Isabella Pu

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RESEARCH OVERVIEW

With today's meteoric rise of AI, children are immersed in powerful and exciting technologies. However, if technology is not designed responsibly or used without sufficient understanding, it has the potential to cause harm, especially to vulnerable populations like children. My research investigates how **social robot and AI systems help K-12 students learn through creative interactive experiences that combine AI with the arts**—such as visual art, storytelling, and music. Specifically, I focus on harnessing these technologies to encourage creative learning, explore human-technology artistic co-creation, and empower the next generation to solve the problems they care most about using AI and robots. I also have a special interest in ensuring these technologies are *accessible* and *understandable* to all, especially students of historically excluded communities.

EDUCATION

2023–25 **M.S.** in **Media Arts & Sciences**, Massachusetts Institute of Technology
Advised by Cynthia Breazeal
Thesis: *Interactive Storybooks for Early AI Literacy*
Committee: Cynthia Breazeal, Scot Osterweil, Joe Blatt

2019–23 **B.S.E** in **Computer Science**, Princeton University, *magna cum laude*
Certificate in **Robots & Intelligent Systems**
Advised by Naomi Leonard, Jeffrey Snyder, and Radhika Nagpal
Thesis: *A Robotic Generative Percussion Quartet*

PUBLICATIONS

Conference Proceedings

2024 A HeARTfelt Robot: Social Robot-Driven Deep Emotional Art Reflection with Children
Isabella Pu, Golda Nguyen, Lama Alsultan, Rosalind Picard, Cynthia Breazeal, Sharifa Alghowinem.
RO-MAN 2024
Winner of *RSJ Pioneering Research Award in Robot and Human Interactive Communication*

RESEARCH EXPERIENCE

2024– **Emotional Storytelling with Social Robots for Social-Emotional Learning**

Advisor: Cynthia Breazeal, Sharifa Alghowinem

Developing a new social robot-driven platform for children age 5-8 that facilitates an emotional storytelling activity guided by social robot and using physical props. Through this interaction, we aim to explore the effects of emotional storytelling and embodiment (in both the robot guide and the props used for emotional storytelling) for practice of social-emotional competencies.

2023– **Interactive Storybooks for Early AI Literacy**

Advisor: Cynthia Breazeal

Leading a team of engineers, designers, and education specialists to build a series of interactive storybooks that teach concepts of artificial intelligence and robotics, particularly in creative AI contexts, to children in primary grades (K-3). They combine storytelling, games, and AI character interactions to teach students

concepts such as machine learning models, affective computing, generative AI, and AI ethics. We ran a pilot study with 40+ students, finding that students are particularly engaged by the storytelling and game aspects, and that the storybooks successfully help students grasp basic AI concepts. Future studies will investigate the specific individual effects of narrative, games, and AI character interactions on student engagement, learning, empowerment, and disposition.

This work will culminate in my Master's thesis (est. May 2025).

2023– ***Doodlebot:*** **Educational Robotics Curricula for Creative AI Education**

Advisor: Cynthia Breazeal

Working with a team of designers and engineers on development of Doodlebot, an affordable social robot for the classroom. Doodlebot can be easily programmed by students using either drag-and-drop coding blocks or Python to draw different shapes, interact socially, and utilize AI models. Doodlebot will be used for in-development curricula that teach K-12 students about robots and AI.

2023–24 ***A HeARTfelt Robot:*** **Social Robot-Driven Deep Emotional Art Reflection with Children**

Advisors: Rosalind Picard, Cynthia Breazeal, Sharifa Alghowinem

Designed and developed a child-robot interaction with the Jibo social robot where children age 7-11 discuss art with the robot as a method of practicing social-emotional competencies like emotion recognition and empathy. We found that children are highly engaged in robot-driven social-emotional learning, even when sharing vulnerably or feeling discomfort, and that the robot's dynamic AI-generated responses helped alleviate their discomfort when sharing vulnerably.

Published at RO-MAN 2024 and winner of RSJ Pioneering Research Award in Robot and Human Interactive Communication.

2023–24 **Empowering High School Students in GenAI for Education: A Participatory Design Approach Informed by Teacher Insights**

Advisors: Cynthia Breazeal, Anastasia K. Ostrowski

Through the SERC (Social and Ethical Responsibilities of Computing) program at MIT, led a Design Justice sub-group focused on participatory design of generative AI in education addressing the lack of high school student involvement in participatory design of GenAI technology. Conducted teacher interviews to inform a design workshop with high schoolers, leading to insights on teacher and student values around GenAI in education and the creation of seven GenAI design and use guidelines for high schools.

2023–24 ***EmoToon:*** **Empowering Storytellers Using Emotion-AI Driven Comic Storyboarding**

Advisors: Cynthia Breazeal, Sharifa Alghowinem, Hae Won Park

Designed and built a human-AI co-creative tool for empowering nonexpert storytellers and artists to create emotional comic storyboards using generative AI. We found that storyboard and comic authors perceived their emotional expression, aesthetic quality, freedom of exploration, and self-confidence to be improved when using our tool as opposed to drawing freehand.

2023–24 **Collaborative Storybook Creation with AI for Elementary School**

Advisor: Safinah Ali, Cynthia Breazeal

Designed and built a collaborative child-robot storybook creating experience using generative AI. The experience is scaffolded to help children improve divergent thinking and encourage complex stories. Used Unity to develop a tablet app from scratch for children to easily participate in the co-creation experience.

2023–24 **Climate Data Exploration & Visualization Curriculum for High School**

Advisor: Matt Taylor, Cynthia Breazeal

Developed curriculum for high school students (and educator guide) to learn how Python can be used to explore and visualize climate data. The curriculum also includes a beginner's guide on using linear regressions and SVMs as predictive models for climate data as well as modules on how to communicate data stories using data theatre. Curriculum was published online for free during Day of AI 2024 in May 2024 to students in 114 countries and all 50 U.S. states.

2022–23 **Generating Percussion Music with a Multi-Agent Robotic System**

Advisors: Naomi Leonard, Jeffrey Snyder, Radhika Nagpal

Designed and developed a robotic percussion quartet using Sphero BOLT robots. Robots performed live by maneuvering through an arena and colliding against frame drums and tambourines along the walls to play coordinated generative percussion music. Audience members interacted with robots by picking them up, adding obstacles, and playing a MIDI keyboard to change robots' colors and movements.

My undergraduate senior thesis work was sponsored by the Princeton School of Engineering and Applied Science and the Princeton Council on Science and Technology.

2021–22 **Educational GANs Animation for Vancouver Art Gallery**

Advisor: Adam Finkelstein

Designed and coded two five-minute animations targeting non-technical audiences, teaching viewers about training GANs and demonstrating it in an easily understandable manner. Trained and optimized GANs to generate handwritten digits and photographs of cat faces to create assets for the animations. Animations displayed in *The Imitation Game* exhibit at the Vancouver Art Gallery from 03/05/2022 - 10/23/2022.

PROFESSIONAL EXPERIENCE

2021–23 **Software Engineering Summer Intern**, Blizzard Entertainment (Player Interactions & Trust). Irvine, CA.

Projects included developing neural networks to predict player churn based on disruptive behavior and building data pipelines for an industry-first positive player behavior analysis platform—implemented in multiplayer online games with millions of players (Overwatch, World of Warcraft)

2020–23 **Undergraduate Course Assistant/Grader**, Princeton University. Princeton, NJ.

Fall 2020: *Introduction to Programming Systems*

Spring 2021: *Introduction to Machine Learning*

Fall 2021: *Computer Vision*

Spring 2022 and 2023: *Economics and Computation*

2016–19 **Kid Code Teacher**, The Westminster Schools. Atlanta, GA.

Taught Scratch and basic Python coding to 2nd through 5th graders at after-school program.

AWARDS AND HONORS

2024 RSJ Pioneering Research Award in Robot and Human Interactive Communication, RO-MAN 2024

2023 Outstanding Undergraduate Thesis in Computer Science, Princeton University

2023 Sigma Xi Membership, Princeton University

TEACHING

2023 Guest talk, COS IW Seminar: *Swarm Intelligence: Ants, Bees, Fish, and Humans* (Princeton University)

VOLUNTEERING

2020–23 *President*, Princeton Women in Computer Science. Princeton, NJ.

2020–22 *FIRST Robotics Competition Mentor*, Robbinsville High School. Robbinsville, NJ.

Updated November 2024