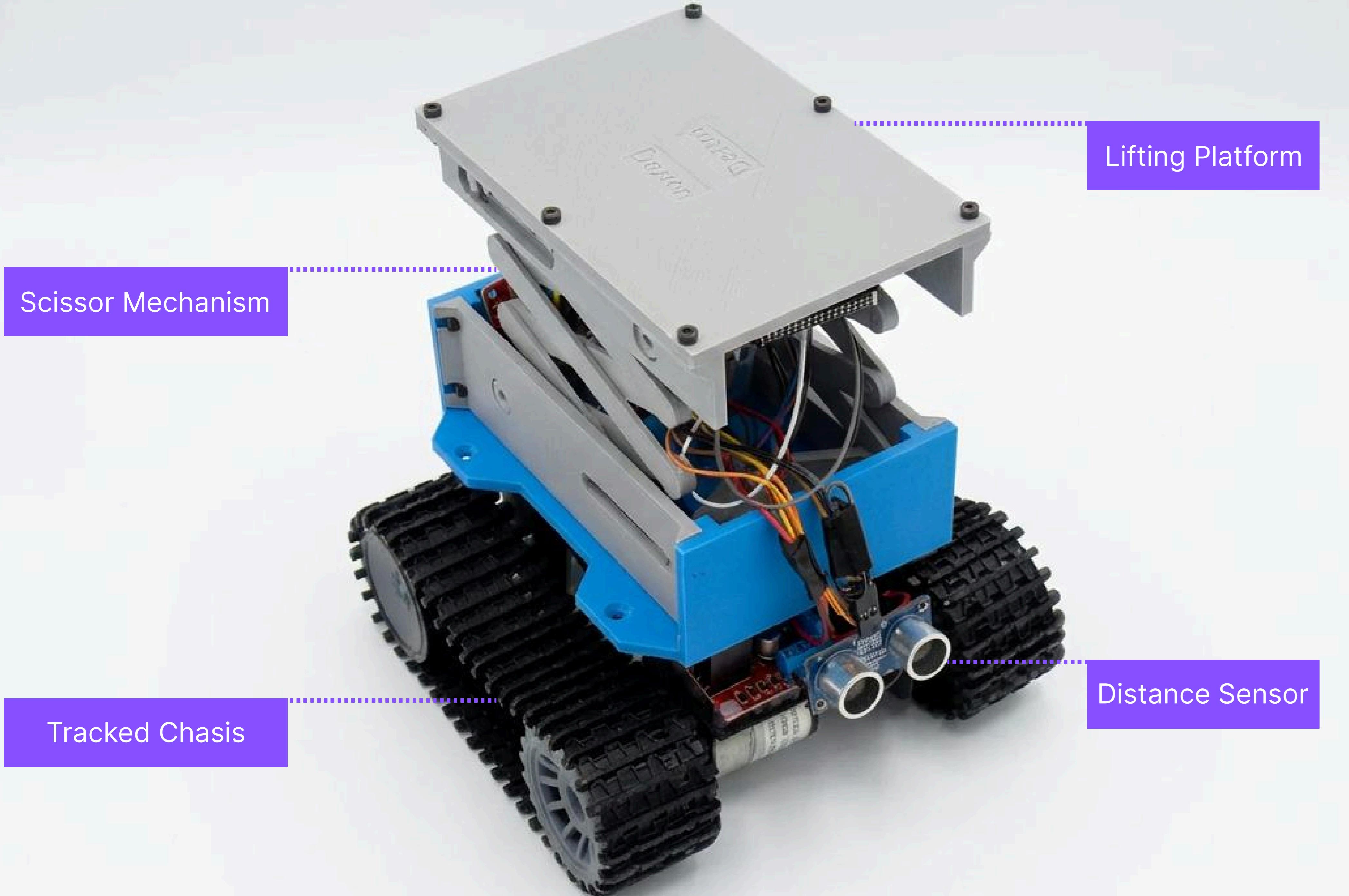
We can add keyboard shortcuts and customizable tool presets for power users.

Basic operations work well, but complex tasks need clearer guidance. Participants struggled with advanced features, suggesting a need for contextual help and improved onboarding.

Total tasks: 40

# Milo

A Companion Robot for Safe, Effortless Indoor Assistance



## MOTIVATION

Many **older adults** face daily **challenges moving items across rooms, bending down, or managing small household tasks**. Limited mobility and safety concerns often restrict independence. Traditional assistive devices provide **partial support but lack adaptability or intuitive interaction**. Milo addresses these gaps by combining simple physical assistance with accessible, elder-friendly interaction design—offering dependable support without adding cognitive load.

## AIM

**Design and build an indoor delivery robot** capable of transporting small items between rooms through an intuitive mobile interface. Milo integrates a **tracked chassis for stable movement**, a **motorized lift platform for customizable item height**, **Bluetooth remote control via smartphone joysticks**, and an **ultrasonic-sensor following mode for hands-free operation**. The project aims to create a lightweight, approachable assistive robot that enhances autonomy, safety, and comfort for older adults in everyday home environments.

## TYPE

Individual Project | Assistive Robotics | HCI

## FRAMEWORKS / TOOLS

Arduino Serial/Bluetooth Communication Framework | Scissor Mechanism | 3D Printing

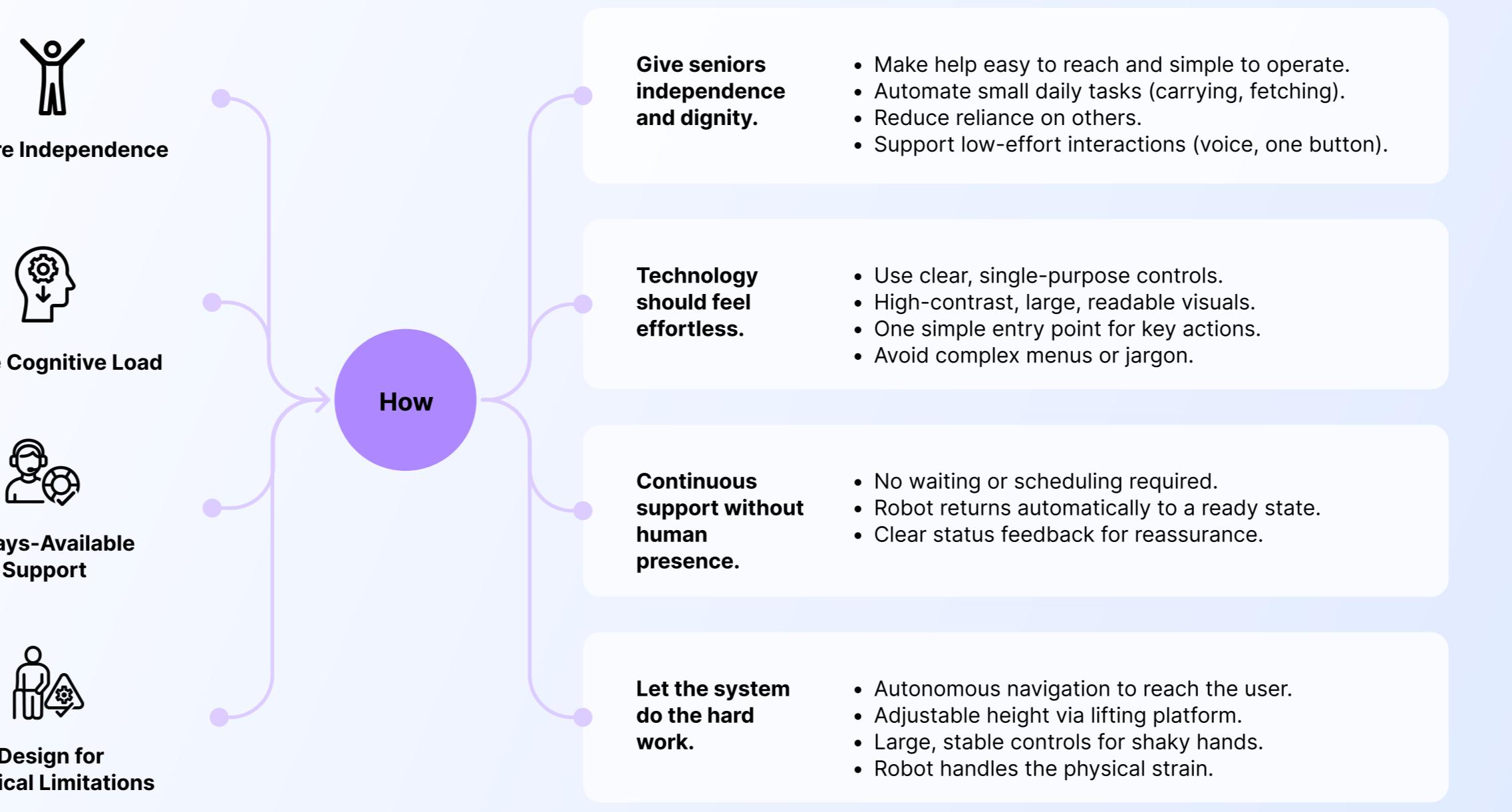
## TIME

2024

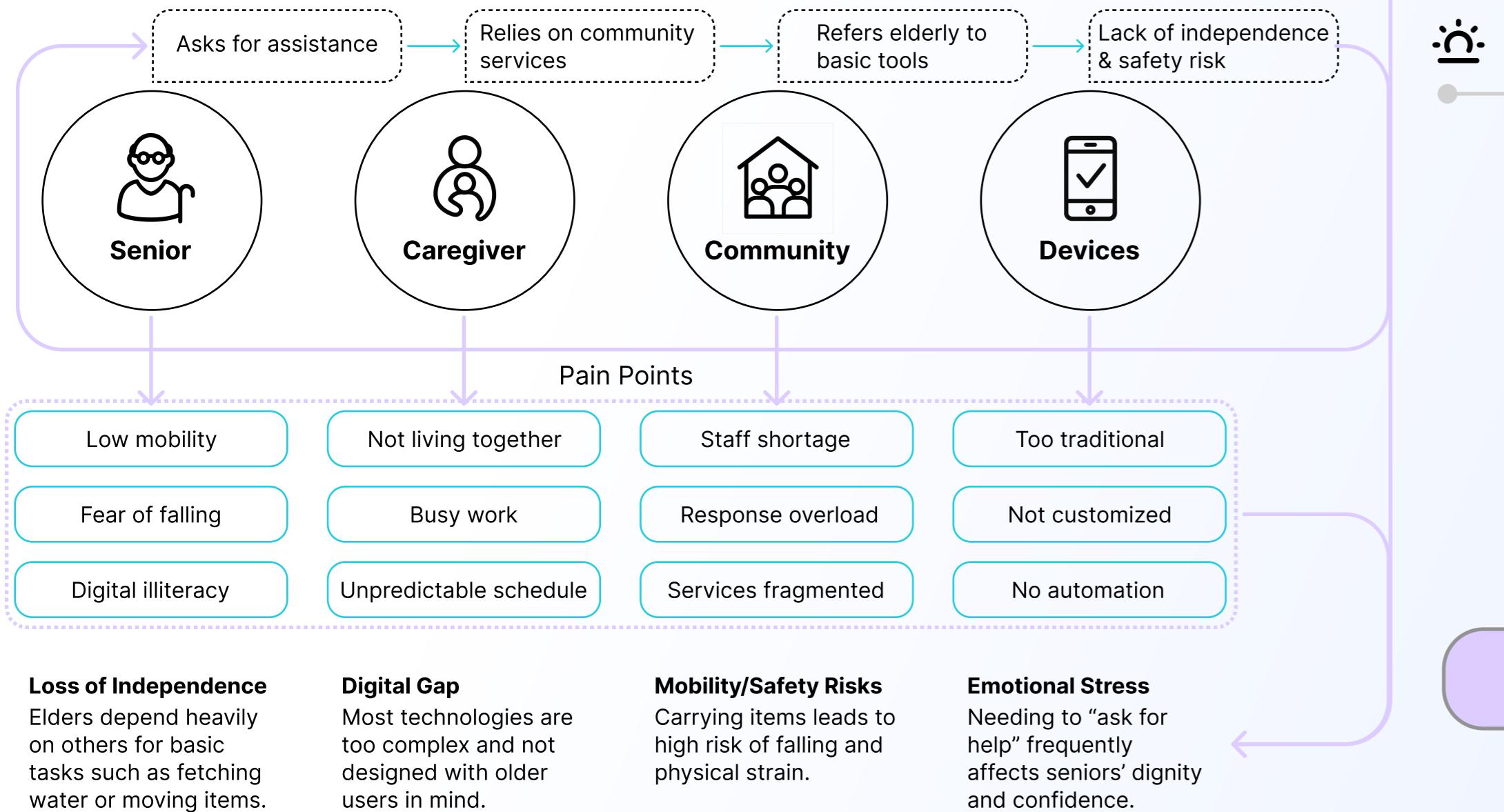
## Storyboard



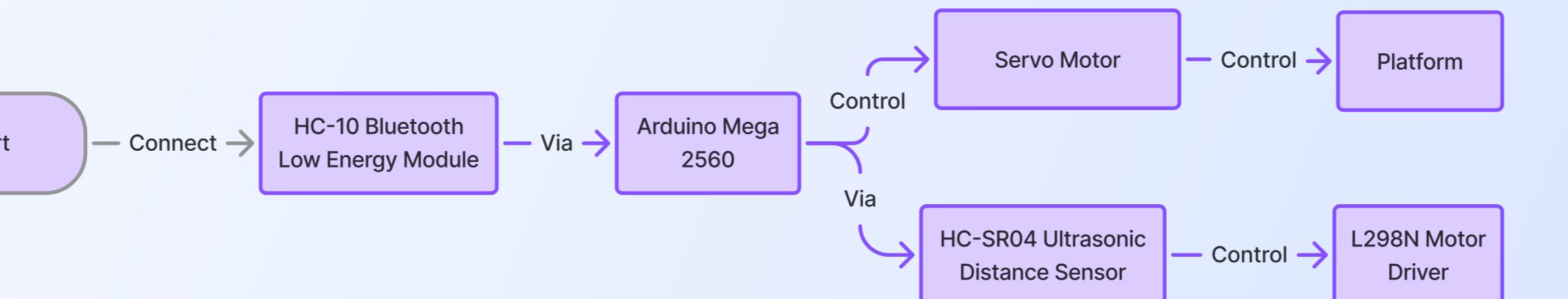
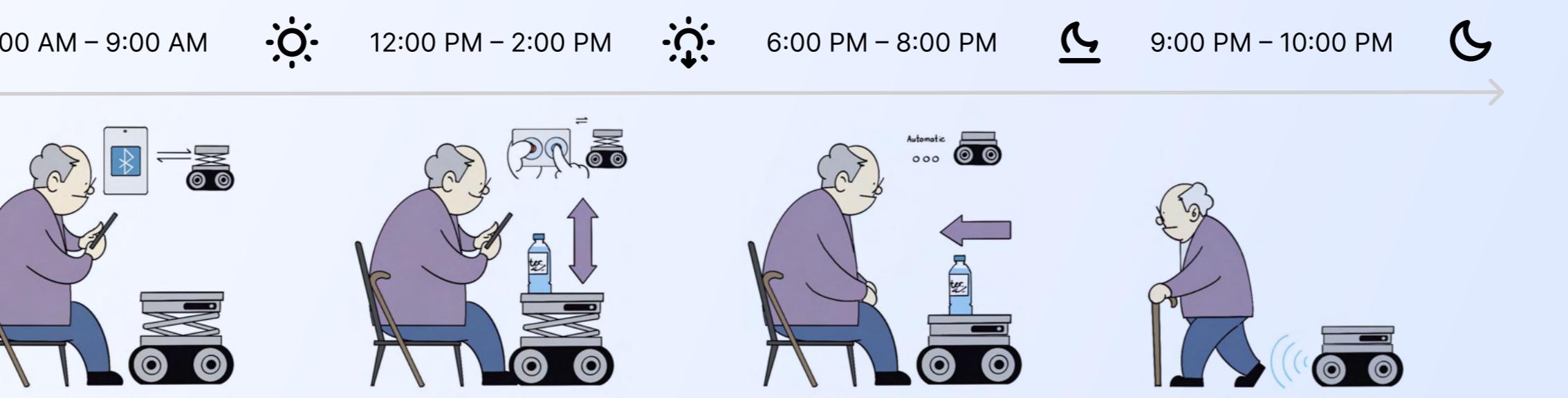
## Design Principles



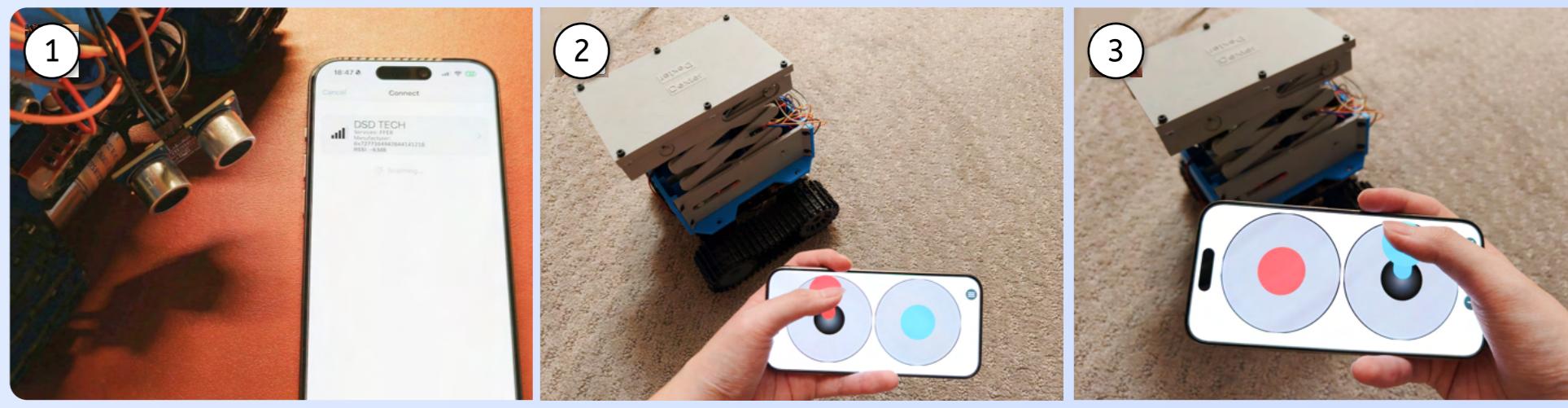
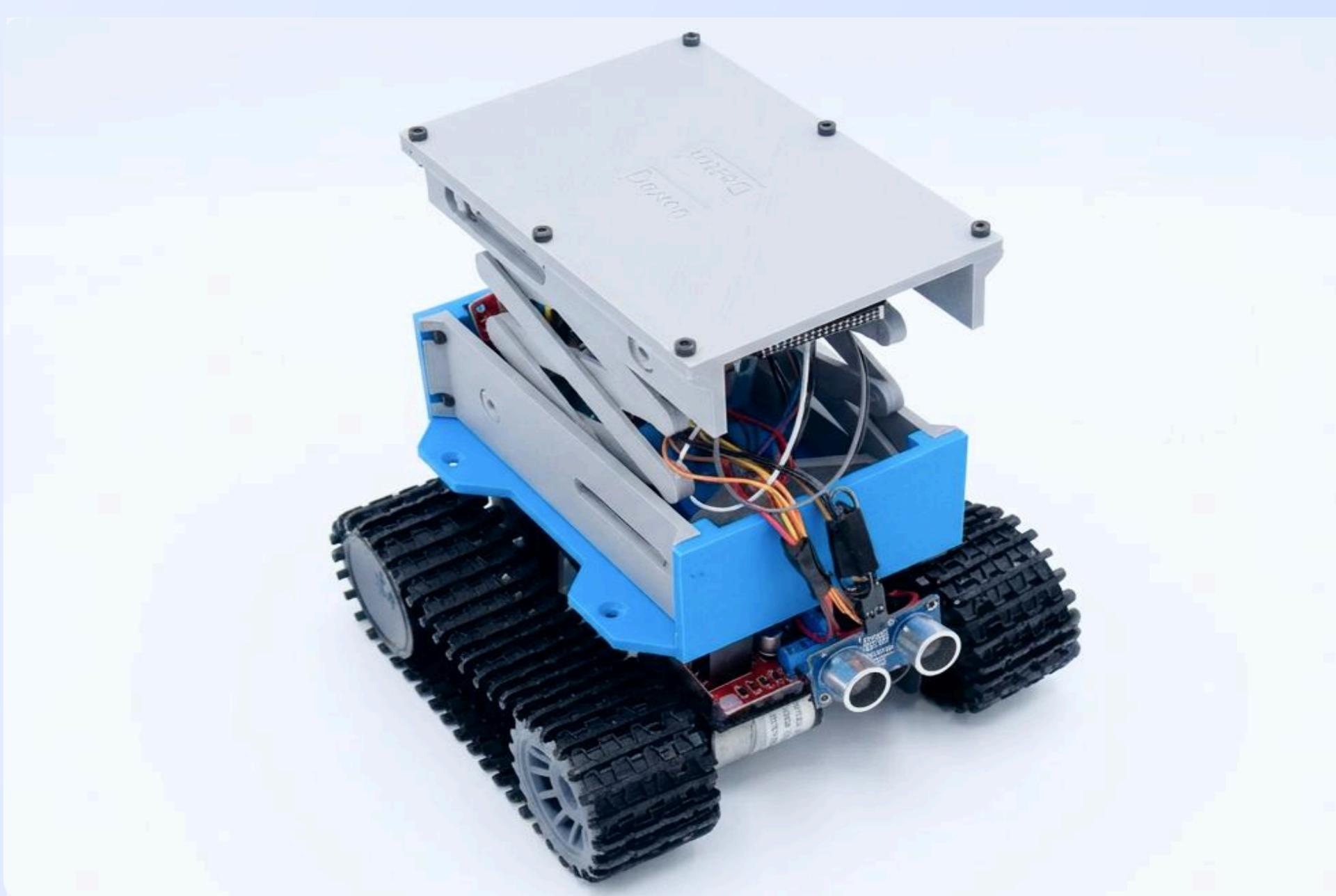
## Challenges



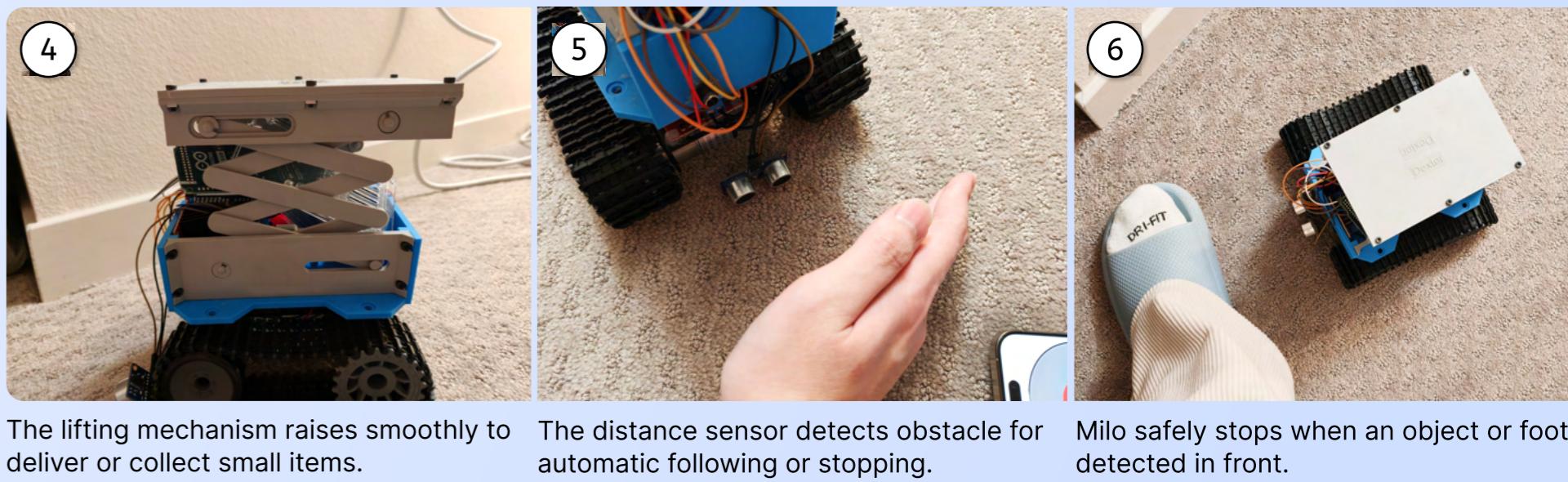
## A Day in Milo's Life



## Final Product & Walkthrough

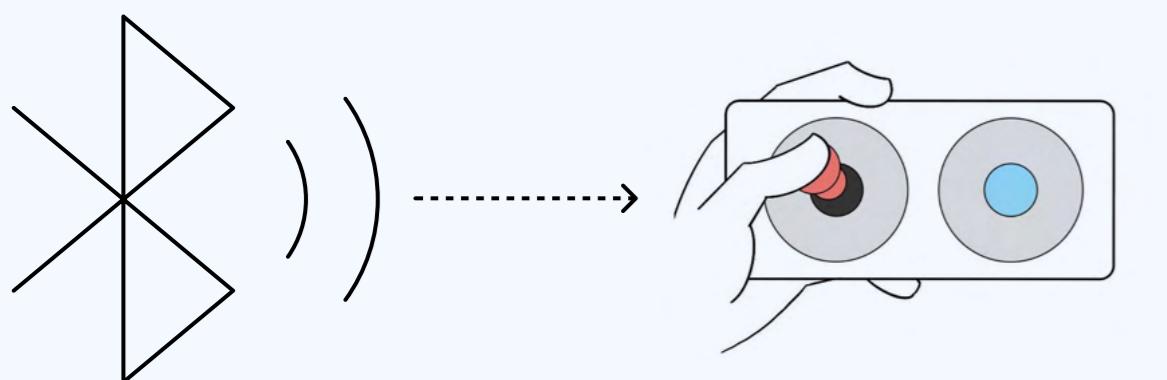


1 Milo connects to the mobile controller app via Bluetooth for remote operation.  
2 The left joystick on the app controls milo's movement and steering.  
3 The right joystick controls the lift platform for up-and-down motion.

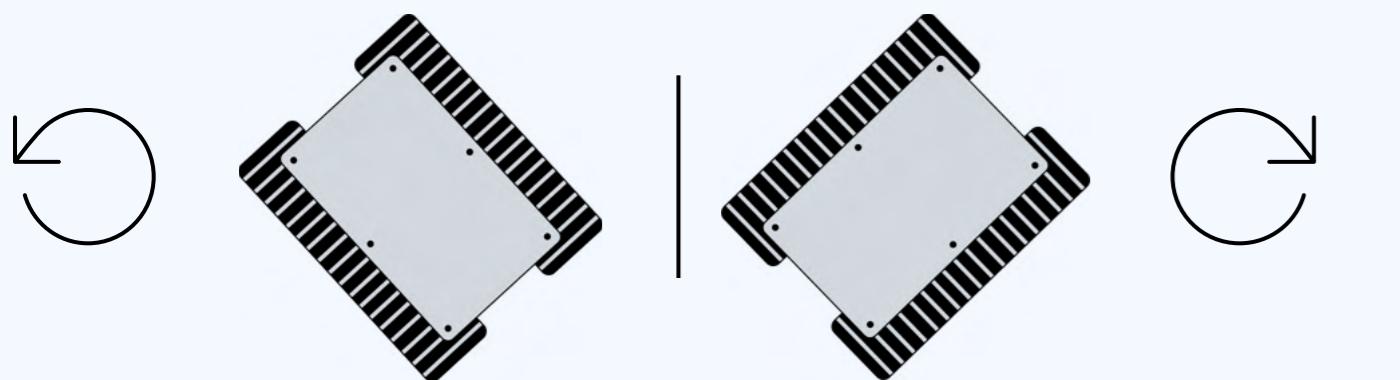


## Interactions

### Remote Control via Bluetooth

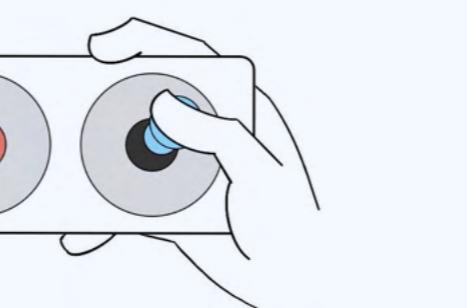


Milo connects to the smartphone via Bluetooth, allowing real-time control through virtual joysticks.

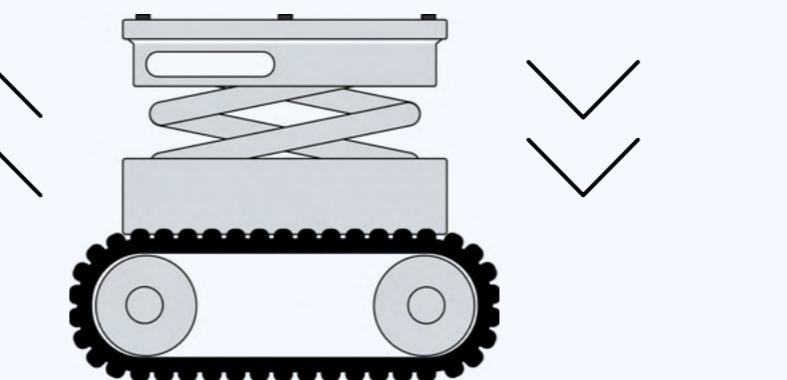


The tracked structure enables the robot to rotate fully left or right, allowing on-the-spot turning for precise maneuverability.

### Platform Lift Operation

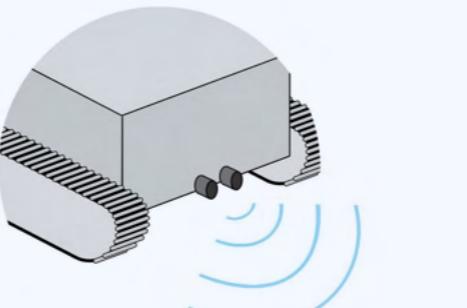


The right joystick allows the user to control the lifting platform, adjusting its height smoothly and precisely.

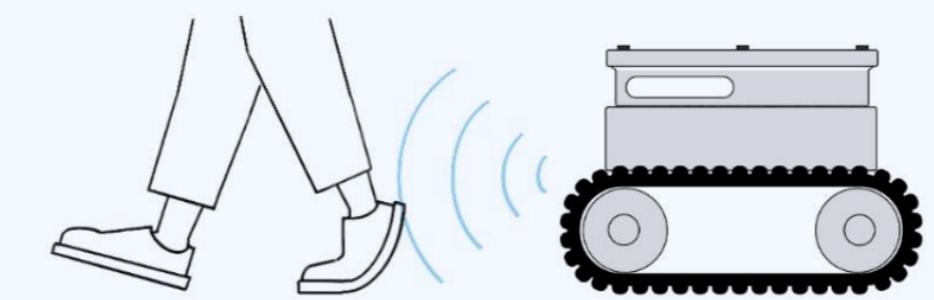


The scissor-lift platform can move up and down smoothly and stop at any desired height for flexible item handling.

### Autonomous Following

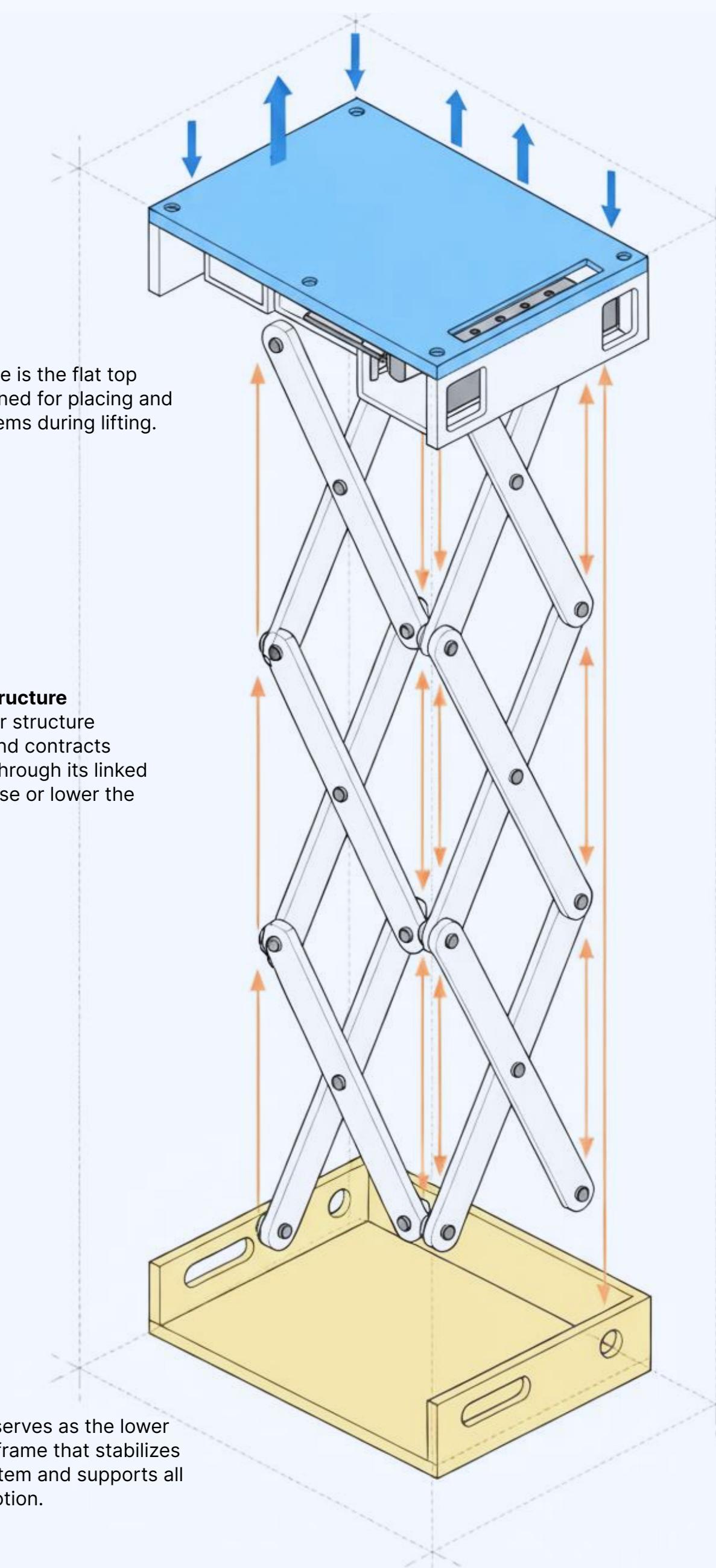


The front of Milo is equipped with a sensor that emits sound waves and measures their reflections to detect surrounding objects.



Milo employs its sensor to continuously detect the user's position and adjust its movement, achieving smooth automatic following.

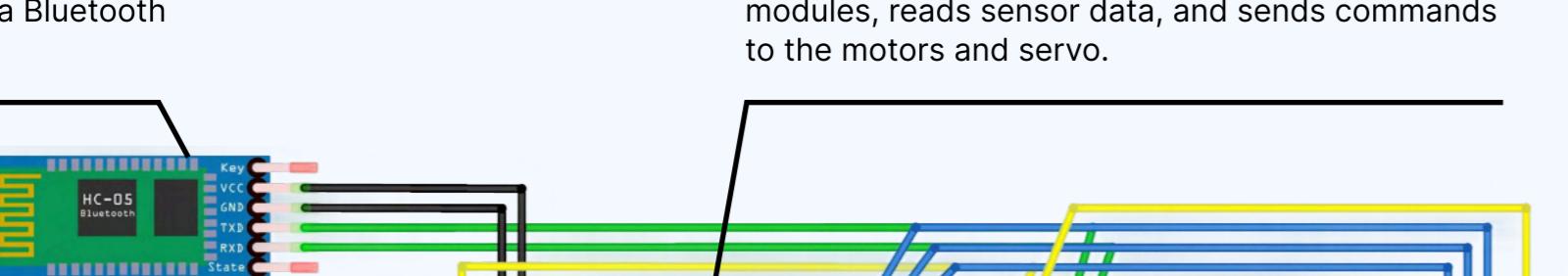
## Exploded Diagram



## Hardware Architecture

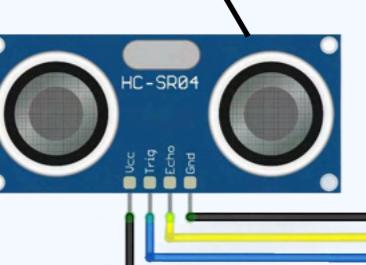
### Bluetooth Module HC-05

Enables wireless communication between the robot and the mobile app via Bluetooth serial (TX/RX pins).



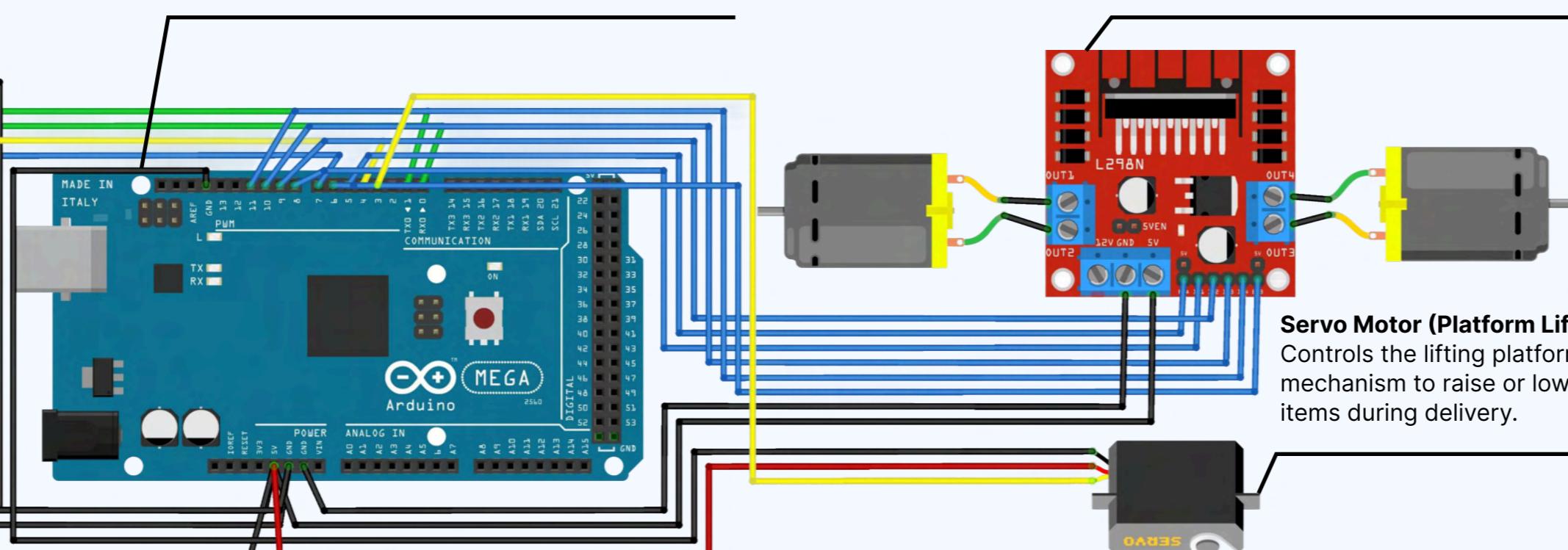
### HC-SR04 Sensor

Measures distance to obstacles using ultrasonic waves and sends feedback to the controller for collision avoidance.



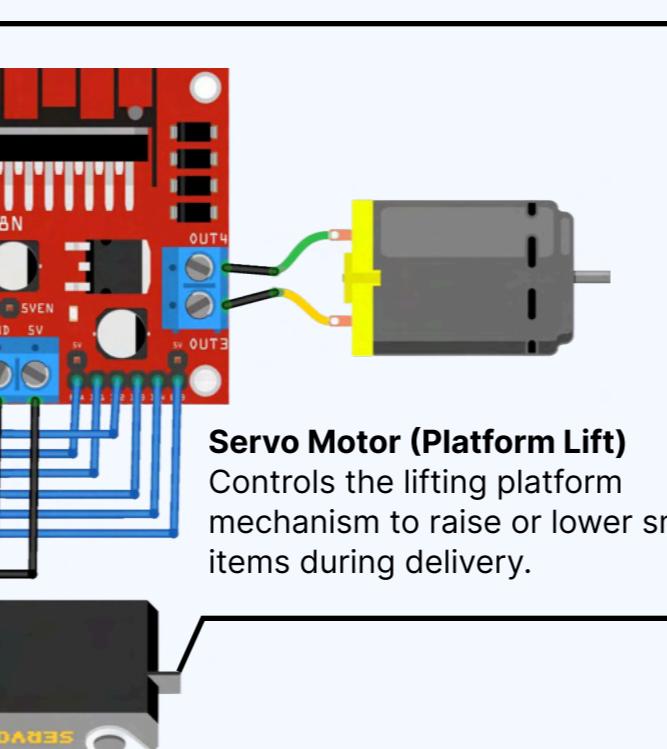
### Arduino Mega 2560

Main microcontroller board that coordinates all modules, reads sensor data, and sends commands to the motors and servo.



### Motor Driver L298N

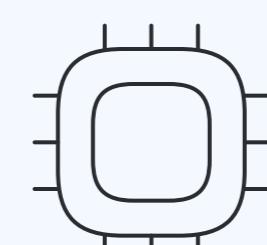
Dual H-Bridge driver that controls the direction and speed of the two DC motors through PWM signals from the Arduino.



**Servo Motor (Platform Lift)**  
Controls the lifting platform mechanism to raise or lower small items during delivery.

### Central Control

The Arduino Mega 2560 serves as the core controller that processes input from both the Bluetooth module and the ultrasonic sensor. It coordinates motor movement and platform lifting through precise PWM and serial communication signals.



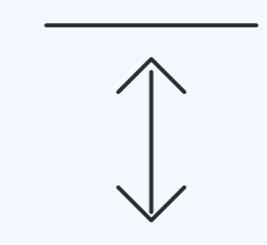
### Wireless & Sensor Feedback

The Bluetooth module enables smooth wireless control from the mobile app, allowing flexible user interaction. Meanwhile, the distance sensor continuously measures distance to detect obstacles and maintain safe operation.



### Motion & Lift Mechanism

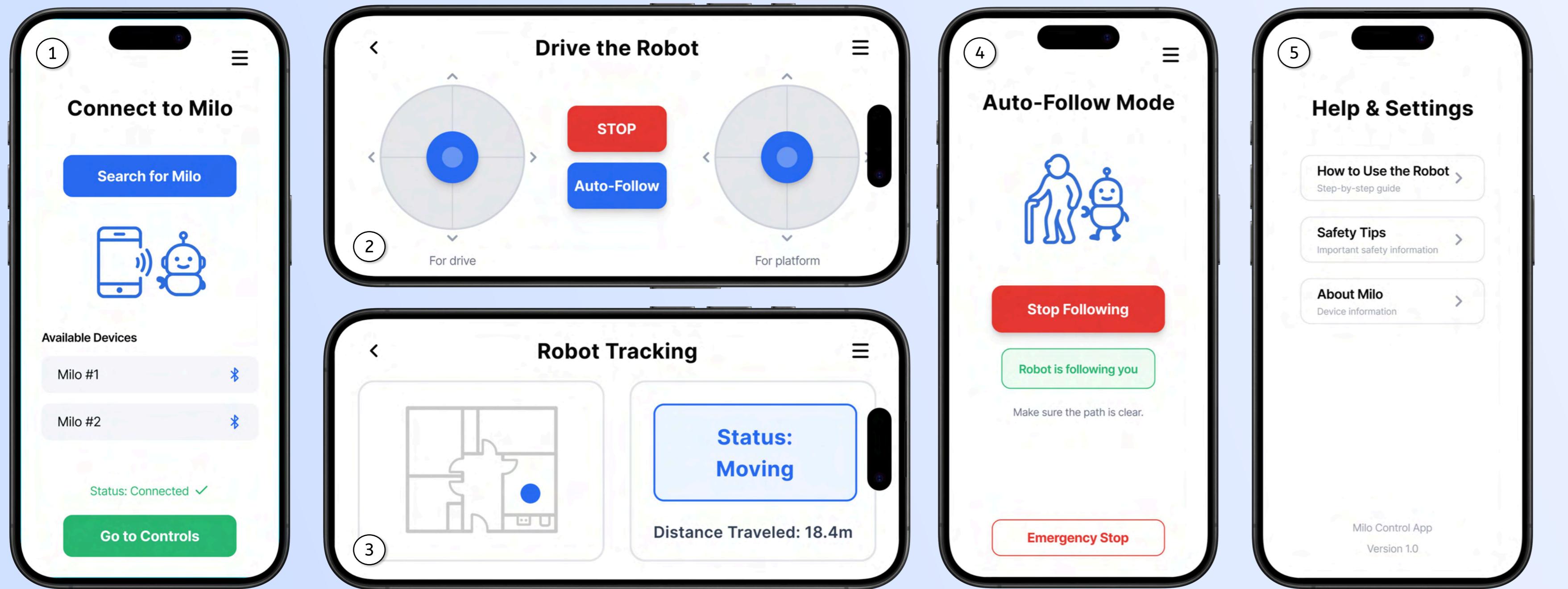
The L298N motor driver regulates direction and speed for the dual DC motors, ensuring stable movement. The servo motor operates the lifting platform, enabling the robot to deliver or retrieve items efficiently.



### Base

The base serves as the lower structural frame that stabilizes the lift system and supports all upward motion.

## User Interfaces



## Features Decompose

1

### Bluetooth Connection

This screen lets the user search for nearby Milo robots, view available devices, and connect to one before entering the control interface. Once connected, the user can proceed to the main control panel.

2

### Driving & Platform Control

This screen allows the user to control the robot's movement with the left joystick and adjust the platform height with the right joystick. It also provides quick access to emergency stop and Auto-Follow mode.

3

### Robot Tracking

This screen shows the robot's real-time location on a simple home map and displays live movement status and distance traveled. It helps the user monitor where the robot is and how it is moving.

4&amp;5

### Auto-Follow & Support Center

The Auto-Follow screen lets the robot safely follow the user with clear status indicators and an emergency stop option. The Help & Settings screen provides simple guidance and essential information to support older users whenever needed.

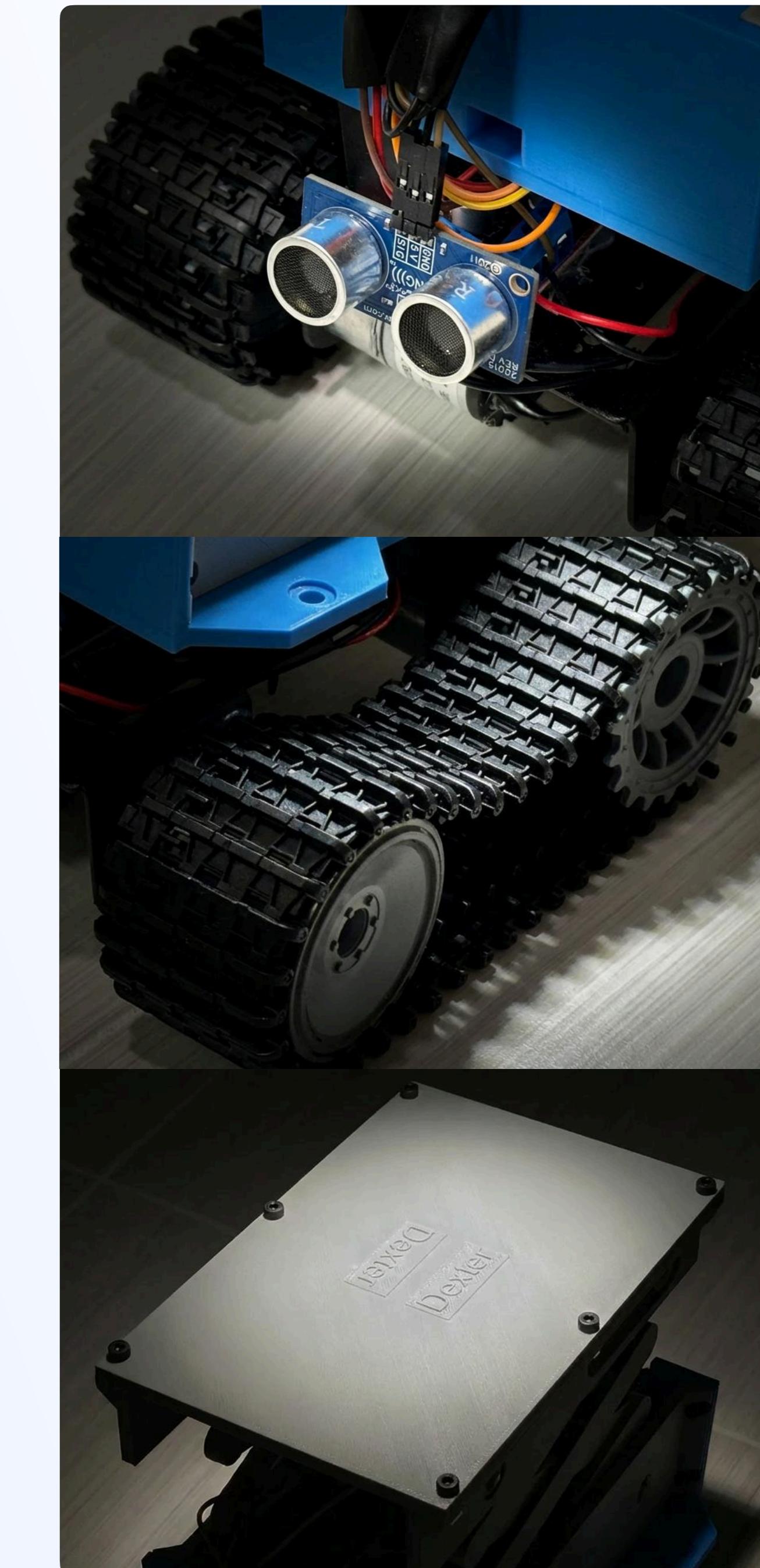
**The Milo Remote Control App** offers a simple, elder-friendly way to operate the robot. Users can connect via **Bluetooth**, drive Milo with the **left joystick**, and adjust the lift platform with **the right**. Key actions like **Auto-Follow** and **Emergency Stop** are always visible for safety. A **real-time tracking** screen shows Milo's location and movement status, while the Help section provides quick guidance, making the entire experience clear, safe, and easy to use.

## Walkthroughs

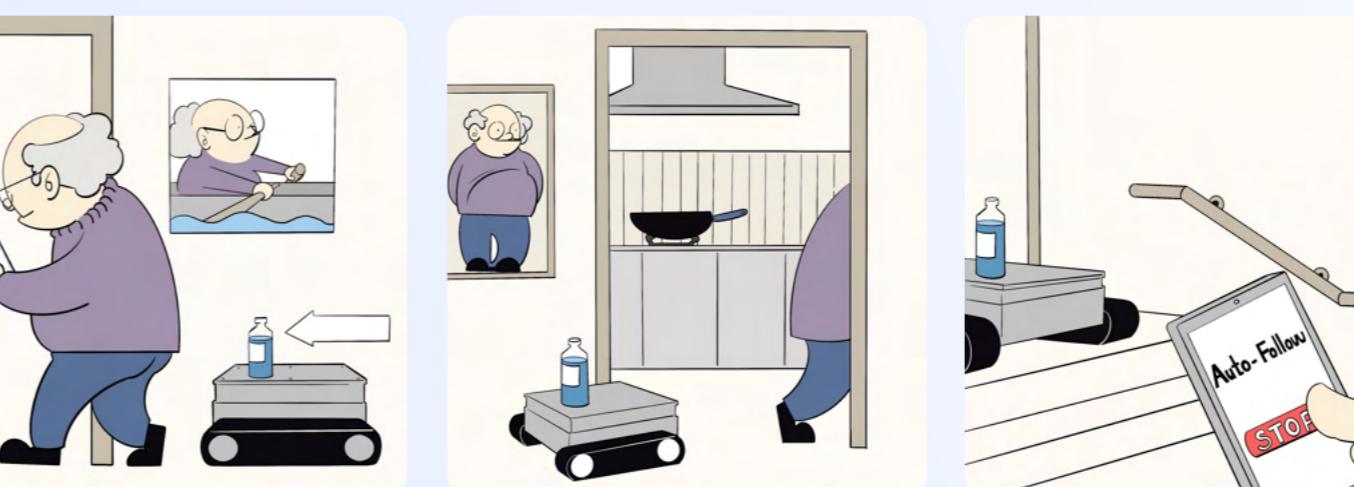
### Scenario 1 — Initial Setup & Manual Driving



The user opens the app, connects to Milo via Bluetooth, and uses the dual joysticks to drive the robot and adjust the lift platform for daily indoor tasks.



### Scenario 2 — Auto-Follow for Assisted Mobility



The user activates Auto-Follow Mode so Milo can safely follow behind while they move across the apartment, carrying small items such as water bottles or medication.

### Scenario 3 — Monitoring & Safety Tracking



The user checks Milo's real-time movement, location, and distance traveled on a simple indoor map to ensure the robot is operating safely and not stuck.

# Sentry

Reclaiming Personal Data Autonomy in Social Networks

## MOTIVATION

In centralized social platforms, personal data is treated as a locked asset—collected, analyzed, and monetized beyond users' control. While users generate value through their interactions, they are often excluded from meaningful ownership, transparency, and decision-making regarding their own data. This imbalance erodes trust and limits users' ability to exercise digital self-determination.

## AIM

Sentry explores how decentralized architectures can restore user agency over personal data. The project proposes a social app framework where users control data ownership, permissions, and visibility through decentralized identity and storage. By visualizing data flow, permissions, and control mechanisms, Sentry helps users understand, manage, and reclaim authority over how their data is stored, shared, and utilized.

## TYPE

Individual Project | Interaction Design | Decentralized Systems | HCI

## FRAMEWORKS / TOOLS

Decentralized Identity (DID) | Data Visualization | Prototyping (Figma)

## TIME

2025



# Background

## How is global data centrally stored and managed?



- Local & fragmented storage
- Growth of AWS, Azure, Google Cloud
- Market dominated by top providers
- Hybrid cloud adoption

- Unified platforms & standards
- Multi-cloud integration tools
- Real-time analytics & automation
- Strong security & compliance

- Higher efficiency & speed
- Cost optimization, but high barriers
- Faster global innovation
- Risks: breaches & monopolization

### From Centralization to New Approaches

Centralized storage scales efficiently but sacrifices autonomy for high costs and a single point of failure.

Rising data demands are driving organizations toward alternatives to reduce provider dependency.

This shift drives **Distributed Data Management** as a resilient alternative to centralized systems.

### Why hasn't it become widespread?

Despite benefits like privacy and lower costs, decentralized storage lacks mass adoption due to technical barriers, slow speeds, and regulatory uncertainty. These hurdles prevent it from replacing centralized systems in the near term.

#### Barriers to Adoption:

- **Technical:** High entry barriers and slower access speeds.
- **Structural:** Immature ecosystems and unstable incentives.
- **External:** Lack of user trust and unclear legal frameworks.

### Summary

Achieving personal data sovereignty requires solving key issues: unclear ownership, data misuse by centralized platforms, lack of user control tools, limited transparency, and underdeveloped decentralized infrastructure. These barriers prevent individuals from fully owning and benefiting from their data.

# Research

## How is global data centrally stored and managed?

### Research Objective:

To investigate user attitudes toward personal data sovereignty by examining acceptance levels, control preferences, and perceived importance of different data rights across varying sensitivity levels.

### Research Subjects:

88 2X Tech-Savvy Women

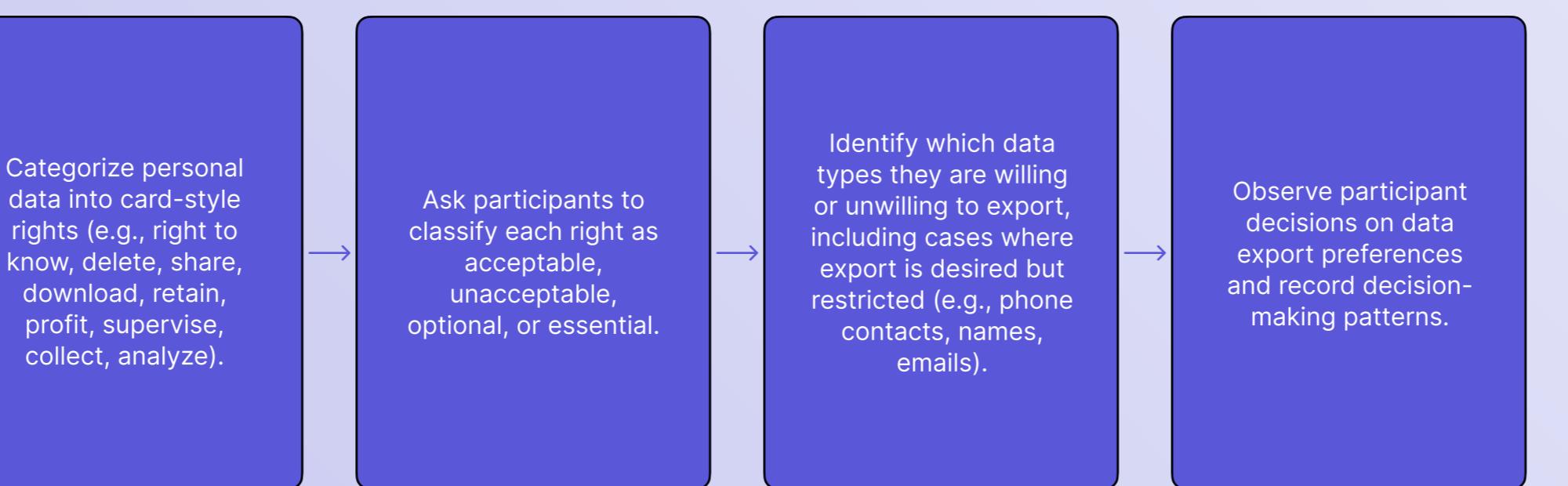
88 2X Non-Tech Women

88 2X Tech-Savvy Men

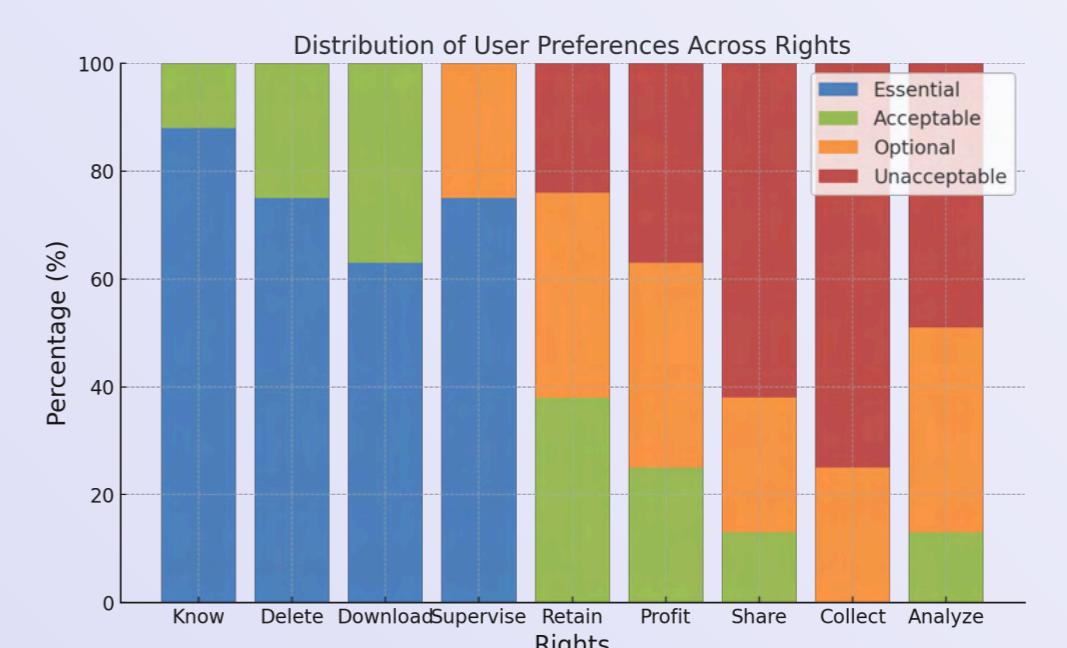
88 2X Non-Tech Men

A total of 8 participants

### Research Steps:

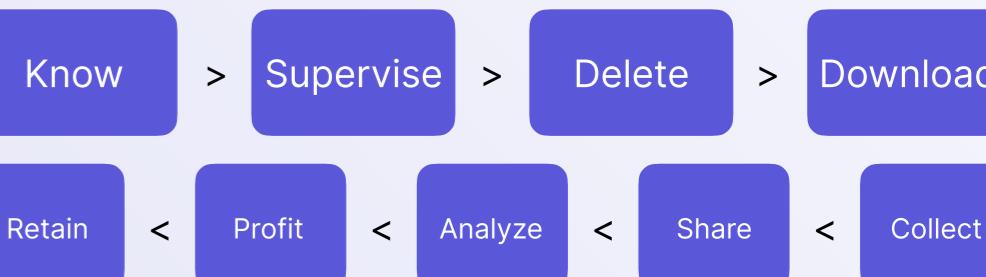


### Research Process - Personal Data Rights Sorter



### Key Insights

- Core rights (Know, Delete, Download, Supervise) received >70% Essential ratings.
- Profit, Share, Collect, Analyze faced >60% resistance, showing strong distrust in commercial/third-party use.
- Retain is the most split, sitting between Acceptable and Optional.

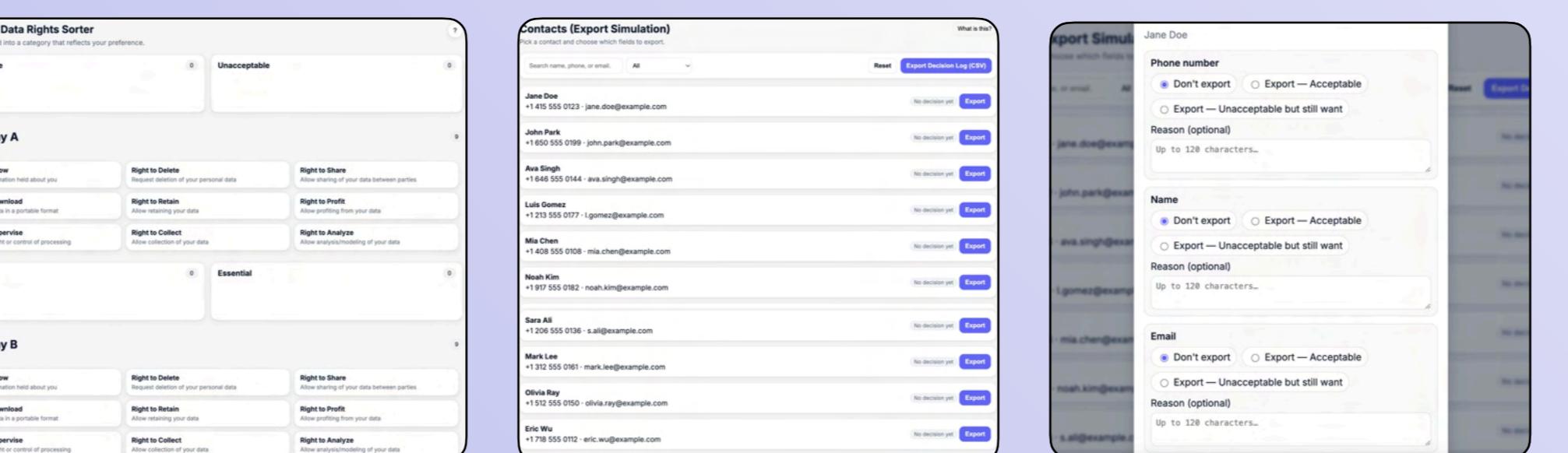


### Results Classification - Contacts (Export Simulation)

#### Convenience-Driven

Value ease of use over strict privacy, willing to export most data.

#### Research Tools/Context:



#### Contacts (Export Simulation)

- User selects a contact from the simulated list of entries.
- An export dialog opens, showing phone, name, and email fields.
- For each field, the user chooses: Don't export, Acceptable to export, or Unacceptable but still want.

#### Personal Data Rights Sorter

- The user may add an optional reason for each choice.
- Decisions are saved and logged, creating a record for later analysis.

#### Conditional Sharers

Will share data if conditions are met, balancing convenience and control.

#### Right-first Guardians

Strongly protect privacy, prioritize control, and export only essential data.

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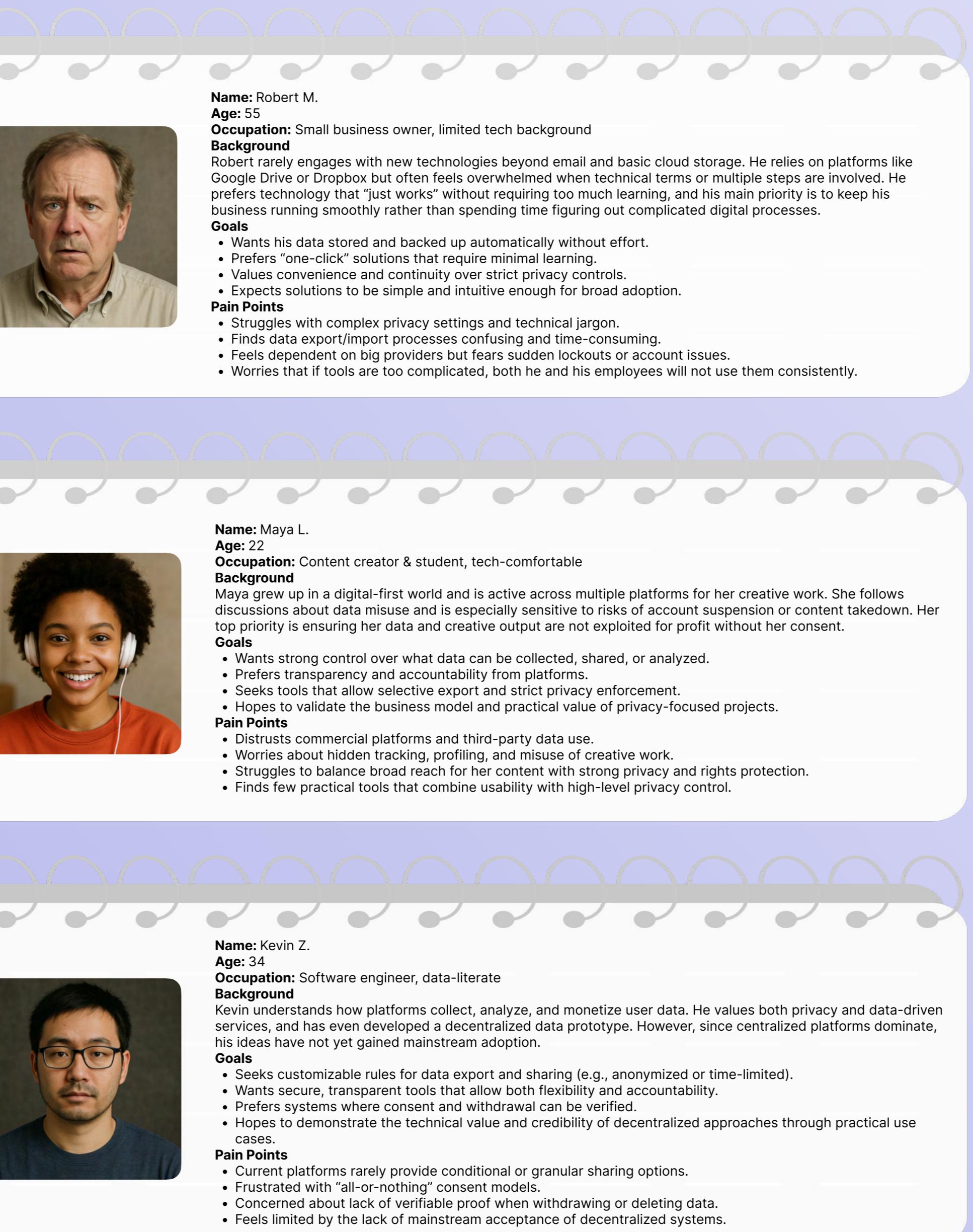
#### Right-first Guardians

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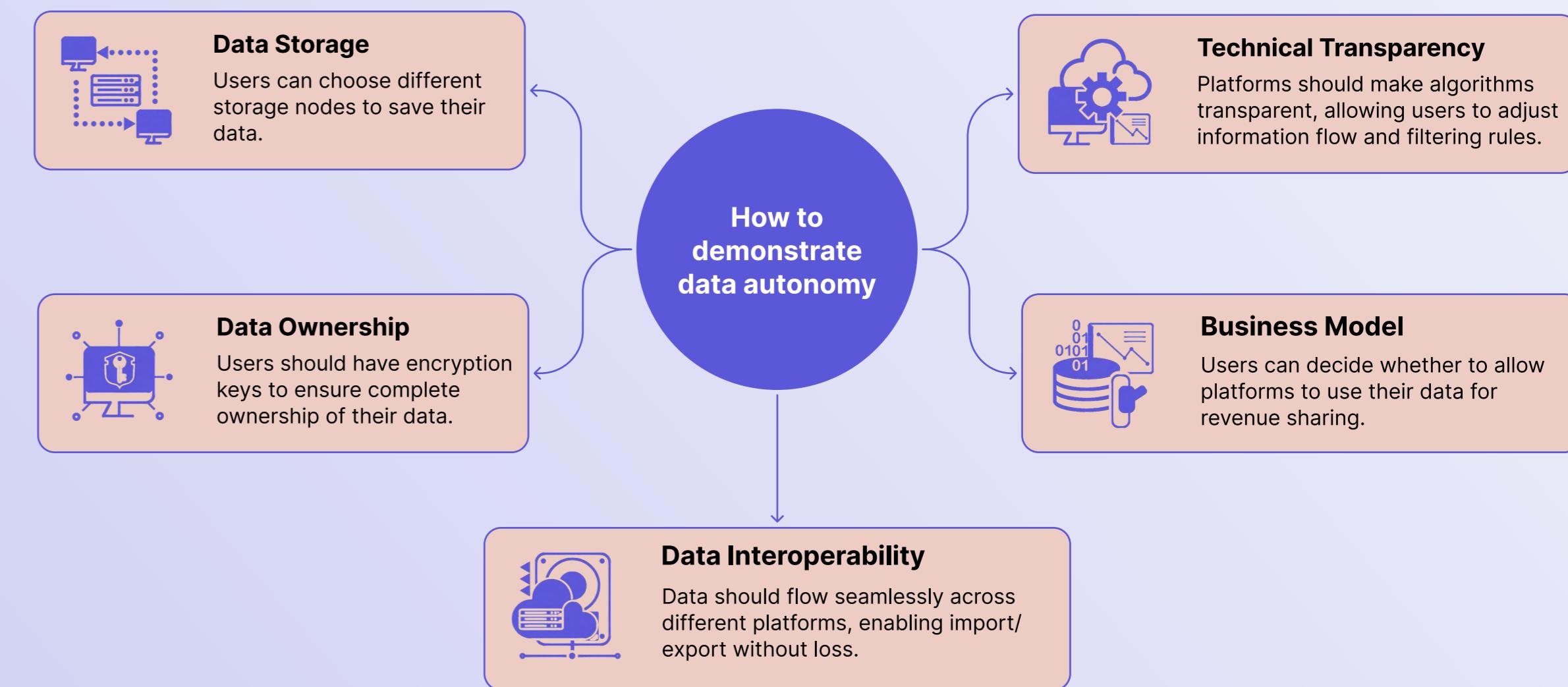
# Insights



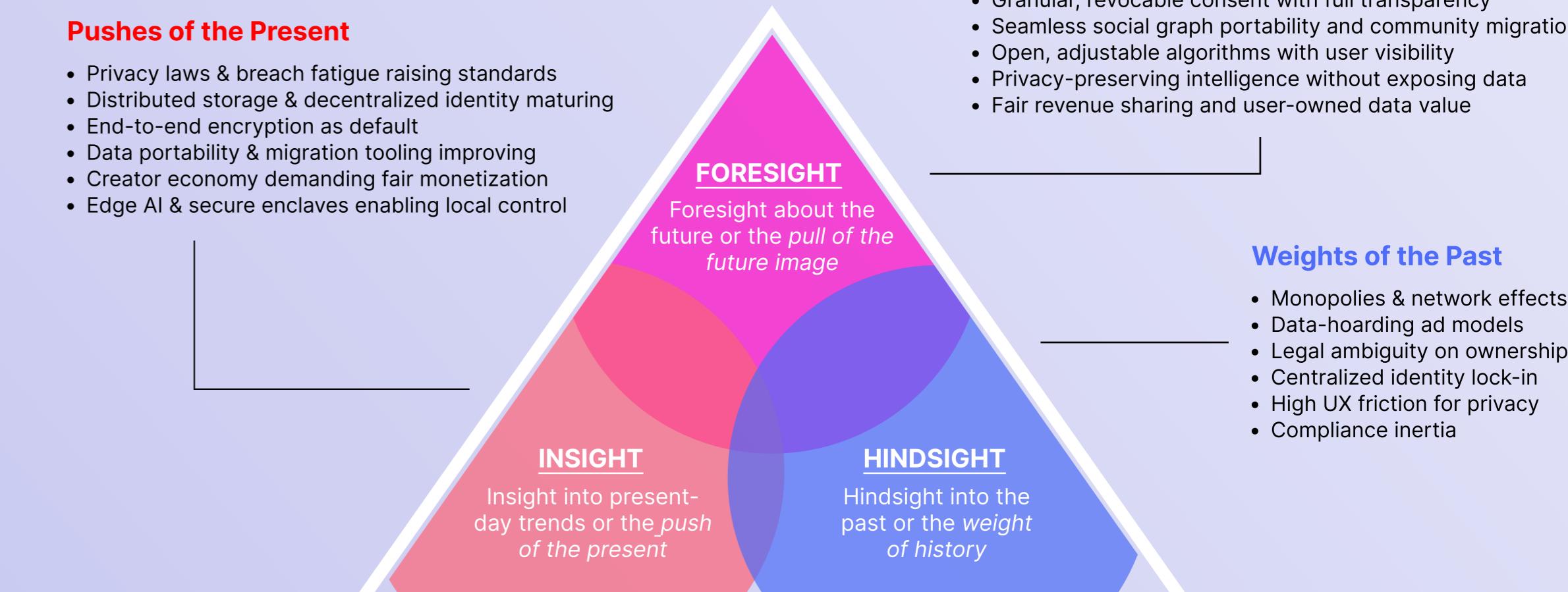
# Persona



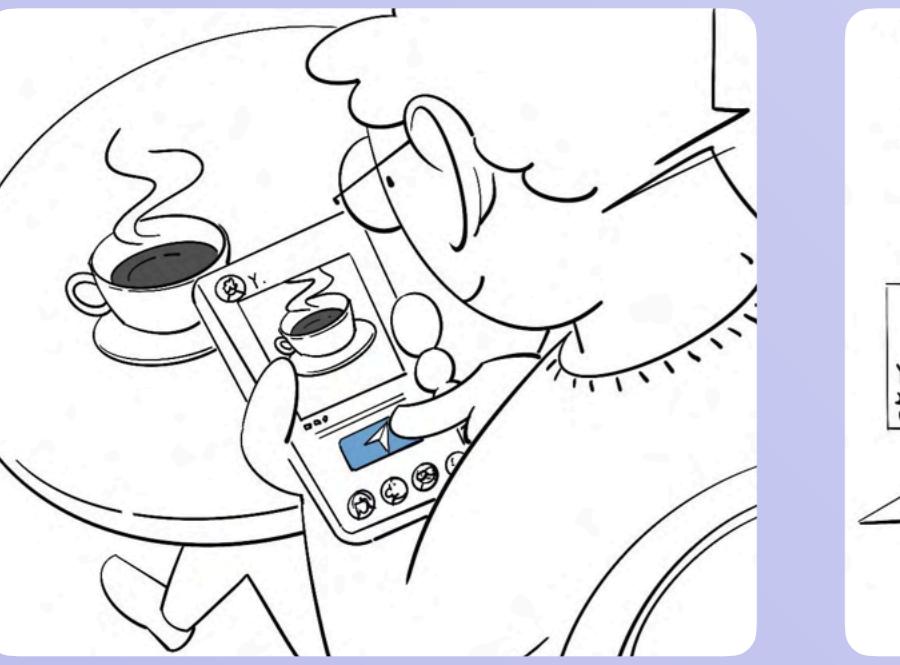
# Mindmapping



# Futures Triangle



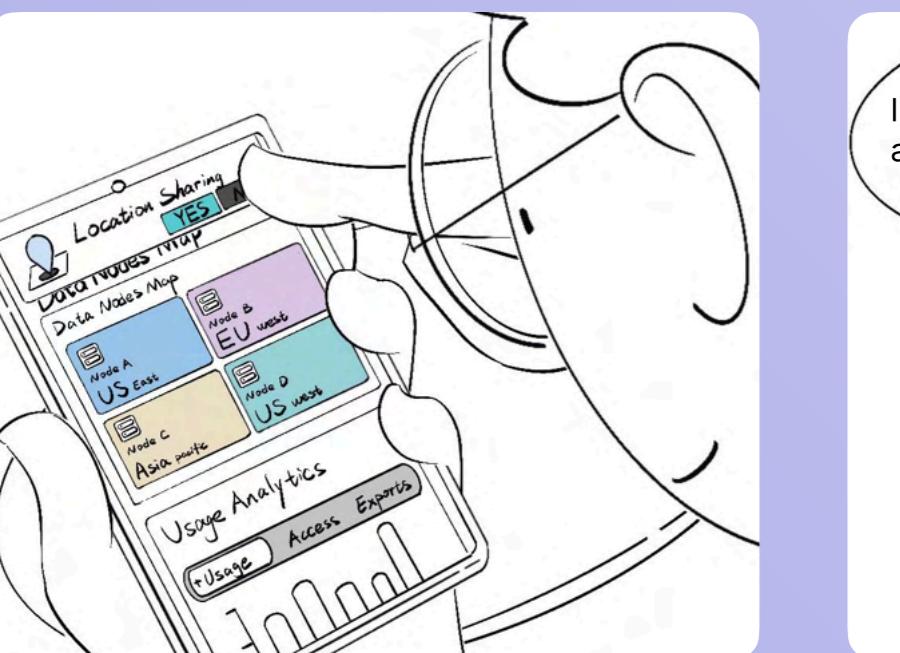
# Storyboard



A user scrolls through a social feed, unaware of the continuous personal data collection happening in the background.



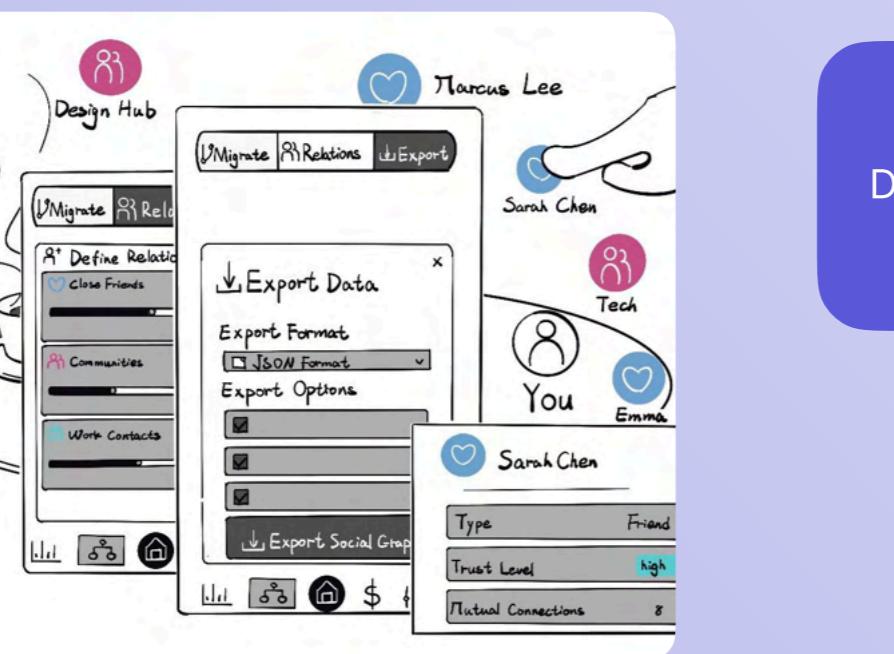
Sentry introduces a guided process that reveals data flows and supports migration into a user-controlled environment.



Data ownership becomes explicit through controls over storage location, access permissions, and usage analytics.



Personal data is aggregated and processed by centralized systems through opaque and unexplainable algorithms.

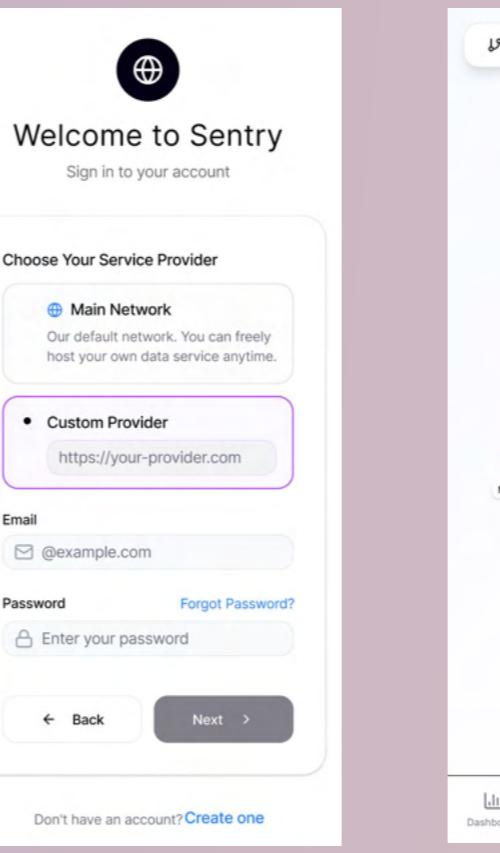
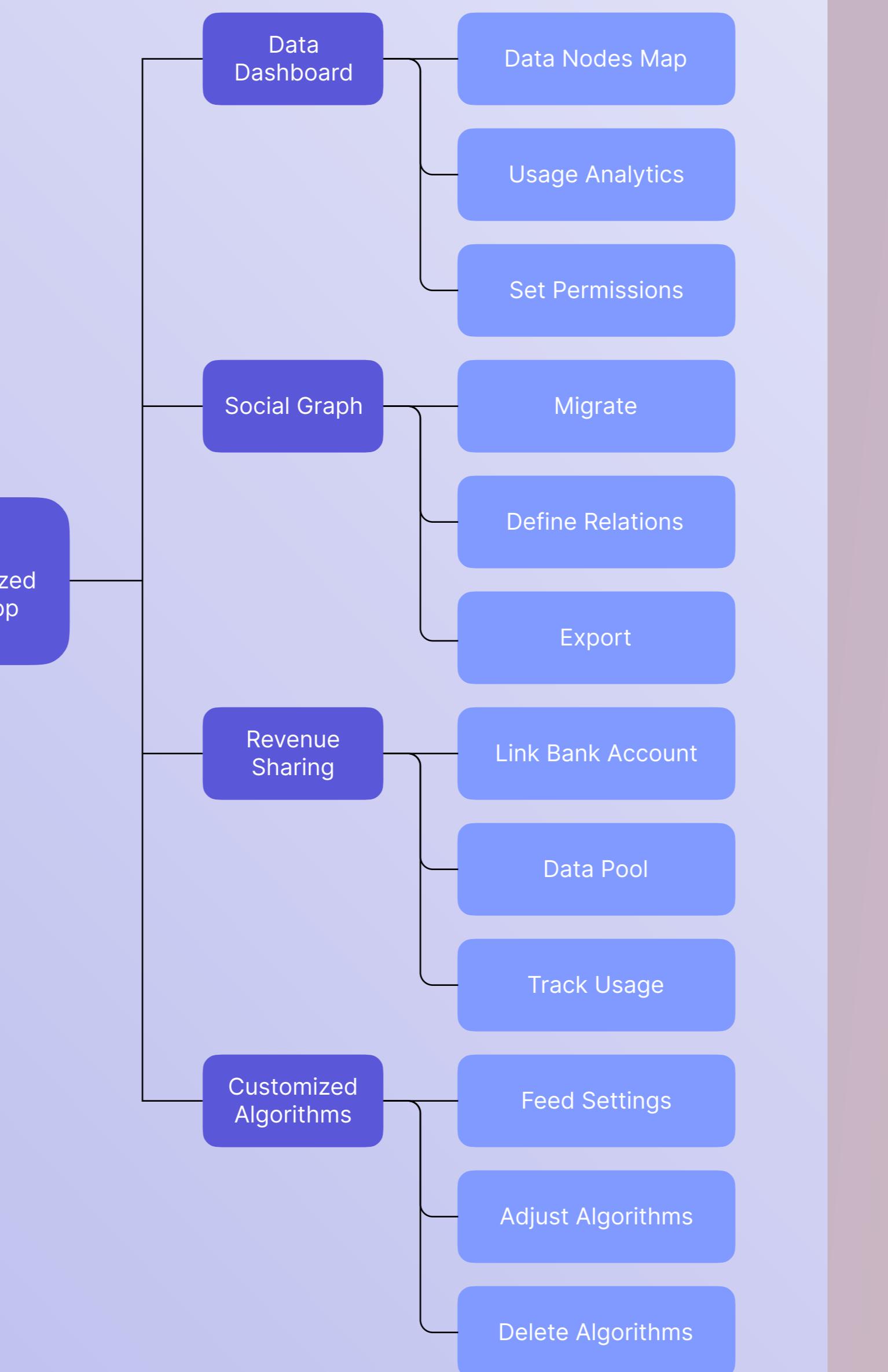


Social relationships and data can be exported, reorganized, and redefined with clarity and transparency.

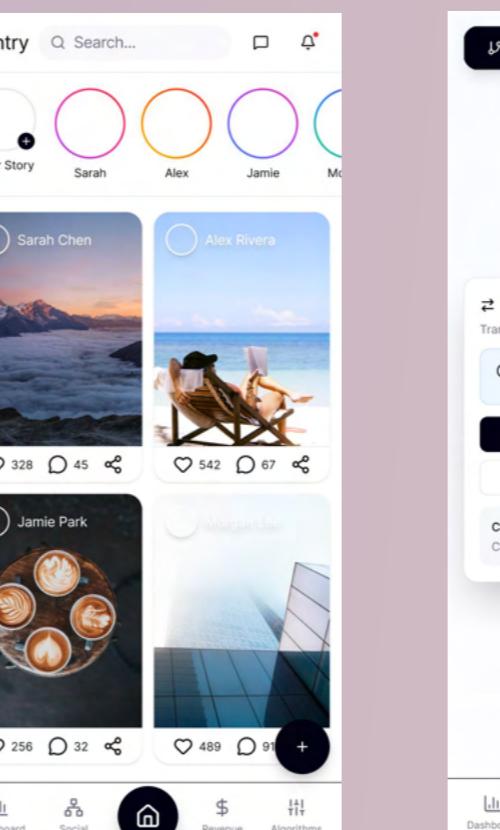


Algorithmic behavior and value distribution are customized to reflect the user's preferences and priorities.

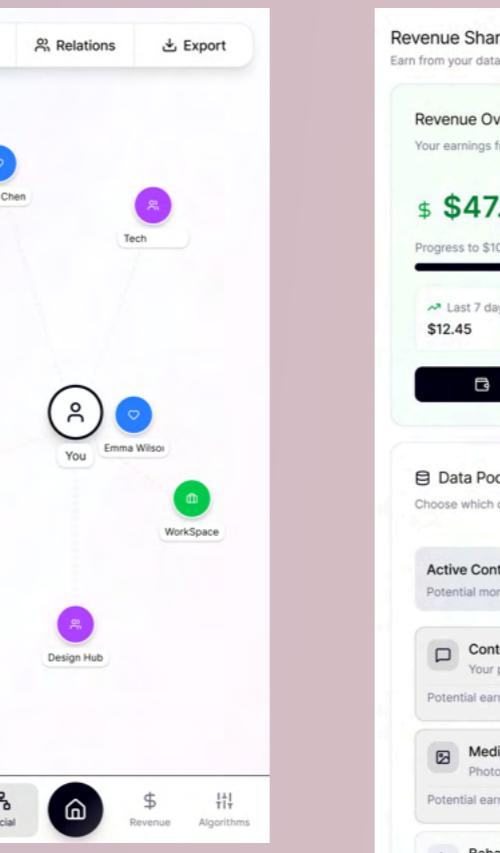
# Architecture



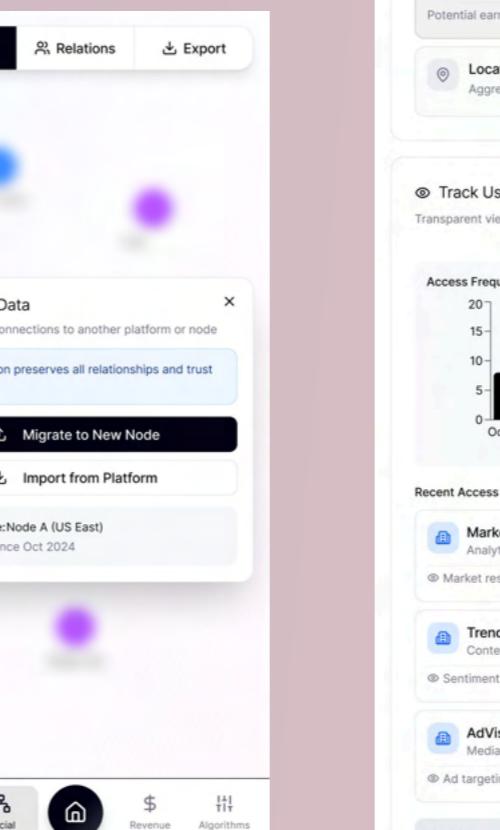
Log in



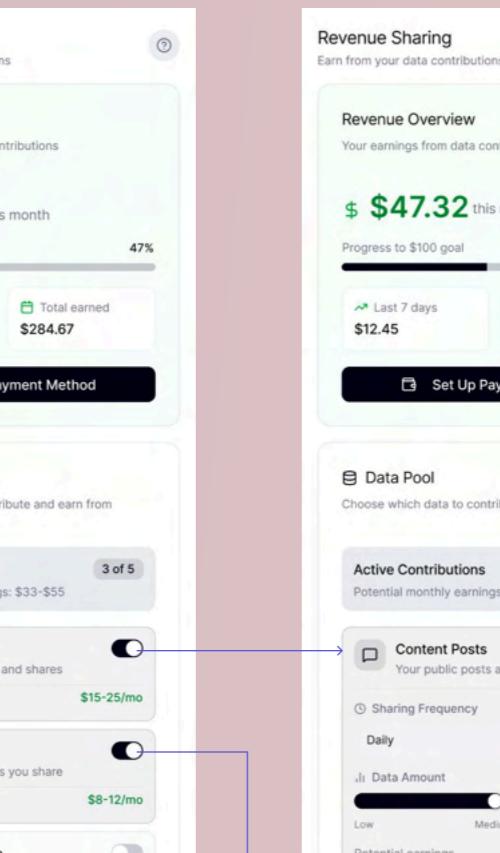
Homepage



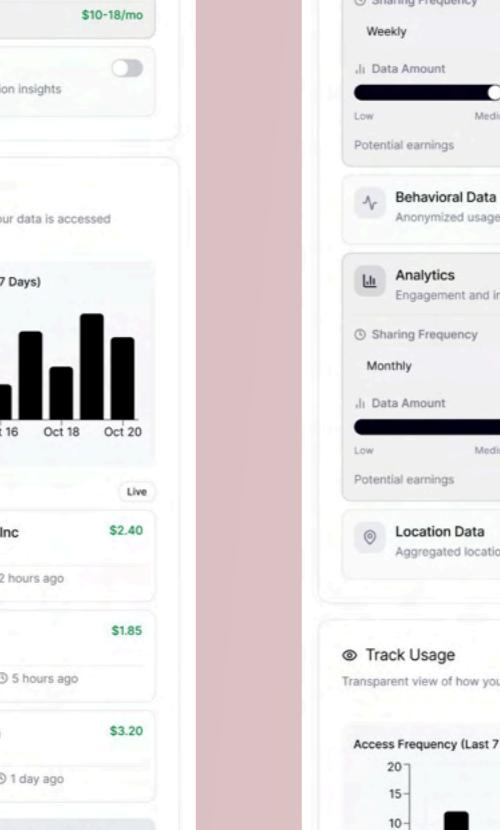
Social Graph



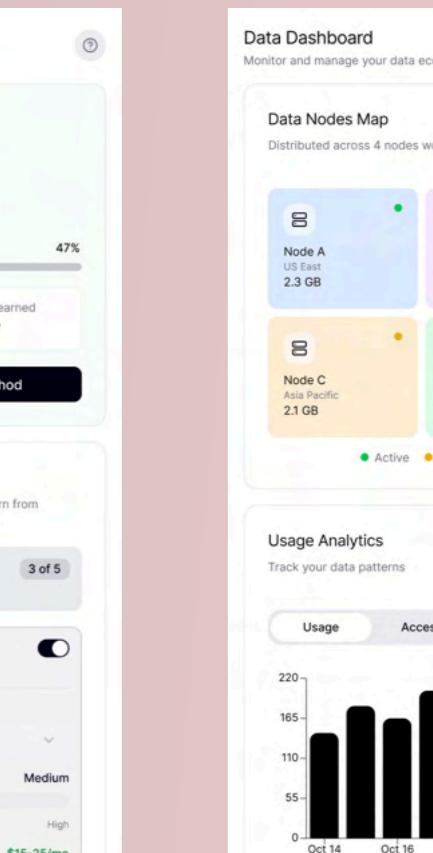
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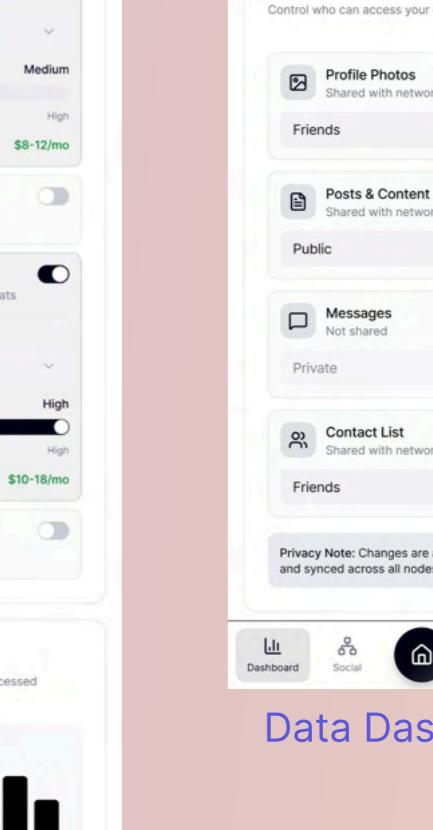
Revenue Sharing



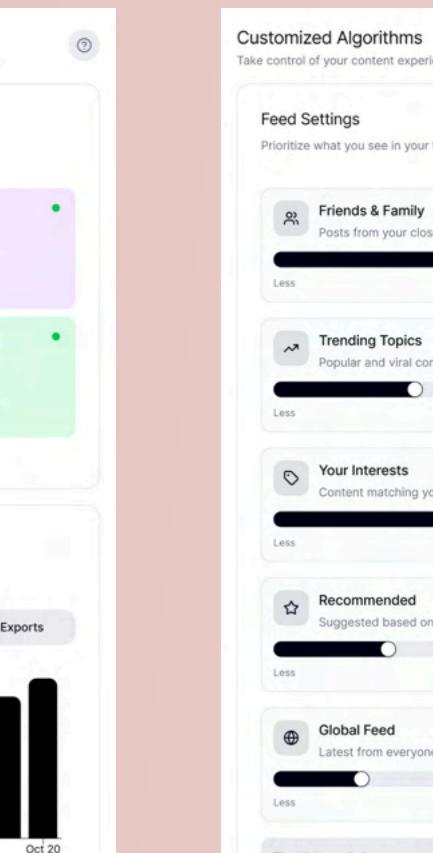
Social Graph



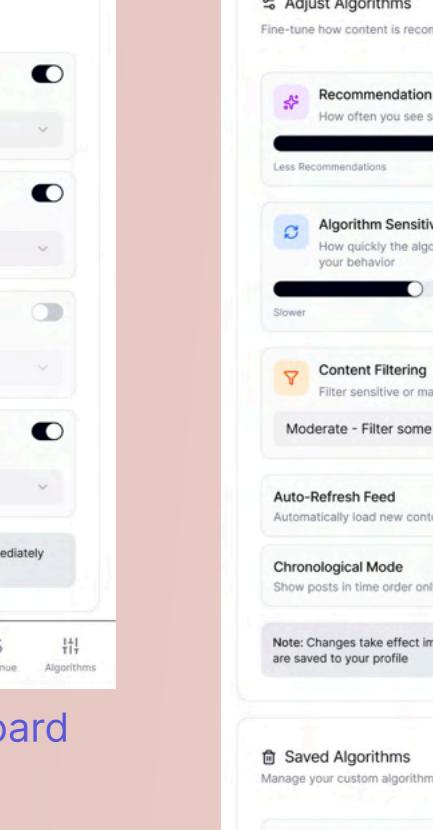
Data Dashboard



Data Dashboard



Customized Algorithms

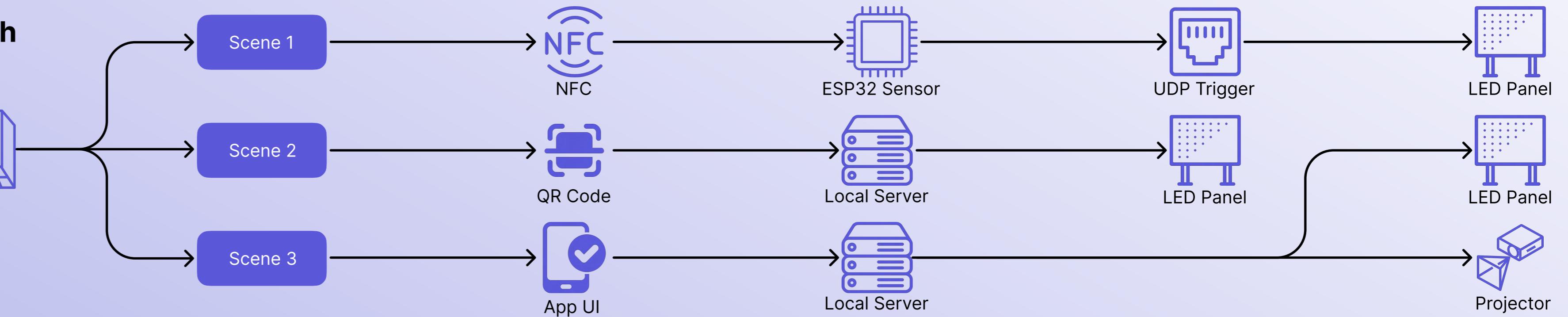


Customized Algorithms

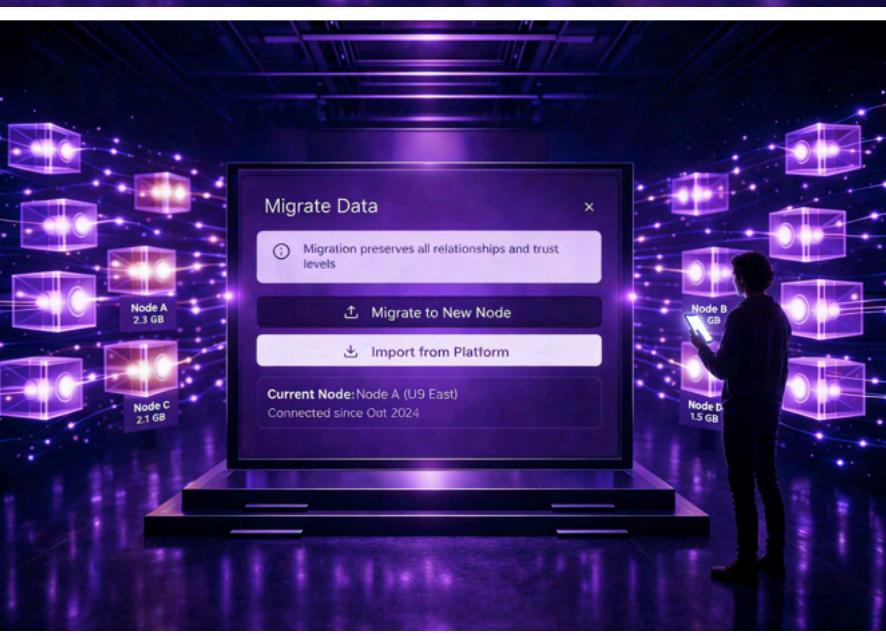
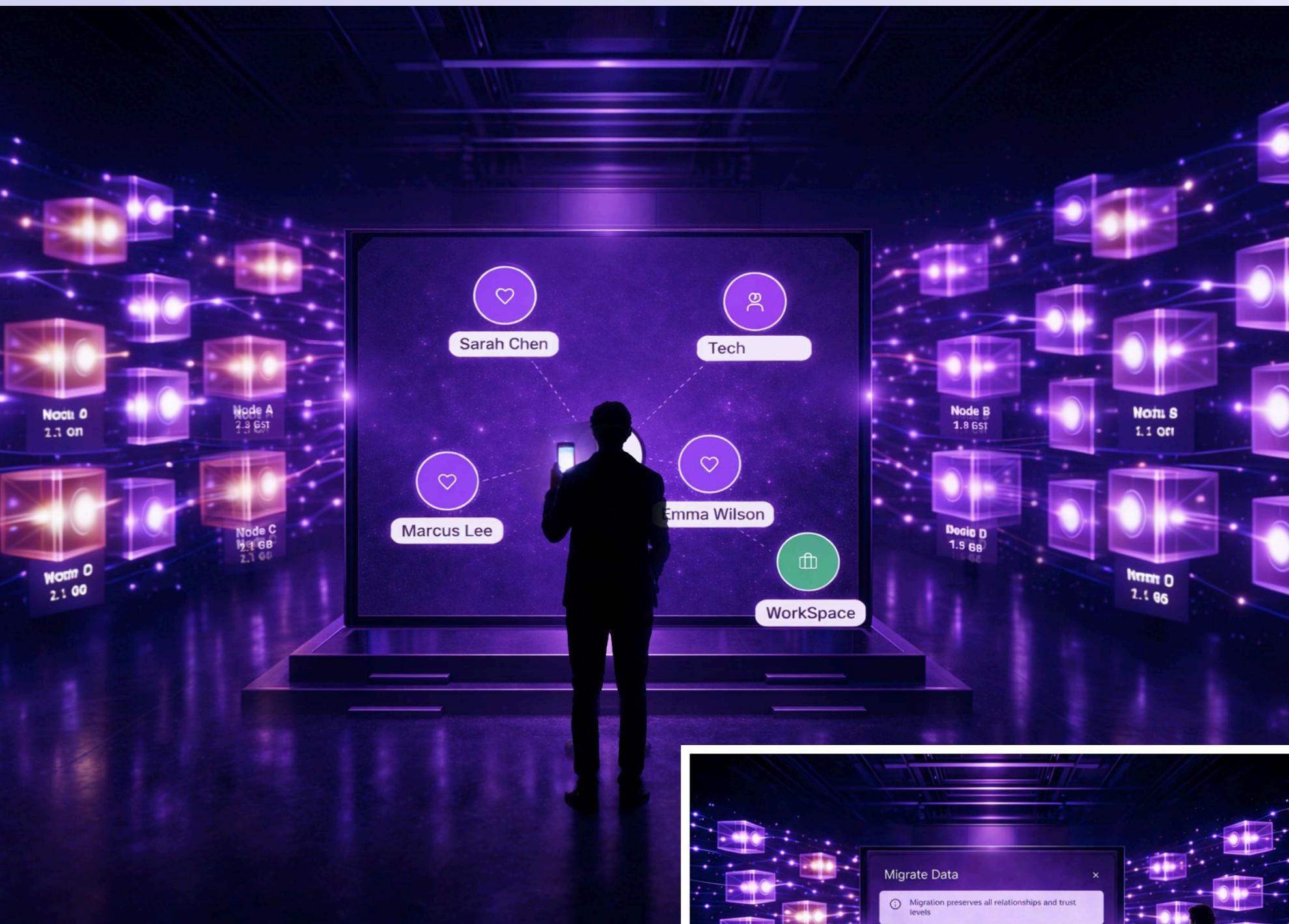
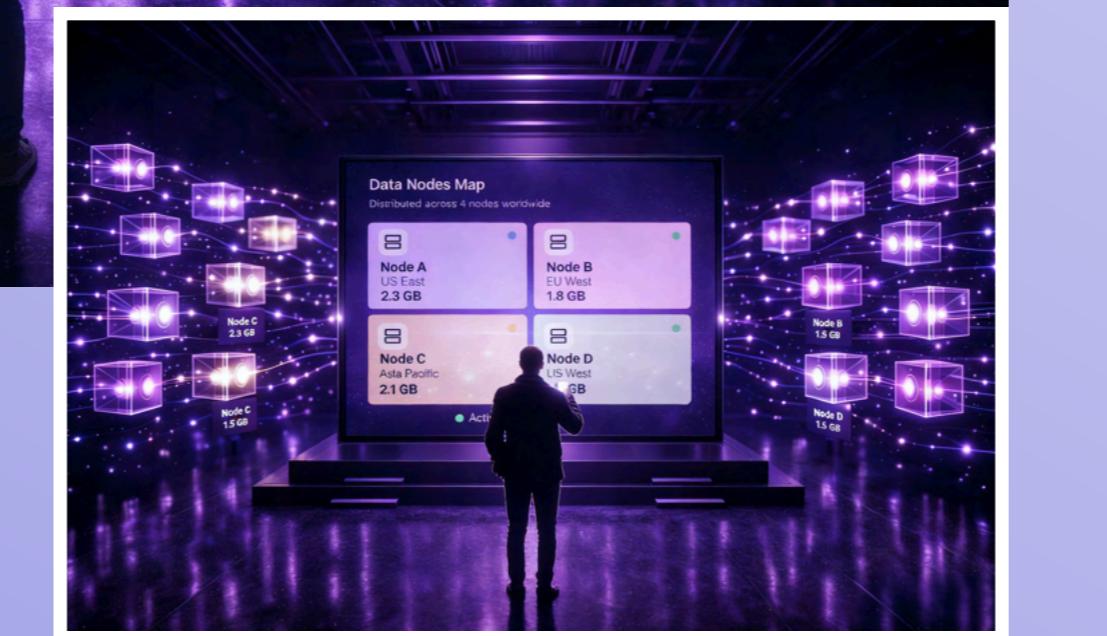
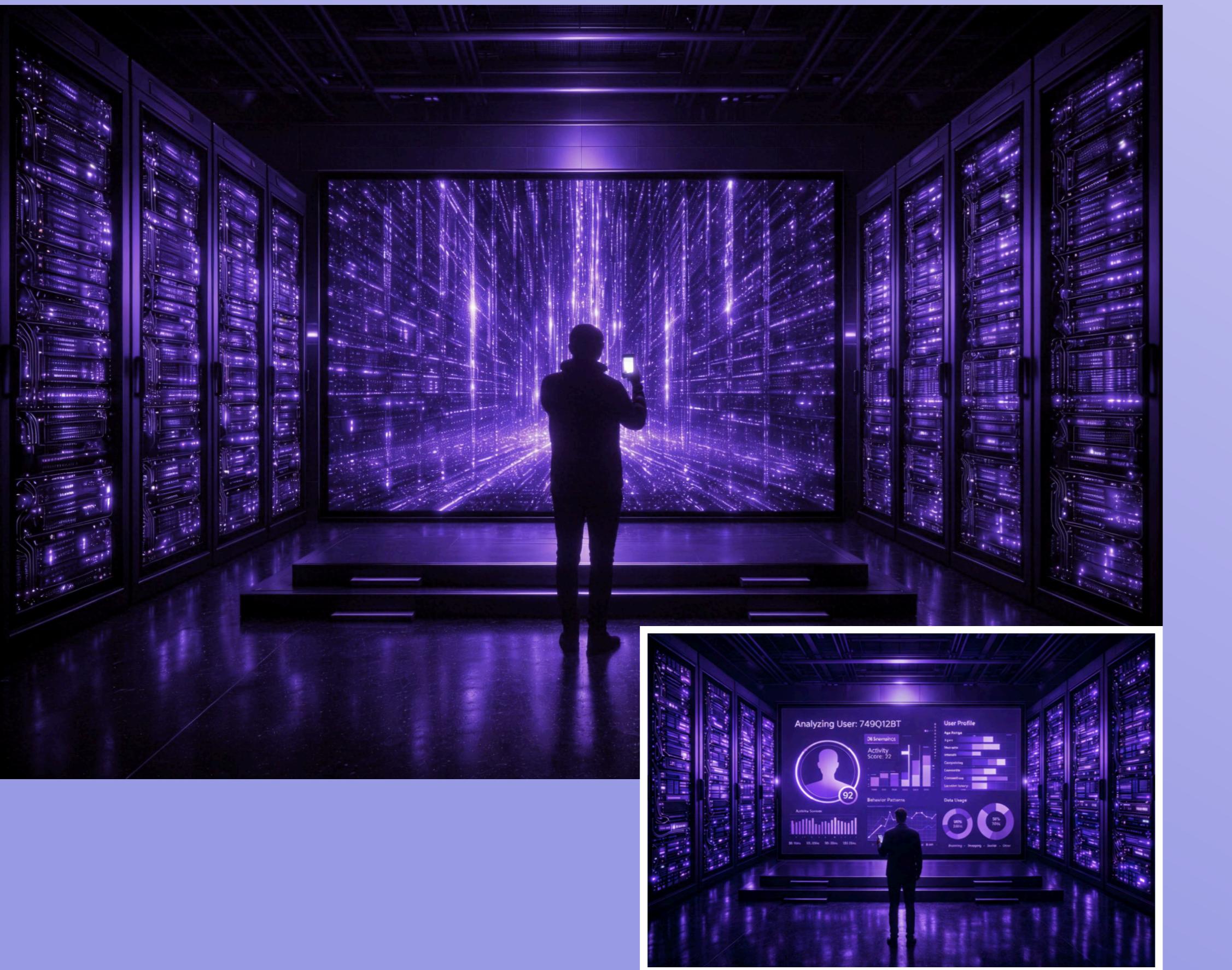
# Space Design

**Aim** By designing an interactive spatial experience, users can viscerally feel the journey of their personal data—from being confined to becoming fully liberated—gaining a deeper sense of data autonomy and understanding how the app serves as the tool that enables this transformation.

## Technology Research



**Space 1:** The state of data within centralized social apps



**Space 2:** Data moving from centralized systems to a decentralized app

**Space 3:** User experience of data permissions in various decentralized app features