# EPICSINEEE Engineering Projects In Community Service

#### 2022 YEAR IN REVIEW

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# **Hello** Friends of EPICS in IEEE!



Students from Project DIANA, working on their prototype to lessen environmental pollution by detecting harmful gasses in the air





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As I reflect on 2022, I am pleased that the EPICS in IEEE committee was able to have a stellar year. As educational institutions were better able to navigate through another year of the global pandemic—students returned to team-based learning and engaging with their local communities to enhance their engineering education while positively impacting the world around them. EPICS in IEEE was proud to provide financial support and mentoring resources.

The highlight of 2022 was hosting the EPICS in IEEE Environmental Competition, sponsored by the United Engineering Foundation. This competition supported ten student teams from across the United States and their work on projects with environmental impact. Many of these stories are shared as blog posts on our website and social media. We also launched a call for proposals for Access and Abilities Competition, funded by the **Jon C. Taenzer Memorial Fund** through the IEEE Foundation. These projects will start in 2023, and we are excited to see the impact we can have globally on making the world more equitable and accessible.

In addition to project support, our committee accomplished a number of improvements to our operating processes. We also increased our public engagements across IEEE to build awareness of EPICS in IEEE. Some of these highlights include:

- **Revised our funding proposal application and review process** to streamline data tracking and improve response time on proposals submitted for funding.
- **Continued to expand material on our new website**, with more information answering common questions about our program and funding.
- **Developed new quarterly check-in questionnaires** that will help us collect metrics about the impact of the EPICS in IEEE-funded projects, including both social impact and student learning outcomes.
- **Presented about EPICS in IEEE to multiple audiences** in webinars and conferences around the world.
- Piloted a mentorship program to match IEEE members to project teams to provide technical and non-technical mentoring for project success.
- Enhanced processes to collect project and student success stories that are used to showcase and raise awareness of the impact EPICS in IEEE has on communities around the world.

With a goal to empower engineers and technical professionals to impact communities, our work is never done. I hope you will join us as we celebrate our accomplishments from 2022, and look forward to 2023.

Stephanie Gillespie, Ph.D. EPICS in IEEE Committee Chair, 2022 Associate Dean, Tagliatela College of Engineering, University of New Haven "With a goal to empower engineers and technical professionals to impact communities, our work is never done."

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**2022 METRICS** 

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Environmental

530

# Global Participation in **COUNTRIES**



28% NORTH AMERICA



ζ% SOUTH AMERICA



**EPICS**INIEEE



#### **PROJECT PILLARS**

Human Access & **Abilities** Services

Q Q Q Q

**Education &** Outreach



Invested in project support this year

945 STUDENTS

University 415 Pre-University Students

Female **Students** 

**49**%

IEEE **106 VOLUNTEERS** Engaged

#### 2009 - 2022 TOTAL METRICS



#### PROJECT PILLARS



#### 10,000 students 4,000 University Students 6,000 Pre-University Students



Total Estimated People Impacted

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<sup>\*</sup>as reported by student teams in project proposals

# EPICS in IEEE Environmental Competition



Volunteers from the community helping at the Charles Madison Nabrit Memorial Garden in Ohio



NC State Students deploying their prototype in coastal North Carolina

Over

The EPICS in IEEE Environmental Competition successfully selected, launched, and supported ten environmental-focused projects from eight different US-based institutions. The students involved in this competition are incredibly passionate about using their technical skills to mitigate and address the impact of climate change. All the teams worked with local non-profit organizations to develop technology that is making real-world, tangible impacts. EPICS in IEEE was thrilled to take on the competition in partnership with the **United Engineering Foundation.** 

From a litter-collecting robot for a local lake to nitrogen-sensing drones for understanding air quality, these projects have provided hands-on learning and community engagement experiences crucial for the development of professional skills for university students. Over a dozen IEEE volunteers are working with the eight universities and 132 university students to complete these environmentally focused projects. Once the projects are complete and deployed in the community, the estimated number of people impacted by all ten projects will be over 500,000.

> Some of the competition teams are working through an engineering class curriculum or a senior design project, while others are utilizing their IEEE clubs on campus to implement these projects. With a shared mission of combating climate change and making a local impact, these students have shown their passion and perseverance through these projects. Additionally, the students have acquired critical knowledge to help them succeed in their future engineering careers. Perhaps the most valuable learning experience was the opportunity to work across multidisciplinary teams and engage in practical activities to apply what is being taught inside the classroom. According to the student survey, 93.6% of the respondents felt that their EPICS in IEEE project contributed to their development of teamwork skills

The EPICS in IEEE committee has supported these teams throughout the year through quarterly checks and mentor assignments. This has ensured that the project teams felt supported and were given the tools to successfully launch their projects. This competition, in partnership with the United Engineering Foundation, resulted in a total of **US\$62,466.20** given out in funding.

people impacted by all ten projects

# Students Use Open-Source Software to Create an Assistive Device for the Blind Community





EPICS in IEEE Student Team Meeting with National Association for the Blind

Students from the IEEE Computational Intelligence Society (CIS) Student Branch of M.S. Ramaiah Institute of Technology are creating an affordable, accessible, and open-source device that is tailored to the wants and needs of the blind community. The device will assist in everyday tasks, such as reading aloud written text and notifying the user how far away a specific object is.

The project began after the students saw firsthand how limited the visually impaired options are due to both expensive devices and inaccessible braille education. "We realized that one of the devices, Orcam, was about US \$3,000. So it's quite expensive and inaccessible, especially for people in India," says Tejas S., one of the student team members. The student team is focusing on creating a more affordable device that is comfortable and friendly to the blind user. In continuous contact with the National Association for the Blind, Bangalore, the team is working collaboratively with some of the blind students to ensure their product is usable. "Merely talking and working with the National Association for the Blind helped us consider problems from a different angle," Tejas M.R. says.

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After a successful round of feedback on their hardware and imaging, the team began developing the software portion, which is to be completed via open source. Essentially, they can work in a collaborative manner to achieve their goals faster. According to the team, the development of software modules has helped the students to apply computer vision concepts learned in the curriculum to real projects. In addition, the students and faculty involved in this project also learned valuable teamwork skills and how to effectively engage with NGOs or nonprofit organizations.

EPICS in IEEE has given the student team a grant of **US\$4,400** to purchase the needed materials to build the prototype. Throughout the project, the students have improved their problem-solving, budget managing, community engagement, and hands-on engineering skills.





# Building Satellites to Teach Students About the World



Volunteers working on a drone launch of a CanSat-type nanosatellite

"Hopefully, we are building bridges that will help students get into university."

#### How do you get kids to look at the world differently?

For a team of engineers working across Colombia, the answer is to teach them about space. Affiliated with the IEEE Electron Devices Society (EDS) Colombia Chapter, a team of engineers is developing satellites that will monitor meteorological and water conditions in the region. The primary purpose of the project is to educate volunteers and students about the different technologies involved in building satellites. The hope is that primary schools, universities, and community teachers find interest in space education for STEM learning purposes.

Spearheaded by IEEE Senior Member and IEEE Electron Devices Society (EDS) Colombia Chapter Chair, Camilo Téllez Villamizar, the team is currently developing three different CanSat prototypes under the project name MALLKU. Villamizar is guiding three teams led by Andrés Felipe Guarnizo, Giovanna Estefanía Ramirez Ruiz, and Camilo Andrés Segura. Each team aims to explore how to develop CanSat products with an agile, fast, and mass-production approach. MALLKU is an indigenous deity from the Quechua language, and its translation is "the high-rise lord" in reference to the abilities of the CanSats.

"While our focus is product development, our main purpose is education. Teaching volunteers and kids about technology like communication, electronics, microcontrollers, and 3D printing provides them with new ways to look at the world," said Segura. While participating in the MALLKU program, students learn the concept of satellites through different STEM activities. They also learned about the basics of 3D printing and design tools. The students also learned about environmental topics and global warming—and how to use technology to create solutions to world problems. "Hopefully, we are building bridges that will help the students get into university," added Segura.

EPICS in IEEE has given the project a **US\$5,000** grant. Now that all three teams are through the design and prototype phase of the project, they will start the product tuning phase, which requires having the students build the actual CanSats before testing.



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Team leaders working on 3D printing their CanSat designs

# Installation of Solar System at Itara Health Center



In underserved communities, many people cannot afford a visit to a hospital and the current global pandemic only pushed the limits of local health centers. Most rural health centers in Uganda are unable to provide full medical treatment to patients as they lack a supply of medical equipment, electricity, clean water, and more necessities. A team from the IEEE Uganda section, along with other volunteers, worked to improve the health care system at Itara Health Center, in the Rubaya sub-county, through the installation of solar-powered electricity and a water treatment system.

The project implementation that took place in December 2022, provided the Itara health center with lights, power to run the vaccine refrigerator, technology equipment, and clean water that will help it to offer improved services to the people in the community. "Now, the health center has to ability to attend to patients at night, the security of the center has improved, and (the center) no longer has to worry about contaminated water," according to project team member, Tumwebaze Antony. "We believe that this action has and will save numbers of lives and will be helpful to this community for a long period of time."

The solar-powered system is regulated by a charge controller to save the battery for needed times, such as nightfall or during poor weather conditions. This project will drastically improve every area within the community, from the center's security to the improvement in health standards. During this project, the team worked with Changing Lives Uganda and Davis & Shirtliff to ensure all needs for the health center were met. Students from Rwansinga High School also helped the team, while learning basic engineering skills, as well as hands-on installation skills.

EPICS in IEEE has granted the project Installation of Solar System at Itara Health Center **US\$5,955** to better this community and ensure a healthy and safe health care center.



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## EPICS in IEEE Access and Abilities Competition



Students testing their head-mounted assistive device using computer vision

Looking forward, the EPICS in IEEE committee is proud to announce the launch of the Access and Abilities Competition. First announced in late 2022, the competition will challenge university students from all over the world to use their engineering skills to help solve accessibility issues within their communities. With projects beginning in early 2023, students, faculty, and professionals will have the opportunity to address issues of hearing, vision, mental health, or mobility impairments.

The competition is funded by the **Jon C. Taenzer Memorial Fund.** Established by the IEEE Foundation in 2019 with a generous bequest from the estate of Mr. Taenzer, an IEEE Life Senior Member, the fund is restricted for the purpose of supporting engineers in developing countries and sustaining breakthroughs in aid for people with disabilities.

After receiving 40 proposals, the EPICS in IEEE committee has selected ten projects to be funded. The committee plans to select more projects for the competition in phase two. Follow the EPICS in IEEE website for the list of projects selected.





# Thank You to Our Donors and Supporters

The EPICS in IEEE committee is proud of the projects that received funding this year, all of which worked towards the IEEE mission of fostering technological innovation and excellence for the benefit of humanity. We look forward to seeing continued positive impacts on the local communities, as well as the students and volunteers involved in our projects. The team at EPICS in IEEE would like to thank all those who participated, supported, and encouraged the program in 2022, including students, volunteers, university partners, and community partners!

A special thank you to our Donors. Your generosity has supported the educational experience of thousands of students globally, while also providing technological solutions that have positively impacted communities around the world.

Donations for the benefit of EPICS in IEEE are made through the IEEE Foundation. To learn more, visit www.ieeefoundation.org/ impact/illuminate/epics-in-ieee/





#### To learn more, visit epics.ieee.org





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