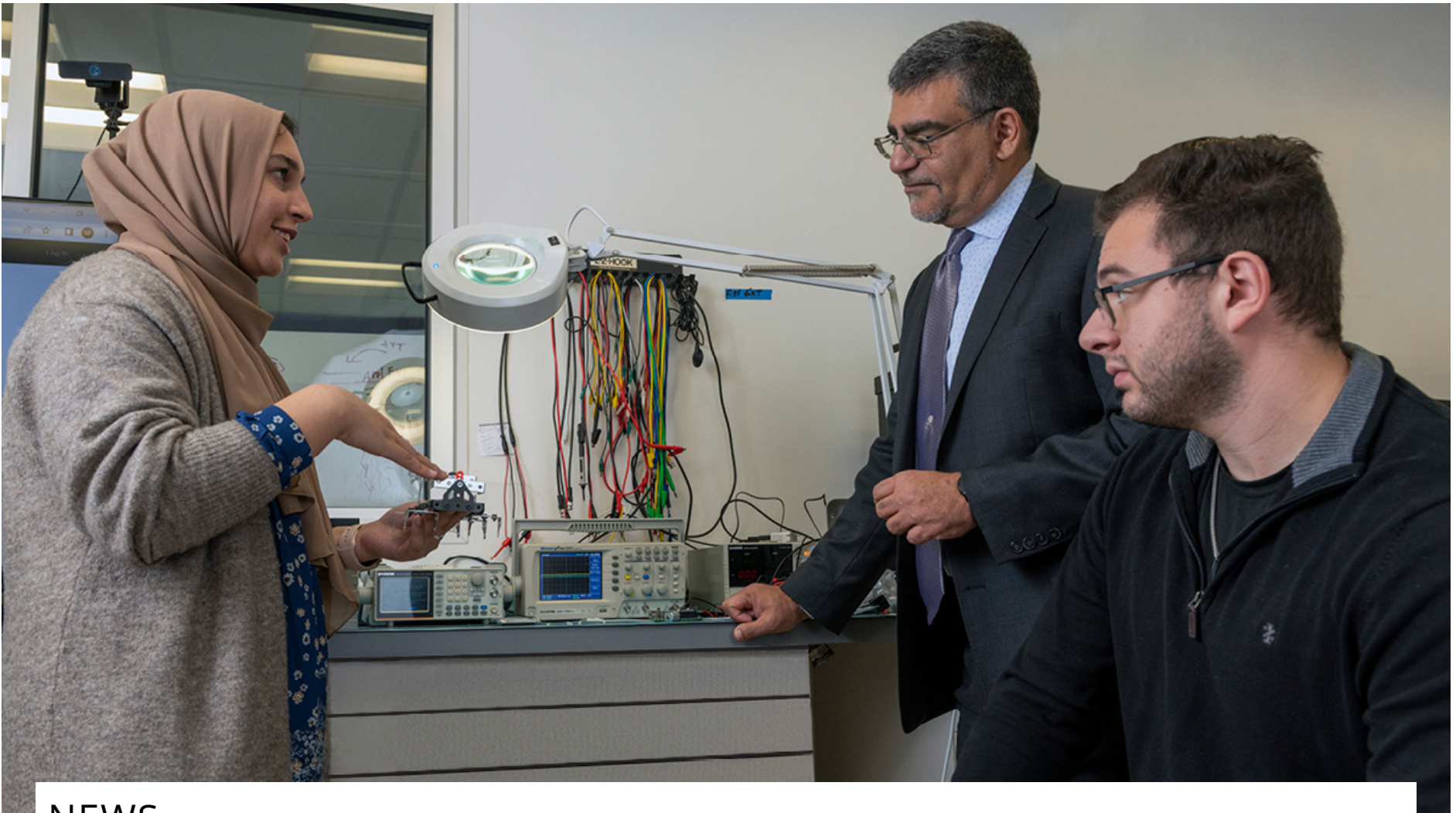


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Reaching for the Stars, One Robot at a Time

NOVEMBER 8, 2022

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PICTURED: ON THE LONG ISLAND CAMPUS, ETIC STUDENT EMPLOYEES ANILA KHAN, LEFT, AND ALEXANDER IMPASTATO, RIGHT, DISCUSS MOTORIZED COMPONENTS THAT WILL BE INCORPORATED INTO A NEW AND IMPROVED E.R.R.S.E.L.A. ROBOT WITH DEAN BABAK BEHESHTI.

Stepping through the doors of New York Tech's [Entrepreneurship and Technology Innovation Center](#) (ETIC), **Alexander Impastato** couldn't have imagined the opportunities within his grasp.

Impastato, an [electrical and computer engineering](#) student, has a particular interest in robotics. Outside of class, he interns with LK Comstock, a transit rail systems specialty electrical contractor, working on signaling systems responsible for speed control and safety for train tracks and subway systems of the Metropolitan Transit Authority and is vice president of the Institute of Electrical and Electronic Engineers

(IEEE) student chapter at New York Tech, where he competes in robotic competitions.

Impastato sought out **Michael Nizich, Ph.D.**, director of the ETIC and adjunct associate professor of computer science, wanting to become involved in projects. Involved might be a bit of an understatement to the serendipitous series of events that has led him to co-manage a collaborative project with far-reaching significance.

The ETIC aims to foster innovation while promoting and expanding New York Tech's industry and academic partnerships and encouraging collaborations among industry, professional organizations, and government entities while providing students with hands-on opportunities and insight into STEM careers.

Robotics and STEM

“Robotics is capable of combining a variety of other disciplines—mechanical, electrical and computer engineering, computer science, energy management, and cybersecurity—to engage students at all levels of knowledge and expertise in their area of interest while solving real-world problems,” says Nizich. The added bonus is that the ETIC robots can also be controlled remotely. “This opens up research opportunities and a virtual classroom providing experiences in STEM to anyone in the world, regardless of location.”

The [first](#) ETIC Robot for Student Engagement and Learning Activities ([E.R.R.S.E.L.A.](#)), built in 2019, has grown in functionality. Teams of researchers work on individual projects while providing STEM opportunities to middle and high school students from around the region and even around the world.

The project Impastato is working on began simply, notes Nizich. “We needed an additional robot when the original robot was down for repairs. We received a [Voya Foundation education grant](#) to promote STEM in underrepresented communities. The original plan was to build a replica of the first robot to serve researchers here and offer consistent virtual opportunities to others.”

However, the vision for the second E.R.R.S.E.L.A. (E2) has expanded since its inception. Because of the opportunities provided by the Voya grant, New York Tech’s prototyping [partnership with NASA](#), and the collaborative research with the [College of Osteopathic Medicine](#) (NYITCOM), what began as a plan to copy the original robot has morphed into a plan to build E2 incorporating a new and improved design from the frame up. “This new robot could impact everything from the surgical field to space exploration while providing all students who interact with the ETIC and E2 a more robust and richer experience,” says Nizich.

Impastato introduced fellow IEEE member **Anila Khan** to Nizich. Khan, a [computer science](#) major, excels at coding and is looking forward to the E2 project and working

with high school students. “New York Tech is a small school, but there are many opportunities here. The professors are very welcoming, always willing to guide and support students,” says Khan. She came on board as a co-manager of the E2 project and is particularly interested in the intersection of computer science and medicine.

Impastato and Khan are tasked with designing the mechanical and electrical systems of the new E2 robot to enable dexterity and precision of movement to be used in a variety of additional projects. The two are building on robotic surgical research conducted in 2021 in collaboration with NYITCOM Professor **Todd Cohen, M.D.**, and **Nolberto Jaramillo** on robotic tissue retraction during surgical procedures. In that iteration, E.R.R.S.E.L.A. used one arm to retract tissue. Impastato and Khan are designing and building an improved robotic surgical assistant with two arms able to perform both retraction and suction procedures during surgeries.

The research project with NYITCOM last year confirmed the concept, notes Nizich. Robots can perform the tedious task of retraction during surgeries freeing up medical staff for other procedures. “Using what was learned during the last project, further refinement of E2 is needed,” notes Nizich. To solve the problems discovered with E.R.R.S.E.L.A., the new robot needs a sturdier base so it doesn’t tip when the arms are extended, as well as increased dexterity so it can maneuver within a surgical suite with other surgeons and assistants,” he explains.

The design for a sturdier base capable of more precise movement that will work in a surgical suite will also benefit New York Tech's service contract with NASA. "The original base design of E2's mobile platform that we are working on will be capable of hosting other mobile applications and innovations, making this base adaptable for other functions and projects," notes Nizich.

Dreaming Big

Looking at what is missing and adapting a robot to meet the needs of individual projects, the possibilities are endless. For example, a robot could deliver medications to a specified floor, room, and patient in a hospital. A similar robot could take air quality samples in a building full of contaminants or measure radiation levels after a reactor leak.

The opportunities at New York Tech are just as endless, given the university's proclivity to involve students in collaborations between departments and within various industries. "I could not have dreamed of the wide range of opportunities present within the ETIC," says Impastato. "I enjoy branching out and being involved in many different aspects of electrical engineering and robotics; Professor Nizich helps us dream big," says Impastato.

Solving Real-world Problems With STEM

E2 will enhance the ETIC's ability to provide STEM exposure. High school and middle school students will work with Impastato and Khan in designing and programming the E2 robot as it is built and grows in functionality. "Presenting students with a problem we don't yet have an answer to allows them to explore ideas and possible solutions. It's a different process than being asked questions with known answers. Solving problems with design adjustment or coding gives students a glimpse into project management and STEM careers," says Nizich.

Open discussions and collaboration are the backbones of innovation. Bringing together individuals of different backgrounds and experiences on projects leads to unplanned results that are often better than anything that could accomplish alone.

"This innovative process enabling creative vision to take shape solving real-world problems is magical for all involved," says Nizich. "I could not orchestrate the incredible results that come out of these projects without the dedicated and talented student engineers."

Through these types of opportunities, New York Tech students learn to communicate their ideas, share their experiences, and work in a team. Additionally, they are exposed to other creative individuals around the world. While exploring challenges

and solving problems, it is these differences that spark ideas and pave the way to discovering solutions that will impact an individual's future and could very well impact the world.

“The College of Engineering and Computing Sciences and ETIC have been at the forefront of innovation and career-oriented education that has been the mission of New York Tech for decades,” says Dean **Babak D. Beheshti, Ph.D.** “It is through highly practical and applied experiential learning projects that our students put their theoretical skills to use and develop an entrepreneurial mindset. I am proud of what our students continue to accomplish at the ETIC under Professor Nizich’s leadership.”

By Denice Rackley

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