



EPICS IN IEEE

Engineering Projects In
Community Service

YEAR IN REVIEW 2024





Hello Friends of EPICS in IEEE!

EPICS in IEEE's milestone 15th anniversary saw the program hit new heights and achieve greater reach than ever before. **In 2024, EPICS in IEEE funded 39 projects and engaged over 900 students, 1,400 volunteers, and a broad range of IEEE members, including reviewers, mentors, and project volunteers.**

Since being appointed to the role of EPICS in IEEE Committee Chair at the start of 2022, I've been able to continue assessing our impact and focus on streamlining the program, improving our processes for funding and reviewing proposals, and amplifying our storytelling efforts to encourage prospective participants and donors.

In 2024, I was excited to expand our partnerships with other IEEE organizational units and societies and help them achieve their goal of benefiting humanity while participating in positive service learning activities. These opportunities are a great way to engage students, senior IEEE members, and young professionals in IEEE societies and promote awareness of EPICS in IEEE.

Internally, we worked to streamline our processes for collecting data and follow-up information on each project. We also boosted our storytelling efforts to help donors connect with our activities and inspire the next round of students applying for project funding. We've also had the opportunity to partner with multiple IEEE conferences and recently initiated a formal travel grant program to enable eligible student participants to travel to an IEEE conference and present on their project. This experience will help strengthen their connection to IEEE, grow their professional network, help build their resumes, and boost their confidence.

During my three years as Committee Chair, I've loved seeing so many students worldwide have the opportunity to engage with their community and truly consider the needs of their stakeholders; there are so many ways in which those positive experiences can trickle through their professional and personal lives. Looking ahead, new leaders bring new ideas, and I'm excited for the future of EPICS in IEEE and the continued growth of this outstanding program with new leadership.

Stephanie Gillespie, Ph.D.

EPICS in IEEE Committee Chair, 2024

Associate Dean, Tagliatela College of Engineering, University of New Haven

Happy New Year to all!

Ever since I first learned about the EPICS in IEEE program in 2018, led an EPICS project with a colleague, and then joined the EPICS in IEEE Committee in 2023, I've been so impressed with the entire initiative and its impact worldwide.

As the newly appointed Committee Chair for 2025, I am both proud and excited to lead EPICS in IEEE toward continued growth and success. My focus will be on increasing engagement from IEEE Societies and industry, recognizing academic institutions and groups that consistently drive high-quality, impactful projects, and inspiring them to keep innovating. Additionally, I aim to create opportunities for multi-year projects, enabling teams of students to tackle complex community challenges that require sustained effort beyond a single year. We'll also continue the outstanding work that my predecessor, Dr. Stephanie Gillespie, initiated to strengthen our monitoring, measurement, and follow-up of EPICS in IEEE projects in order to continue building on the program's sustainability, resilience, resources, and support.

Among my favorite parts of the EPICS in IEEE program, I love that student participants get to venture outside the classroom armed with all the knowledge they've acquired over the years and learn that engineering isn't just a focus on the technical aspects of the discipline but ultimately about solving real problems for actual people. I look forward to helping EPICS in IEEE grow and strengthen because there's so much need out there, but also because so many young engineers around the world are willing to put their energy and knowledge towards improving the well-being of people.

Looking forward to a great year and the immense power of our global efforts!

Pedro Wightman, Ph.D.

EPICS in IEEE Committee Chair, 2025

*Associate Professor, School of Engineering, Science and Technology,
Universidad del Rosario (Bogotá, Colombia)*



"This year, I was excited to expand our partnerships with our IEEE organizational units and societies and help them achieve their goal of benefiting humanity while participating in positive service learning activities."



Global Participation in

39
COUNTRIES

33%
NORTH
AMERICA



33%
ASIA



15%
AFRICA



14%
SOUTH
AMERICA



5%
EUROPE



EPICS IN **IEEE**

2024 METRICS



39 PROJECTS

PROJECT PILLARS



31

Environment



5

Access
& Abilities



2

Human
Services



1

Education
& Outreach

US\$226,000

given out in funding this year

907 STUDENTS

46%

522 University
Students

385 Pre-University
Students

Female
Students

290 IEEE
VOLUNTEERS
Engaged

2009 - 2024 TOTAL METRICS

255 PROJECTS

PROJECT PILLARS



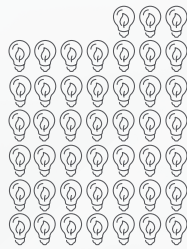
85

Environment



76

Access
& Abilities



45

Human
Services



49

Education
& Outreach

Total
Estimated
People
Impacted

1,633,260**

US\$1,319,831

given out in funding since 2009

12,808 STUDENTS

5,101 University
Students

7,707 Pre-University
Students

1,600 IEEE VOLUNTEERS Engaged

*as reported by student teams in project proposals

Solar Technology Helps Drive Smart Agriculture in West Virginia



“This project aims to pave the way for a greener future in greenhouse cultivation in West Virginia and hopefully also set a **positive example in the broader fight against climate change.**”

Though traditional greenhouses help control growing conditions so plants can enjoy a longer and more fruitful growing season, greenhouses can experience unpredictable temperature shifts, inconsistent humidity levels, and impacts from extreme weather events – especially in the highly diverse climate within West Virginia’s mountainous regions. But thanks to a team of students at Bridgevalley Community and Technical College in South Charleston, West Virginia, US, and their **“Solar PV Powered Smart Sustainable Greenhouse”** project, they’ve delivered an intelligent greenhouse system capable of continuously monitoring and precisely controlling key environmental variables, including temperature, humidity, light intensity, and soil moisture for nearby **Café Appalachia**, a local, eco-friendly café that grows its own produce.

The team’s efforts were focused on developing a smart irrigation system to monitor soil moisture, automate the watering process, and significantly reduce water usage. They also created a smart and energy-efficient ventilation system to control temperature and humidity—all powered by the sun’s rays.

“We achieved these outcomes by seamlessly integrating solar PV panels, state-of-the-art sensors, Arduino-based microcontrollers, and IoT connectivity, resulting in a self-sustaining solution that operates in harmony with the environment,” shared Team Lead Dr. Youngil Kim,

a former faculty member within Bridgevalley Community and Technical College’s Engineering Department.

Successfully overcoming weather-related delays during the project, “our smart greenhouse’s real-time data collection, comprehensive analysis, and automated responses will help ensure optimal growth conditions for a variety of crops while reducing dependence on non-renewable energy sources, enhancing sustainability, and minimizing costs,” Dr. Kim added.

Through their exploration of cutting-edge technologies and materials, the team is proud of their efforts to create a successful model for climate-resilient farming and grateful for the project funding they received from EPICS in IEEE (and the Antennas and Propagation Society, an EPICS in IEEE partner).

“By uniting innovation, sustainability, and education,” Dr. Kim concluded, “this project aims to pave the way for a greener future in greenhouse cultivation in West Virginia and hopefully also set a positive example in the broader fight against climate change.”



Testing of the temperature and humidity regulation sensors that will monitor the greenhouse conditions.



CV and ML Technology Help Promote Plant Biodiversity in Lebanon



“In addition to gaining key skills in machine learning, artificial intelligence, computer vision, data collection, storage, labeling, and handling, GIS mapping, and wireframe development, **students became more aware of and sensitized to biodiversity issues overall.**”



A team member is on a field visit to the Shouf Biosphere Reserve (SBR), where they are collecting data on plant species for their project.

With over 2,600 different types of plants growing within its borders, Lebanon boasts some of the most diverse flora in the world – and the ability to identify and protect these species, especially in light of the current global shortage of taxonomy experts, was paramount to a team of professors and students at the Maroun Semaan Faculty of Engineering and Architecture at the American University of Beirut in Lebanon. Thanks to their project **“Mitigating the Taxonomic Impediment Problem of Plants Using ML and Citizen Science”** and the development of a smartphone app using computer vision (CV) and machine learning (ML); however, they’re successfully mapping the many different types of flora throughout the country and helping to protect endangered species.

Conducted in conjunction with **Lebanon’s Shouf Biosphere Reserve** and completed through the efforts of 110 student volunteers, “our objective was to create a tailored smartphone application using ML to classify plant species in Lebanon and create a robust database of plant images,” shared faculty co-lead Salma Talhouk, Professor of Landscape Design and Ecosystem Management at the American University of Beirut. “Using a state-of-the-art ML model, a camera, and information on the location and time, our app will be able to identify species names from their physical characteristics, geolocation, and season and serve as a real-time plant recognition tool that covers all species, areas, and seasons in Lebanon.”

Though armed conflict in Lebanon during Fall 2024 temporarily delayed field visits by student volunteers, the project met its database targets and was an overwhelming success, both personally and professionally. “In addition to gaining key skills in machine learning, artificial intelligence, computer vision, data collection, storage, labeling and handling, GIS mapping, and wireframe development, students became more aware of and sensitized to biodiversity issues overall,” said faculty co-lead Ibrahim Issa, Assistant Professor of Electrical and Computer Engineering at the American University of Beirut.

Grateful for the project funding they received from EPICS in IEEE and for the opportunity to leverage technology to solve real-world problems, the team has big plans for their app beyond their own borders.

“We’d love to replicate our efforts in other Middle Eastern and North African countries as well as countries around the Mediterranean Sea,” confirmed Dany Abou Jaoude, faculty co-lead and Assistant Professor of Mechanical Engineering at the American University of Beirut. “Given that it will be an impossible task for academic experts to complete on their own, our goal is to popularize taxonomic efforts by allowing citizen scientists to contribute.”



A 3D AR System Brings the Power of Distance Learning to Students in Rural Pakistan



“From funding to mentorship, EPICS in IEEE provided us with essential support that allowed us to bring this project from concept to reality.”

As a result of the area’s harsh weather conditions, damaged roads, sparse healthcare, overcrowded schools, and limited training for teachers, students in rural areas of Pakistan’s congested Sindh province are often challenged to get a quality education and the resources they need to learn, grow, and develop. However, a team of students from the Department of Electronics at Mehran University of Engineering and Technology (MUET) in Jamshoro, Pakistan, have developed a virtual and hands-on learning platform that has provided hundreds of elementary students in underserved areas of Pakistan with instant access to a wealth of educational resources. Nineteen students and two faculty supervisors worked hard on the platform’s display, content, and power management. “Our system features real-time capture, processing, streaming, and 3D visualization of recorded educational content as well as interactive 3D content adapted from the schools’ book lessons, allowing knowledge transfer to remote areas,” Qazi said.

While the team found it challenging to precisely align their prototype’s semi-reflective glasses and LED display to achieve a seamless three-view holographic effect, their ongoing efforts and out-of-the-box thinking proved successful.

“So far, we’ve deployed our 3D AR system in two schools in rural Sindh and have reached about 500 students in first through fourth grade,” Qazi said of their outreach efforts. “The response has been overwhelmingly positive, with students demonstrating higher engagement and better conceptual understanding, and teachers have also appreciated the system’s ease of use and its potential to transform traditional learning.”

“From funding to mentorship, EPICS in IEEE provided us with essential support that allowed us to bring this project from concept to reality,” confirmed Qazi. “Ultimately, our vision is to see our system deployed in rural schools across Pakistan, where it can provide students with access to high-quality, interactive learning tools. More broadly, we hope that the technology can inspire similar innovations in healthcare, vocational training, and beyond and ultimately foster development in underserved communities.”



EPICS in IEEE project university team from Mehran University of Engineering and Technology (MUET) assembling their Augmented Reality 3D System prototype.

The Fast Rural Development Program (FRDP) is a local group in rural Sindh, Pakistan that works to promote sustainable development. “Our goal was to develop a 3D augmented reality (AR) display system to address the unique educational challenges faced by rural communities in Pakistan,” said Sameer Qazi, a senior at Mehran University and one of the project leads.

An Innovative Audio Device Helps Detect Hearing Loss in Guatemala's Youngest Residents



“Ours is a **low-cost, easy-to-use device** that people who aren’t audiologists can use and share with others in their community.”

A wealth of studies confirms that hearing loss in children can lead to developmental delays in everything from speech and academic performance to socialization skills and more. But the lack of affordable access to hearing tests can make it challenging for families to know if their children have hearing deficits, especially in the case of infants, who don’t yet possess the maturity or communication skills to express a hearing disorder.

This is particularly true in Guatemala, where an estimated 400,000 babies don’t have access to any kind of audio screening and are at risk of experiencing these difficulties. But thanks to joint efforts by a team of students at Franklin W. Olin College of Engineering in Needham, Mass., US, and Babson College in Wellesley, Mass., US, via the collaborative Affordable Design and Entrepreneurship (ADE) Program, the affordable and easy-to-use audio screening device they developed is making beneficial hearing tests available to Guatemalan children and communities in need.

Traditional hearing tests are costly and typically administered by trained audiologists, who are in short supply in many regions of Guatemala – all factors limiting accessibility to these services by area residents. “But we’ve been building upon some now-expired patents to develop an otoacoustic (OAE) emissions screening device, a tool that doesn’t involve verbal feedback from the patient, so it can be useful for

nonverbal people such as infants,” shared Olin College senior and team member Andrew Chang.

Working in conjunction with non-profit partner **Sonrisas que Escuchan (“Smiles That Listen”)**, a Guatemala City-based organization dedicated to the early detection, diagnosis, and treatment of hearing loss in children and adults within low-income households, and its director, audiologist Dr. Patricia Castellanos, the team’s device sports a low material cost but huge benefits.

This project was funded by the Jon C. Taenzer Memorial Fund established by the [IEEE Foundation](#) in 2019. The team has had the opportunity to interview audiologists from around the world to gain access to their expertise in the field and is channeling that information into their development of an OAE prototype, which social enterprise collaborator Solar Ear will then help to ready for mass production.

As that day nears, the team hopes their tool will help usher in a new day in audiological healthcare.

“Ours is a low-cost, easy-to-use device that people who aren’t audiologists can use and share with others in their community,” said electrical engineering student and team member Venkadesh Eswaranandam. “They don’t have to make a trip to get hearing screenings or, even worse, not get them at all.”

Team member Venkadesh Eswaranandam assembling his OAE screening device prototype.



EPICS in IEEE Celebrates its 15th Anniversary

“Engineering Projects in Community Service in IEEE (EPICS in IEEE) is a perfect way to converge engineering education and engagement.”



In 2024, EPICS in IEEE proudly celebrated its milestone 15th anniversary and commemorated an outstanding decade and a half of positively impacting and inspiring students and communities worldwide through the power of service learning.

Founded initially as EPICS, a curricular-based program at Purdue University (Lafayette, Indiana, US) in 1995, EPICS in IEEE has proudly honored its commitment to providing community organizations with the technology they need to improve and deliver services while offering undergraduate students invaluable opportunities to broaden their educational skills and benefit from personal and professional development through engagement with their communities.

“Engineering Projects in Community Service in IEEE (EPICS in IEEE) is a perfect way to converge engineering education and engagement,” confirmed Saurabh Sinha, Ph. D., Co-Founder of EPICS in IEEE. “Further, it provides a segue for universities to focus their education paradigm to support the United Nations Sustainable Development Goals. As a co-founder, I’ve seen EPICS in IEEE in multiple countries and enjoyed the ‘globalizing’ benefit the program brought to all parties involved.”

Over the past 15 years, EPICS in IEEE has awarded over 1.3 million dollars in funding to more than 250 service learning projects around the world. “For the past 15 years, EPICS in IEEE has played a key role in expanding the global reach of projects in which engineering students bring their learning and skills to bear in addressing challenges faced by their local communities,” shared Leah Jamieson, Co-Founder of EPICS at Purdue and 2007 IEEE President. “By tackling community needs in the areas of access and abilities, education and outreach, human services, and the environment, students participating in EPICS in IEEE gain first-hand experience in marrying engineering and community, and, project by project, contribute to IEEE’s goal of ‘advancing technology for the benefit of humanity.’”

“Through our 15th Anniversary campaign, we’ve promoted awareness of our program and increased donations from our generous donors and supporters,” said Stephanie Gillespie, Ph.D., EPICS in IEEE Committee Chair, 2022-2024. “During our celebration, it was wonderful to hear from past and current participants about their impactful experiences through EPICS in IEEE over the past 15 years.”

EPICS in IEEE hopes that you enjoyed celebrating this milestone with us. We look forward to the next 15 years of this groundbreaking program.



Thank You to Our Donors and Supporters



EPICS in IEEE sincerely appreciates the many supporters and partners who worked with EPICS in IEEE in 2024!

Thank you for helping us celebrate our 15th anniversary and continuing to grow this engaging and impactful program. We look forward to seeing the outstanding activity and stellar results generated by the 39 approved projects this year!

The EPICS in IEEE team is extremely grateful to all those who participated in, supported, and encouraged the program in 2024, including our many students, volunteers, IEEE colleagues, and community partners! Your work—along with the indelible impact you're having on your communities—has been incredible to see!

- Fischer Mertel Community of Projects
- Jon C. Taenzer Memorial Fund

IEEE Partnering Organizations



EPICS in IEEE would like to thank the **Educational Activities Board** and the **Humanitarian Technologies Board** for supporting the program.

We would also like to extend a special thank you to the **IEEE Foundation and EPICS in IEEE Donors**. Your generosity has supported and informed the educational experience of thousands of students globally while enabling technological solutions that have positively impacted communities worldwide!





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