MIT FUTUREMAKERS

2024 IMPACT REPORT

Preparing youth change-makers to make a better world with AI

RAISE Initiative
Responsible AI for Social Empowerment and Education

ABOUT MIT FUTUREMAKERS

Artificial intelligence is shaping our personal and professional lives. It is transforming industries as AI-powered applications, tools, and solutions enter the marketplace. It has already contributed to impressive economic growth, and organizations continue to harness it to help address society's most urgent challenges and realize exciting opportunities. However, if not designed and deployed responsibly, it can cause considerable harm.

MIT RAISE (raise.mit.edu) created the MIT FutureMakers program to nurture early talent pipelines in under-served student communities toward a more inclusive, creative, and ethical AI workforce for the future. The goal of MIT FutureMakers is to help prepare the next generation of AI-powered changemakers who aspire to make a better world for all.

ABOUT MIT FUTUREMAKERS

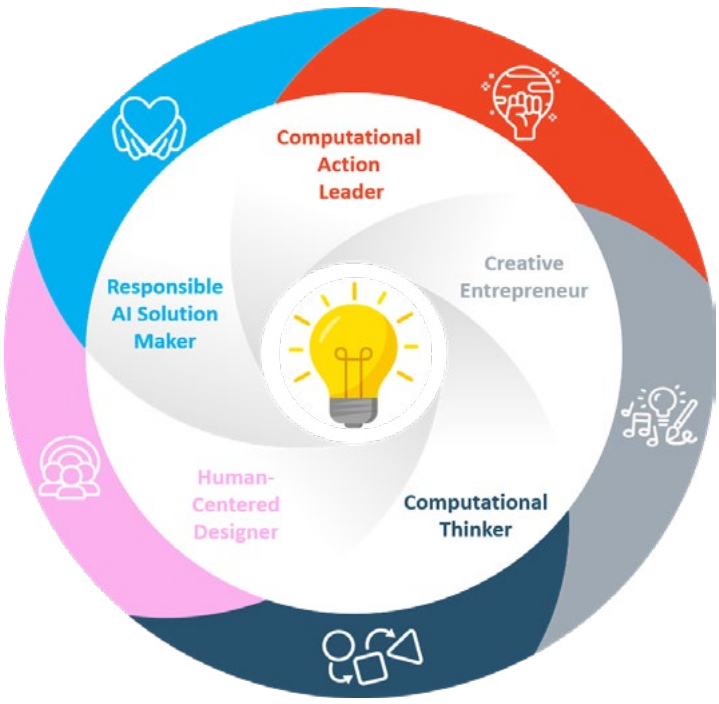
MIT FutureMakers is a free, virtual-format program designed to serve students across the USA, especially those from under-resourced, under-served communities. It runs for six-weeks over the summer. MIT FutureMakers systematically develops students' hands-on technical skills while also developing human-centered skills such as teamwork, leadership, entrepreneurial mindset, critical awareness, and responsible design methods of AI-powered solutions. It cultivates the formation of young people's computational identity and their confidence in digital empowerment. MIT RAISE has developed a novel pedagogical framework and curriculum built on the principle of computational action, an impact-driven learning approach that empowers and encourages students to solve personally meaningful and authentic problems relevant to groups with whom they feel invested.

The program, run in collaboration with SureStart (mysurestart.com), has two phases. The first phase is a 4-week technical training curriculum where participants engage in hands-on learning from a curated, interest-led curriculum, with regular mentoring. The second phase is a 2-week create-a-thon where participants form teams and work with their mentor to develop AI-based solutions to a real-world problem they want to solve. This culminates in a pitch competition with prizes.

Participants attend seminars on career skills, engage in formal and informal peer-networking, and attend technical talks by AI industry professionals. All interactions are hosted online using a digital platform and video-conferencing.

PEDAGOGICAL FRAMEWORK

STUDENT LEARNING OBJECTIVES



ABOUT FUTUREMAKERS

The 2024 iteration of MIT FutureMakers ran virtually from July 1 to August 9. It brought together middle school (14% of 2024 participants), high school (50%), and college students (36%) from across the United States and Puerto Rico as a group of over one hundred highly motivated learners who wanted to develop new skills creating AI-enabled solutions that use artificial intelligence.

Participants learned foundational concepts in AI and product development of software solutions. This included mobile and web apps, using AI-powered extensions with generative AI, and training custom machine learning models, and data science.

No prior coding experience is necessary. We offer three different program tracks to accommodate participants with a wide range of coding experience. In 2024 we offered four tracks: 1: Mobile app development with AI, for middle school students. 2: Mobile app development with conversational AI, for high school and early college students. 3: Applied deep learning. 4: Data activism. Students present their projects on the last day of the program to a panel of judges who are experts from industry. Winning teams received cash prizes and a trip to the ASU-GSV Summit in San Diego, California, where they presented their winning pitches in a special session and networked with other conference attendees.

Track 1

Mobile app development with AI, middle school students

Team Certified Squirrels won the Track 1 competition with Findable, empowering people with disabilities with an app that extracts detailed accessibility data from New York City records, making the city more navigable and inclusive.

The **Mobile App Development with AI Track** is for middle-school students and uses MIT App Inventor. To support novice coders in this track, MIT RAISE has developed student-friendly, block-based coding tools with AI extensions to lower the barrier in making AI-powered mobile applications for Android and iOS. In this MIT RAISE curriculum, students learn how to code and debug their own mobile apps, as well as how to manage projects with their team.They learn about machine learning, computer vision, and Internet of Things (IoT) through engaging, hands-on interactive tutorial examples. They are also introduced to free web-based UX design tools for designing the user interface of their app. Importantly, they also learn about highly consequential technologies, such as deepfakes, and understanding why the responsible design of AI applications is so important for society.

ABOUT FUTUREMAKERS

Track 2

Mobile app development with conversational AI, high school and early college students

Team EcoGuardians won Track 2 with GreenGuard, a recycling and waste management app designed to help communities make environmentally conscious decisions. It scans products to identify how they should be recycled, provides an information hub for recyling-related queries, locates nearby rececling centers, and helps track users' recycling efforts to encourage good habits.

The **Mobile App Development with Conversational AI Track** is for high-school students and undergraduates with no prior coding experience. Similarly to Track 1, MIT RAISE has developed student-friendly, block-based coding tools for MIT App Inventor with AI extensions. In this curriculum, students delve into the fundamentals of coding, debugging, and project management within a team. Through interactive sessions with a mentor, they explore machine learning, computer vision, and conversational AI, gaining practical experience and skills. Additionally, students receive guidance on designing the user interface of their apps using free web-based UX design tools. Beyond technical skills, participants also learn about the societal implications of AI, including topics like deepfakes. Emphasis is placed on the responsible design of AI applications, highlighting their impact on society.

Track 3

Applied deep learning, high school students

Track 3 winner, Team KineX, produced an innovative physical therapy app that leverages AI to improve mobility and reduce health risks. Among other AI-driven features, it employs computer vision to analyze user poses in order to provide feedback on safe, effective exercise.

The **Applied Deep Learning Track** is for high school and undergraduate students using the Python programming language. In this curriculum, developed by SureStart, participants learn machine learning (ML) principles, responsible design to mitigate potential ML bias, and hands-on examples of ML applied to affective computing, computer vision, and natural language processing (NLP). They also learn about data analytics, visualization, UI, and responsive web design. They learn to use industry tools, libraries, and techniques including Python, Numpy, Keras, Github, Jupyter Notebooks, and Google Colab. They use ML frameworks such as TensorFlow and explore Kaggle challenges using publicly available datasets that we provide.

ABOUT FUTUREMAKERS

Track 4
Data activism

Student teams worked with non-profits to analyze data for advocacy. For instance, they worked with AfroPink to detecting breast cancer early within the African- American community and with the Vera Institute of Justice to explore how systemic inequities contribute to high school dropout rates in Baltimore City.

The **Data Activism Track** is part of a research project designed to empower minoritized youth to use data science and AI for social justice. It equips them with both technical expertise and critical thinking skills to challenge systemic inequities. Students learn Python and Pandas to clean datasets, perform statistical analyses, and create compelling visualizations. Through critical participatory action research (CPAR), they investigate problems affecting their communities, collaborating with social justice organizations to collect, interpret, and apply data ethically. They worked with the Vera Institute of Justice to analyze racial disparities in incarceration, AfroPink to address breast cancer inequities, and the Algorithmic Justice League to mitigate AI surveillance bias. Students use data and art for advocacy, storytelling, and policy recommendations. The program ensures that studentsare prepared to leverage data-driven solutions for racial and social justice.

> I was able to feel independent and was able to learn how to effectively and efficiently research topics that I don't understand fully.
> **-FutureMakers Student**

> I enjoyed the process of figuring things out by myself rather than be guided completely through the whole process.
> **-FutureMakers Student**

	TRACK 1: MOBILE APP DEVELOPMENT WITH AI (MIDDLE SCHOOL)	TRACK 2: MOBILE APP DEVELOPMENT WITH CONVERSATIONAL AI (HIGH SCHOOL AND EARLY COLLEGE)	TRACK 3: APPLIED DEEP LEARNING (HIGH SCHOOL)	TRACK 4: DATA ACTIVISM (HIGH SCHOOL AND EARLY COLLEGE)
TECHNOLOGY-ENHANCED SMART CITIES	1	0	0	1
PHYSICAL HEALTH AND MENTAL WELL-BEING MANAGEMENT	1	2	2	3
ENVIRONMENTAL PROTECTION EFFORTS, WASTE MANAGEMENT	1	1	2	1
EQUITABLE RESOURCE ALLOCATION	0	1	1	4
AI USAGE TO IMPROVE HEALTH AND FITNESS	0	0	1	1
ENVIRONMENTAL RISK MITIGATION	0	1	0	4
GENERATIVE AI FOR IMPROVING EDUCATION	0	1	0	0

Themes tackled by the number of student create-a-thon teams.

I am no stranger to judging and it was amazing to see what I saw today. It compares to a lot more experienced teams and considering time that you were able to put into it, it's a big achievement…reflect on what you have learned. Maybe it's not just the information about how to use certain technologies. I'm sure there have been a lot of things that you have been able to achieve by understanding how to work with each other, how to communicate in challenging situations, resolve conflicts, and look at things creatively.

– Create-a-thon judge

MIT FUTUREMAKERS 2024 LEARNING OUTCOMES

We collected survey data from participants to evaluate the success of the program in building student's conceptual and technical skills in addition to developing their human-centered skills such as teamwork, leadership, entrepreneurial mindset, critical awareness, and responsible design methods of AI-powered solutions. We also assessed the content and pacing of the program as well as the success of our mentor training.

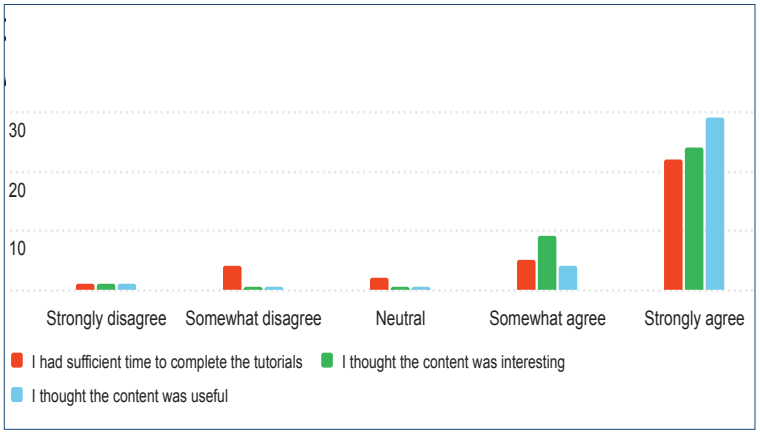


Figure 1: student survey responses to the prompt "Please rate the content presented to you over the first four (4) weeks of the program."

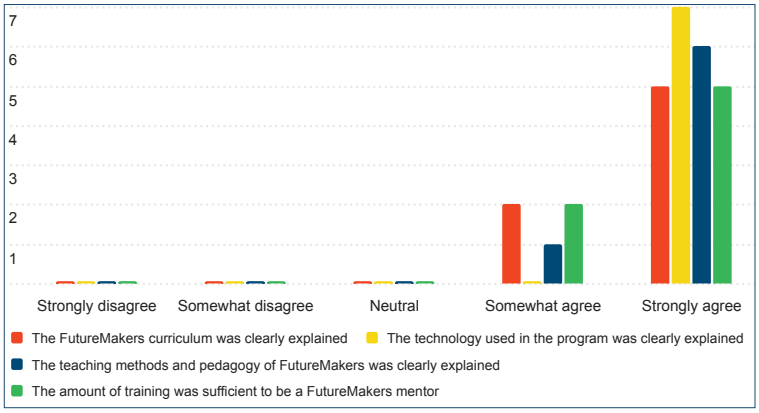


Figure 2: mentor survey responses (Likert scale) to the prompt "Regarding the mentor training you received, please respond with your level of agreement to the following questions."

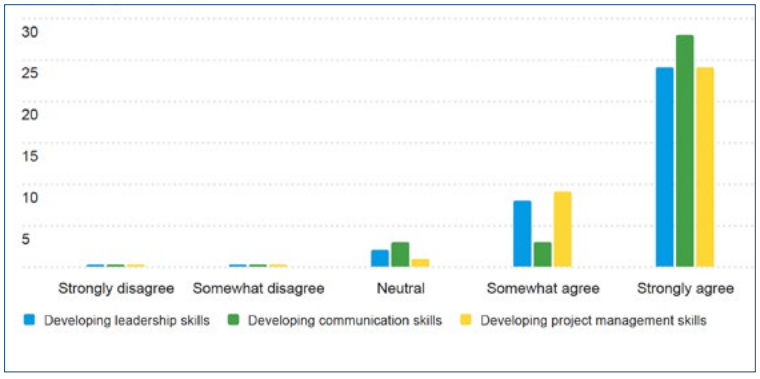


Figure 3: student survey responses to the prompt "What have you learned in this program?"

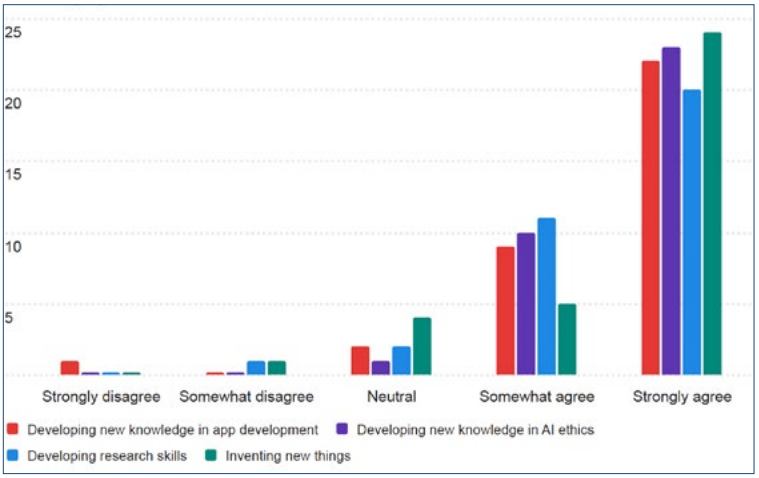


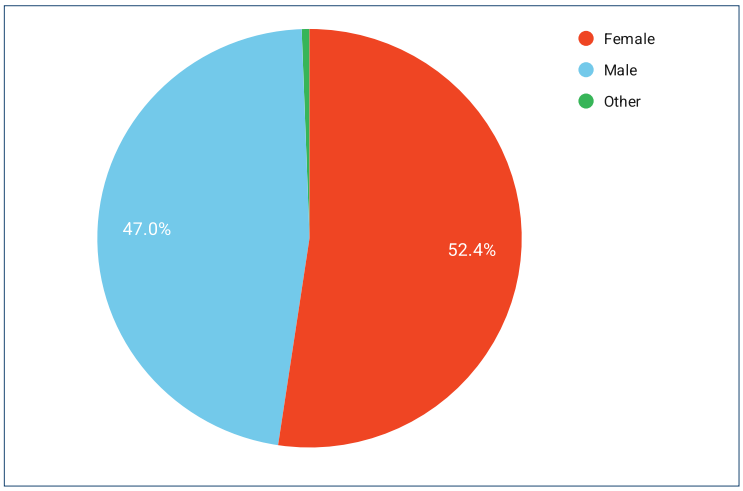
Figure 4: student survey responses to the prompt "What have you learned in this program?"

MIT FUTUREMAKERS IMPACT

We created the MIT FutureMakers program to help to prepare the next generation of AI-powered change makers who aspire to make a better world for all. Our goal is to offer a high-impact and inclusive educational experience, particularly for students from under-served or under-resourced communities.

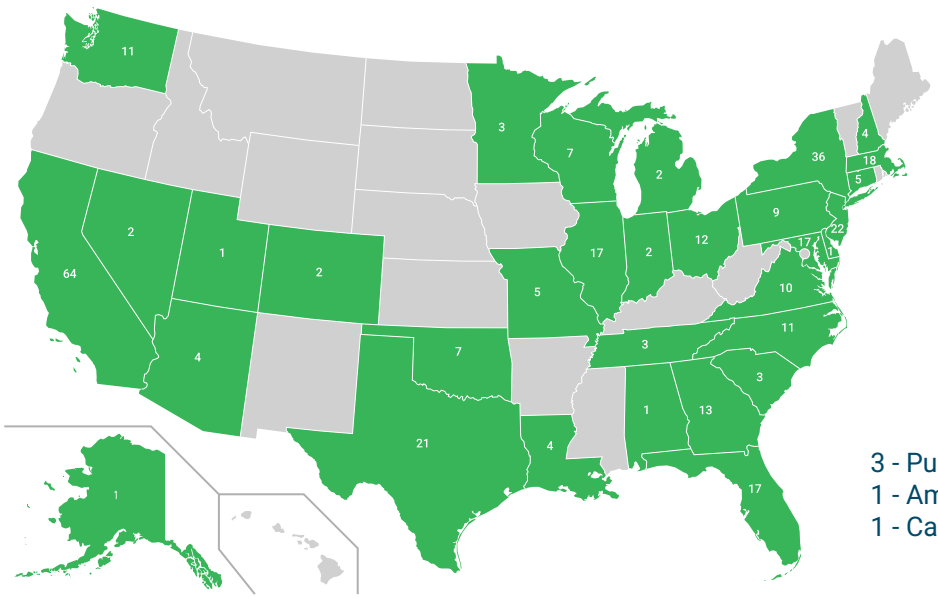
Our program is designed to cultivate the formation of young people's computational identity and digital empowerment. It builds students' confidence to become rising leaders, learn how to design compelling solutions with AI, and convincingly communicate their ideas for solving real-world problems that benefit others.

Participants leave the program with a certificate of completion, practical technical skills, a compelling project (some with GitHub code), an enhanced resume, and improved interview skills that will help them secure their next summer internship, apply to college, or even make progress toward their own startup idea. Our hope is that MIT FutureMakers alumni finish the program better prepared to apply for college in computing and STEM fields and are more competitive for summer internships with a wide range of well-known companies. Our cumulative data since the first launch of MIT FutureMakers in 2021 shows the impact of the program on meeting these meaningful outcomes.



Participation by Gender

> I loved working with others who have similar ideas and interests.
> **-FutureMakers Student**

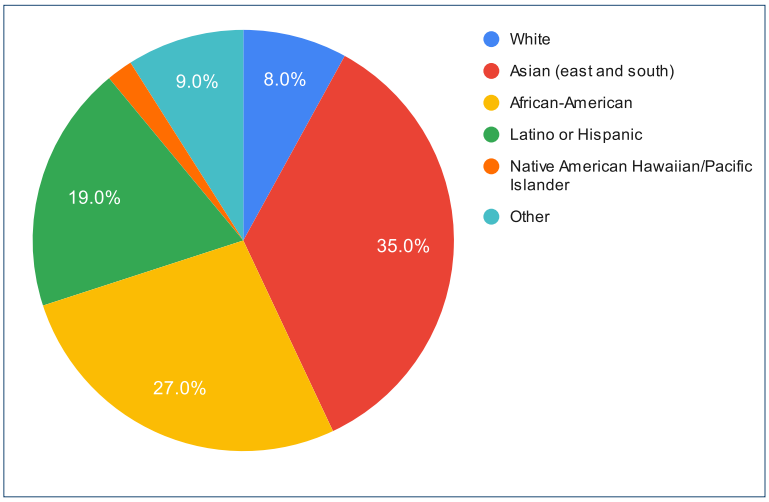


3 - Puerto Rico
1 - American Samoa
1 - Canada (Saskatchewan)

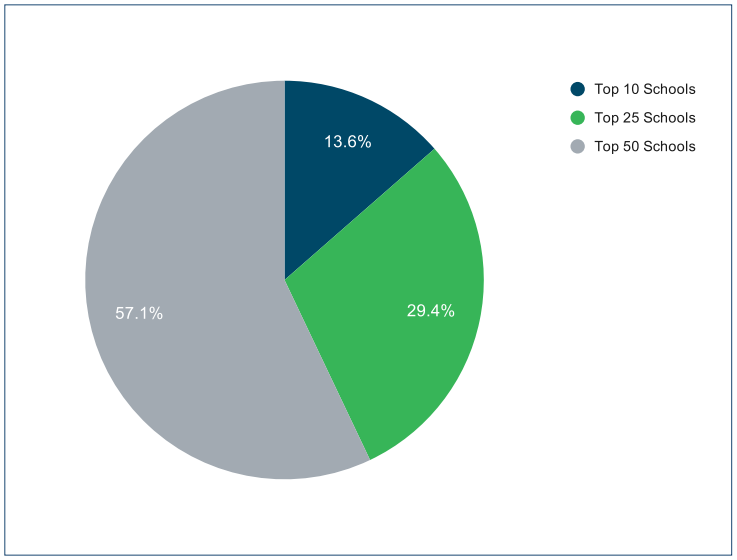
Participation by State

MIT FUTUREMAKERS IMPACT

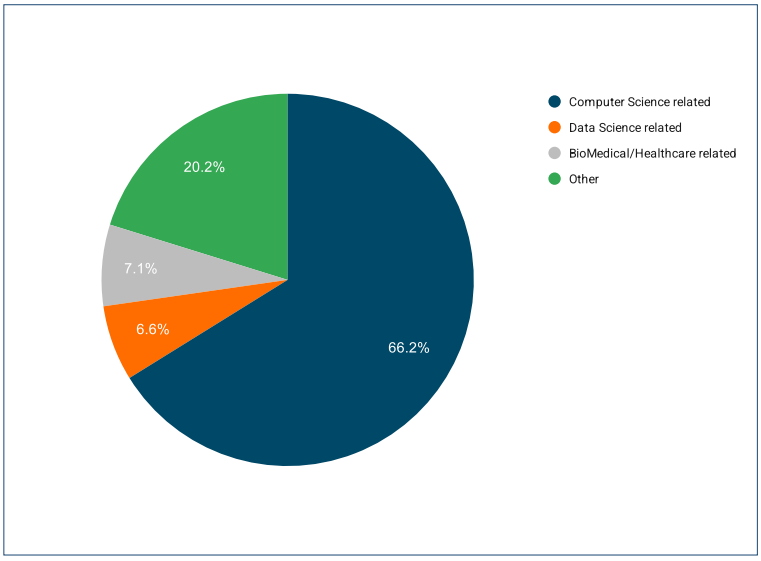
> The Create-a-thon was challenging to put the pieces together coherently but it was ultimately rewarding.
> **-FutureMakers Student**



Participation by Race-Ethnicity



University matriculation of FutureMakers participants by U.S. News & World Report ranking (usnews.com/best-colleges). Students have entered MIT, Stanford, Columbia, Yale, Carnegie Mellon, and other top schools. Data is from 90 respondents of 114 participants.



Distribution of majors from those who reported one.

Many alumni who were in high school as FutureMakers program participants look back at their experience as influencing their competitiveness in their college applications and even in their choice of majors, particularly in computer science, engineering and other STEM topics.

110

The number of 2024 MIT FutureMakers participants, hailing from 22 states and Puerto Rico. They worked with 21 mentors from across the U.S.

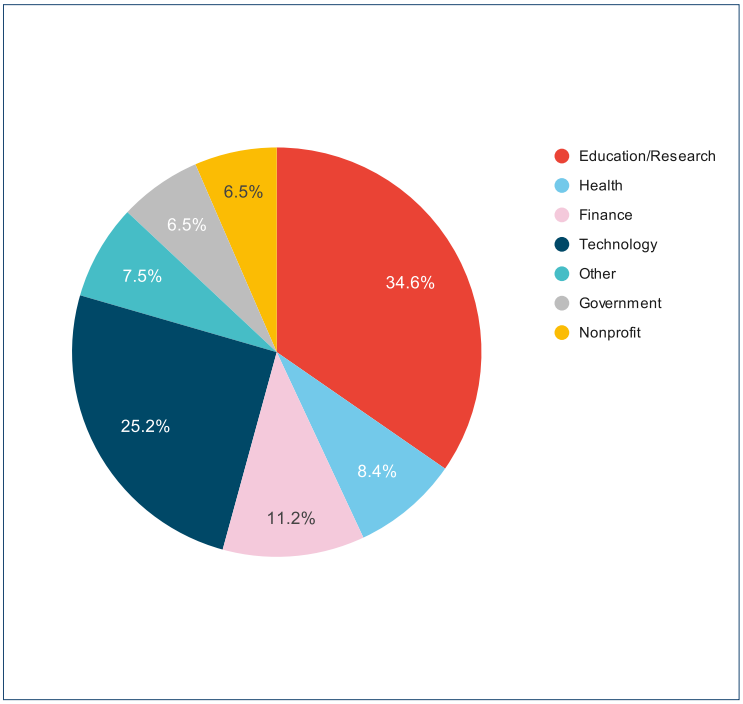
7.5x

The before-and-after increase in MIT FutureMakers students reporting that they “completely agree” that they know how AI works.

100%

The percent of 2024 MIT FutureMakers mentors who responded to a post-program survey and agreed the MIT RAISE team clearly explained the curriculum, technology, methods, and pedagogy.

MIT FUTUREMAKERS IMPACT



Industries where participants have secured internships. Organizations include Google, Amazon, Disney, NASA, the Society of Women Engineers, Vanguard, CVS Health and two dozen universities.

> When I was a professor in my country, I was a little tired of teaching, because sometimes students don't care, they don't care at all, and here...my overall experience is great! I really enjoyed it. It renewed my feelings about teaching! I like teaching again!
>
> – MIT FutureMakers Mentor

OTHER HIGHLIGHTS

- One of the winning teams from 2021 in the Deep Learning track (an all-female team; Ericka Corral, Ashmita Kumar, Joon Luther) filed their first patent and are in the process of starting a healthcare startup, focussed on early stroke detection.

- Ralph “Trey” Barton (LI n/a), from 2021 was awarded a US Congressional Medal for Youth in 2023 based on a project that he started during the 2021 FutureMakers program. The app, Udiet, created by Trey and his teammates focused on helping individuals jumpstart their health journey by aligning app recommendations with their age and budget.

- Milan Ferus-Comelo, from 2021, who now goes to university in Germany, secured a prestigious opportunity to explore social responsibility related to the tech economy at the European Future Technologies Summit in Brussels.

- 16 students comprising four student teams (two from 2021 and two from 2022) presented their FutureMakers capstone projects at ASU+GSV 2023, an education-focussed investor conference, at a Student Innovation Showcase, in front of an audience of educators, tech industry professionals and investors.

Other outstanding outcomes include the majority of our college student trainees landing tech internships across various industries and verticals, with several of our senior high-school students embarking on their college journey at universities nationwide.

MIT FutureMakers create-a-thon winners travel to the ASU+GSV Summit in San Diego. Last year's winners, shown here, presented their projects, networked, celebrated each other, and met people like RAISE director Cynthia Breazeal and STEM education legend Bill Nye.

MIT RAISE director Cynthia Breazeal celebrating with some of the create-a-thon winners in San Diego

Create-a-thon winners meeting Bill Nye "The Science Guy"

MIT FutureMakers is made possible in part through the generous support of DP World

As well as 2024 Data Activism track student scholarships from:
ACM Conference on Fairness, Accountability, and Transparency 2024 DEI Scholarships
MIT Sea Grant
A Vision for Engineering Literacy and Access

HOW YOU CAN HELP

A generous grant by DP World supports our summer MIT FutureMakers program. The inaugural MIT FutureMakers program was launched in the summer of 2021 with 71 students and by 2024 hosts well over 100.

MIT FutureMakers is seeking support to scale our program beyond the summer session to accommodate more participants (students and mentors) across the U.S. and in other countries. If you are interested in becoming a sponsor, please contact us at futuremakers-info@mit.edu.

ABOUT MIT RAISE INITIATIVE

MIT RAISE (Responsible AI for Social Empowerment and Education) is an MIT initiative to innovate learning and education in the era of AI. As computers continue to automate more routine tasks, AI education is a key enabler to future opportunities where success depends increasingly on intellect, creativity, empathy, and having the right skills and knowledge. In the face of this accelerating, AI-powered change to people's personal and professional lives, the RAISE research, outreach, and impact mission is to advance equity in learning, education and computational action to rethink and innovate how to holistically prepare diverse K-12 students, an inclusive workforce, and lifelong learners to be successful, responsible, and engaged in an increasingly AI-powered society.

Headquartered in the MIT Media Lab, RAISE is a collaboration with the MIT Schwarzman College of Computing and MIT Open Learning. As part of the RAISE research effort, faculty, staff and students from across MIT explore new pedagogical approaches, develop constructionist curriculum where students learn-by-making, creative innovative tools, advance the science of learning, as well as how AI can advance human learning. These advances are applied to RAISE outreach programs, designed to promote an AI literate society by engaging teachers and students in impact-driven learning from preK-12 to the workforce. The educational goals are to demystify AI and to enrich AI literacy for everyone by empowering learners of all ages to embrace AI technology creatively and to use it responsibly and ethically. By doing so, we aspire for people to know how to use AI responsibly, have an informed voice to shape how AI is used in society, and to prepare a diverse and inclusive workforce that can design and apply AI responsibly to make a better world.

ABOUT SURESTART

SureStart's mission is to build early opportunity pipelines for a highly diverse tech workforce through technical skills training and project-based learning. We are specifically committed to training and mentoring high-school and college students from communities underrepresented in AI, and connecting them to opportunities for hands-on work in innovative DEI-focused tech startups.

RAISE Initiative
Responsible AI for Social Empowerment and Education