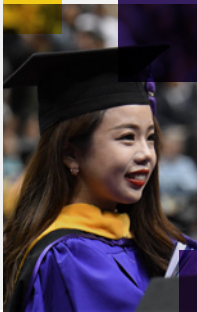




NYU

TANDON SCHOOL
OF ENGINEERING



2017

YEAR IN REVIEW

TECHNOLOGY IN SERVICE TO SOCIETY



DR. KATEPALLI R. **SREENIVASAN**

Katepalli Sreenivasan, or Sreeni as he is known, has enjoyed a distinguished career that includes leadership posts at such esteemed institutions as the International Centre for Theoretical Physics, University of Maryland, and Yale University; memberships in a multitude of prestigious organizations including the National Academy of Engineering, National Academy of Sciences, the American Academy of Arts and Sciences, the Indian Academy of Sciences, and the Accademia dei Lincei; and a long list of laurels that features a Guggenheim Fellowship and the UNESCO Medal for Promoting International Scientific

Cooperation and World Peace from the World Heritage Centre.

His many accomplishments at the helm of our institution have earned him the deepest respect of everyone here. Sreeni oversaw the formal completion of the merger between NYU and the school previously known as Brooklyn Poly, and he cemented our commitment to placing technology in service to society. Under his leadership, the School of Engineering attracted one of the most generous gifts in university history and became home to many of new research centers, including C²SMART, The GovLab, AR/VR Lab, and the NYU Center for

Cybersecurity; prototyping facilities such as our 10,000-square-foot MakerSpace; and expanded entrepreneurial initiatives, including one aimed at supporting and fostering the nation's military veterans. During Sreeni's tenure, greater numbers of female faculty members and students have arrived at Tandon, as well as new professors considered giants in their fields.

While Sreeni is stepping down in July 2018 to pursue his own research and scholarship more single-mindedly, his determination to ensure that Tandon is at the forefront of engineering and creating a better world will continue to inform our ethos.

TANDON'S 10-POINT PLAN

Sreeni leaves us with the following 10-point plan for further growth and evolution that will be a blueprint for years to come.

1 Continue the trajectory of success and high caliber of research in our established centers and institutes, and in the coming years **launch at least four to six world-class research centers aimed at addressing important global problems.**

2 With many of our students eligible for Pell Grants and the first in their families to attend college – and with average SAT scores very high and on the rise – continue to **attract academically strong and diverse students, expand their vision, provide resources to ensure their academic and career success, and help them find suitable jobs.**

3 Design and build a more innovative, hands-on, interdisciplinary curriculum (including online offerings) with a focus on **entrepreneurship and leadership**, on the basis of the momentum and success of programs such as Vertically Integrated Projects (VIP), which allows students to participate in multi-year research-active projects that involve others throughout NYU and NYC.

4 Leverage NYU's reach as a major research university to provide **interschool, interdisciplinary, and global learning opportunities** at our campuses in Shanghai, Abu Dhabi, and other locations around the world and encourage upper-level Tandon students to take advantage of a unique exchange program that allows them to enroll at international partner institutions, in courses that will be accepted for transfer credit and count toward their engineering degrees.

5 Fuel a **culture of technology and entrepreneurship among faculty and students** that includes participation in our Future Labs as employees, consultants, and engineers-in-residence; our many contests like InnoVention, which encourage students to prototype and turn their ideas into reality; and programs like NSF I-Corps, meant to take research from the lab bench to real-world application.

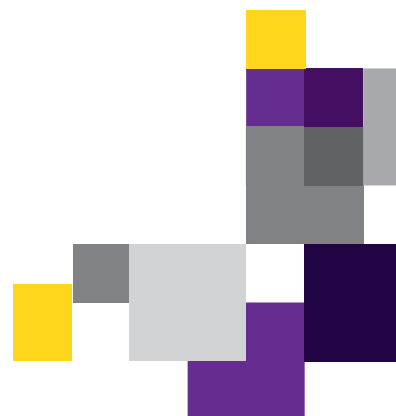
6 **Partner effectively for technological and social impact**, drawing upon existing templates such as the NYU WIRELESS industry affiliates program, which gives partner companies access to NYU research and talent while providing students with internship and employment opportunities, equipment, and support.

7 **Continue to invest in services and facilities**, an especially noteworthy endeavor in light of the resounding success of our new MakerSpace, which allows students to take their concepts from the ideation stage to actual prototype, and the exciting renovation of 370 Jay Street.

8 Acknowledge the strength and experience of our School of Engineering grads by **deepening and fostering alumni engagement**, with mentorship opportunities, chances to network, family-friendly events, and more.

9 **Spread the word about Tandon** so that the whole world knows of our commitment to placing technology in service to society, our students' determination to improve the world, and our researchers' progress in fields like cybersecurity, 5G communications, robotics, bioengineering, transportation, Big Data, and more.

10 Take steps to ensure that Tandon **continues to climb** until it is officially ranked among the top engineering schools in the nation and the world, based on the solid accomplishments of our high caliber faculty, students, staff, alumni, programs, departments, and facilities.






ACADEMIC CENTERS



NYU WIRELESS



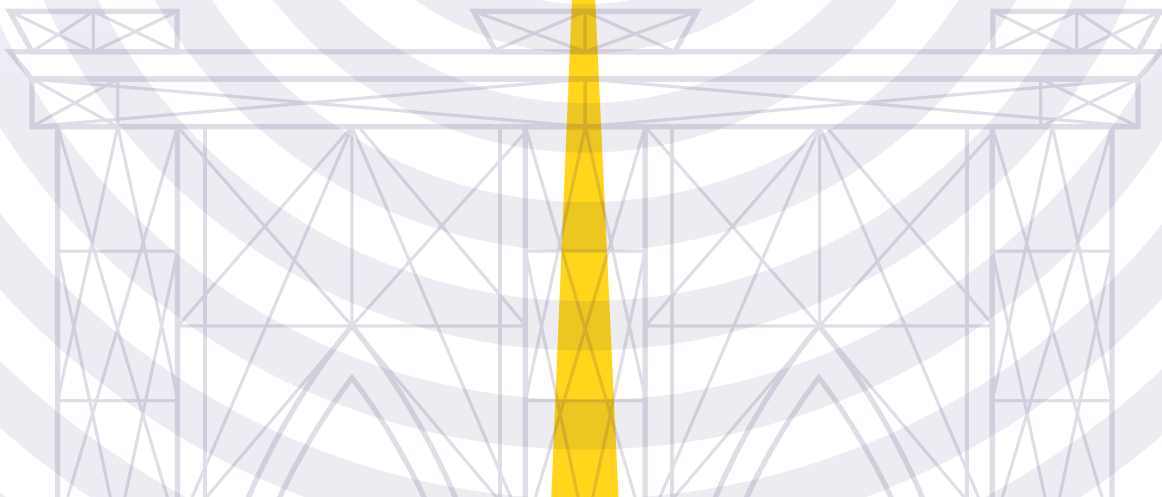
A world-renowned multidisciplinary academic research center, NYU WIRELESS is creating the fundamental theories and techniques for next-generation mass-deployable wireless devices across a wide range of applications and markets. Research conducted at the center, which was founded by Professor Theodore “Ted” Rappaport, has been instrumental in making 5G cellular a commercial reality, thanks to studies of the millimeter-wave spectrum.

It was not until 2013, when Rappaport published the seminal paper “Millimeter Wave Mobile Communications for 5G Cellular: It Will Work,” that the world awoke to the possibilities of tapping that underutilized spectrum.

While consumers will enjoy speeds up to 1,000 times faster than those obtained with 4G devices, the move means much more for the world than effortlessly streaming movies and sharing selfies. Fifth-generation wireless is predicted to usher in an era in which physicians use sophisticated virtual-reality gear

to operate from remote locations on patients; cars sharing a road communicate in order to avoid accidents; hundreds of millions of illiterate adults around the globe have access to needed educational materials; and smart buildings make the most efficient possible use of energy.

Because 5G opens the possibility of better service in rural regions as well as in densely populated urban areas, NYU WIRELESS research is helping democratize access to the digital world — an outcome that speaks directly to Tandon’s core goal of creating technology that will serve society.





■ AI.Now

With artificial intelligence (AI) rapidly moving into everyday life and being woven into our core social institutions like health care, employment, education, criminal justice, AI.Now is working towards a deeper understanding of its effects and exploring ways to harness AI's power for good. The initiative's core research areas include rights and liberties, labor and automation, bias and inclusion, and safety and critical infrastructure.

■ Center for Advanced Technology in Telecommunications (CATT)

One of New York State's original Centers for Advanced Technology, CATT aims to create economic impact through research, technology transfer, and faculty entrepreneurship. CATT encourages collaborations between industry and university experts who understand how to turn technological breakthroughs into commercially viable products and services.

■ The Governance Lab (The GovLab)

At no other time in history has innovation brought about more challenges and opportunities for government, and The Governance Lab (The GovLab) studies the impact of technology in that sphere. This “think-and-do-tank” partners with public institutions to design, implement, and assess new ways of using technology to advance more effective and legitimate governing. Its goal is to strengthen the ability of institutions and people to work more transparently and collaboratively to make better decisions, solve public problems, and advance social justice.

■ NYU Center for Cybersecurity (CCS)

An interdisciplinary research institute dedicated to training the next generation of cybersecurity professionals and to shaping the public discourse and policy landscape on issues of technology and security, CCS is a collaboration among Tandon and its experts in both hardware and software security with the NYU School of Law; the NYU Steinhardt School of Culture, Education, and Human Development; NYU Abu Dhabi; and other NYU schools and departments.

■ Resiliency Resource Center (R2C)

With recent storms exposing critical shortcomings in the resilience of our built environment and capacity for organizational resilience, sharing information on better practices has never been more important. R2C takes an interdisciplinary, collaborative approach to providing the latest research and information to stakeholders involved in the prediction of, response to, and recovery from catastrophic events — and in organizational resilience and business continuity.

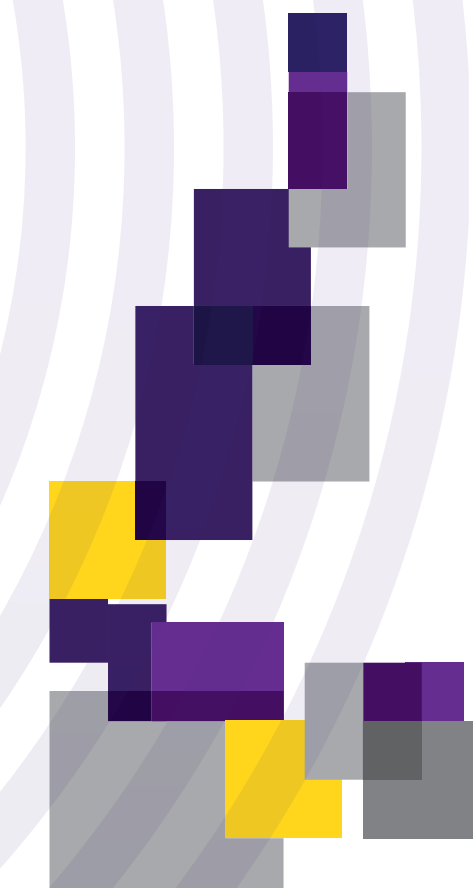
■ Connected Cities for Smart Mobility towards Accessible and Resilient Transportation (C²SMART)

A U.S. Department of Transportation Tier 1 University Transportation Center (UTC) for research, education, workforce development, and technology transfer activities, C²SMART takes as its priority the “Mobility of People and Goods in Urban Areas” with a focus on “Smart and Connected Cities.”

Rather than just focusing on developing technologies, this solutions-oriented center is dedicated to a related critical step: how to connect these disparate technologies with cities of different population and infrastructure scales and different systems of systems.

■ Visualization and Data Analytics (ViDA)

The data scientists at ViDA are working on a variety of projects to better harness the power of big data, including focused web crawlers, open-source scientific workflow and provenance management systems, domain discovery tools, and methods for ensuring computational reproducibility.



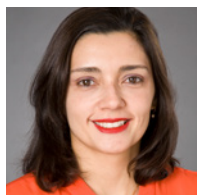
SUCCESSFUL FACULTY



Mariela Alfonzo, a Research Assistant Professor in the Department of Technology, Culture, and Society, was named an Associate Fellow of the NewCities Foundation — a global nonprofit dedicated to making cities more inclusive, connected, healthy, and vibrant — for her accomplishments in the field of placemaking, whose practitioners seek to design and manage local-level public spaces that promote wellbeing.



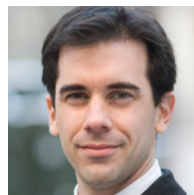
Associate Professor of Electrical and Computer Engineering Yong Liu, a faculty member of the Center for Advanced Technology in Telecommunications (CATT) and NYU WIRELESS, was named a fellow of the Institute of Electrical and Electronics Engineers (IEEE), the world's largest technical professional association, for contributions to multimedia networking.



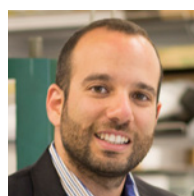
Professor of Computer Science and Engineering Juliana Freire was elected as chair of the Association for Computing Machinery (ACM) Special Interest Group on Management of Data (SIGMOD). Known for her seminal work on data reproducibility and her development of data science tools for projects with a social justice slant, she is the first woman to be elected as chair of SIGMOD in its 42-year history.



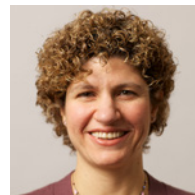
Assistant Professor of Civil and Urban Engineering Joseph Chow, who is active in NYU's new research center Connected Cities for Smart Mobility toward Accessible and Resilient Transportation (C²SMART) and heads the Behavioral Urban Informatics, Transport and Logistics (BUILT) Laboratory, was the recipient of a National Science Foundation Faculty Early Career Development Award, more widely known as CAREER Award. The prestigious prize was bestowed in recognition of his studies of how Big Data can inform the design of urban transportation systems, with a special emphasis on the privacy issues inherent in gathering and interpreting that data.



Assistant Professor of Urban Informatics in the Department of Civil and Urban Engineering Constantine E. Kontokosta, who directs the Urban Intelligence Lab, garnered a CAREER Award for his efforts to develop a data-driven understanding of cities and metropolitan energy dynamics and the impacts on human well-being. Kontokosta has been widely praised for launching the Quantified Community research initiative, deploying sensors to measure factors such as noise and air quality in various areas of the city.



It isn't every day that academics and fashion industry insiders interact, but that was the situation when **Assistant Professor of Chemical and Biomolecular Engineering Miguel Modestino** accepted a 2017 Global Change Award from the H&M Foundation. The organization recognized Modestino for his efforts to synthesize nylon — a popular material whose annual market is valued at more than \$20 billion — using water, plant waste, and solar energy, rather than fossil fuel. Modestino also received the rare honor of being named to MIT Technology Review's Latin American Innovators under 35 list.



Professor of Electrical and Computer Engineering Elza Erkip was given the Institute of Electrical and Electronics Engineers (IEEE) Women in Communications Engineering (WICE) Award for her outstanding technical work in communications engineering and for bringing a high degree of visibility to the field. Erkip has made several significant advances in communications technology and is considered one of the pioneers of cooperative networking.



This year, we were happy to welcome to the Department of Electrical & Computer Engineering Tom Marzetta, renowned for originating Massive MIMO (Multiple-Input Multiple-Output), one of the cornerstones of fifth generation wireless technology.

He joins an impressive list of other new faculty members:

Greg Aloupis
Computer Science & Engineering

Dora Angelaki
*Mechanical & Aerospace Engineering /
FAS, Neural Science*

Eray Aydil
Chemical & Biomolecular Engineering

Amber Benezra
Technology, Culture & Society

STUDENT OPPORTUNITIES

VIP Program

We want all of our students to be VIPs.

At Tandon, students get a chance to take part in long-term, multidisciplinary ventures with real societal impact, thanks to our Vertically Integrated Projects (VIP) program.

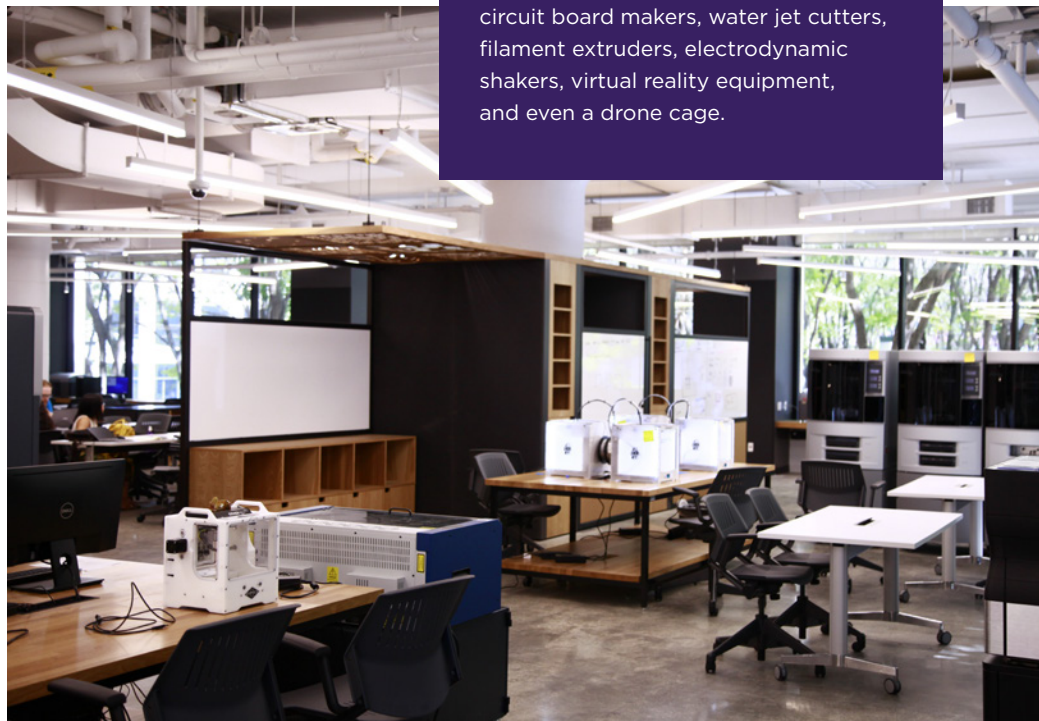
VIP was created so that learning isn't fragmented into years, semesters, or class periods, and scholarship isn't slotted into rigid disciplinary silos. It aims to encourage the type of in-depth learning that keeps students engaged and improves career preparation.

Participants can choose from a wide variety of current projects, including:

The **ReprintBot**, a proposed all-in-one system that will, when fully developed, allow users to recycle used plastic bottles to make 3D printing filament and then use the filament, which will be coiled and stored right in the unit, to print an item.

Vertical Farming, for which students will use their knowledge of automation, biology, and waste-derived energy generation to develop high-efficiency growing methods that can be scaled up to meet demand.

The MakerSpace



If our students can dream it, they can make it, test it, and refine it! Our bi-level, 10,000-square-foot MakerSpace features an array of 3D printers, laser cutters, scanners, plastic injection machines, circuit board makers, water jet cutters, filament extruders, electrodynamic shakers, virtual reality equipment, and even a drone cage.

Soft Robotics, which will require participants to develop the soft, deformable components crucial in robotic systems that deal with uncertain and dynamic task environments like grasping and manipulating unknown objects, locomotion in rough terrains, and physical contact with living cells and human bodies.

Smart Cities Technology, a collaboration with the Center for Urban Science and Progress (CUSP), the Rudin Center for Transportation, and the Urban Future Lab that will focus on the vital issues of air pollution, water quality, food access, energy use, electric-autonomous vehicles, and public transportation.

Tega Brain
Technology, Culture, & Society

Eugene Callahan
Computer Science & Engineering

Yanir Maidenbergl
Chemical & Biomolecular Engineering

Ludovic Righetti
*Mechanical & Aerospace Engineering /
Electrical & Computer Engineering*

David Shimko
Finance & Risk Engineering

Paul Torrens
Computer Science & Engineering / CUSP

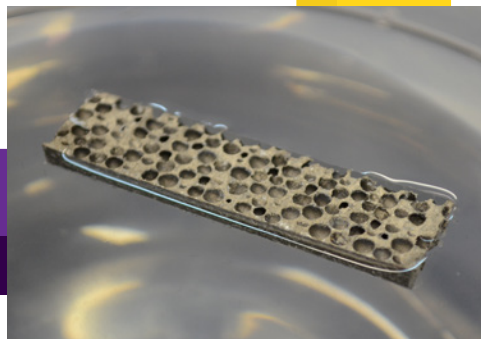
Gianna Figà-Talamanca
Finance & Risk Engineering

Nicholas Dizinno
Mechanical & Aerospace Engineering

Jörg Schumacher
Mechanical & Aerospace Engineering

RECOGNIZED RESEARCH

Every day, our researchers tirelessly work to engineer solutions to the problems facing the world. From improving our health to making cyberspace safer, members of the Tandon community are doing their part. Read on to learn more about some of our most noteworthy work of the year.

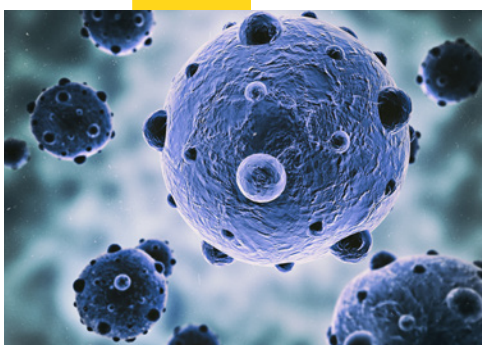


Syntactic foams — strong, exceptionally light materials made of plastic perfused with hollow microspheres — are used in everything from buoys and boat hulls to soccer balls and solid rocket boosters. They are now making their way into new industries, including the automotive sector, but producing the foams at such a large scale is a daunting challenge.

Associate Professor of Mechanical and Aerospace Engineering Nikhil Gupta is helping meet that challenge by developing a manufacturing method that saves money and energy and lowers the carbon footprint of suppliers, automakers, and drivers alike, leading to benefits not just for industry, but for society as a whole.

Gupta has also made significant contributions to the field of additive manufacturing, or

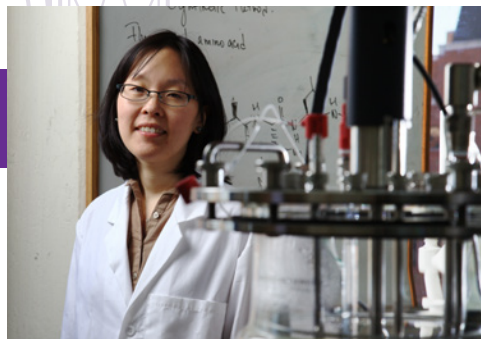
3D printing, as it is commonly known, discovering ways for manufacturers to turn the tables on thieves by deliberately embedding hidden flaws in CAD files to thwart intellectual property theft.



Gaining a better understanding of immune cells allows physicians to more effectively diagnose, monitor, and treat a wide range of diseases. Their complexity and sheer number make studying immune cells a difficult challenge, however. **Assistant Professor of Mechanical and Aerospace Engineering Weiqiang Chen** has embarked on the development of a new platform that combines an efficient microfluidic immune cell isolation technique and an ultra-sensitive nano-scale biosensor that will provide biologists and clinicians with a new approach to analyzing the proteins secreted from individual human immune cells.

One of the major challenges in regenerative medicine — replacing diseased tissues and coaxing those that are damaged to regrow — is designing targeted therapies that deliver the equivalent of molecular scaffolding and cellular construction crews to affected tissues, while allowing doctors to “see” and monitor where and how well these molecular care packages are being delivered. By adding an imaging component to a self-assembling macromolecule, **Associate Professor of Chemical and Biomolecular Engineering Jin Kim Montclare** is leading a team that is well on its way to building these biosynthetic materials that can deliver drug therapy or tissue engineering to a damaged area and non-invasively visualize the biomaterial amidst cells and tissue.

Additionally, new hybrid materials recently developed in Montclare’s lab combine a lipid “container” for transfection — the transportation of cargo past a cell membrane — and an easy-to-make protein capsule that can bind both small chemotherapeutic molecules and nucleic acids, thereby delivering a powerful chemical one-two punch to cancer cells.



Professor of Computer Science and Engineering

Nasir Memon is proving that fingerprint-based authentication systems used in cell phones and other devices are extremely vulnerable to hacking, and his work is expected to inform the design of more secure system.

Memon has also spearheaded development of a first-of-its-kind application to combat “shoulder-surfing,” in which a criminal stands close enough to observe a financial transaction and note a PIN or account number.

The technology, called “IllusionPIN,” deploys a hybrid-image keyboard that appears one way to the close-up user and differently to an observer at a distance of three feet or greater. IllusionPIN reconfigures the keypad for each authentication or login attempt, adding a new level of security to using an ATM or store card reader.



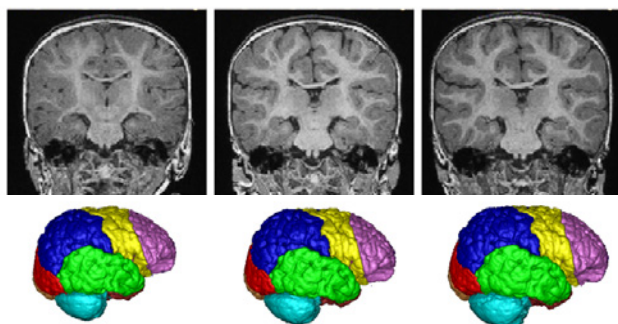
Assistant Professor of Computer Science

and Engineering Damon McCoy has helped devise the first automated techniques to identify ads potentially tied to human trafficking rings and link them to public information from Bitcoin — the primary payment method for online sex ads. This is the important first step toward developing a suite of freely available tools to help police departments and nonprofit institutions identify victims of sexual exploitation.

In another arena, McCoy has also conducted what is believed to be the first comprehensive security analysis of its kind, finding vulnerabilities in MirrorLink, an industry standard for connecting smartphones to in-vehicle infotainment (IVI) systems. McCoy and his colleagues found that when unlocked, MirrorLink can allow hackers to use a linked smartphone as a stepping stone to control safety-critical components such as the vehicle's anti-lock braking system. The research is expected to inform the development of more secure protocols.



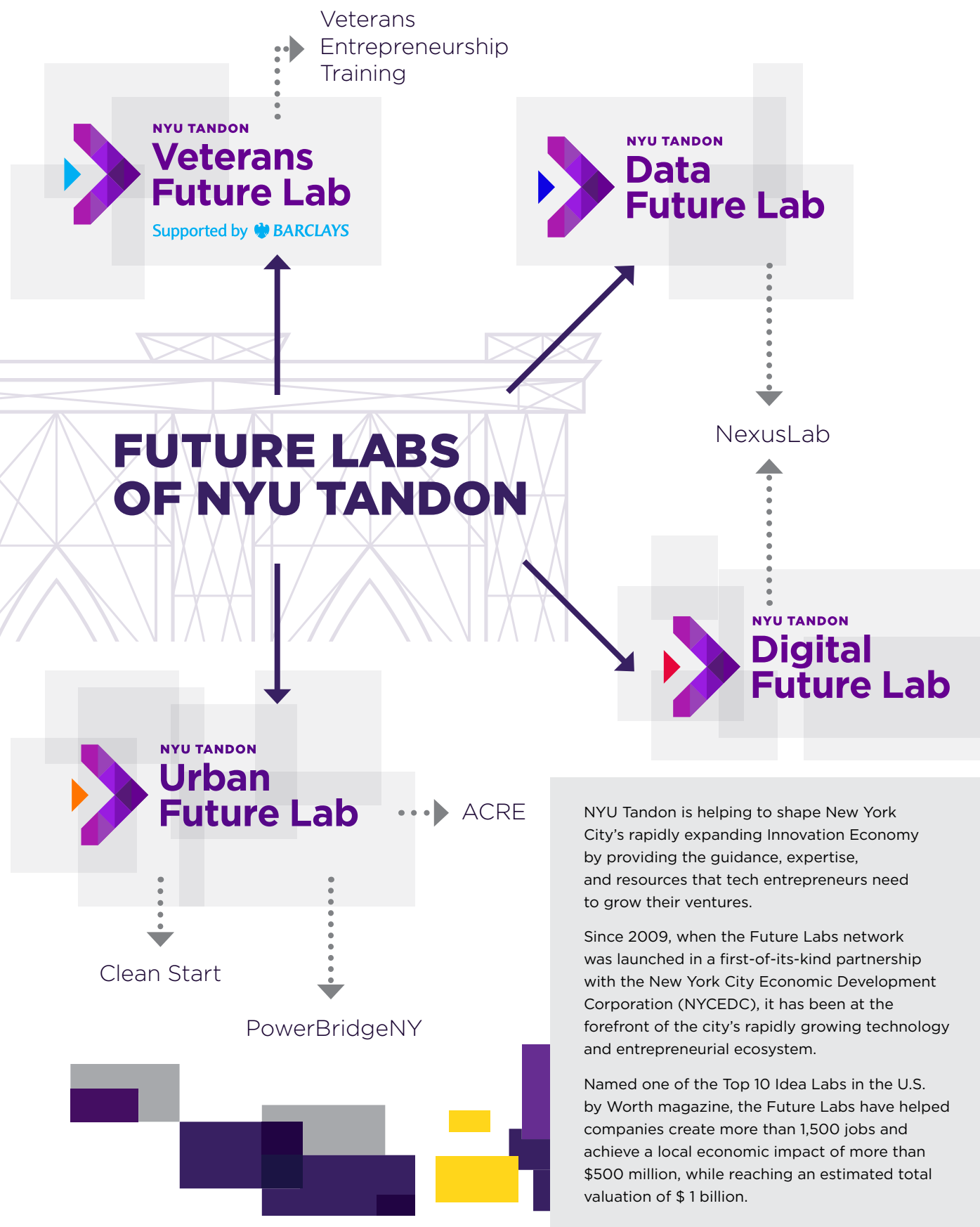
When clinical researchers wondered if it would be possible to detect autism before they could spot behavioral clues, they added to their team one of the world's foremost authorities on medical image analysis: **Guido Gerig, chair and professor in Tandon's Department of Computer Science and Engineering.** Gerig, who conducts research in Tandon's Visualization and Data Analytics (ViDA) Laboratory, contributed to a recent landmark study that predicted autism by looking not at how children act but how their brains grew. Current work, which builds on earlier studies, suggests that neurological signs of autism might be detectable in infants as young as six months old.



Modern cars contain dozens of computers — called ECUs (Electronic Control Units) — that control everything from safety equipment to entertainment systems. The increasing complexity of modern cars accompanies an increasing likelihood of flaws in the software. To combat this, vehicle makers are equipping ECUs with update capability, allowing the software to be changed without visiting a service depot. However, hackers can target these software update mechanisms to install malicious software, viruses, or even ransomware, the results of which could be catastrophic. **Assistant Professor of Computer Science and Engineering Justin Cappos** was one of the developers of the award-winning Uptane, a universal, free, and open-source framework to protect those wireless software updates in vehicles. Uptane allows automakers to completely control critical software but to share control when appropriate. It also helps automakers to quickly deploy secure fixes for a vulnerability exploited in an attack or to remotely (and inexpensively) update a car's electronics.



STRONG ENTREPRENEURSHIP



WOMEN AT TANDON

With the Class of 2021 containing more women than any in school history and female faculty members at the forefront of their fields, Tandon is fully committed to promoting and supporting women in engineering, science, technology, and math. Through a wide range of programs, services, and activities, we're building a supportive environment for — and of — women at the School of Engineering.

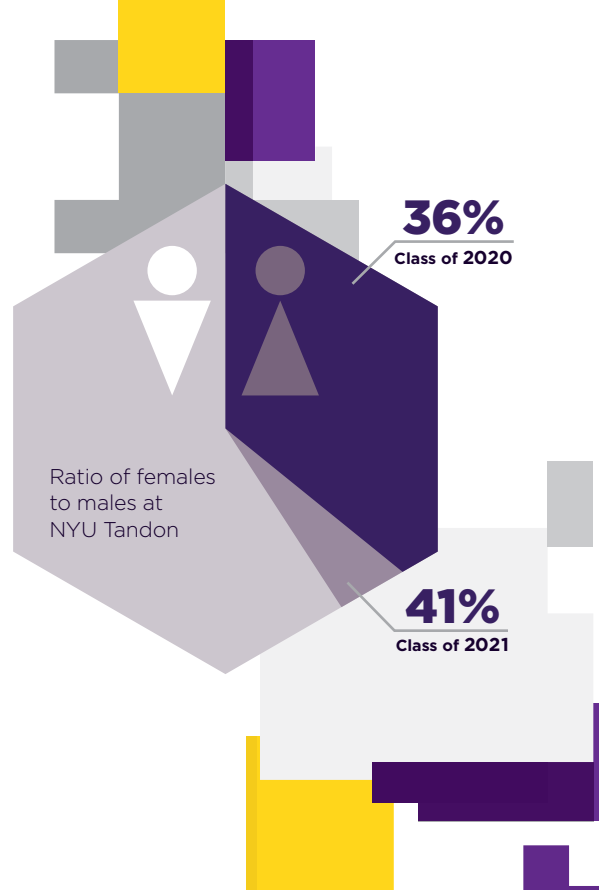
Our efforts start even before young women apply for admission, with initiatives like:

- K-12 outreach to schools across the city.
(This past summer alone, we reached more than 700 girls.)
- Computer Science for Cyber Security, a two-week, full-day summer program providing an introduction for high school women on the fundamentals of cyber security and computer science.
- A mentoring partnership with the Urban Assembly Institute (UAI) of Math and Science for Young Women.



Once here, our students take advantage of a variety of resources, including

- An annual week-long Women's Summit that empowers women students by helping them build connections to female faculty and alumnae and learn about topics relevant to women in STEM.
- Tandon-WEST, a biannual event that provides admitted women students with the opportunity to learn more about the school.
- WEST FEST, a summer event for accepted women students that provides them with the opportunity to meet fellow prospective students and connect with campus resources.
- "Girls Talk Tech," an event established by Google and pioneering computer scientist Anita Borg to give students valuable guidance on what it's like to pursue a tech career.
- The Women at Tandon Explorations Community, a floor in the Othmer Residence Hall created to offer women students a strong support system to reinforce their positive experience as STEM students.
- WoMentorship, a peer mentoring program that matches sophomores and juniors with seniors and graduate students to foster better understanding and help develop a strong women's community at Tandon.
- A variety of student organizations, like Society of Women Engineers (SWE), Women in Search of Excellence (WISE), and STEMInist, to help empower women on campus, in their careers, and in the engineering world at large.
- Women Empower Hours, monthly lunchtime discussions that range from topics like leadership development and job exploration to scholarship opportunities.
- Career Discovery in CyberSecurity, an annual conference that brings together some of the best minds in the industry, with the goal of guiding women with a talent and interest in cyber security into top-flight careers.
- For our male students, we mount events, panels and roundtable discussions to highlight the importance of gender diversity and inclusion and encourage men at Tandon to engage in concrete behaviors to become more meaningful allies to their female classmates.





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