PRERNA RAVI

PhD Student: MIT CSAIL | prernar@mit.edu |
https://prernaravi.com | linkedin.com/in/prerna-ravi | Google Scholar

Education:

MASSACHUSETTS INSTITUTE OF TECHNOLOGY | CAMBRIDGE, MA
Doctor of Philosophy (PhD), Computer Science (2022-Present)

- Affiliated Labs: MIT CSAIL, MIT Media Lab (Personal Robotics Group)
- Advisors: Hal Abelson and David Karger

GEORGIA INSTITUTE OF TECHNOLOGY | ATLANTA, GA
Bachelor of Science, Computer Science (2018-2022)

- GPA: **4.0/4.0** (Highest Honors)
- Concentration: **Intelligence** and **Human Computer Interaction**
- Advisors: Thad Starner, Neha Kumar, and Betsy DiSalvo

Research Experience:

RESEARCH ASSISTANT | MIT CSAIL & MIT MEDIA LAB | SEPTEMBER 2022 – PRESENT

- Current Research Projects: I am collaborating on and leading parts of the following projects currently at MIT:
  - Sparki | Interactive Learning Companion for AI Education
    - Advisor: Cynthia Breazeal
    - S.P.A.R.K.I. (Students' Personal Assistant for Reinforcing Knowledge and Innovation) is a GPT-powered chatbot that scaffolds children's work on AI projects. Sparki provides programming assistance, gives students feedback on their ideas, and socially mediates creative thinking. Measured the effectiveness and usability of Sparki through evaluative user studies.
  - Generative AI Curriculum for K12 Students and Educators
    - Advisors: Hal Abelson, Cynthia Breazeal
    - This curriculum focusses on making generative AI knowledge as well as tools accessible to everyone, regardless of background and age group, using both interactive (plugged) and non-interactive (unplugged) resources. Developed, taught, and investigated the long-term effectiveness of generative AI educational programs tailored for adult learners, policy makers, as well as K-12 educators and students. Initiatives also include conducting professional development workshops for K-12 teachers on the integration of generative AI into classroom settings.
    - Deployments:
      - MIT Special Topics Course Fall 2023: Generative AI in K12 Education
      - MOOC on Impact and application of Generative Artificial Intelligence within Education
      - ISLS Workshop: Demystifying Text-to-image Generation for K12 Educators
      - MIT IAP Seminar 2023: Introduction to Text-to-Image Generation for K12 Education
  - MIT App Inventor | Mobile App Programming Environment
    - Advisor: Hal Abelson
    - MIT App Inventor is an intuitive, visual programming environment that allows everyone (including children) to build fully functional apps for phones and tablets. The project seeks to democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation. Developed extensive curricula and teacher professional development resources on the use and integration of App Inventor within diverse contexts.
  - Aptly | Generative AI Platform for Mobile App Development
    - Advisor: Hal Abelson
    - Aptly is a generative AI platform within MIT App Inventor that transforms written or spoken natural language descriptions into working mobile apps, thus empowering people with no coding or knowledge of programming. Aptly poses challenges for research in computational thinking education for K-12 students.
  - NB | Social Annotation Platform for Large-scale Classroom Collaboration
    - Advisor: David Karger
    - NB is an in-place document annotation platform that enables and encourages students and faculty to collaboratively author and discuss questions, comments, and answers in the margins of course resources. Conducted multiple user studies and experiments, through the collection of qualitative and quantitative data, to guide the ideation, prototyping, and, and development of new features within NB as well as inform the revamping of large-scale (1000+ students) course resources and curriculum.

- MIT Responsible AI for Computational Action (RAICA) | Project-based K12 AI Curriculum
  - Advisors: Hal Abelson, Cynthia Breazeal, Eric Klopfer
  - RAICA focusses on growing middle-school students' skills as informed consumers and ethical producers of AI tools and technology through computational action. The curriculum is project-centered: students produce authentic learning artifacts by the end of each module and their learning is driven through explorations. Developed frameworks to assess fundamental computational thinking and AI literacy skills and conducted in-depth, iterative analysis to evaluate the efficacy of the curriculum.
- K12 Data Science Curriculum and Toolkit for Environmental Data Collection and Analysis using Micro:bits | Day of AI 2024
  - Advisors: Hal Abelson, Cynthia Breazeal, Eric Klopfer
  - This curriculum and toolkit aims to educate students on the fundamentals of collecting, analyzing, and visualizing data collected from the environment. It will provide students with a framework needed to plan investigations for real-world challenges and prepare them to share the evidence obtained using IoT sensors and MIT App Inventor. Built tools and scaffolded resources, in combination with plugged and unplugged activities, to make this data science literacy accessible to both middle and high school students. Developed professional development materials for educators to seamlessly integrate and adapt these in their classrooms.
- Generative AI Tutor | Personal Pedagogical Agent for Underrepresented College Students in Intro to Computing
  - Advisors: Hal Abelson, Cynthia Breazeal
  - This generative AI powered tutor aims to promote culturally relevant, equitable education in introduction to programing courses by acting as a personal pedagogical agent to students from marginalized contexts. Designed tutor interactions that enhance student learning outcomes within diverse learning environments. Investigating the capabilities of Large Language Models (LLMs) in understanding and critiquing student-written solutions, providing detailed, scaffolded feedback, and the impact of different forms of model-generated feedback on student learning and problem-solving strategies.

DESIGN RESEARCHER INTERN | MICROSOFT | MAY 2023 – AUGUST 2023

- Research in generative AI tools for neurodivergent and motor disability groups within Microsoft's Windows + AI UX research team.
- Deployed a foundational accessibility study to investigate the delighters and pain-points that people with disabilities encounter when using personal devices as well as AI tools. Also investigated their perceptions, expectations, and ethical concerns when using AI platforms.
- Designed and employed qualitative methods: surveys, unmoderated diary missions, and semi-structured interviews—to collect the above data and used deductive coding analysis to draw emerging trends between the two user groups.
- Conducted co-design workshops to inform future directions for the integration of generative AI platforms into the Microsoft Windows ecosystem.

RESEARCH INTERN | GOOGLE | *JANUARY 2022 – APRIL 2022*

- Research in American Sign Language (ASL) Recognition at **Google Research's Perception Team**, under the guidance of wearable computing pioneer Dr. Thad Starner.
- Collected and annotated over **1 million** videos for an ASL fingerspelling dataset in collaboration with the National Technical Institute for the Deaf (NTID) and DPAN (Deaf Professional Arts Network) for PopSign.
- Built an automated **data processing** pipeline for extracting features and tracking movement using **pose estimation** tools: Google MediaPipe.
- Led the development, training, testing and fine tuning of multiple models-- Hidden Markov Models (**HMMs**), Long Short-Term Memory models (**LSTMs**), and **Transformers**-- used for fingerspelling sign recognition.

Google Research Blog at I/O 2023: Technologies for inclusive and fair ML applications | YouTube Video

RESEARCH ASSISTANT | GT UBIQUITOUS COMPUTING LAB | *JANUARY 2019 – MAY 2022*

- Research in **Contextual Computing**, at Georgia Tech, under the guidance of **Dr. Thad Starner**.
- Developed an **American Sign Language Recognition (ASL) System** through the CopyCat game in **Unity** with **C#** to improve communication between the deaf children and the hearing using **Computer Vision** tools – Microsoft **Kinect**, Google **MediaPipe** and **AlphaPose**.
- Built a calibration feature in Unity using the **Azure Kinect 4K depth** camera to create a real-time motion capture system (body, hands and face) for ASL signers.
- Achieved an accuracy of **90.6%** for a recognition pipeline built using pose-estimation and **Hidden Markov Models (HMMs).**

RESEARCH ASSISTANT | GT TANDEM LAB | *MAY 2020 – OCTOBER 2021*

- Research in Human Centered Computing and Global Development at the **Technology and Design for Empowerment on the Margins** (TanDEm) Lab under the guidance of **Dr. Neha Kumar**.
- Conducted **empirical** and **ethnographic** studies to examine the transition into online learning within the education system for underserved communities in India, during the COVID-19 pandemic.
- Employed **qualitative methods** such as **interviews** and surveys to **study** the workflows and social dynamics across different sectors and intersections of the Indian population such as class, gender and caste.

- Outlined areas for improvement in the **design of online learning platforms**, by partnering with students, teachers, non-profit organizations and school administrators within marginalized contexts.

RESEARCH INTERN | AVANTI FELLOWS | *JUNE 2021 – OCTOBER 2021*

- Research Intern at Avanti Fellows, an **educational technology**-based startup guided by **Dr. Neha Kumar**.
- Organized a **girls' leadership and mentorship program** for high school girls of low-income backgrounds from central schools for students predominantly from rural areas in India, in partnership with LedBy Foundation to facilitate equitable access to high-quality college education and accelerate professional growth.
- Conducted **ethnographic studies** to examine and assess the outcomes of the mentorship program with respect to students' ability to articulate their career goals, confidence in communicating with peers and professionals, public speaking, their leadership strengths, and their ability to recognize and navigate anger and stress triggers.
  Designed and employed **qualitative methods - interviews and surveys** at the baseline, midline and endline stages of the program with its participants and **code**, summarize, and compare their results to analyze the program efficacy and outline future directions.

RESEARCH ASSISTANT | GT CAT LAB | *AUGUST 2019 – MAY 2020*

- Research in the Culture and Technology (CAT) Lab advised by **Dr. Elizabeth DiSalvo**.
- Organized **participatory design** workshops to explore how low-income Hispanic immigrant parents leverage **Information & Communication Technologies (ICTs)** to engage in their children's education, given the information channels, cultural practices, & socio-economic contexts.
- Conducted **ethnographic studies** informing the role of **bilingual parent-education liaisons** in creating connections towards assisting immigrant parents in the United States.

Publications:

Safinah Ali, **Prerna Ravi,** Katherine Moore, Hal Abelson, and Cynthia Breazeal. "A Picture is Worth a Thousand Words: Co-designing Text-to-image Generation Learning Materials for K-12 with Educators". *Proceedings of the AAAI Conference on Artificial Intelligence 2024*

Safinah Ali, **Prerna Ravi**, Daniella DiPaola, Randi Williams, and Cynthia Breazeal. "Constructing Dreams using Generative AI". *Proceedings of the AAAI Conference on Artificial Intelligence 2024*

David Kim, **Prerna Ravi**, Randi Williams, and Daeun Yoo. "App Planner: Utilizing Generative AI for Design Thinking in K-12 Mobile App Development Education". *preprint*

Jumana Almahmoud, Marc Facciotti, Kamali Sripathi, **Prerna Ravi,** Michele Igo, and David Karger. "Designing Effective Comment Curation Strategies for Social Annotation platforms in Large Online Class Environments." *Under review at ACM DIS 2024*

Prerna Ravi, Annalisa J. Broski, Glenda Stump, Hal Abelson, Eric Klopfer, and Cynthia Breazeal. "Understanding Teacher Perspectives and Experiences after Deployment of AI Literacy Curriculum in Middle-school Classrooms". *Proceedings of the 16th annual International Conference of Education, Research and Innovation (ICERI) 2023, IATED 2023.*

Ariel Blobstein, Marc T. Facciotti, Michele Igo, David Karger, **Prerna Ravi**, Kamali Sripathi, and Kobi Gal. "#let's-discuss: Analyzing Students' use of Emoji when interacting with course readings". *To appear in the International Journal of Artificial Intelligence in Education (AIED).*

Prerna Ravi, Annalisa J. Broski, Glenda Stump, Angela Daniel, Hal Abelson, Eric Klopfer, and Cynthia Breazeal. "An Art Teacher and AI: Creating Adaptable Curriculum for AI Literacy". *Play Make Learn Conference 2023.*

Alex Duncan, Ana Rusch, **Prerna Ravi**, and David Joyner. "The L@St Eight Years: A Review of Papers and Authors at Learning @ Scale". *Proceedings of the Tenth ACM Conference on Learning @ Scale, 2023*.

Safinah Ali, **Prerna Ravi**, Katherine Moore, Cynthia Breazeal, and Hal Abelson. "Demystifying Text-to-Image Generation for K12 Educators." *In Workshops and Tutorials: International Society of Learning Sciences (ISLS) 2023.*

Glenda Stump, **Prerna Ravi**, Annalisa J. Broski, Angela Daniel, Hal Abelson, Eric Klopfer, and Cynthia Breazeal. "Ethical by Design: Teaching Middle-school Students to Think Ethically About AI". *AI Literacy Workshop at the 2023 CHI Conference on Human Factors in Computing Systems.*

Prerna Ravi, Azra Ismail, and Neha Kumar. "The Pandemic Shift to Remote Learning under Resource Constraints". *Proceedings of the ACM on Human-Computer Interaction 5, CSCW2, Article 314 (October 2021), 28 pages.*

Dhruva Bansal, **Prerna Ravi,** Matthew So, Pranay **A**grawal, Ishan Chadha, Ganesh Murugappan, and Colby Duke. 2021. "CopyCat: Using Sign Language Recognition to Help Deaf Children Acquire Language Skills." *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, Article 481, 1–10.* [ACM CHI Student Research Competition Winner 2021]

Prerna Ravi (Advisor: Thad Starner). "CopyCat: Leveraging American Sign Language Recognition in Educational Games for Deaf Children." *Georgia Tech Bachelor's Thesis (2022)*

Fellowships and Awards:

- MIT Work of the Future Fellowship 2023-2024
- Kaufman Teaching Certificate Program (In progress)
- Ida M. Green Memorial Fellowship, 2022-2023
- MIT Vice Chancellor's Inclusive Excellence Fellowship 2022-2023
- Winner - ACM CHI Student Research Competition, 2021
- Georgia Tech Outstanding Junior (EDS Rising Senior) Award, 2020-2021
- Georgia Tech Outstanding Sophomore Award, 2019-2020
- Adobe Research Women in Technology Scholarship, 2021
- Google Computer Science Research Mentorship (CSRMP), 2021
- President's Undergraduate Research Award (PURA), 2020
- Apple Women in Science and Engineering Scholarship, 2021
- Georgia Tech Faces of Inclusive Excellence Honoree, 2021
- Microsoft Invent Finalist, 2021
- Winner - Nunn School of International Affairs Paper Competition for Global Development, 2021
- Rewriting the Code Fellowship, 2020-2021
- Apple's Grace Hopper Conference Scholarship, 2020
- Honorable Mention, Microsoft Global Hackathon, 2020
- GT College of Computing Grace Hopper Conference Scholarship, 2019
- Faculty Honors for 4.0 GPA, 2018-2022

Teaching Experience:

INSTRUCTOR | 6.S062 / MAS.S10 GENERATIVE ARTIFICIAL INTELLIGENCE IN K-12 EDUCATION | FALL 2023

- Course Website: https://mit-cml.github.io/gen-ai-fall-2023.github.io/
- Massachusetts Institute of Technology, Fall 2023.
- Enrollment: MIT & Harvard graduate and undergraduate students

INSTRUCTOR | IMPACT AND APPLICATION OF GENERATIVE ARTIFICIAL INTELLIGENCE WITHIN EDUCATION | MASSIVE OPEN ONLINE COURSE, 2023

- MOOC Website: https://iedra.uned.es/courses/course-v1:UNED+ImpactGAI_001+2023/about

INSTRUCTOR | MAS SPECIAL TOPIC, INTRODUCTION TO TEXT-TO-IMAGE GENERATION FOR K-12 EDUCATORS | *JANUARY 2023*

- Seminar Website: https://image-gen.github.io/
- Massachusetts Institute of Technology, Fall 2023.
- Enrollment: MIT & Harvard graduate and undergraduate students, MIT staff

HEAD TEACHING ASSISTANT | GT COLLEGE OF COMPUTING | *JANUARY 2019 – OCTOBER 2021*

- Head Teaching Assistant for CS1331- **Object-Oriented Programming (OOP) in Java** under **Dr. John Stasko**.
- Led a team of 30 TA's (8% of total TAs within the College of Computing) for the course and substituted as a lecturer for **800+** students. Directed the **Teaching Assistant hiring process**. Coordinated timely development and delivery of course resources (homeworks, lectures, exams, office hours and **automated grading frameworks**. Provided instruction and support in OOP, enhancing students' coding, and debugging skills.

INSTRUCTOR | HUMAN CENTERED DESIGN | CODE.X | *JUNE 2021 – JULY 2021*

- Instructor for Human Centered Design for Code.X under its summer program which serves over **150** students.
- Led the Human Centered Design program, overseeing the full cycle from problem identification to MVP creation and usability testing. Created course materials and taught human-centered design principles, UX research and laws, and prototype evaluation. Supervised **design sprints for student capstone project execution.**

Software Engineering Experience:

SOFTWARE ENGINEER INTERN | MICROSOFT | *MAY 2022 – JULY 2022*

- Software Engineer Intern for the Corporate, External, and Legal Affairs (CELA) team within the Experiences and Devices (E&D) organization.

- Designed and built an end-to-end Office 365 Extension/Add-in: Legal Ease for Microsoft's Artifact Management System, used for onboarding all legal matters (involving law firms for example), their stakeholders and documents into the Office 365 Infrastructure.
- Constructed a pipeline using React and C# .NET Core APIs to facilitate the smooth migration of artifacts sent via email on the Exchange server to the rest of the Office 365 ecosystem (SharePoint, OneDrive, Teams), thereby centralizing their storage.
- Developed an ML-based recommendation service for the add-in that displays projects (already in SharePoint) pertinent to the emails opened on Outlook, allowing users to iterate on existing matters and eliminating duplication.
- Deployed the add-in to the Office 365 add-in store, thereby making it available to over 220,000 employees.
- Formulated and conducted extensive accessibility assessments to test the functionality of interactive interface elements for the accessibility team.

SOFTWARE ENGINEER INTERN | MICROSOFT | ***MAY 2021 – JULY 2021***

- Software Engineer Intern for the Employee Experience Team within Microsoft's Cloud and Artificial Intelligence (C+AI) organization.
- Designed and built an end-to end intelligent solution for the **Office 365 Enterprise Records Management System** used for storing **6M+** regulatory, legal, and business-critical electronic records spanning **100** countries in three regions (US, EMEA and Asia) for over **160K** employees.
- Constructed a pipeline to create file plans and retention policies that automatically labels, stores, retains, retrieves and disposes records stored across the entire Office 365 ecosystem (**SharePoint, OneDrive, Teams, Outlook Exchange**) using an **in-place** approach that allows users to manage their content from within existing repositories.
- Built a **microservice** for transactional systems using **Azure Functions** and data connectors that leverages **C# (.NET Core**) Rest APIs, Azure Portal and Visual Studio resources to facilitate automatic and iterative migration of records from every external Microsoft System (**Azure Cosmos DB**, SQL, File/Data Storage Blobs, etc.) into the Office 365 infrastructure, after which the records get stored and retained in-place.
- Implemented and trained **machine learning models** to automatically classify records across all Office 365 locations into different categories and extract critical and sensitive metadata information from them by leveraging **Azure Machine Learning** resources and **SharePoint Syntex**.

SOFTWARE ENGINEER INTERN | MICROSOFT | ***MAY 2020 – JULY 2020***

- Software Engineer Intern for Professional Services within Microsoft's **Core Services Engineering and Operations (CSEO)** organization.
- Designed a **centralized telemetry service** to monitor a web platform used by internal consultants to track their projects and finances.
- Developed a new telemetry system using **Angular** and **TypeScript** that logs all UI events, page views, API requests and errors to **Azure Application Insights** to assist debugging and product improvement, thereby directly impacting **5000+ users**.
- Standardized telemetry and documented new rules and updated naming conventions, to make telemetry development and querying from Azure Application Insights fast, efficient and consistent.
- Built dashboards from real-time user data using **Kusto Query Language (KQL), Azure Data Explorer** and **Microsoft Power BI** to analyze user behavior and track key trends, feature usage and pain points across multiple environments, to make recommendations for improving performance.

Invited Talks and Presentations:

- **2024 Future Steminist Convention**
  - Guest speaker and panelist, sySTEMic flow
- **Boston Public School AI and Data Science with App Inventor workshop**
  - MIT Computer Science and Artificial intelligence Laboratory (CSAIL)
- **How Might We Redefine Learning in the Age of AI?**
  - Guest speaker and panelist, Center for Constructive Communication (CCC), MIT Media Lab
- **AI is for Everyone: Transforming K-12 Learning and Education in the Era of AI**
  - Center of Excellence in Teacher Education (CETE) at Tata Institute of Social Sciences (TISS), Mumbai, India
- **Day of AI India**
  - Global Partnership on Artificial Intelligence (GPAI) 2023, New Delhi, India
- **Generative AI with MIT App Inventor**
  - U.S. Congressional App Challenge 2023
- **Tracking Carbon Footprint using MIT App Inventor**
  - Monterrey Institute of Technology and Higher Education, Mexico, and ELENA-Climate Academy
- **Supporting Entrepreneurship through Mobile App Development using MIT App Inventor**
  - Guest Speaker at the Roxbury Latin High School, Massachusetts
- **PopSign: Mobile Games to teach Sign Language**
  - Imagine RIT 2022, Rochester, NY
- **Intuitive Calibration and Data Collection Procedures for ASL Recognition using Azure Kinect**
  - Undergraduate Research Symposium at Georgia Tech 2019
- **Pose Estimation for ASL Recognition using OpenPose and Microsoft Kinect**
  - Georgia Tech GVU Center Research Showcase 2019

Service and Non-profit Work:

- Diversity and Inclusion Chair, ACM Symposium on User Interface Software and Technology (UIST) 2024
- Editor, MIT Work of the Future Substack Newsletter [link]
- Reviewer, ACM Computer-Human Interaction (CHI) 2024
- Reviewer, ACM Designing Interactive Systems (DIS) 2023

- Workshops and Outreach, App Inventor Foundation
- Founder and President, UNICEF @ Georgia Tech, 2018-2022
- Executive Project Lead, CS + Social Good @ Georgia Tech, 2019-2022
- Training Manager, Robogals @ Georgia Tech, 2019-2020

Selected Media Coverage:

- **App Inventor Foundation News.** Boston Public School Students Consider AI and Data Science. [link]
- **MIT Center for Constructive Communication.** CCC and DemocracyNext hosted the First-Ever Tech-Enhanced Student Assembly. [link]
- **Georgia Tech College of Computing News.** CS Major Earns Adobe Research Women-In-Tech Scholarship. [link]
- **Adobe Research News.** Women-in-Technology Scholarship: Sparking Curiosity. [link]
- **App Inventor Foundation News.** High School Girls in Mexico Build App to Track Carbon Footprint. [link]
- **Rochester Institute of Technology (RIT) News.** Parents of deaf children can more easily learn sign language thanks to powerful tech collaboration. [link]
- **Google Research at I/O 2023.** Students x Sign Language Recognition | Google Lab Sessions. [link]
- **Avanti Fellows.** LedBy Girls' Leadership and Mentorship Program: The Why, What, and How. [link]