



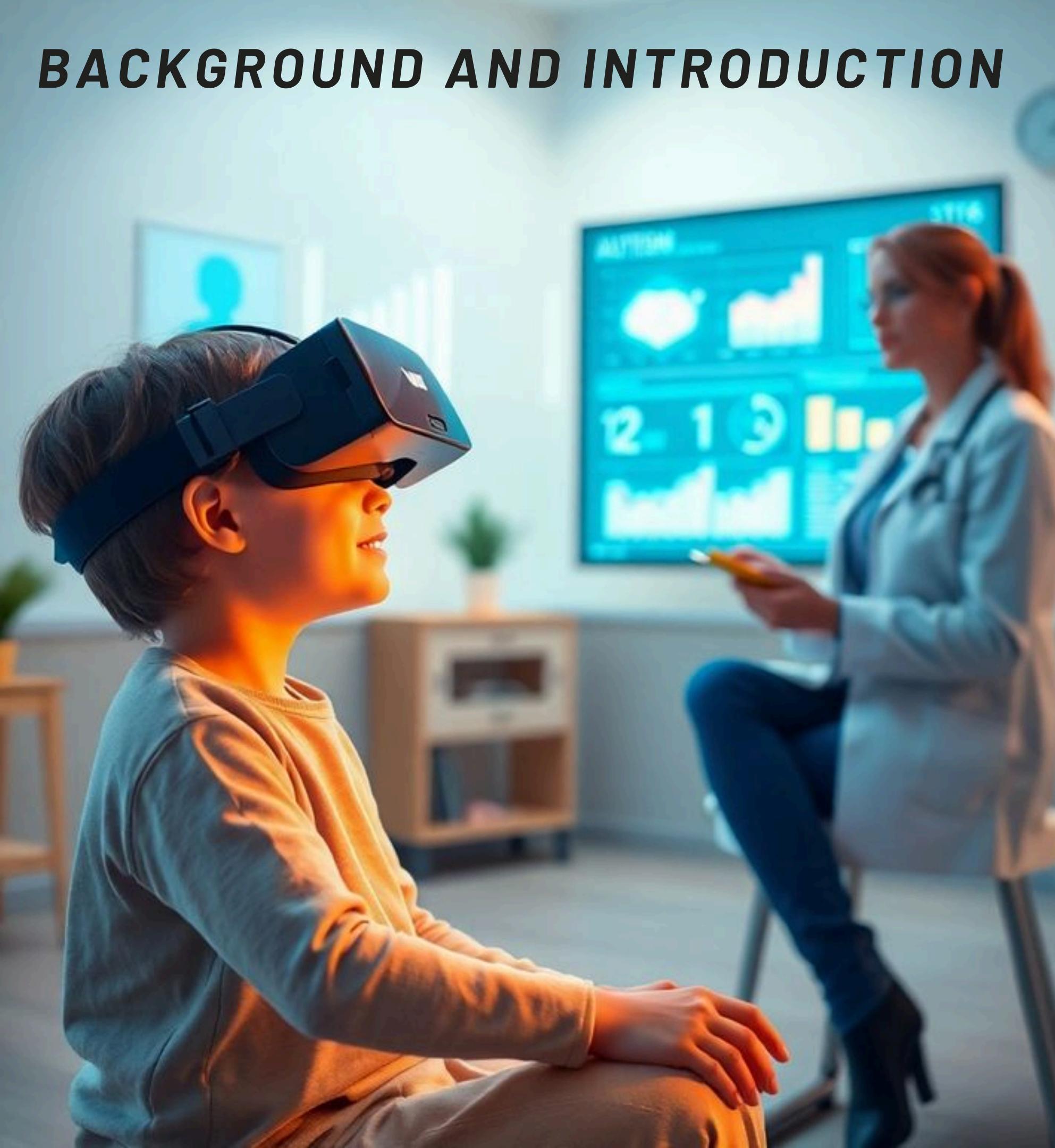
# CPT208 PORTFOLIO

**AUTISM RECOVER: BUILDING BRIDGES THROUGH AR**

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# BACKGROUND AND INTRODUCTION



## Topic Description

"Generative AI in Autism Rehabilitation" uses AI to aid autistic kids in the autism rehabilitation domain, creating personalized experiences with GAI and AR.



## Problem/Opportunity and Relevance

It tackles the lack of engaging, tailored tools for autistic kids, addressing social and sensory issues via human-centric computing, boosting engagement and life quality.

## Existing Work and Differentiation

Traditional autism rehab uses static behavioral therapy, lacking interactivity. This project adds GAI and AR, turning drawings into 3D scenes for an immersive, creative experience.



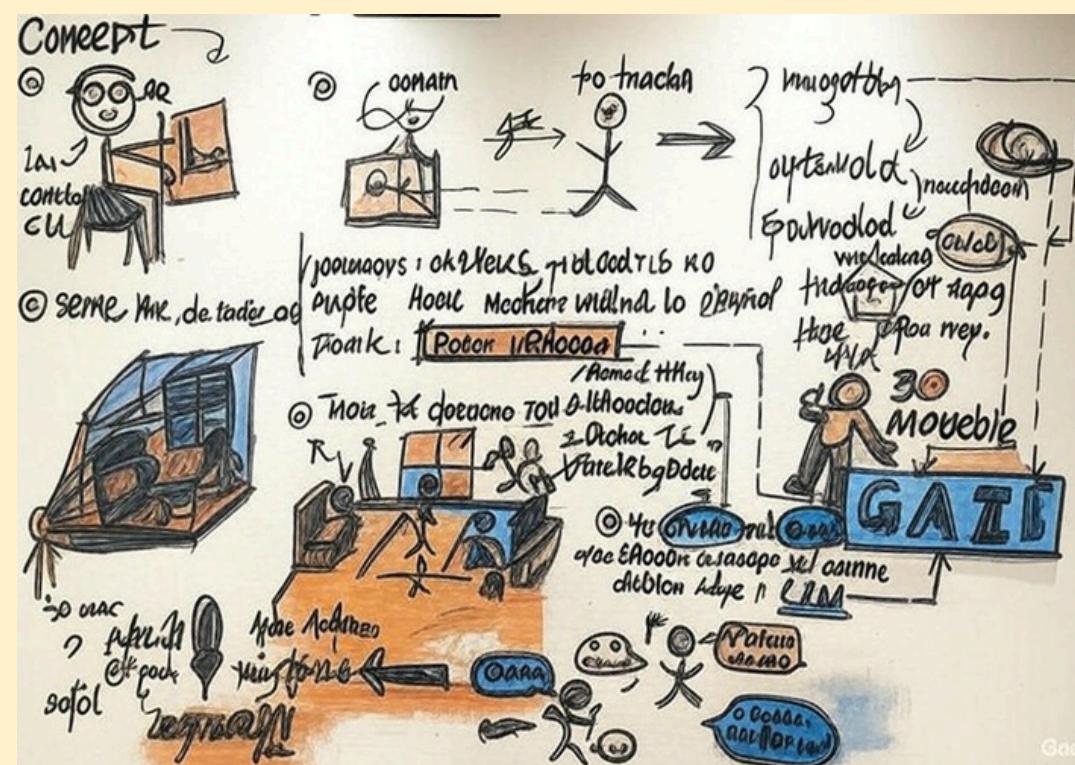
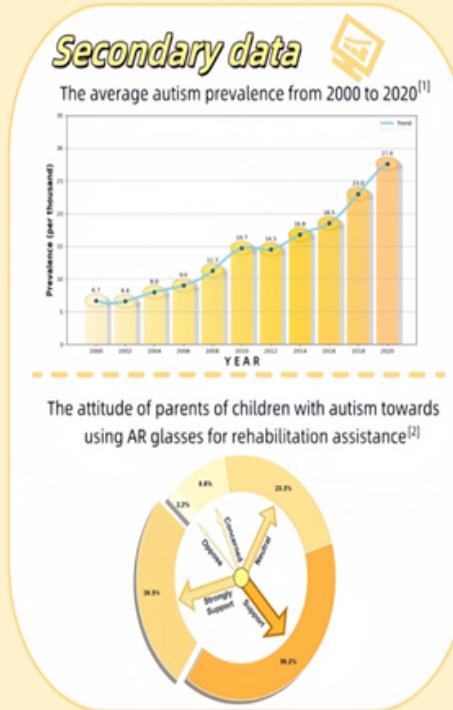
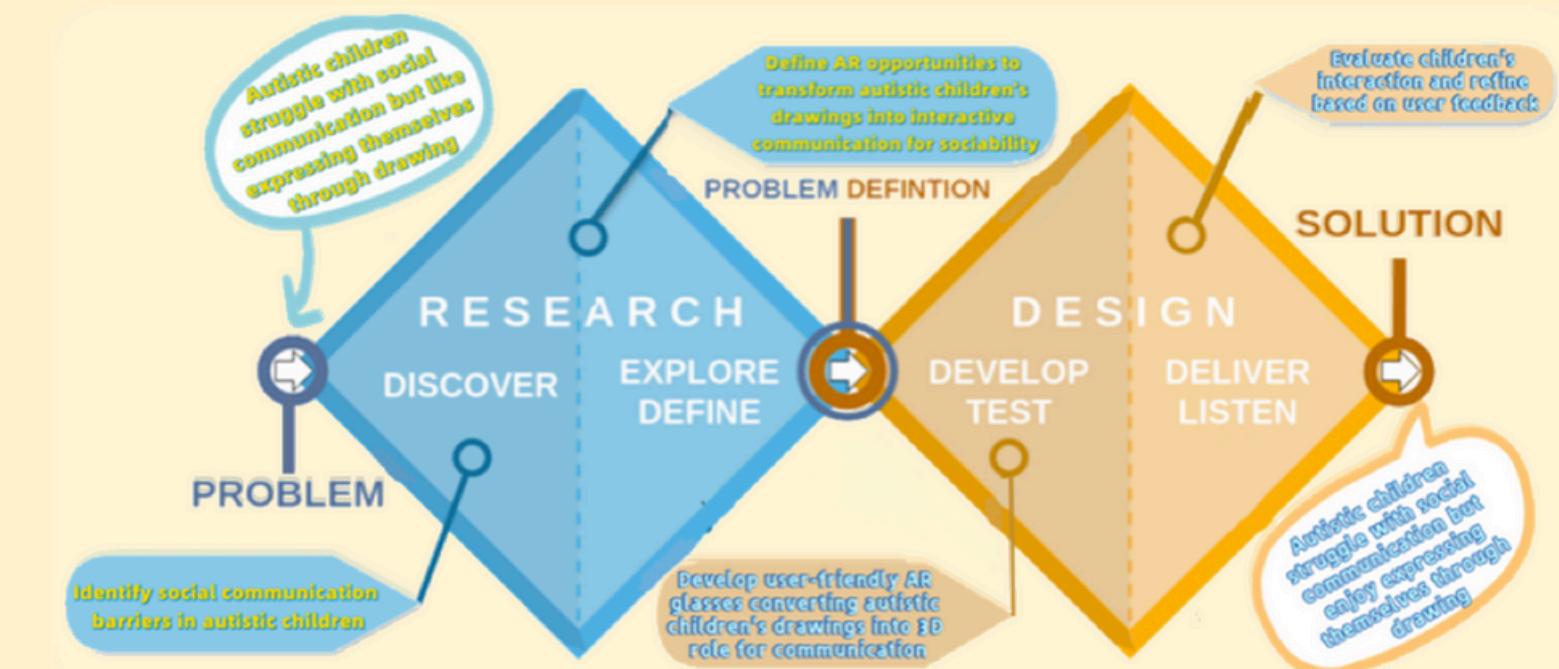
# Design and Methodology

## • PROCESS OVERVIEW, TARGET USERS, AND KEY REQUIREMENTS

THE DESIGN PROCESS FOR AUTISM RECOVERY TARGETS AUTISTIC CHILDREN AGED 5-12, WITH STAKEHOLDERS INCLUDING PARENTS, DOCTORS, AND TEACHERS. KEY REQUIREMENTS, GATHERED THROUGH INTERVIEWS, QUESTIONNAIRES, AND SECONDARY RESEARCH, INCLUDE ENGAGING INTERACTION, EMOTIONAL VALUE, AND ENCOURAGING SELF-EXPRESSION. THE PROCESS FOLLOWED THE DOUBLE DIAMOND MODEL AND INTERACTION DESIGN LIFECYCLE: DISCOVERING REQUIREMENTS, EXPLORING ALTERNATIVES, PROTOTYPING, AND EVALUATING.

## • APPROACH AND TOOLS

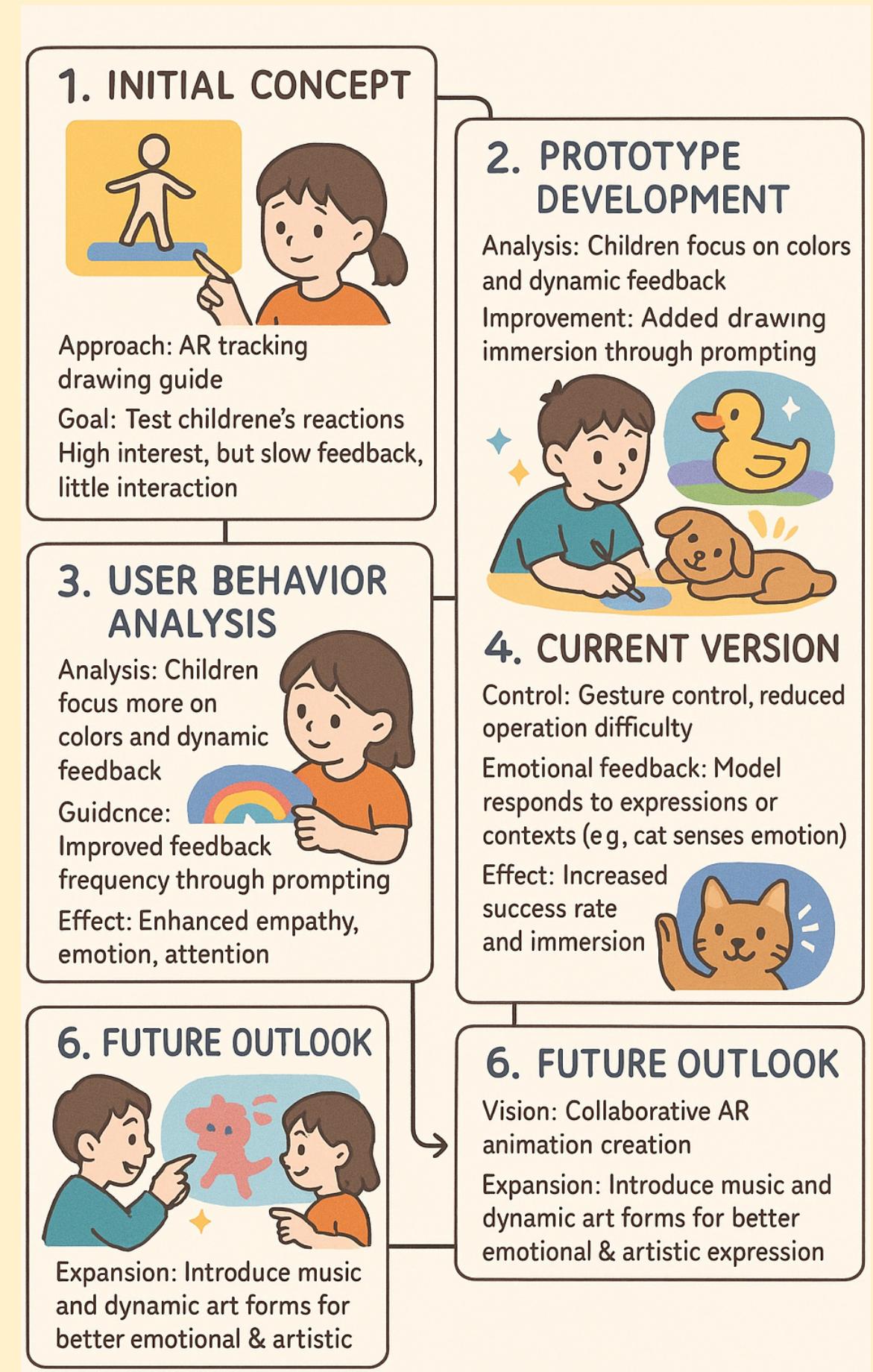
WE USED GENERATIVE AI (GAI) AND AUGMENTED REALITY (AR) TO TRANSFORM 2D DRAWINGS INTO INTERACTIVE 3D CHARACTERS. METHODS INCLUDED A/B TESTING FOR UI LAYOUTS, FOUR PROTOTYPING ITERATIONS (SKETCHING TO HIGH-FIDELITY), AND EVALUATIONS USING THE HEART FRAMEWORK, UEQ STANDARDS, HEURISTIC PRINCIPLES, SHNEIDERMAN'S RULES, AND USABILITY TESTING.



## • SYSTEM WORKFLOW

THE PROTOTYPING FOR AUTISMRECOVER INVOLVED FOUR ITERATIONS: SKETCHING, LOW-FIDELITY, HIGH-FIDELITY, AND FINAL REFINEMENT. THE PROCESS INCLUDED SIX STEPS: DRAWING ON A VIRTUAL CANVAS, GAI CONVERTING DRAWINGS TO 3D CHARACTERS, AR ANIMATING THEM, ENABLING INTERACTION VIA GESTURES/CONVERSATION, PROVIDING EMOTIONAL FEEDBACK, AND ADDING PLAYFUL ANIMATIONS. TWO PROTOTYPES (A AND B) WERE DEVELOPED—PROTOTYPE A FOCUSED ON EMOTIONAL CONNECTION WITH VIBRANT VISUALS, WHILE B PRIORITIZED SIMPLICITY BUT LACKED ENGAGEMENT.

# ITERATION

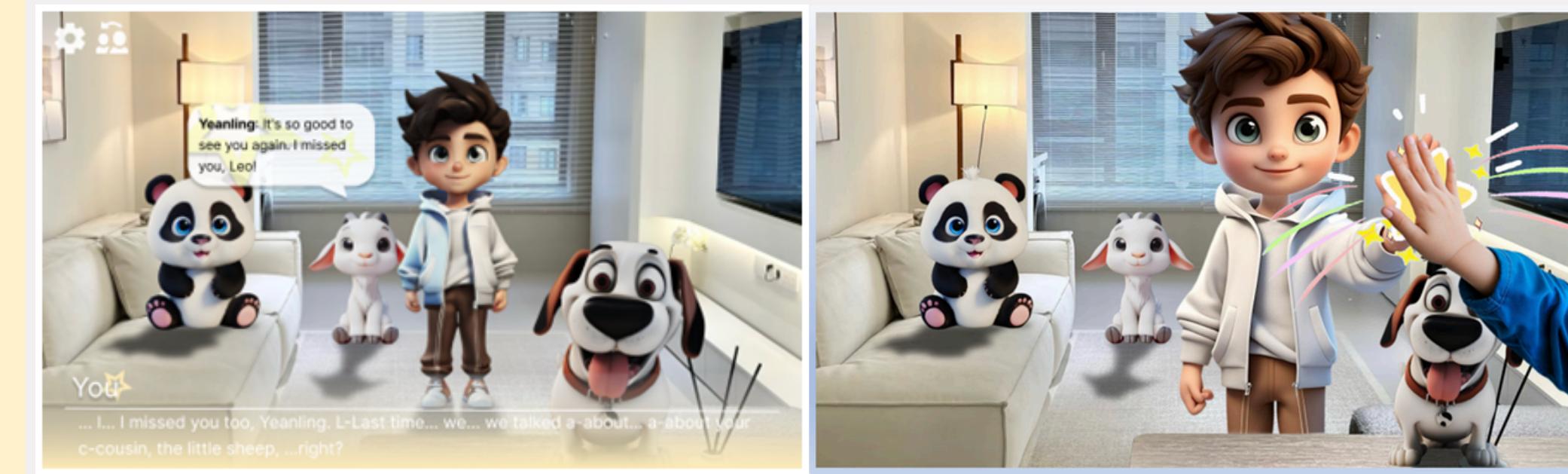
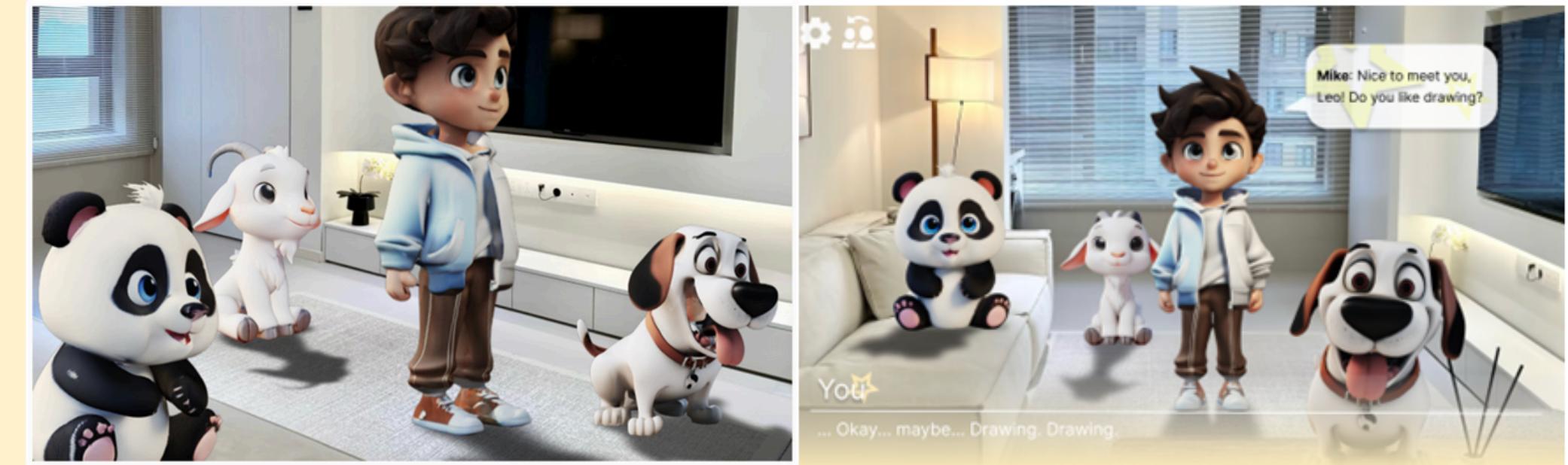
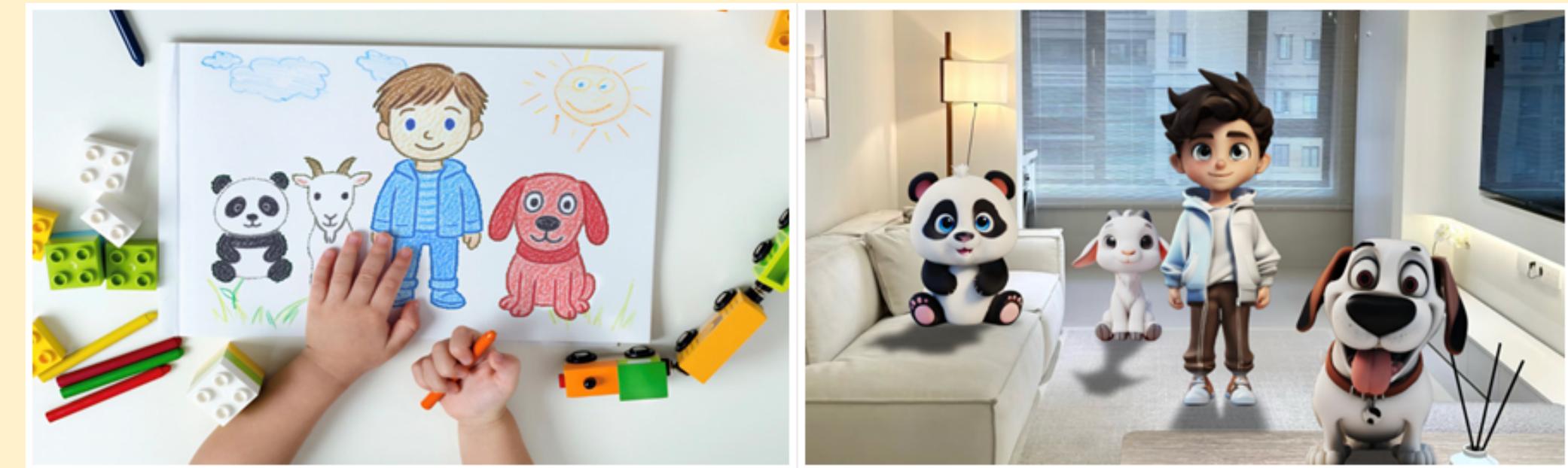


# PROTOTYPING AND IMPLEMENTATION

## PROTOTYPING AND IMPLEMENTATION PROCESS

The workflow includes six steps:

- Child draws on a virtual canvas.
- GAI converts the drawing into a 3D character.
- AR animates the character.
- Child interacts via gestures and conversation.
- Character provides emotional feedback.
- Playful animations enhance engagement.
- This cycle fosters communication and emotional connection for autistic children



# EVALUATION AND RESULTS

## Heuristic Evaluation & Shneiderman Rules

- Consistency and Standards
  - Consistent Color System
  - Offer informative feedback
- Follow platform standard
  - Match Between System and the Real World



## Evaluation-Usability Testing

- Thinking about the versions
- Interaction first VS content first
- Preferences of child's parents
  - ½ of the parents B → A
  - ¾ of the parents A → B
- Prototype A      Prototype B
- UEQ      UEQ
- HEART      HEART
- Prototype A      Prototype B
  - Text first      Friend first
  - Friend first      Text first



# DISCUSSION AND REFLECTION



IN THIS PROJECT, OUR TEAM (GROUP 35) GAINED A DEEP UNDERSTANDING OF THE IMPORTANCE OF COMBINING TECHNOLOGY WITH EMPATHY IN DESIGNING FOR AUTISTIC CHILDREN THROUGH HUMAN-CENTERED DESIGN METHODS. WE LEARNED TO BALANCE CREATIVITY AND STRUCTURE USING THE DOUBLE DIAMOND MODEL AND INTERACTION DESIGN LIFECYCLE, OPTIMIZING EMOTIONAL CONNECTION VIA USABILITY TESTING, HEURISTIC EVALUATION, AND THE HEART FRAMEWORK. HOWEVER, WE MISSED OPPORTUNITIES TO INVOLVE CHILDREN DIRECTLY IN THE EARLY STAGES AND TO EXPAND OUR TESTING SAMPLE. PERSONALLY, AS HAOTIAN ZENG, I CONTRIBUTED TO THE ITERATIONS FROM SKETCHES TO HIGH-FIDELITY PROTOTYPES, DESIGNED THE SIX-STEP PROTOTYPING FLOW (FROM DRAWING TO 3D CHARACTER INTERACTION), AND USED THE HEART FRAMEWORK AND HEURISTIC EVALUATION TO COMPARE PROTOTYPES A AND B, INCORPORATING USER FEEDBACK TO ENSURE THE DESIGN WAS ENGAGING, EMPATHETIC, AND CREATED A COMFORTABLE, MEANINGFUL EXPERIENCE FOR THE CHILDREN.



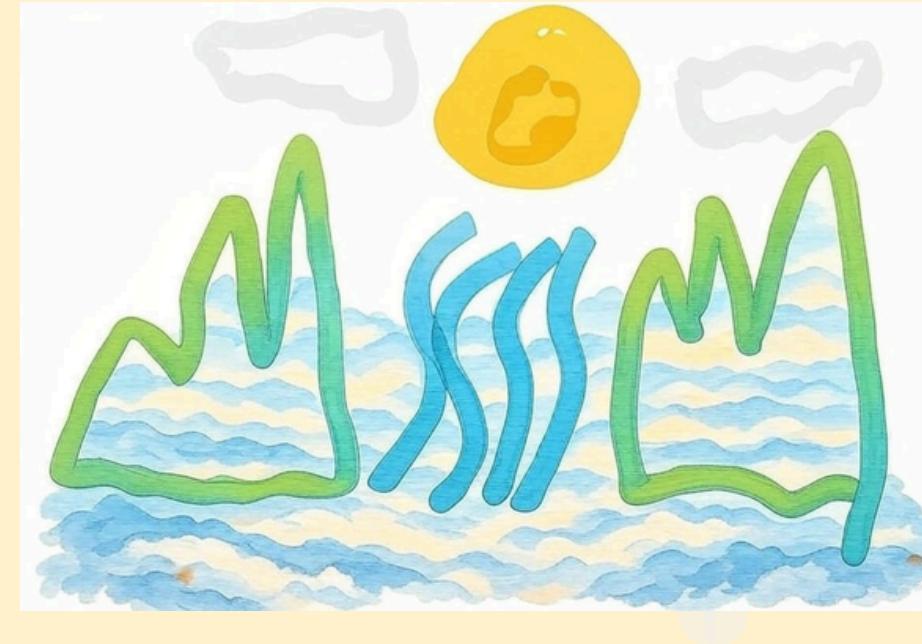
TO ENHANCE AUTISMRECOVER'S SUPPORT FOR CHILDREN WITH AUTISM, IMPROVEMENTS CAN BE MADE IN FIVE ASPECTS: STRENGTHENING PERSONALIZATION AND ADDING CHARACTER CUSTOMIZATION OPTIONS; ENHANCE SENSORY ADAPTABILITY AND ENABLE AR GLASSES TO ADJUST SETTINGS SUCH AS BRIGHTNESS; INTRODUCE A MULTI-PERSON INTERACTION MODE TO PROMOTE SOCIAL COOPERATION; IMPROVE THE ACCESSIBILITY FOR NON-VERBAL CHILDREN AND ADD INPUT METHODS SUCH AS EYE MOVEMENT TRACKING; ADD A LONG-TERM PROGRESS TRACKING FUNCTION TO PROVIDE INSIGHTS FOR PARENTS AND OTHERS. THIS WILL MAKE THE PRODUCT MORE INCLUSIVE AND EFFECTIVE, AND HELP CHILDREN WITH AUTISM GROW SOCIAILY AND EMOTIONALLY.



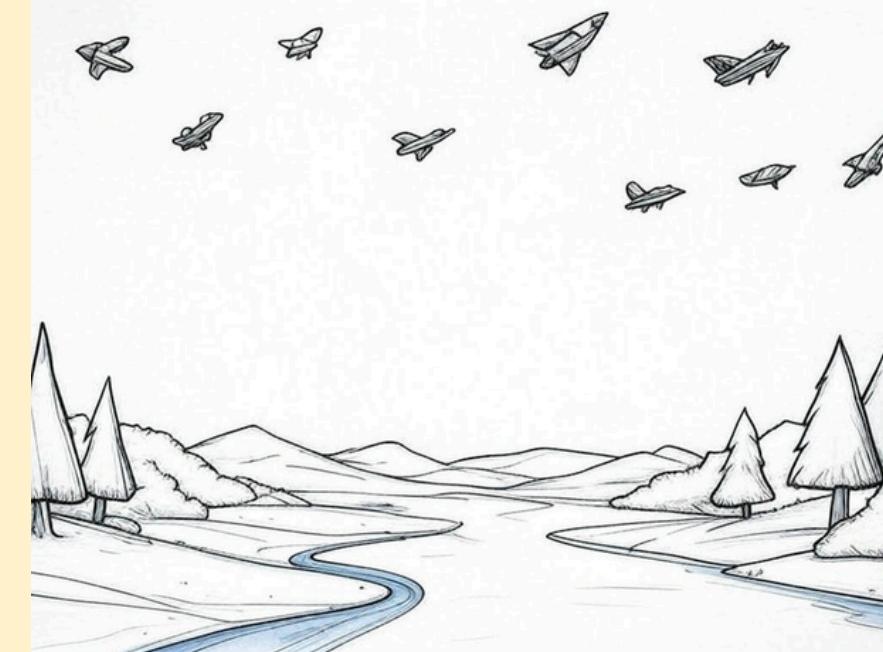
# FUTURE WORK

## HOW ABOUT DRAW THE BACKGROUND

If children spend something that cannot be transformed into characters, can it be turned into scenery and background



FIRST



FIRST

AI CHANGED



AI CHANGED



# FUTURE WORK2

## **HOW ABOUT ADD SOME MUSIC**

Music therapy may increase the likelihood of overall improvements at the end of treatment, and may also help improve quality of life and reduce symptom severity for children with autism.(Gold C, et al. 2018)

GOLD C, ET AL. (2018). MUSIC THERAPY FOR PEOPLE WITH AUTISM SPECTRUM DISORDER. COCHRANE DATABASE OF SYSTEMATIC REVIEWS. 2018(4).  
[HTTPS://DOI.ORG/10.1002/14651858.CD004381.PUB4](https://doi.org/10.1002/14651858.CD004381.PUB4).



# FUTURE EDITION DEMO



WHEN CHILDREN WITH AUTISM DRAW LANDSCAPES OR CHARACTERS FROM THEIR IMAGINATION, OUR PRODUCT TRANSFORMS THOSE DRAWINGS INTO IMMERSIVE, INTERACTIVE ENVIRONMENTS. THIS ALLOWS THEM TO STEP INTO THE WORLD THEY CREATED, OFFERING A JOYFUL AND EMPOWERING EXPERIENCE. IT ALSO PROVIDES A SAFE SPACE FOR SELF-EXPRESSION, HELPING TO FOSTER COMMUNICATION SKILLS AND ENCOURAGE SOCIAL INTERACTION.

THANK YOU TO PROFESSOR MA TENG, PROFESSOR LI YUE, AND ALL THE TAS FOR YOUR HELP AND SUPPORT.