Center *for an* Urban Future

# Harnessing CUNY as a Launchpad into Tech Careers

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**Harnessing CUNY as a Launchpad into Tech Careers**

# Building NYC's Future Tech Workforce

**NEW YORK CITY'S FAST-GROWING TECH SECTOR HAS BECOME THE CITY'S MOST CONSISTENT SOURCE** of new middle- and high-wage jobs. But even as demand for tech talent surges, New Yorkers of color remain strikingly underrepresented among the city's tech workforce. As city leaders consider options for expanding access to the well-paying jobs powering the city's economic future, there is no institution better positioned to accelerate these efforts than the City University of New York (CUNY).

Although the city is home to a number of well-regarded nonprofit tech training programs, only CUNY has the capacity to help New Yorkers from underrepresented populations prepare for technology careers at scale. Training providers such as Per Scholas, Pursuit, and The Knowledge House serve anywhere from a few dozen to a few hundred New Yorkers each year—meeting only a fraction of the opportunity that exists today to expand access to the tech sector. By comparison, CUNY graduates more than 9,000 students annually with science, technology, engineering, and math (STEM) degrees, including nearly 4,000 students with technology degrees.[1] Among all CUNY students enrolled in STEM programs, approximately half are Black and/or Hispanic, and roughly 71 percent of all CUNY students come from households earning less than $40,000 per year.[2]

Unfortunately, New York has only begun to harness CUNY's remarkable potential to serve as the city's largest and most equitable springboard into technology careers.

Today, most tech companies in the city employ few if any CUNY grads. An analysis of data from the social networking site LinkedIn shows that fewer than 0.3 percent of the employees of the city's largest technology firms are affiliated with CUNY—a smaller share than other New York colleges including Columbia and NYU, and other public universities such as the University of Washington and the University of Texas at Austin.[3] At the same time, only a handful of tech companies actively recruit for entry-level positions from CUNY campuses. And although CUNY produces more undergraduate students with computer science degrees than any other university in New York City, they find themselves in fierce competition for a limited supply of internships. Just 10 percent of all CUNY students report participating in a paid internship during their college careers—an especially serious problem among graduates interested in entering the tech sector, where internships are considered vital on-ramps to full-time technology jobs.[4]

While New York City has launched some successful programs that have helped grow the number of CUNY graduates in computer science and related fields, these initiatives still serve only a fraction of the students who could benefit from them. For example, the CUNY Tech Prep program serves just 170 students each year. The $20 million CUNY 2X Tech initiative has only reached 7 of 25 colleges, with no community colleges served to date. And while CUNY students who participate in the city's Tech Talent Pipeline (TTP) Residency internship program are more than three times as likely to secure a full-time job after graduation compared to their peers, the program has only served about 750 students over the past five years.[5] Compounding these capacity challenges, our research finds that most CUNY colleges have no more than two or three career counselors per 10,000 students.[6]

Creating a more equitable economy in New York City will require bold new efforts to expand access to the well-paying jobs in the city's ever-growing tech sector—and CUNY is the institution best positioned to help city leaders realize these goals at scale.
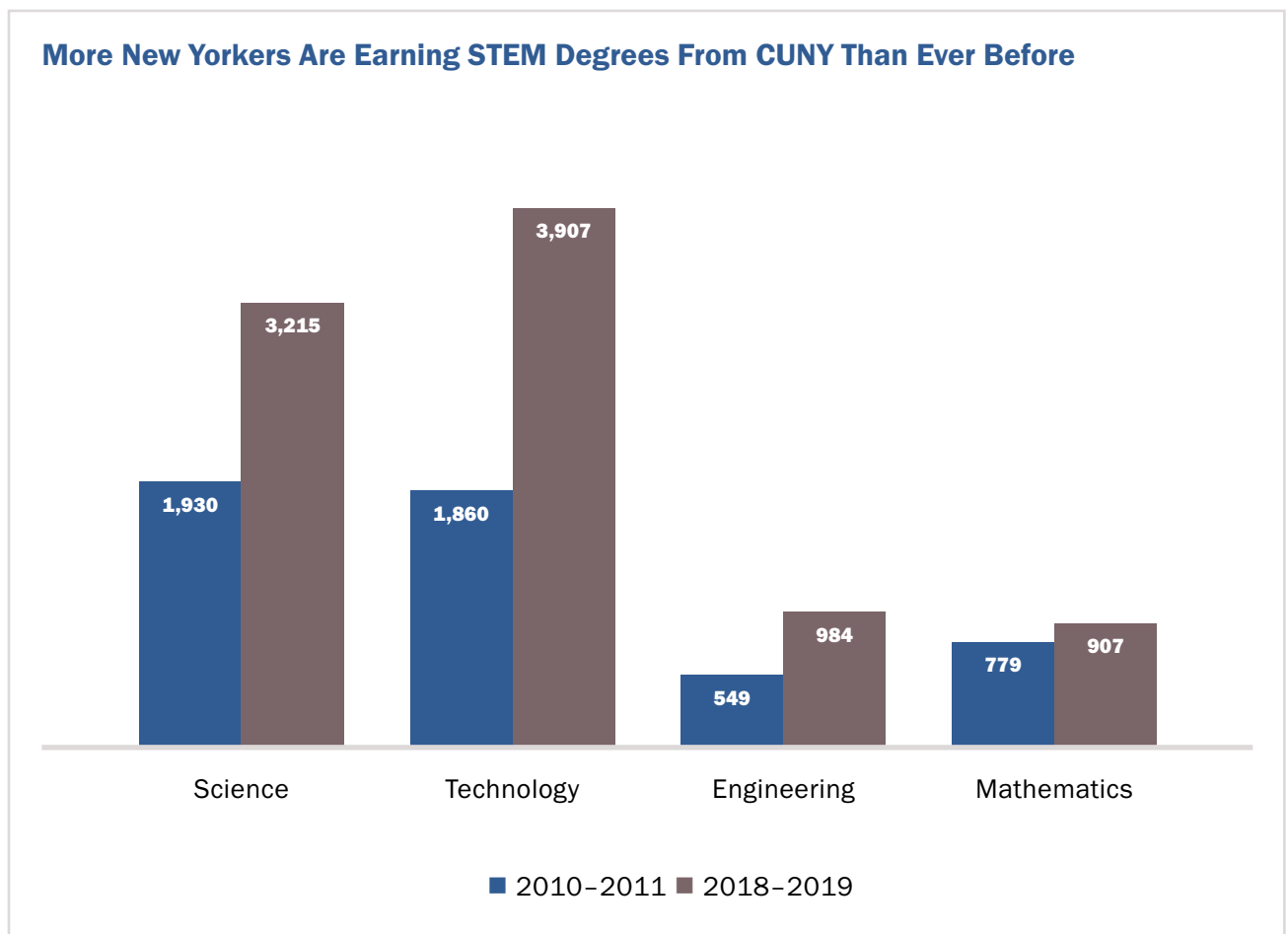
By strengthening CUNY's role as a springboard into tech careers, Mayor Eric Adams and the New York City Council can significantly expand access to the well-paying jobs driving the city's economic recovery—and lay the foundation for a more equitable economy in the future.

This report provides analysis about what more is needed—from CUNY, from the city's tech employers, and from city and state policymakers—to expand access to technology careers for CUNY students. Made possible with support from Amazon, the report builds on CUF's long track record of research around opportunities to expand access to tech careers, from the first study to map the city's tech training and education ecosystem to several data briefs about the need to upskill New York's workforce in anticipation of a more automated economy. CUF has also published several studies about CUNY, including a 2021 report that detailed CUNY's vital role as a springboard to the middle class.

This new report details the barriers that prevent larger numbers of CUNY graduates from breaking into the technology sector, showcases programs at CUNY and elsewhere that are working, and advances more than a dozen achievable policy recommendations to ensure that far more CUNY graduates are able to access well-paying tech careers. The study was informed by extensive data analysis and draws on more than 75 interviews with CUNY officials—including college presidents, administrators, faculty, and career advisors—as well as decisionmakers from technology companies, including HR officials and company executives; leaders of nonprofits focused on expanding pathways into the tech sector; and more than 20 current and former CUNY students pursuing technology careers.

Over the past two decades, New York City's tech sector has become arguably the city's most reliable source of new, well-paying jobs—and continues to drive job growth during the pandemic. Since 2010, the city's tech sector has added 113,900 jobs, a growth rate of 142 percent, accounting for a remarkable 17 percent of the city's entire private-sector job growth during this period. Even as the city's economy plunged following the onset of the pandemic in early 2020, the city's tech firms continued hiring. While most other parts of the city's economy have yet to rebound to their pre-pandemic

## More New Yorkers Are Earning STEM Degrees From CUNY Than Ever Before

| | Science | Technology | Engineering | Mathematics |
|---|---|---|---|---|
| 2010–2011 | 1,930 | 1,860 | 549 | 779 |
| 2018–2019 | 3,215 | 3,907 | 984 | 907 |

Source: Center for an Urban Future analysis of data from the CUNY Office of Institutional Research and Assessment.

**NYC's Tech Sector Driving the Creation of Middle- and High Wage Jobs**
Number of jobs created between 2010 and 2021



| | |
|---|---|
| Tech | 113,909 |
| Construction | 28,652 |
| Finance and Insurance | 25,762 |
| Advertising, PR, and Related Services | 15,677 |
| Legal Services | 3,078 |
| Manufacturing | -19,692 |
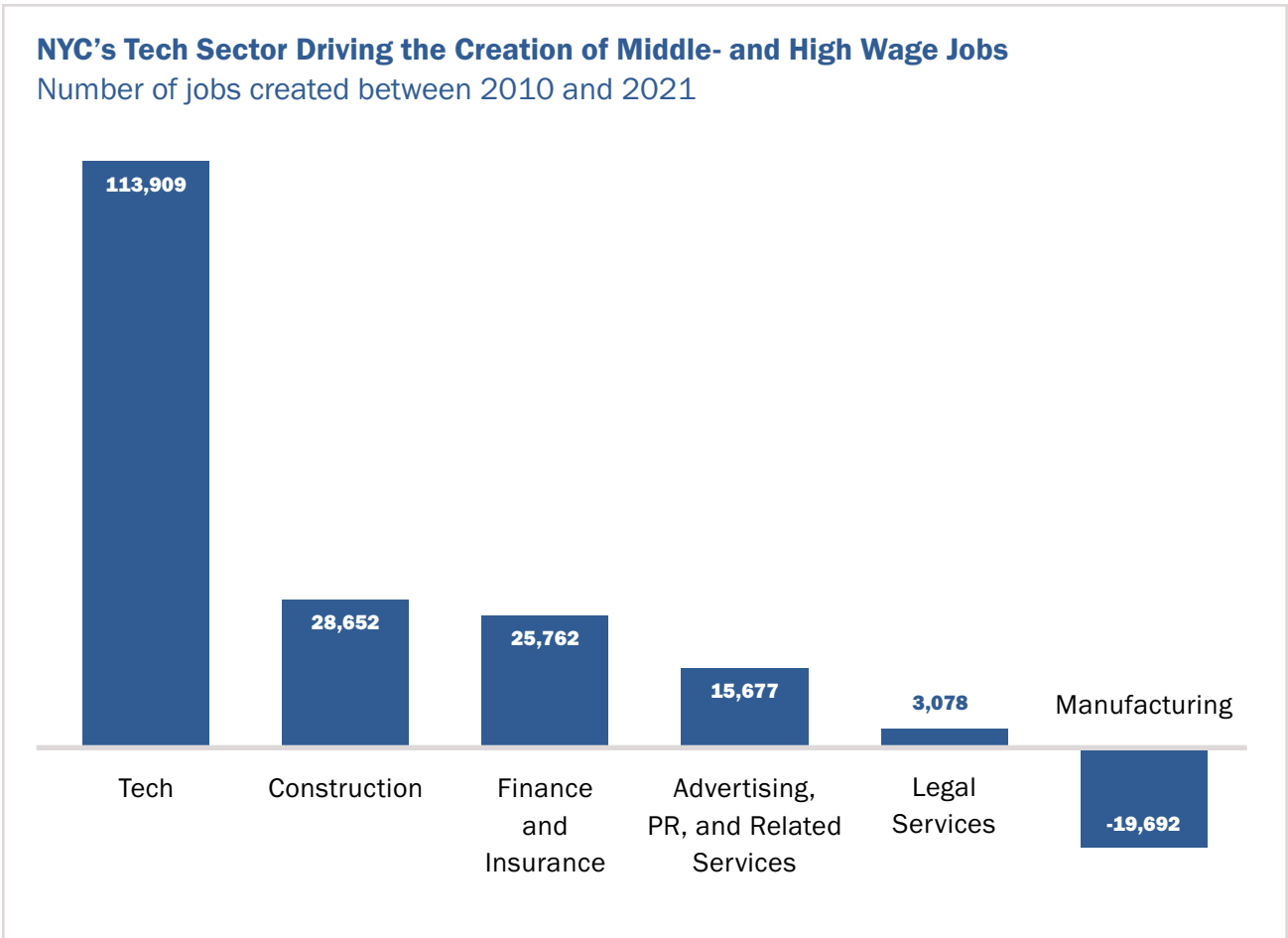
Source: Center for an Urban Future analysis of data from the Quarterly Census of Employment and Wages, 2010 to December 2021.

employment levels, employment in the city's tech sector is up 17.5 percent since 2019, outpacing all other industries.[7]

But while jobs in technology represent a large and growing opportunity for New Yorkers, the city's tech sector still falls far short of reflecting the diversity of the city. Black and Hispanic New Yorkers make up 43 percent of the city's overall workforce, but account for just 20.8 percent of those employed in the tech sector.[8]

If city leaders are to succeed in tackling these disparities—and building stronger and more equitable pathways into the city's roaring tech economy—then CUNY will have to be a centerpiece of the strategy. As just one example of the university's potential, CUNY colleges graduated more Black and Hispanic students with technology degrees in 2019 (1,741) than Columbia University granted total undergraduate degrees in 2021 (1,044).

The problem is that while the number of CUNY students earning technology degrees has surged over the past decade—from 1,597 in 2010 to 3,907 in 2019, a 145 percent increase—graduates are still struggling to get hired and advance into the sector's well-paying career paths.

"Our campus looks like the future of [the tech sector's] workforce and its customers," says Thomas Isekenegbe, president of Bronx Community College. "But our students are not well represented in New York's tech companies today."

Leaders across the CUNY system express a similar sentiment: too few CUNY graduates are securing jobs in the city's high-flying tech sector after graduation, even as a growing number of students are pursuing technology degrees and credentials.

"The technology sector needs to recognize that there's a goldmine in these campuses," says Vince Boudreau, president of City College. "But it takes getting in the door. If employers are window-shopping for students, they often walk past our window."

**NYC's Largest Tech Companies Employ Relatively Few CUNY Graduates**

Self-reported university affiliations from LinkedIn profiles

| University | Percentage |
|------------|-----------|
| CUNY | 0.29% |
| Columbia | 0.41% |
| NYU | 0.49% |
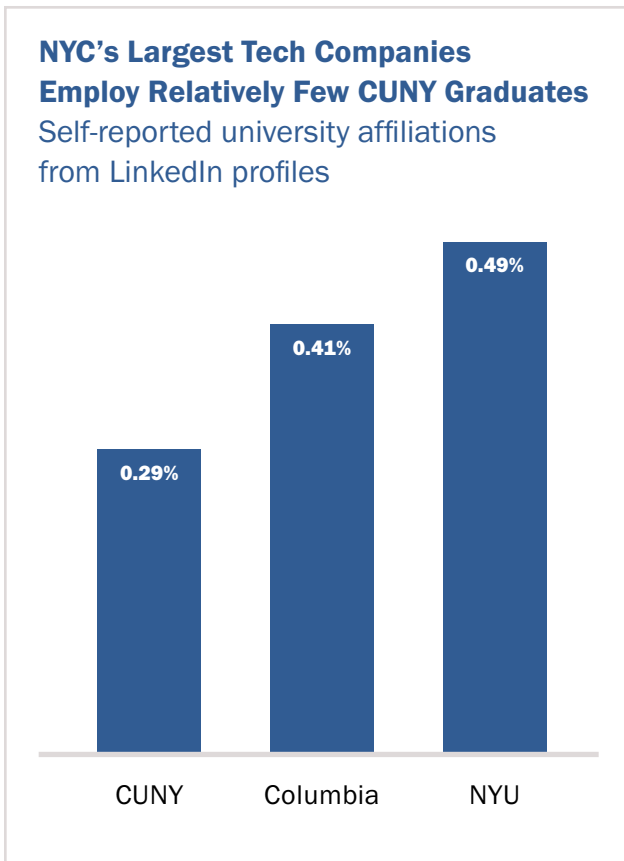
Source: Analysis of self-reported university affiliations for all employees at Amazon, Apple, Google, Meta, and Netflix with active LinkedIn profiles.

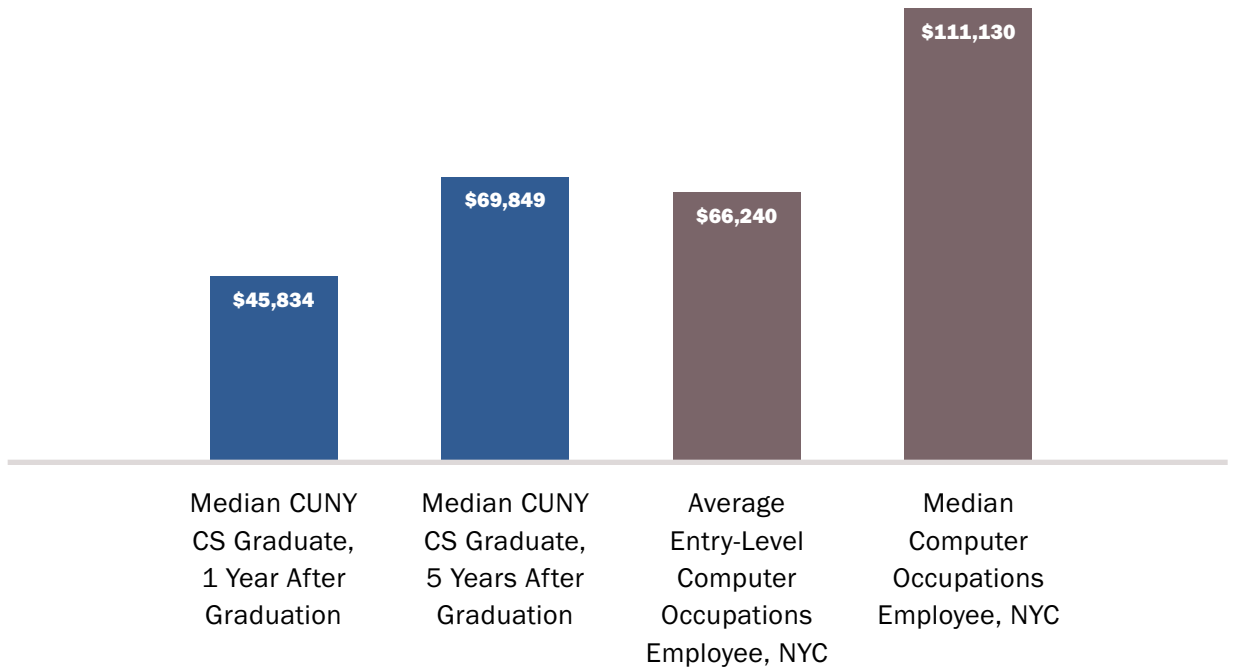Indeed, the Center for an Urban Future's analysis of publicly available data on employment and earnings reveals that computer science and other technology degrees are not always translating into career success for many CUNY graduates. In many cases, CUNY graduates are securing jobs in lower-paying positions like technical support or software quality assurance—rather than software engineering—which leads to striking earnings disparities. For instance, the median CUNY graduate with a bachelor's degree in computer science earned just $45,834 one year after graduation—31 percent less than the $66,240 earned by the average entry-level worker in a computer occupation in New York City. Five years after graduation, the earnings gap is even wider, with the median CUNY computer science graduate earning $69,849—37 percent less than the $111,130 median wage for all computer occupations workers in NYC.[9]

In other cases, CUNY graduates are struggling to break into the tech sector in the first place. According to CUF's analysis of data from labor market analytics firm Lightcast, only 50 percent of all CUNY computer science graduates from 2017 to 2021 were employed within their field of study one year after graduation.[10] CUF's analysis of data from the U.S. Census Bureau shows that about one in seven—or 13.9 percent of—CUNY computer science graduates is working in the retail or food service industries one year after graduation. Among community college graduates with computer science degrees, the share in retail or food service is 15.2 percent. At City Tech, it's 18.1 percent. By comparison, just 16.7 percent of City Tech's computer science graduates are working in professional, scientific, and technical services occupations.[11]

**Only 50 percent** of all CUNY computer science graduates from 2017 to 2021 were employed within their field of study one year after graduation.

## CUNY Computer Science Graduates Earn Less Than the Average New Yorker in Computer Occupations at Each Stage of Their Careers
### Annual earnings for CUNY graduates with a bachelor's degree in computer science and NYC computer occupations employees

| Category | Earnings |
|---|---|
| Median CUNY CS Graduate, 1 Year After Graduation | $45,834 |
| Median CUNY CS Graduate, 5 Years After Graduation | $69,849 |
| Average Entry-Level Computer Occupations Employee, NYC | $66,240 |
| Median Computer Occupations Employee, NYC | $111,130 |

Source: Center for an Urban Future analysis of wage data for CUNY CS graduates from the CUNY Wage Dashboard and New York State Department of Labor Occupational Wages data, which calculates average entry-level wage by

## Graduates Struggling to Break into the Tech Sector
### Percent of computer science graduates working in retail or food service one year after graduation
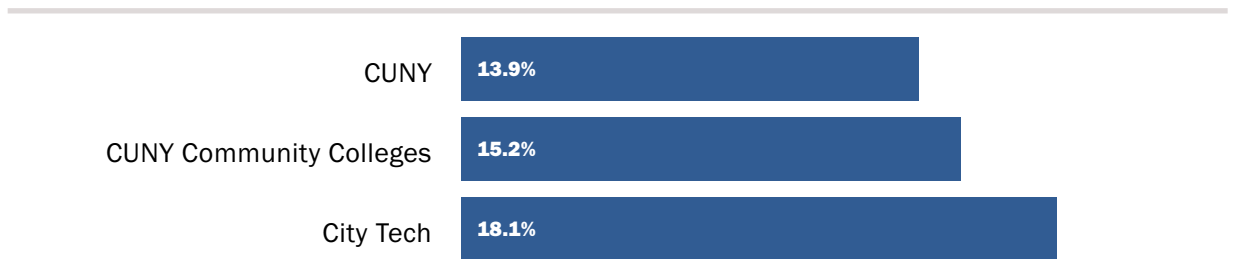
| Category | Percent |
|---|---|
| CUNY | 13.9% |
| CUNY Community Colleges | 15.2% |
| City Tech | 18.1% |

Source: Center for an Urban Future analysis of data from the U.S. Census Post-Secondary Employment Outcomes Explorer.

Despite these challenges, some large tech companies, including Amazon and Google, have taken significant steps to recruit from and partner with CUNY in recent years, leading to an increase in the number of CUNY students landing internships and jobs. In March 2022, Amazon and CUNY announced a partnership as part of CUNY's Career Success Initiative, which helps New Yorkers launch and grow careers in partnership with employers. Amazon provides tuition for hourly employees to pursue degrees at eight CUNY colleges. Google, likewise, has developed new programs together with CUNY, including recruiting from CUNY colleges, partnering with Borough of Manhattan Community College to train tech apprentices, and investing in career readiness training.

"We have thousands and thousands of entry-level tech jobs and I anticipate that growing," says Derrick Bates, early career recruiting leader for Amazon Web Services. "When I look at the 25 CUNY schools, I see such an opportunity to expand on. Corralling the schools is hard. But with a central point of contact, we could build something really dynamic here."

These initiatives, however, are still the exception rather than the norm among tech firms in New York City. Across interviews with more than a dozen tech sector leaders familiar with their employees' educational backgrounds—including startup founders and CEOs, software engineers at large and mid-sized tech firms, campus recruiters for tech giants, and hiring managers representing a wide range of companies with tech-talent needs—most reported having no CUNY graduates currently employed in tech roles or could only identify one or two. Even at companies that are focused on diversity and inclusion, or that have expanded hiring of candidates from nontraditional backgrounds, CUNY graduates are underrepresented in their ranks when compared to students from other public colleges or private universities.

"There are two CUNY graduates working at our company last time I checked—I'm one of them, the other was a person I recommended," says a software developer in the New York City office of a global tech company who requested anonymity in order to speak candidly. "I'm the only one," says another CUNY graduate working as an engineer for a mid-sized tech company headquartered in New York City. Interviews suggest it's the same at companies that began as startups in New York City during the past two decades and have since expanded. "We haven't made a single new grad offer to anyone coming in from CUNY," says an engineering director at one such mid-sized firm.

## Obstacles to Unlocking CUNY's Full Potential as a Springboard into Tech Careers

Even after a decade of steady progress, several challenges prevent CUNY from achieving its full potential as a launchpad into tech careers. Although New York City has launched several new initiatives in recent years designed to strengthen CUNY's role as an incubator of tech talent, these programs are still operating at too small a scale. Insufficient investment in career services means that few students have support navigating the job market and connecting with potential employers in advance of graduation. Far too few CUNY students are obtaining paid internships, seriously limiting employment prospects after earning a degree. Meanwhile, employers struggle to find a clear entry point into the CUNY system, driving all but the most well-resourced and determined to seek out partnerships elsewhere.

### Promising city-funded initiatives are still too small-scale.

In recent years, New York City has made important new investments intended to boost the number of CUNY students earning technology degrees and help more students break into tech sector careers. This report finds that these efforts are showing results but remain too small scale and still serve just a fraction of the students who could benefit from them.

For instance, beginning in 2017, the city invested $20 million in CUNY 2X Tech, an effort to double the number of CUNY students graduating with tech-related degrees by 2022 while expanding access to industry-informed instruction and advising. But while the program has succeeded in boosting the number of technology graduates, our analysis of data on the initial five years of the program finds significant room to grow.

As of 2022, CUNY 2X Tech has only reached 7 of 25 CUNY colleges; the list includes no community colleges and leaves out City Tech, the college with the largest number of technology students in the system. In total, CUNY 2X Tech is providing enhanced

programs to just 4,962 out of more than 23,000 technology majors across the university—approximately 21 percent.

Other crucial CUNY programs are significantly smaller in scale. The well-regarded CUNY Tech Prep program is opening doors to tech careers, with 75 percent of program participants landing a job or internship within five months of completing the program. But it serves just 170 students annually—less than 1 percent of all CUNY students pursuing technology degrees. Likewise, while students who go through the city's Tech Talent Pipeline Residency internship program are more than three times as likely to land a job when they graduate compared to their peers, the program's capacity has been limited to just 150 students per year across three colleges. Additionally, students who take a course taught by an industry professional through the Tech-in-Residence Corps are more than two times as likely to land a job when they graduate compared to their peers, but this program reaches only about 500 students per semester.

### More investment is needed to expand and strengthen career services and build relationships with the tech sector.

Across interviews with professors, career advisors, and administrative leaders on multiple CUNY campuses, our research finds that a ratio of 2 to 3 career services counselors per 10,000 students is common. City Tech has just three career advisors serving approximately 17,000 students, each with office hours just two days per week.

This leaves CUNY woefully understaffed for the level of career counseling and employer engagement that could significantly expand work-based learning opportunities and improve post-graduation employment outcomes.

Perhaps because of this staffing shortfall—as well as a lack of career support tailored to technology and other in-demand fields—few students are taking advantage of resources that are available. Only about 25 percent of students make use of existing career services during their college careers, according to current and former CUNY faculty and administration officials and survey data, and they tend to be students who are already among the top performers.

"CUNY says it cares about career services, but it doesn't sufficiently fund it," says one senior university official who requested anonymity. "There is not an adequate investment in work-based learning, internships, and the business development roles focused on building and managing employer partnerships. And faculty just don't have time to take this on independently."

### Far too few CUNY students are able to access paid internships, limiting job prospects after graduation.

For most college students aspiring to a career in tech, an internship in the industry is an essential prerequisite for employment after graduation. However, just 10 percent of CUNY students say they have held a paid internship at any point during their time at CUNY and only 21 percent report participating in an internship of any kind. Fully 34 percent of CUNY students surveyed say they never received information about internship opportunities and 61 percent say they did not have time to participate.

For students pursuing degrees in computer science and related internships in highly competitive tech fields, the odds are even slimmer. Data from Lightcast shows that of the 13,647 total internship postings nationwide seeking computer science majors, only 709 were in the New York City metro area, of which just 398 were posted in the city itself. Moreover, an average of 175 candidates applied for each internship in New York City, compared to just 5 candidates per internship nationwide.

"An internship at a bigger tech company is typically a 3-month tryout where you're working on a project for 12 weeks, and that's pretty much what the actual full-time job is," says a talent recruiter focused on university programs for a large tech company, who requested anonymity to speak openly about his experiences with CUNY. "Having an internship is absolutely the best experience you could have in terms of getting a full-time job."

## 175:1 candidates per CS internship, NYC

## 5:1 candidates per CS internship, US

**CUNY is challenging for employers to navigate.**

Nearly all of the tech sector recruiters and hiring managers interviewed for this report say that they have either struggled to work directly with CUNY or have been dissuaded from reaching out due to the complexity of the system and the lack of employer support.

Many simply don't know how to approach a system with 25 separate career services offices and no one single point of contact for employers. These challenges are exacerbated by a lack of dedicated employer relations specialists focused on working with companies. Our research finds that most CUNY colleges rely on the director of the campus career services center to facilitate all employer engagement, leaving very little bandwidth to proactively reach out to prospective partners.

For enterprising employers willing to explore campus-by-campus opportunities, options are generally limited to posting jobs to online bulletin boards and participating in annual or biannual career fairs. Additional employer services are few and vary widely across campuses; for instance, while LaGuardia Community College offers employers options to table on campus, conduct on-campus interviews, and organize field trips for students to visit workplaces, Medgar Evers lists no information for prospective employers on the college's official career services website. By comparison, NYU offers dozens of employer engagement services ranging from social media takeovers, industry meetups, and on-campus coffee chats to university-wide branding, sponsorship of career hubs and hackathons, and tailored support from a dedicated relationship manager.

"Getting help setting up recruitment events at CUNY is difficult," says an experienced recruiter for a New York-based tech company who asked to remain anonymous in order to speak candidly. "It's hard to even get in front of students."

**CUNY is struggling to hire enough faculty to keep pace with demand for computer science and tech programs—and the needs of a fast-changing industry.**

Although interest in computer science and other tech programs is surging across CUNY, staffing shortages are preventing some programs from meeting this demand. Unable to afford more full-time faculty, department leaders are scrambling to hire adjuncts and converting courses that were formerly taught as seminars into large lectures, according to interviews with CUNY faculty, advisors, and administrators.

For example, ten years ago, Queens College was home to 406 computer science majors and 20 faculty. Now, the college has more than 3,500 majors and just 15 tenure-track faculty, according to administrators with first-hand knowledge of the department. Likewise, Hunter College has gone from 85 computer science majors twelve years ago to more than 1,600 today, while only adding 13 new faculty, which has resulted in the conversion of every required computer science course into a large lecture with at least 150 students.

"The lack of faculty for computer science is a problem," says one CUNY department chair, who requested anonymity as he is not authorized to speak publicly about these challenges. "A few colleges have added faculty, but it's not enough. All the colleges have the same problem."

CUNY colleges face challenges hiring and retaining faculty with up-to-date industry knowledge in part because industry salaries far exceed what CUNY is able to pay. Several CUNY students interviewed for this report say that the practical knowledge they were exposed to was too often out of date. "They're not really keeping up with the latest trends, the latest languages, and really the latest technologies," adds a recent graduate of Hunter College.

"We have about 200-plus students in the cybersecurity program," says President Isekenegbe of Bronx Community College. "The problem is hiring the faculty. You can make $100,000-plus in industry, but we can only pay $65,000."

Only 10 percent of all CUNY students report participating in a paid internship during their college careers

Just 170 students are served by the CUNY Tech Prep program each year

As of 2022, CUNY 2X Tech has only reached 7 of 25 CUNY colleges

Just 750 students have participated in the city's Tech Talent Pipeline (TTP) Residency internship program over the past five years

The typical ratio of CUNY students to career counselors is 5,000:1

The Tech in Residence Corps only reaches 500 students per semester

**Few tech employers have embraced recruiting and hiring from CUNY.**

Although a small but growing number of employers in the city's tech sector have embraced CUNY in recent years, too few tech firms have made it a priority to recruit and hire from CUNY. Many firms, especially those among the city's fast-growing ranks of small and mid-sized start-ups, continue to hire through personal referrals from current staff and direct outreach to a small number of highly selective colleges, leading to predictably similar results. Even as some companies place new emphasis on hiring goals around diversity and inclusion, hiring managers and CUNY advisors say that firms often end up competing for a small pool of diverse talent emerging from the same well-known colleges and universities, rather than tapping into CUNY.

The problem is evident at nearly any CUNY campus. Tech firms typically account for just one or two out of 100 or more companies that participate in on-campus career fairs. Tech internships marketed to CUNY students are in very short supply and students say they are far more likely to see job postings for tech roles in government, healthcare organizations, or financial services firms than in the tech sector. Even as firms across the tech sector race to keep pace with hiring needs, a recent survey of tech executives in New York found that just 24 percent say they are even considering CUNY to help meet their hiring needs.[12]

"We have two career fairs a year with dozens of presenters from different industries," says one CUNY career advisor who asked to speak anonymously. "But almost no tech companies attend."

## The Path Forward

New York City's booming tech sector is producing more well-paying jobs than any other part of the city's economy and is poised for significant future growth. But while employer demand for tech talent has continued to escalate, New Yorkers of color and those from low-income backgrounds remain seriously underrepresented in the tech workforce. Building a more equitable economy for the long-term will require changing this dynamic, and CUNY is uniquely positioned as an engine of change. But little progress will be possible without a new level of investment focused on boosting career success, in addition to significant policy changes within the CUNY system, city and state government, and among employers in the tech sector.

City leaders, employers, and CUNY should all take bold steps to broaden access to the thousands of good jobs expected to come online in the coming months and years.

To achieve this goal, Mayor Eric Adams and City Council should prioritize new investment in CUNY focused not only on boosting the number of technology graduates, but on greatly expanding initiatives that lead to postgraduate career success. Mayor Adams should set a goal of doubling the number of technology graduates from underrepresented backgrounds over the next five years and invest $10 million in scaling up successful programs that are otherwise in danger of coming to an end—including CUNY 2X Tech, CUNY Tech Prep, and the Tech in Residence Corps—while expanding these initiatives to other senior and community colleges.

City and state officials should also collaborate to create new programs aimed at tackling the most persistent barriers CUNY students face to career success, including a major new initiative to boost the number of paid internships available in the tech sector; new resources for strengthening and expanding career services and employer relations at every CUNY college; and new investment to hire full-time computer science and technology program faculty, especially those with industry experience and knowledge in high-demand fields like cybersecurity, artificial intelligence, and cloud computing.

Equipped with these additional resources, CUNY should commit to new efforts focused on boosting career success in technology fields and making the university a much more approachable partner to employers in the private sector. To that end, CUNY should prioritize the hiring of career services staff with tech industry expertise and employer relations specialists who can forge connections with recruiters and hiring managers. CUNY should also work to develop a single point of entry for employers interested in partnering with CUNY and expand the services offered to those employers beyond online job postings and occasional career fairs. CUNY leaders should partner with tech firms and the city's tech industry association to launch a new fellowship program that would embed faculty in industry for short-term professional development sprints, and

create a flagship Tech Careers Hub—modeled on a similar initiative in San Diego—which would boost the visibility of tech firms on campus.

These efforts will only prove successful if employers in the technology sector step up, too. Tech firms should commit to offering far more paid internships—including spring and fall sessions and microinternships—and work with CUNY on university-specific internship and fellowship programs. Tech leaders should make CUNY a centerpiece of early-career recruiting efforts; develop partnerships with CUNY's computer science and technology departments by joining advisory boards, working directly with campus career centers, and hosting both on-campus and offsite hackathons, work-shops, networking events, and other activities where CUNY students can engage with industry professionals at each stage of their college careers. Lastly, tech employers should partner with city leaders and CUNY to launch a CUNY Tech Alumni Network, leveraging the small but growing number of CUNY graduates employed in the city's tech sector to help market CUNY students to tech compa-nies and build support systems within the industry.

There is no one simple solution for fully leveraging CUNY as a springboard into technology careers, but the potential is nearly limitless. This report makes the case that CUNY should be the centerpiece of the city's effort to expand access to technology jobs, analyzes the challenges preventing more CUNY students and alumni from finding career success in technology fields, and outlines the ways city and state government, technology employers, and CUNY itself can build on and go beyond the most successful initiatives of recent years to develop a tech workforce that better reflects the diversity, talent, and determination of New Yorkers across all five boroughs.

## CUNY Internship Participation Rates by College

| CUNY College | Participated in Paid Internship | Participated in Unpaid Internship |
|---|---|---|
| BMCC | 7% | 6% |
| Bronx | 4% | 6% |
| Guttman | 12% | 12% |
| Hostos | 4% | 6% |
| Kingsborough | 5% | 7% |
| LaGuardia | 8% | 6% |
| Queensborough | 5% | 5% |
| Community Colleges | 6% | 6% |
| Baruch | 23% | 17% |
| Brooklyn | 12% | 15% |
| City College | 15% | 10% |
| Hunter | 10% | 15% |
| John Jay | 11% | 10% |
| Lehman | 9% | 13% |
| Medgar Evers | 7% | 11% |
| NYCCT | 11% | 11% |
| Queens | 11% | 11% |
| Professional Studies | 5% | 5% |
| Staten Island | 10% | 7% |
| York | 7% | 13% |
| Senior Colleges | 12% | 13% |
| **Total CUNY** | **10%** | **11%** |

Source: CUNY OIRA Student Experience Survey.

# The Case for CUNY: Why City Leaders Should Redouble Efforts to Leverage CUNY as a Springboard into Tech Careers

**THERE'S NO DOUBTING CUNY'S VITAL ROLE AS A** springboard to the middle class in New York City. Recent research confirmed that ten of CUNY's senior colleges are among the nation's very best in providing a pathway to economic mobility for low- and moderate-income graduates. But beyond these broad-based benefits, CUNY also arguably holds the key to one of New York's greatest economic challenges: diversifying the workforce in the city's fast-growing tech sector.

CUNY is singularly well-positioned to help address the opportunity gap that has existed for far too long in New York's tech sector. Moreover, its unique ability to produce a reliable pipeline of diverse technology workers could give New York's tech sector a competitive edge over the long run, especially as employers here and across the nation struggle to address two related challenges: finding enough qualified workers to meet their growing hiring needs and ensuring that workforce reflects the demographics of their community and their customers.

## Diversifying NYC's Tech Workforce

Like it or not, tech is the new engine of good job creation in New York City. Between 2010 and 2021, employment in the tech sector grew more than eight times as fast as the city's overall economy. And this doesn't even include the thousands of additional technology jobs being created outside the tech sector, in fields from healthcare to finance to education. The 114,000 jobs added in the city's tech sector during this period was also significantly more than other industries that have long produced middle- and high-wage jobs in New York, including hospitals (which added just 3,800 jobs during the same period), construction (28,600 jobs), law firms (3,000 jobs), and manufacturing (which shed 19,700 jobs).

But even as demand for tech talent grows, too few of these good jobs have been going to New Yorkers of color. Black New Yorkers make up 18.4 percent of the city's workforce, but account for just 9.4 percent of those working in the tech sector. Similarly, Hispanic New Yorkers comprise 24.6 percent of the workforce, but fill just 11.4 percent of tech sector jobs.
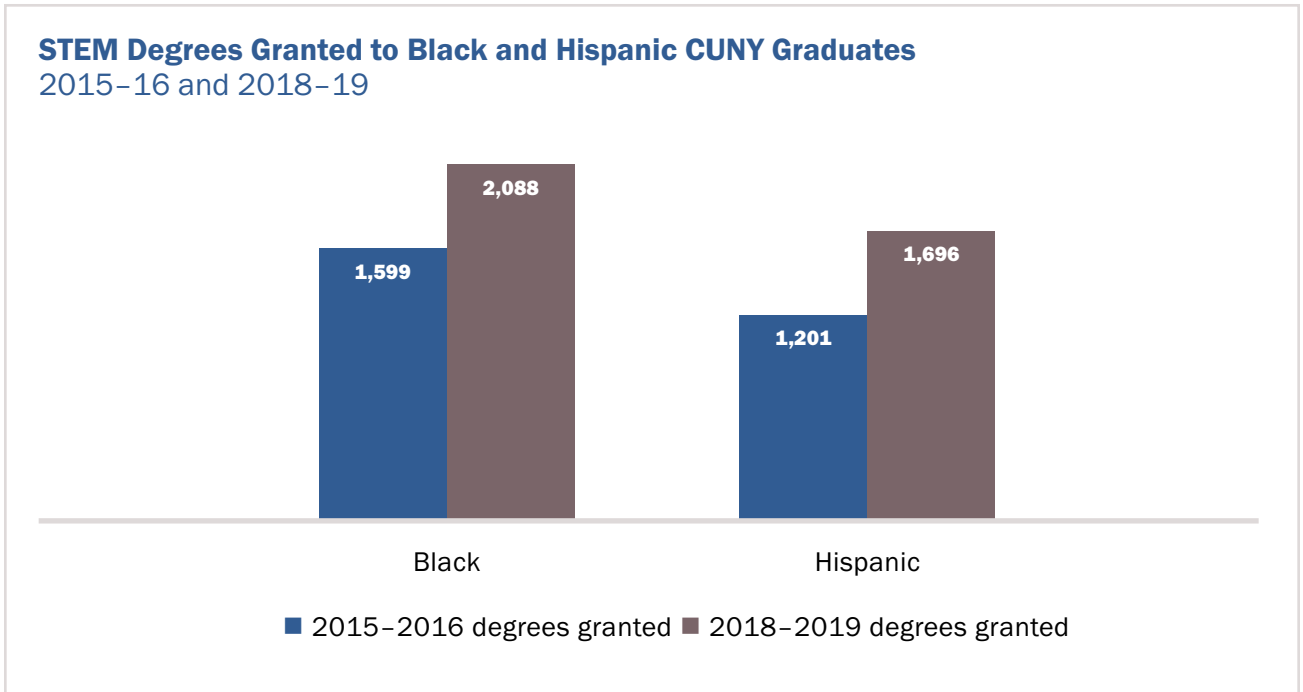
Changing this and putting far more New Yorkers of color on the path to technology careers is crucial to creating a more equitable economy. No other institution or organization is better positioned to help New York get there.

## CUNY's Unmatched Talent Pipeline

In 2019, more than 1,700 Black and/or Hispanic students graduated from CUNY with a technology degree—45 percent of the university's technology graduates. Incredibly, more Black and/or Hispanic students earned a degree in computer science from CUNY (327) than the total number of undergraduate computer science degrees awarded by Columbia University (258).

In 2019 alone, 3,900 CUNY students graduated with a technology degree. That included 1,232 graduates at City Tech, 423 at Borough of Manhattan Community College, 330 at Baruch College, 257 at LaGuardia Community College, 248 at Queens College, and 204 at Brooklyn College.

This is just the tip of the iceberg. More than 23,000 CUNY students were enrolled in technology degree programs in 2019. Tens of thousands of additional students are enrolled in other programs at CUNY, an important point to note since tech companies routinely hire college graduates in non-tech positions, from marketing to human resources. Of the 241,000 undergraduates enrolled in degree programs at CUNY's senior and community colleges in 2019, 31.6 percent were Hispanic, 25.6 percent were Black, and 21.7 percent were Asian.

## STEM Degrees Granted to Black and Hispanic CUNY Graduates
### 2015–16 and 2018–19

| | Black | | Hispanic | |
|---|---|---|---|---|
| 2015–2016 degrees granted | 1,599 | | 1,201 | |
| 2018–2019 degrees granted | | 2,088 | | 1,696 |

■ 2015–2016 degrees granted   ■ 2018–2019 degrees granted

Source: Center for an Urban Future analysis of data from the CUNY Office of Institutional Research and Assessment.

Although the city's many outstanding workforce training organizations will also need to play a key role in preparing New Yorkers from diverse backgrounds for technology jobs, all these nonprofits together do not come close to matching CUNY's scale.

## Giving NYC's Tech Ecosystem a Long-Term Talent Edge

CUNY is uniquely positioned to not only help New York diversify its tech workforce, but also equip New York's technology companies with a pipeline of talent for years to come. This would give the sector—and the city at large—an enormous lift. Right now, the biggest challenge facing tech companies in New York involves their ability to hire talented workers. With the sector expanding rapidly, companies are regularly struggling to fill positions fast enough. These workforce challenges may get even more difficult as technology jobs continue to explode, not only in New York but from the San Francisco Bay area and Boston to Austin and Miami. And since remote work now makes it easy for companies located elsewhere to hire skilled workers that live in New York, tech companies here may face even more intense competition for workers in the years ahead.

New York's tech companies will need CUNY's large talent pool just to keep pace with hiring needs.

## CUNY Students Give Tech Firms Diverse Problem-Solving Perspectives

Many of the educators, employers, and students we interviewed for this report say that CUNY graduates bring a valuable perspective to their work that distinguishes them from white graduates of private universities—and can help tech firms differentiate themselves, too.

"The technology sector needs to recognize that there's a goldmine in these places," says Vince Boudreau, president of City College. "When you get a CUNY student, you get a perspective on problems that could be totally different. If employers bring our students into their shops, they see that our students have solved problems in their lives, they're resilient, they've fought for every opportunity they have. They're highly motivated to prove their worth in the workplace."

# Toward Tech Career Success: Overcoming the Key Obstacles to Better Postgraduate Outcomes in Tech

## Promising city-funded initiatives are still too small-scale.

In recent years, New York City government has partnered with CUNY on several initiatives that are working to help expand the number of students earning computer science and technology degrees and improve career outcomes for graduates. At the same time, a handful of nonprofit organizations have launched initiatives designed to boost support for underrepresented students in technology degree programs and careers, including women and Black and/or Hispanic students. But while these programs and initiatives are beginning to deliver meaningful results, their scale remains too small to serve more than a sliver of the CUNY students who could benefit.

The largest and most expansive recent initiative is CUNY 2X Tech, a five-year effort to double the number of CUNY students graduating annually with a tech-related bachelor's degree by 2022. Launched in 2017 with $11 million in city funds and $9 million in federal and private commitments, the program focuses on expanding industry-aligned classroom instruction, boosting tech-specific advising, and enabling more tech majors to gain hands-on work experience. According to students, faculty, and advisors at colleges who participated in the program, the results have been impressive. Students who participate in CUNY 2X Tech programs are more likely to be employed in their field at a market-rate salary than their peers.

"We achieved the goal of doubling the number of tech graduates in five years," says Akira Kawaguchi, computer science department chair at the City College of New York. "City funding has been hugely helpful—it's allowing us to produce the next generation of tech workers, build a new game development program, and bring industry professionals into the classroom."

Other related initiatives are also showing significant promise. Among students who participate in the CUNY Tech Prep program, 75 percent land a job or internship within five months of completing the program. Students who take a course taught by an industry professional through the Tech-in-Residence Corps are more than twice as likely to get a job in the field after graduation, and students who participate in the Tech Talent Pipeline Residency internship program are more than three times as likely to wind up employed compared to their peers.

"Our internship placement with top companies has changed, and it's incredible," says a computer science advisor at College of Staten Island (CSI). "We actually have a student at Facebook. We have two at Amazon. All of our efforts have really just come to fruition. The CUNY 2X Tech and Tech Prep programs opened that door for us. And it looks like those are the programs that are bringing more of the recruiters to CSI."

Despite these initiatives' many successes, their five-year funding period is coming to an end with much more room to expand. In total, among the more than 23,000 CUNY students enrolled in tech programs each year, just 21 percent are served by CUNY 2X Tech, just 2 percent are able to enroll in a Tech-in-Residence Corps course taught by an industry professional, and fewer than 1 percent are able to participate in CUNY Tech Prep or TTP Residency internships.

Expanding the reach of these programs will require new public and private investment, as well as a clear directive to expand what's working across the CUNY system. For instance, CUNY 2X Tech launched at seven campuses: Hunter College, Lehman College, City College, Brooklyn College, the College of Staten Island, John Jay College of Criminal Justice, and Medgar Evers College. Notably, the program has not expanded to City Tech—the college producing the largest number of technology graduates—or any of the city's community colleges.

## Expanding Pathways to Technology Degrees and Careers for Black and Hispanic Students and Women

CUNY reflects the diversity of New York City. Among the university's roughly 270,000 students, 25.2 percent are Black, 30.2 percent are Hispanic, 21.2 percent are Asian, and 23.1 percent are white. Approximately 59 percent are women and 35 percent were born outside the mainland United States. But while the ranks of CUNY's technology majors are far more diverse than those of most other local colleges and universities, significant disparities remain.

While 55.4 percent of all students enrolled at CUNY identify as Black and/or Hispanic, just 31 percent of computer science degrees in 2018-19 were awarded to Black and/or Hispanic students. At the same time, just 19 percent of computer science degrees at CUNY were awarded to women, even though women comprise 58 percent of CUNY's overall student population. When both gender and ethnicity are considered, even starker disparities emerge: despite making up 18 percent of the CUNY student body, Hispanic women received just 7 percent of all STEM degrees and only 4 percent of degrees in technology—the lowest shares of any demographic group.[13]

"Historically, the diversity, equity, and inclusion (DEI) recruiters that come here say, 'We want Black and Latinx talent,' and then hire white and Asian students," says a CUNY advisor for computer science students. Bias is likely part of the problem, she says, but at the same time, Black and Hispanic students and women remain underrepresented among CUNY's technology degree seekers and graduates. "There is still a dearth of Black and Latinx computer science majors," says the CUNY advisor. "So the recruiters coming [to CUNY] for DEI, they just didn't find the numbers they were hoping for in terms of Black and Latinx CS majors."

Addressing these disparities will require a multifaceted approach: long-term commitments to expand computing education in the earliest years of New York City's public education system; major new investment in pre-service training and professional development to equip teachers with the skills needed to integrate computing education into every grade level; additional peer and mentorship support for women, girls, and students of color interested in computer science and technology; and an expansion of college-focused programs like the innovative Break Through Tech initiative, which is focused on encouraging women and other underrepresented students to pursue degrees and careers in computing.

**Black and Hispanic Students Still Underrepresented Among CUNY STEM Graduates**
Black and Hispanic share of CUNY STEM graduates and total CUNY enrollment, 2018-19
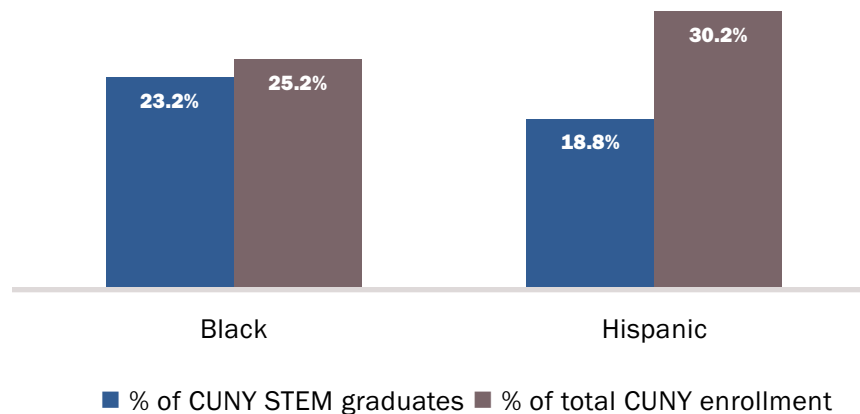


■ % of CUNY STEM graduates  ■ % of total CUNY enrolllment

Source: Center for an Urban Future analysis of data from the CUNY Office of Institutional Research and Assessment.

## More investment is needed to expand and strengthen career services and build relationships with the tech sector.

One of the reasons relatively few CUNY students are getting jobs and internships with tech companies is that CUNY has very few staff dedicated to career services and employer relations. A ratio of 2 to 3 career services counselors per 10,000 students is the norm at many, if not most, CUNY campuses and has changed little over the past decade. City Tech, the CUNY college that produces more technology graduates than any other, has just three career advisors serving approximately 17,000 students, each with office hours only two days per week.

As a result, CUNY students report challenges accessing career services support. Fully 77 percent of CUNY students report that they have not used career planning and placement services in a given semester. And while most students who are able to take advantage of career services report positive experiences, 22 percent of students say they "strongly disagree" that CUNY had "adequate career planning and placement resources available to help," including 27 percent of all community college students.[14]

"Career and professional development is the most underinvested in sector in CUNY," says City College President Vince Boudreau. "Campuses are managing this with two people, five people. What are you going to do with such limited staff? You're not developing the professional potential of these students."

"If we had more resources we would achieve better results," adds Queens College President Frank Wu. "Even if the career counselors we have are twice as good, you're not going to be as competitive as a place with ten times as many people doing that function."

New investment through the CUNY 2X Tech initiative has helped the seven colleges selected for the program to expand career services by hiring advisors focused on computer science students. In interviews conducted for this report, two of those advisors recounted their efforts to help students gain the practical skills and networks necessary to break into tech, such as creating resources for technical interview prep and initiating connections to nonprofits that provide work-based learning opportunities.

These kinds of efforts are helping some students get internships, but advisors are spread far too thin. "There have to be more resources for career services. Our career staff is just three people for the whole campus, so no matter how good they are, they cannot reach every major," says an advisor for advanced computer science students at one CUNY college.

Several current students and recent graduates described an ongoing need for career counseling at each stage of the college experience—from before even selecting a major through graduation day. But access isn't the only challenge. Many students who did take advantage of campus career centers found that staff didn't necessarily have a full understanding of what it takes to jumpstart a career in tech, leaving them to navigate decisions on their own. "I was really lost when it came to first entering the computer science major. And even after I spoke to an advisor, I was not really sure what a career in this field would mean," says a recent Brooklyn College graduate who participated in CUNY Tech Prep.

For other students, the missing piece has been career counseling specifically tailored to the tech sector. "We did have a class about revising your resume and networking, but I think it would have been good to have that material tailored specifically to careers that involved [the database management system] SQL," says a former continuing education student in data management at a CUNY community college who has not been able to get a job in tech.

Some of the most effective student-employer connections are made not by career services staff, but by faculty—including temporary Tech-in-Residence Corps instructors, according to interviews with several CUNY graduates and administrators. But these ad hoc approaches are unable to meet the needs of the more than 23,000 students pursuing tech degrees in any given year.

"I might be able to connect five students with a recruiter at my company, but that doesn't get us to 40,000 hires," says one tech worker at a large company who has taught through the Tech-in-Residence program and who requested anonymity due to ongoing involvement with CUNY.

Ultimately, significantly more investment is needed to expand and improve career services across the CUNY system, while enabling administrators and faculty to spend more time focused on employer engagement. Current and former students, career

services advisors, tech employers, and talent specialists say that CUNY has not yet established a systematic approach to engaging with employers in the tech sector. As a result, CUNY students have fewer opportunities for internships and jobs than their counterparts attending other schools, where there are more staff focused on building bridges to employers. "The reality is most private and state universities have that, so CUNY is competing against that system," says the founder and CEO of a small tech company who has hired interns from Hunter College.

Some CUNY faculty are drawing on their own industry connections to link their students with prospective employers. Where this is happening, it's helping students secure internships and jobs, and become more aware of their career options. But faculty are doing this extra work because they're passionate about it; it's not a scalable solution. In an interview, one computer science faculty member said that he was the only regular point of contact for industry leaders before the pandemic. "As hard as they tried, they could not find someone at the other CUNY campuses to regularly connect to."

Advisors, especially those hired for CUNY 2X Tech efforts, are struggling to establish and deepen connections with industry while at the same time creating professional development tools and training materials for their students. One advisor to computer science students says, "Students are working hard in the classroom. We're doing everything we can to provide them with professional development activities. But we don't have recruiter connections. We need more recruiter connections. We're not a targeted school, so it's challenging."

Students and industry leaders have also tried to forge connections between CUNY and the tech sector, but even well-organized attempts have not succeeded. As a student, Harpreet Gaur, a City Tech alum and current technical program manager at LinkedIn, tried to reach out to tech employers to organize a career fair, but their responses were hesitant at best. She was told they didn't hire many students from City Tech.

## Far too few CUNY students have access to paid internships, limiting job prospects after graduation.

For any college student interested in pursuing tech careers, an internship in the industry is a critical step. Landing a summer internship nearly doubles the odds of employment within six months of graduation and can help students develop relationships in the sector that can launch and advance their careers.[15] On average, 70 percent of employers make a full-time job offer to their interns.[16] For many first-generation college students at CUNY, internships can also provide a vital confidence boost, connecting the theory learned in the classroom to real-world applications.

While internships are an established entry point to the talent pipeline in many industries—including finance, consulting, advertising, media, and health-care—they are particularly important in tech. Data from the education technology firm Chegg shows that tech companies are highly likely to hire entry-level workers with internship experience; for instance, 80.2 percent of recent Facebook hires have completed an internship, as have 78.3 percent of workers at Google and 70.1 percent at IBM.[17]

Unfortunately, very few CUNY students are participating in internships during their college careers, with significant repercussions for students pursuing technology jobs. Just 10 percent of students say they have held a paid internship at any point during their time at CUNY and fewer than 21 percent of students report participating in an internship of any kind. About one-third (34 percent) of CUNY students surveyed say they never received information about internship opportunities and 61 percent say they did not have time to participate.

"We just don't have enough paid internships for our students," says Queens College President Frank Wu. "We have internships at some big tech companies in onesies and twosies. We could have them by the dozen."

Taken together, our research suggests that CUNY students are struggling to access internships during college for several reasons: there is too little awareness of internship opportunities on campus; students are struggling to juggle school, paid work demands, and unpaid internship opportunities; and students are competing for a very limited supply of highly competitive internships.

City Tech graduate Harpreet Gaur is among the 34 percent of CUNY students who say that information about internships is often scarce or nonexistent, especially for students interested in pursuing tech careers.

"There were no internship resources, at least in my college," she says. "I didn't even have any internship experience when I was applying for jobs." She says she tried to compensate by contacting employers directly to encourage them to visit her campus, mentoring her fellow students in her spare time, and applying to grants for research opportunities to help bolster her resume. She was initially unable to land a job in the tech sector, but was eventually hired as a data scientist at a major financial institution after participating in a conference for women in computing hosted by a nonprofit organization.

For other CUNY students, the biggest obstacle to internship participation is the time required and the need for sufficient funding. About 56 percent of CUNY students are already working during any given semester; among those working students, 27 percent are employed full-time. Given that approximately 71 percent of all CUNY students come from households earning less than $40,000 per year, the demands to earn income while in college can be intense. Students say that access to paid internships in computing occupations could take the place of the jobs they currently hold down while enrolled in college, but only if they pay enough to help offset their numerous non-tuition costs. For many students, adding an unpaid or stipend-funded internship on top of existing school, work, and family responsibilities is nearly impossible.

"They can't participate in this internship because they need to pay rent, they need to pay for food, they need to pay bills," says Agnes Wong, describing the experiences of her peers at Queens College.

"For our students, unless it's a paid internship that will meaningfully advance their career, they're going to help out at their parents' business," adds President Wu.

CUNY graduates who have been able to land internships in the tech sector express frustration that more internships aren't going to their peers. CUNY graduates working in tech say that internships are going not only to graduates of top colleges, but also a number of lesser-known colleges with strong employer relationships and a steady pipeline of students into internship roles.

"I can give you 500 students that live in New York that would kill to have this internship, but instead you're getting people from not just out of state, but out of the country," says a CUNY graduate who interned at a mid-sized tech firm in Manhattan. He says that the underrepresentation of computer science students from CUNY among technology interns is a problem, in part, because that first internship experience goes on to open doors. "The amount of responses [I received from employers] after the first internship drastically increased," he says.

In addition to a lack of awareness about internship opportunities and the challenge of juggling internships alongside school, other paid work, and family responsibilities, CUNY's technology students face an additional barrier: a striking shortage of computer science–related internships in New York City. "There's currently a limited supply of tech internships in New York City and those are in high demand," says an advisor for computer science students at one CUNY college.

Data from Lightcast reveals that of the 13,647 internship postings nationwide in 2021 that sought out computer science majors, only 398 were in New York City. The data also shows that an average of 175 candidates applied for each of these internship postings, compared to a ratio of 5 to 1 per internship posting nationwide. This data suggests that the odds of landing a computer science internship in New York City (1 in 175) are longer than those of gaining admission to Columbia University (1 in 15).

To solve this problem, CUNY will need to do more than build stronger employer relationships in the tech sector and better market existing internship opportunities. It will need significant help from city government, philanthropy, and the tech sector to supercharge the supply of tech internships available to CUNY students in New York City—including in-depth internships that can lead directly to employment, as well as fall and spring internships to supplement the typical summer internship session, and new support for short-term "microinternships" that can lower the barrier to entry for employers while increasing access. To encourage more of the city's 25,000-plus start-ups to offer paid internships, additional consideration should be given to wage subsidies that can help more firms bring CUNY students on board for the first time.

"The funding for paid interns is a huge part of reputation change," says one tech industry leader with experience placing CUNY students in roles with tech companies. "This gives smaller companies and start-up employers an easy reason to say 'yes' to CUNY interns, and then they are impressed and start recruiting from the system."

## CUNY is challenging for employers to navigate.

There is little doubt that the city's tech employers could do much more to recruit from and partner with CUNY. Out of 80 to 100 companies participating in a typical CUNY college career fair, no more than one or two are from the tech sector. Students and faculty say it is rare to see tech firms tabling or doing outreach to students on campus, or posting opportunities on virtual CUNY job boards. But while there is more that tech firms could be doing to connect with CUNY talent, CUNY remains highly challenging for employers to navigate—a reality that places students at a disadvantage compared to peers at other institutions.

Nearly all of the tech sector recruiters and hiring managers interviewed for this report say that they have either struggled to work directly with CUNY or have been dissuaded from reaching out due to the complexity of the system and the lack of employer support. One HR leader at a large media technology company, who requested anonymity, expresses optimism that CUNY graduates could succeed at their firm, but feels overwhelmed by the prospect of determining which colleges, programs, administrators, and faculty members could be most helpful in connecting them with potential candidates.

"If I went to a CUNY campus today, I could probably hire people for this job tomorrow," they say, "So, how do you do that? Is there somebody at each campus, or is there one person that's going to handle all of CUNY around New York City? How do you navigate that and who's our contact person?"

Employers say that identifying a point of contact that leads to an ongoing relationship is the most difficult aspect of partnering with CUNY to recruit talent. With 25 colleges and more than 23,000

students currently enrolled in technology degree programs, recruiters and hiring managers have no idea where to begin.

"The frustrating thing is we've got employers who are desperate to connect with CUNY," says the founder of a nonprofit that connects students with work-based learning opportunities in well-paying industries such as finance and tech, and who requested anonymity. "For companies [seeking a more diverse workforce], CUNY is a core focus—but they don't know how to go about it."

These challenges are magnified by a lack of dedicated employer relations staff assigned to CUNY's colleges and departments. Most CUNY colleges are dependent on the director of the campus career services center to facilitate employer engagement and field incoming requests, leaving very little capacity available to conduct cold outreach or build longer-term relationships with hiring managers and recruiters. Only a handful of colleges employ even a single dedicated employer relations staff member, including John Jay, Hunter, and BMCC. Most fold those responsibilities into another staff role focused more broadly on career services, in many cases simply fielding offers from employers if and when they come in.

For those employers who do take the initiative to reach out to CUNY directly, one college at a time, opportunities to engage directly with students are limited. Employers are usually directed to post jobs or internship opportunities directly to online bulletin boards and some are made aware of opportunities to participate in career fairs once or twice per year. Additional employer services are very limited and strikingly uneven across campuses; for instance, while LaGuardia Community College offers employers options to table on campus, conduct on-campus interviews, and organize field trips for students to visit workplaces, Medgar Evers lists no information for prospective employers on the college's official career services website. By comparison, NYU offers dozens of services to prospective employers, including social media takeovers, university-wide branding opportunities, industry meetups, on-campus coffee chats, sponsorship of career hubs and hackathons, and ongoing support from a dedicated relationship manager.

Absent preexisting relationships with CUNY faculty or administrators, recruiters say that trying to establish a partnership with CUNY that goes beyond an online posting feels nearly impossible.

"It's difficult knowing which professors are going to be most interested in gearing their students up for these opportunities," says a talent specialist for purpose-driven tech firms who asked to remain anonymous. "I have relationships, but if I didn't it would be really hard."

A lack of investment in and focus on employer engagement has also led to the demise of once-promising initiatives. One tech sector leader helped to organize networking events from 2014 to 2019 that were regularly attended by dozens of CUNY students and tech workers, but says it failed to reach its full potential.

"I couldn't connect with CUNY students in a large-scale way," says the tech organizer, who asked to speak anonymously. "I befriended people at certain schools so that they could then share it, but communication was always fractured. Getting space was a challenge, communicating was a challenge. Ultimately, CUNY wasn't able to take it on and help it continue."

## CUNY is struggling to hire enough faculty to keep pace with demand for computer science and tech programs—and the needs of a fast-changing industry.

In order for CUNY to continue to expand the number of students earning technology degrees—and ensure that they receive the best possible educational experience—CUNY will need additional resources to hire and retain full-time computer science and technology faculty.

Over the past decade, enrollment growth in computer science and other technology degree-granting programs has far exceeded the pace of faculty hiring. Ten years ago, Queens College had 406 computer science majors and 20 faculty; today, just 15 tenure-track faculty service more than 3,500 majors, according to college administrators. Likewise, Hunter College has grown from 85 computer science majors twelve years ago to more than

1,600 today, while hiring just 13 new faculty during the past nine years. One Hunter College computer science professor who asked to remain anonymous credits the administration for its willingness to hire more faculty when enrollment started to balloon—something that hasn't been the case for many other CUNY colleges—but says it's still not enough. "We still need another 10. NYU is hiring 12 faculty this year alone," the professor says. Budget constraints and a pandemic-induced hiring freeze have stymied efforts to add more instructors over the past two years, even as demand for computer science courses shows no signs of waning.

"Every single one of Hunter's required courses in computer science, except for our senior capstone, is taught in a large lecture with at least 150 students," explains the Hunter computer science professor. "We cannot handle more than 400 or 500 students in our Intro to CS class. And now we're looking at 800 or 900, maybe 1,000 students in the fall. There's just no way to maintain this with our pre-growth teaching format, which was to offer multiple sections of all of our courses."

Across more than two dozen interviews with computer science faculty and senior administrators at CUNY, three concerns emerged repeatedly: enormous class sizes dilute the quality of computer science courses; the large lecture format severely restricts one-on-one support, leading more underrepresented students to drop out of their programs; and the growing gap between CUNY salaries and those in the tech sector makes it difficult to recruit instructors with cutting-edge industry knowledge and experience.

"We struggle to attract competitive tech talent in our CS and technology programs," says one senior university administrator who requested anonymity. "We need state-of-the-art labs and tiered funding that's reflective of the real cost of keeping our programs competitive. Faculty are leaving to work in the private sector and we can't pay tech adjuncts or even full-time faculty at a remotely competitive rate."

In addition to the competition from tech employers and private universities, CUNY is coping with additional staffing challenges. A hiring freeze in effect since spring of 2020 has contributed to a growing gap between course demand and faculty availability, according to students and department chairs, and a

wave of aging faculty are preparing to retire at several CUNY colleges. In total, the number of faculty employed by CUNY has dropped from 7,522 in 2019 to 7,110 in 2021—a 5.5 percent decline in just the past three years.

"There's going to be a precipitous drop in faculty across CUNY," says one CUNY leader focused on technology programs. "A lot of campuses have hired adjunct lecturers, but we need full-time faculty."

More faculty are needed, but keeping them will demand more funding for their professional development. Currently, some computer science departments can offer faculty as little as $25 per year in conference support, according to interviews with faculty and department chairs. With greater support, faculty could dedicate time to learning about new industry trends, networking with researchers and practitioners at the vanguard of their fields, and exploring diversity, equity, and inclusion best practices—whereas now most faculty are faced with the choice to either pay out of pocket or forego these opportunities. Additionally, our research finds that inadequate administrative support is holding back computer science programming at some CUNY schools. "There are huge capacity gaps around admin," says one city official familiar with the operations of CUNY's technology programs. "Administrative staff capacity is a reason why some colleges have been unable to participate in CUNY 2X Tech."

Without additional faculty in computer science, some department leaders are concerned that steps will be taken to limit enrollment, with the most damaging effects on students already underrepresented in the industry.

"The growth is still outstripping our faculty [hiring]," says another computer science department chair. "The inability to be able to grow faculty will force departments to put very draconian restrictions on the major," such as instituting a GPA requirement.

CUNY has made some progress in ensuring students have opportunities to experience project-based learning, building and deploying products using their skills. Much of that momentum stems from CUNY 2X Tech programs, which focus on the skills students need to get hired and have infused several CUNY computer science programs with a tech industry presence. But several students expressed concerns that faculty are still focused on theory over practical skills.

"Classes that were more theory-based and less about coding and building projects and stuff: in my opinion, they just weren't very useful," says a recent Brooklyn College graduate.

Across interviews with CUNY faculty, advisors, and students, as well as current and former Tech-in-Residence corps members, our research suggests that CUNY's computer science departments are hesitant to integrate more practical, hands-on learning into coursework.

"Faculty is still basically promoted on research, not preparing kids for jobs," says a computer science faculty member. And when interviewed, recent graduates complained that few CUNY teachers had exposure to working in the tech sector. "They're more from the world of academia," says a graduate of Hunter's computer science program. "I think that the program was lacking in that sense."

A frequent concern among tech industry professionals who have worked with CUNY is that too few students have opportunities to demonstrate their skills to potential employers. "I can't hire people that don't have demonstrated experience working with real-world data and live code," says a Tech-in-Residence corps member who works for a large financial technology company. Recent graduates and current students also described a frustrating lack of access to current technology–both in terms of hardware and software for practical learning and in regard to the specific skills and languages being taught.

"We had programming languages last year like Pearl and ML. Those are basically dead at this point," says a recent John Jay College graduate with a degree in computer science. "That's what the class focused on as opposed to Python, a very popular language right now."

In addition to continually updating curricula to reflect the evolving needs of industry, CUNY will also need to ensure that current faculty are able to create learning experiences that better reflect work in the tech sector—including through access to technologies and datasets that mirror those found in tech workplaces.

"You can learn SQL from here to eternity," says a Tech-in-Residence corps member who teaches at Queens College. "But if you don't have access to real-world data to work with, you won't have the experience you need to get hired."

## Tech Companies Have a Lot More Work to Do

Although a handful of tech companies have developed promising partnerships with CUNY and made important strides hiring the university's graduates, these efforts are still not the norm across the city's tech sector. Relatively few tech companies actively recruit from CUNY, commit to taking CUNY students on as interns, or develop pathways programs that help train and prepare CUNY students for jobs at their firm. It's time for tech companies across New York City to step up.

To be sure, New York has many small and mid-sized tech companies, many of which do not have large human resources departments to coordinate recruiting, hiring, and training CUNY grads. Hiring managers at many of these companies typically don't know enough about CUNY, have no experience hiring CUNY grads, and often take the default route of hiring graduates from prestigious private colleges. "There's not that many people in my company that I know of that have a degree from CUNY. So sometimes it can feel a bit isolating, because a lot of people that work here graduated from fancy Ivy league schools," says a CUNY graduate who was hired by one of New York's largest tech companies.

Some recent efforts among tech companies to set new industry standards for how to achieve and report on workforce diversity are promising. For example, the Tech Equity Accountability Mechanism program urges tech firms to enhance recruitment efforts at schools that enroll large numbers of first-generation college students, which our research suggests is lacking. Even as many companies have ramped up diversity, equity, and inclusion efforts as part of their recruitment strategy, they often leave out first-generation candidates as well as those from lower-income communities, according to sources with experience working for multiple tech companies in New York City over the past two decades.

"I have seen the approach to DEI consistently ignoring first-generation college graduates. People from lower-income backgrounds—they are intentionally left out," says an engineer for a mid-sized technology company headquartered in Manhattan.

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Technical interviews can make or break candidates for tech roles, but our research finds a lack of attention to technical interviewing across CUNY computer science departments. Whereas several private and public colleges, including Stanford and the University of Waterloo, have created for-credit technical interview prep courses or at least encouraged students to take advantage of outside resources like Leapcode, CUNY students have few, if any, opportunities to practice for these high-stakes trials before actually getting into the interview room.

"Before going into technical interviewing, I remember [thinking] that it could have been something cool for professors to integrate into their classes. They just didn't," says a recent Brooklyn College graduate who majored in computer science. "I even suggested it to a professor and she was like, 'I don't really know that technology and I don't want to spend time on it.'"

## CUNY Computer Science Graduates' Sector of Employment One Year After Graduation

Data for CUNY graduates from Computer and Information Sciences and
Support Services programs

| College | Professional, Scientific, and Technical Services | Finance & Insurance | Retail Trade | Healthcare & Social Assistance | Administrative & Support Services | Educational Services | Information | Accommodation & Food Services |
|---|---|---|---|---|---|---|---|---|
| NYCCT | 16.7% | 13.8% | 14.0% | 9.4% | 9.2% | 7.7% | 3.9% | 4.1% |
| BMCC | 10.6% | 9.9% | 12.9% | 10.1% | 10.0% | 7.7% | 4.1% | 7.8% |
| Baruch | 22.5% | 20.9% | 6.3% | 7.6% | 7.9% | 4.7% | 7.9% | 2.5% |
| LaGuardia | 10.7% | 11.8% | 13.7% | 6.8% | 10.7% | 7.3% | 0.2% | 9.6% |
| Queens | 28.2% | 15.6% | 6.5% | 5.5% | 7.4% | 5.1% | 8.9% | 3.0% |
| Brooklyn | 24.2% | 17.4% | 7.2% | 8.0% | 7.6% | 8.1% | 9.3% | 7.6% |
| Queensborough | 7.6% | 11.9% | 19.7% | 13.9% | 5.7% | 6.6% | 4.5% | 3.3% |
| Lehman | 14.1% | 11.4% | 9.9% | 12.7% | 9.2% | 11.2% | 6.0% | 2.7% |
| Bronx | 9.4% | 6.8% | 14.3% | 17.2% | 7.5% | 12.3% | 1.6% | 5.5% |
| Kingsborough | 10.4% | 6.6% | 13.8% | 14.1% | 16.4% | 6.6% | 4.3% | 2.9% |
| Staten Island | 23.5% | 18.8% | 6.6% | 8.9% | 6.3% | 7.4% | 9.7% | 1.9% |
| City | 31.5% | 20.5% | 5.8% | 5.2% | 8.9% | 6.7% | 8.6% | 0.6% |
| Hunter | 27.8% | 13.6% | 5.0% | 7.5% | 5.2% | 5.9% | 9.6% | 4.9% |
| York | 11.6% | 12.6% | 11.4% | 11.6% | 10.1% | 10.8% | 3.9% | 4.9% |
| John Jay | 16.3% | 17.0% | 9.7% | 9.5% | 9.9% | 11.2% | 6.5% | 3.2% |
| Medgar Evers | 14.9% | 15.8% | 11.9% | 20.8% | 7.9% | 2.0% | 6.9% | 5.9% |
| Hostos | 8.1% | 4.1% | 8.1% | 6.8% | 1.4% | 16.2% | 5.4% | 1.4% |
| **Total, Community Colleges** | **9.8%** | **9.3%** | **14.4%** | **12.2%** | **9.5%** | **8.2%** | **3.9%** | **5.7%** |
| **Total, Senior Colleges** | **21.2%** | **16.4%** | **8.1%** | **8.5%** | **8.1%** | **7.2%** | **7.3%** | **4.0%** |
| **Total, CUNY** | **18.7%** | **14.8%** | **9.5%** | **9.3%** | **8.4%** | **7.4%** | **6.5%** | **4.4%** |

Source: Center for an Urban Future analysis of data from the U.S. Census Bureau Post-Secondary Outcomes Explorer.

# A Portrait of NYC's Aspiring Tech Workforce: Six CUNY Graduates Share Their Stories

## Bibi Hassan

Bibi Hassan, 21, was a computer science major at Queens College who graduated in May 2022 and is now a software engineer at Google. She was exposed to tech early, attending the computer science program at Bayside High School and working as a web design intern between high school and college. That summer, Hassan also participated in the Computer Science Summer Institute (CSSI)—a partnership between Google and Queens College for incoming freshmen. It was there that she learned the basics of programming, got to tour Google's offices, and made friends with similar interests, with whom she went on to start a club on campus. "I would definitely say with a hundred percent confidence that this program cemented the part of my mind that made me want to stick to a career in tech," she says.

In college, Break Through Tech accepted her into its program and she was matched to a tech internship for a Big Four accounting firm. Break Through Tech, she says, allowed her to exist in a community of women with similar interests, where she felt welcomed and invited, which provided a stark contrast to her classes, where at times she was one of the only women in the room. Hassan says maybe four to six classes were helpful in her career, but most were theoretical. But the professional center at her college did help her greatly, especially since they work closely with the tech incubator on campus. With its support, she participated in three internships at Google over the course of three years.

For Hassan, tech has unbounded potential, and she knows as a lifelong learner that there will always be something new to discover. Hassan was able to harness the limited but highly effective resources that currently exist to find employment and hopes more employers realize the enormous potential at CUNY. "There could be somebody at CUNY who is just as, or even more talented than somebody at an Ivy League school," she says. "We're not given as much of a chance to show, 'Hey, we're pretty great at tech too.'"

## Francis Lam



Francis Lam, 22, has applied to over 100 tech jobs with no luck. Lam decided to go to CUNY because she wanted an affordable education where she could explore "different fields of study right in her home borough, while also following in the footsteps of her sister, a CUNY alum. She says that participating in Queens College and Google's Computer Science Summer Institute convinced her to pursue tech, and she decided to major in interaction design with a computer science minor.

Unlike many of her peers, Lam has had several work-based learning experiences during her college career, although none was with an employer directly. Throughout her time at Queens College, she took part in several CUNY programs offering design-related opportunities, including CUNY Cultural Corps and CUNY Service Corps. But when she applied to

internships or jobs on her own outside of those programs, both during college and seeking a job after graduation, more often than not she was not invited to interview or didn't even receive a reply. "When I apply to things outside of CUNY-related stuff it's been a struggle," she says. "I feel like maybe not all companies know about CUNY."

Finding professional help at her college hasn't been fruitful, either. Lam says Queens College's career services center does have some resources to find software- or business-related jobs, but not anything specific for the UX/UI positions she wants to pursue. Career fairs don't have opportunities for her field; her college job board hasn't been helpful; and while she says the design department taught her applicable and industry-standard skills, its job board is often out of date.

Lam says CUNY needs to work more closely with employers to develop technology internship and fellowship programs for alums who need help breaking into the industry, especially in tech roles outside of software development. And, she adds, employers need to step up, as Google has done, to create college-to-career opportunities for CUNY students as well.

"I have experience," she says. "I'm just waiting for the right company to be like, 'Oh my God, she's a gem.'"

## Faisal Farooq



Faisal Farooq, 30, is a startups solutions architect for Amazon Web Services who used his tenacity to break into tech as a first-generation college student. Farooq

and his family moved from Pakistan to New York in 2009, while he was still in high school. In his senior year at John Bowne High School in Queens, Farooq set his sights on an engineering career. He knew he wanted to pursue STEM and work with people as opposed to in a lab, so engineering seemed like an attractive option. One of the only colleges with an accredited engineering program he could afford was City College. Farooq completed the program, which is designed to take five years, in six and a half. He took longer because he worked throughout college to pitch in for bills and rent at home, something he had done in high school as well.

Farooq says his first internship experience was the key to unlocking every experience in tech that came after. After working in customer service for a few years, he put himself out there on a recruitment website and found a startup looking for help with software engineering. A three-month gig turned into a one-year paid internship. And he gained much more than a line on a resume—he also received mentorship help developing professional skills like interviewing and networking. He met a recruiter at a conference unrelated to CUNY, hosted by the Society of Asian Scientists and Engineers, which helped him land his first job out of college at the consulting firm Booz Allen Hamilton. Two years later, Amazon recruited him.

Farooq says that City College could have done more to help him land work. While the curriculum was rigorous, it lacked real-world applications and project-based learning, he says. And before his internship, he recalls, he wasn't aware he could work for the big tech companies like Amazon or Google out of college. There were few options for him at career fairs; aside from employers like Con Edison and the MTA, he didn't see many engineering-related opportunities. "The New York City companies were missing from there," he says. "Now that I'm coming out of college, you hear about how other schools have that. The kind of career development resources available [at CUNY] is not even close."

While Farooq, with determination and a bit of luck, did find job opportunities, he observed many of his peers struggling to find work. He's convinced that early exposure to tech careers—especially internships—could have helped him and his fellow students realize more of the pathways possible before graduation. "I know many of my friends dropped

when it got really hard around the second year," he says. "You should be engaging students early on. 'How are you thinking about life after college? What are your plans?'"

Alongside his role at Amazon, Farooq is now an adjunct lecturer at Hunter College. He says employers should look to CUNY as a source of untapped potential. Not many of his peers in the city's tech sector are from CUNY, and he'd like that to change.

"Start-up companies and founders [can] find incredibly resilient individuals at CUNY. These are the folks who are working, going to college, they have families to take care of, all of that—and they're just incredibly smart."

## Harpreet Gaur



Harpreet Gaur, a current technical program manager at LinkedIn, hustled to break into the industry by any means possible. Despite enrolling at City Tech, CUNY's flagship tech college, she says there was no targeted help for students pursuing tech. "In City Tech, we had no resources, no mentorship, or any kind of career fairs or development plans whatsoever," she says, "Not just that, but even internship opportunities." In fact, she and some of her peers became mentors themselves to underclassmen to fill the gap.

Many students attend City Tech because they know from the outset they want to enter the industry, but the college is strapped for resources; it has only three career advisors for about 17,000 students. And when Gaur, determined to find opportunities, took the initiative to reach out to tech employers to organize a career fair, she says she was met with hesitation. "They refused to come because they said,

'Hey, you know, we don't really source so many of our students from city colleges like City Tech.'"

Gaur was not deterred and decided that if her college could not help her get her foot in the door, she would find a way to break it open. She applied to a variety of research grants on her own as an undergrad, which is where most of her experience came from. She also participated in a program outside of CUNY called the Grace Hopper Fellowship, which she said gave her the opportunities she was looking for. That program hosts a conference every year, which led to an interview opportunity for a data science analyst position at JPMorgan Chase. She got the job, and nearly two years later became a technical program manager at LinkedIn.

CUNY students like Gaur exist across all campuses, using their scrappiness to make their dreams possible, especially when their colleges don't make it easy. Gaur recommends that CUNY take a look at which campuses are in desperate need of resources for its students in tech programs and create more opportunities for their development.

## Anne Wells

Anne Wells, 43, took a free SQL training course that BMCC offered through a federal grant in fall of 2020, but still cannot find a job in tech. Before deciding to enter the tech field, she says her career trajectory was aimless. She has worked in administration for most of her career, but does not enjoy it, and thought that since the tech industry is growing, it would be easy to find a job that was lucrative. But Wells says for a long time she was stuck in a catch-22 where she made enough money to get bumped out of free and low-cost programs, but not enough money to have any savings. That's why, when she saw the free course offered at BMCC through a COVID relief program, she jumped at the opportunity. CUNY, she says, should offer more classes like it to lower barriers to access.

While the course was helpful, finding a job in tech has been difficult since Wells completed it. She still works at the same administrative job she had before learning SQL. The course included a professional seminar at the end, but it was not as practical as she had hoped. "It didn't seem particularly tech focused and it certainly wasn't particularly tech focused on careers that involve SQL," she says.

Wells says she wishes employers would partner with CUNY's continuing education courses to invest in students and train them for specific jobs. She says this would be beneficial for both the students and for the employers seeking talented employees with the specific skills needed for a job. "Tech companies could provide the financial resources to get this person trained in what they need, with the promise of, 'Okay, we'll invest in your training and then we'll have a job waiting for you when you're done,'" she says. For now, Wells will continue to search for her first tech job.

## Aaliyah John



Aaliyah John, 21, was born in New York City but grew up in the Caribbean. Both of her parents were in the criminal justice field, and that exposure coupled with her love of math and computer science led her to

pursue a degree in cybersecurity. Throughout her time at CUNY, John says the curriculum she and her fellow students were taught was outdated and no longer applicable to the industry. "We had programming languages last year like Pearl and ML," she says. "Those are basically dead at this point." John points out that the college never taught her current languages like JavaScript or Python, skills that she needed to break into her chosen field.

John also says that there was a significant gender disparity in her college classes. Among a sea of men, most with previous coding experience, her classes would have "just five women sprinkled across it and even less a woman of color." Her desire to learn skills for a modern workplace and get targeted support as a woman in STEM led her to apply to Break Through Tech, a program that aims to accelerate gender equality in the tech industry through internship opportunities and career readiness workshops.

John interned at Cognizant Vision, a software engineering company in Hudson Yards, and the United Nations International Computing Center. "They just really focus on getting us out there," says John. "I always encourage everyone else who I meet at school to join Breakthrough Tech because they catapulted my career more than I could even explain." Her involvement in Breakthrough Tech led her to talk to a recruiter at American Express at a program matching event. She interned at the company and then later received a job offer before graduation.

# Key Programs and Initiatives That NYC Should Scale Up

A handful of programs have been crucial to growing the number of CUNY computer science and other tech-related degree graduates, as well as helping graduates connect to internships and jobs. With support from city government, tech employers, and philanthropy, these programs have energized select CUNY colleges with up-to-date industry knowledge and the presence of working tech professionals.

In addition, our research finds that certain non-profit organizations have played an essential role in helping CUNY students and alumni find inroads to tech. By expanding professional networks and facilitating access to workplace experience, these nonprofits are helping close gaps between what CUNY is currently able to offer and what is needed for students and alumni to launch successful careers.

Lastly, even as CUNY and city leaders strive to build a tech sector representative of New York City's full diversity, and distinct from other locations, they should look to the most impactful initiatives outside of New York City for inspiration. With that in mind, we highlight a few outstanding programs in other cities and at other colleges. These programs can inform how CUNY and New York City approach computer science education and tech industry engagement going forward.

## CUNY PROGRAMS

## CUNY Tech Prep

A year-long industry-guided program blending hands-on application building with career guidance and mentorship for advanced CUNY computer science and computer information systems majors.

**Who is served:** Launched in 2014 as part of the $10 million NYC Tech Talent Pipeline, this competitive program accepted only 125 out of 400 applicants for the 2019-2020 school year.
During the 2020-2021 school year, 139 students participated.

**Outcomes:** For most participants, CUNY Tech Prep opens doors: 75 percent landed a job or internship within five months of completing the program.

**How the program works:** CUNY Tech Prep is a free, year-long program for advanced students in computer science and other tech-related majors at any of the 11 CUNY senior colleges throughout New York City. Developed with input from multiple industry leaders, such as Verizon and LinkedIn, the program is aimed at helping students not only learn necessary technical skills, but also understand what's needed to break into the industry.

Students participate in weekly technical classes, learning full-stack coding and working individually and in teams. They receive mentoring and one-on-one career coaching, instilling practical knowledge that can lead to internships and jobs, such as how to network, write a technical resume, and prepare for technical interviews. Teams of students create a full-stack web application to present to NYC tech employers at end-of-year Demo Nights hosted by local tech companies.

**What makes the program effective:** The second half of the program focuses heavily on technical interviewing, which program leaders have determined is crucial to job applicants getting hired. These mock interviews

involve whiteboarding—a popular interview format that requires applicants to solve technical problems in real time—and are often led by alumni of the program who are working in tech.

In interviews, CUNY graduates who participated in Tech Prep broadly cited the importance of the program's emphasis on technical interviews. One former student, who graduated from City College with a degree in bioengineering, urged CUNY to incorporate training from Tech Prep into the standard curriculum. "The biggest help that CTP provided was the mock technical interview, and they had alumni do that. CUNY could have a system where all students have to go through this mock technical interview class or program, even a one-credit seminar," he said.

The focus on practical skills building and access to industry-relevant technology also make CUNY Tech Prep stand out from the standard computer science curriculum, according to several former participants we interviewed for this report. "You build hands-on products, and it's nice to get away from theory-based stuff," says an alum of the program who is now a PhD candidate and engineer at Sinai BioDesign, Mount Sinai.

Students also said that they valued being able to work collaboratively, which is not often a focus of computer science coursework at CUNY. And even top-tier students found the program's practical emphasis and industry relevance necessary to their progression from college to the professional world. One participant who was the valedictorian of her class, completed several internships, and is currently a software engineer at JPMorgan Chase says, "It was one thing that really helped me feel prepared for my job after college. I felt like I was using modern technology. I felt like I was working with teams more, in a way that was different from working in my other classes."

## CUNY 2X Tech

A five-year effort to grow the number of CUNY computer science graduates through industry-aligned instruction, career and academic advising, and real-world experience in tech.

**Who is served:** CUNY 2X Tech launched at seven campuses: Hunter College, Lehman College, City College, Brooklyn College, the College of Staten Island, Medgar Evers College, and John Jay College.

**Outcomes:** The program has helped double the number of CUNY students graduating with computer science and tech-related degrees from 2017 to 2022, according to administrators who have reviewed as-yet unpublished data from CUNY. (Publicly available data shows that the number of technology graduates has spiked in recent years, from 3,094 in 2017 to 3,907 in 2019.)

As of spring 2021, CUNY 2X Tech was serving 4,962 computer science majors and had seen a 16 percent average year-over-year growth rate in employment outcomes for graduates, defined by full-time NYC-based employment in the field at market-rate salary.

**How the program works:** In 2017, as part of NYC Tech Talent Pipeline, New York City invested $20 million in CUNY 2X Tech, including $11 million in public funding and $9 million in federal and private dollars. The program centers industry-informed instruction, advisors in the tech ecosystem, and opportunities for real world experience tailored to tech careers.

**What makes the program effective**: Across interviews with CUNY faculty, advisors, and students, our research finds that CUNY 2X Tech has been game-changing for participating students, helping them acquire the skills, confidence, and professional connections necessary to break into tech. It has also empowered CUNY faculty and career advisors to create innovative new programs that, with more time and greater investment, could help propel CUNY into the top tier of New York City colleges for computer science and other tech-related degree programs.

Career advisors hired specifically for CUNY 2X Tech are helping ensure that more computer science students understand the landscape of the tech industry. These advisors expose students to possible career options from the early days of their college experience. By combining academic and career advising, with an eye toward the needs of tech employers and internship opportunities, advisors play a critical role in the program's success. "We created a 'degree career map' that we hand out to every freshman, where we match the courses they take, starting in the first semester, with very simple career development activities. If they're introduced to these opportunities early and in a relaxed manner, they're able to handle them," says an advisor for advanced computer science students at one CUNY college.

Advisors are finding ways to meet students where they are, such as providing paid professional development opportunities for students who would otherwise not be able to attend. "Our students traditionally are working, and have families and other responsibilities. In tech now, you have to have a large amount of professional development, and that's occurring outside the classroom. For students to attend a resume workshop when they're working is hard," says an advisor who helped create a paid professional development and technical interview prep program for CUNY students in the Bronx.

## Tech-in-Residence Corps

A CUNY 2X Tech initiative that invites tech professionals into CUNY classrooms to teach advanced computer science electives.

**Who is Served:** The program serves about 500 students per semester.

**Outcomes:** Students who take a Tech-in-Residence Corps course are more than two times as likely to land a job when they graduate compared to their peers.

**How the program works:** The city-wide program emphasizes industry-academic collaboration between CUNY faculty and students and a pool of about 60 Corps members from more than 40 different New York City tech employers. With guidance from faculty mentors at CUNY, Corps members create syllabi for semester-long electives in their area of expertise.

Examples of recent courses taught by Tech-in-Residence Corps members range from Data Warehousing for Analytics taught by a senior consultant at EY to Software Engineering taught by an engineer at LinkedIn to Web Development taught by two Addepar developers.

**What makes the program effective:** The Tech-in-Residence Corps has been crucial in expanding student access to the skills and internships they need to secure entry-level tech jobs, according to interviews with CUNY faculty, advisors, and Corps members who understand industry hiring needs. "The Tech in Residence program gave students exposure to industry-led courses and also gave industry people a window into the pool of talent at CUNY, and that was the most significant thing, because a lot of companies hired CUNY students out of that program," says an administrative leader focused on computer science and technology programs at CUNY.

Across interviews with current and former Tech-in-Residence Corps members, our research finds that the program has been highly effective in getting students to actually do the work of professionals in tech, giving them greater confidence and a better chance at getting hired. "Going from theory to practice is where Tech-in-Residence is really working," says one Corps member, a FinTech professional who taught courses at CCNY. Another former member who works for a large social media tech company recounted how Tech-in-Residence helped students realize that tech careers are not only about technical skills. "Basic things like being able to communicate and write up planning work, all of that stuff that is in service of the actual coding is super important. That's one reason why I think the Tech-in-Residence program is important: it lets students see how the sausage is made. Being an engineer, it's only maybe 20 percent coding in any given day. There's a lot of discussion, a lot of writing," he says.

Students collaborate at a Break Through Tech event.

## Break Through Tech

An organization focused on building gender equity in tech through programs that make careers in computer science and related disciplines accessible to women and underrepresented students.

**Who is served:** Since 2016, the program has connected more than 2,700 women and underrepresented students at CUNY with programs aimed at propelling more women into tech careers and has partnered with more than 100 employers.

**Outcomes:** Break Through Tech programs have helped grow the number of CUNY women graduating with degrees in computer science and related disciplines by 124 percent, from 174 in 2016 to 390 in 2020. Between fall 2016 and fall 2020, the number of CUNY women declaring computer science and other tech-related disciplines as their major increased 84 percent, from 1,270 to 2,331.

Between 2016 and 2022, Break Through Tech New York partnered with employers that hosted nearly 1,000 CUNY students in a microinternship program called a Sprinternship. More than half of participants landed employment during the first summer after their Sprinternship. In 2022, 77 percent secured longer term internships at their microinternship host site. Only 3.6 percent of similar students had been able to get a summer internship in tech before participating in the program.[18]

**How the program works:** Break Through Tech has its flagship location in New York City and partners with CUNY on three programs for women and underrepresented students. Offerings include Summer Guild, a free week-long program that introduces students without any prior experience to coding real-world, mission-driven applications. Sprinternships are paid three-week microinternships for first- and second-year students that provide experience inside a tech company along with career development workshops, paving the way for students' first paid summer internship. The Career Readiness Program (CaRe) has featured expert-led professional development sessions for students who want to pursue careers in tech.

**What makes the program effective:** Many CUNY students begin college without awareness of career options in tech, nevermind coding experience. This prevents them from pursuing computer science degrees and makes it harder for them to get internships in tech-related fields, as they lack the real-world experience—coding camps, hackathons—that many companies require of internship candidates. Break Through Tech targets these students, who often lack the time for tech-related extracurriculars because they work alongside their studies.

Participants also build a community of other students and professional mentors who can help them navigate their progression through college, internships, and landing their first job. One CUNY student interviewed for this report described how participating in Break Through Tech, which matched her to a tech internship for a Big Four accounting firm, helped her connect with other women in the field. It was a stark contrast to her classes at Queens College, where at times she was one of the only women in the room. "With Break Through Tech, you enter the seminars and workshops and you just feel like you belong. The population of women in tech is so small, but you go into these rooms and they're filled with women who have the same interests and experience. It just feels so welcoming and inviting," says the student, now a rising senior pursuing a degree in computer science.

**THE FORAGE** lets students sign up for brief virtual work experiences for Fortune 500 companies, such as Accenture, JPMorgan Chase, Lyft, SAP, and Y Combinator. Virtual experiences can last from two hours up to about 15 hours and cover a wide range of fields, such as cybersecurity, data science and analytics, project management, software engineering, and design.

"They're not actual tasks that the companies derive value from, but hypothetical tasks which are designed to mimic what it's like to work in a particular organization. And the simulations contain learning resources, enabling students—in an asynchronous, on-demand, self-paced way—to build skills and confidence," says Thomas Brunskill, CEO and founder of The Forage. Experiences are free for students and universities; companies pay to be able to participate and "engage with that future pipeline of talent," at a moment when many companies are choosing not to recruit in person on campuses, says Brunskill.

**DEVELOP FOR GOOD**, an organization created by Stanford alumni, pairs students and recent graduates with cash-strapped nonprofit and government agencies in need of development and design services at discounted rates. The program is aimed at underrepresented populations: among volunteers, 66 percent are women and 33 percent are first-generation college students or low-income students. Applicants are matched with teams and projects that provide real-world experience in disciplines such as product management, front- and backend development, design, and data engineering. Projects are unpaid, with a time commitment of 5 to 10 hours per week for a minimum of 14 weeks. Team and one-on-one mentoring from tech professionals is also available or volunteers.

One CUNY 2X Tech advisor interviewed says the program provides a confidence boost for students experiencing imposter syndrome. They work on teams with students at highly selective schools and hold their own, "so they know that they're equal, and they're doing the same job that a Stanford or MIT student is doing. We just need to let the recruiters understand that now."

Certain nonprofit programs are helping students build social capital, which is difficult to access at CUNY, yet can be critical to securing a job in the technology sector.

Recent graduates of public colleges and universities at a COOP Careers orientation.

**COOP CAREERS** is a national nonprofit that helps recent graduates of public colleges and universities build a network and get full-time jobs in tech and marketing. Cohorts of local graduates, overwhelmingly first-generation college graduates and people of color, convene for 200 hours to learn digital skills and develop community while pursuing full-time tech jobs. Each cohort is led by alumni of the COOP program, giving them a chance to hone leadership skills and leverage their professional network to help participants gain access to upwardly mobile jobs.

"What actually helps get your foot in the door and helps you grow your career is the social capital built into your network, which many first-generation college graduates lack, especially if they're going to a commuter campus where it's particularly difficult to build relationships," says Sarah Wessel, senior director of partnerships for COOP Careers.

"Data shows that the most powerful mechanism to get hired at a company is to have an employee at that company vouch for you," says Markus Ward, managing director of development for COOP Careers. "In some ways, we view that as so informal that

there's no way it could be scaled or that we could actually facilitate that institutionally. But obviously, it has been done, because elite colleges have invested so much money in alumni engagement and alumni relationships. It's viewed as just the way that it works at these schools."

Even without the resources to hire hundreds and hundreds of more career services professionals or invest heavily in alumni engagement, CUNY can augment computer science and related discipline departments with "intentional social capital building programming that allows a student to leave their undergraduate experience with the professional network necessary to get a job in an upwardly-mobile career," Ward says.

**PROJECT BASTA** helps CUNY students plot career paths and build the social capital needed to land full-time jobs in tech and financial services. The New York City-based nonprofit offers a ten-week Job Search and Readiness fellowship program for first-generation college students of color. The program helps recent graduates who are underemployed or unemployed

discover and pursue a compatible career path and define their career expectations as well as their strengths and weaknesses. It also equips them with "information to allow them to make those micro-decisions to put them on a path to a great career," says Sheila Saremzadeh, Project Basta's CEO and founder. That can mean knowing when to send thank you notes after an interview, how to communicate during a technical interview, or knowing when to have completed an internship in order to land a job. "We don't talk enough about the sort of invisible access to information that comes with being born into the right family and to the right networks, so that's a lot of what Basta has done, just really examined why this young person went left instead of right at this point," Saremzadeh says.

Basta also provides its framework—a career roadmap informed by data and industry knowledge—to college career centers and other organizations that work with college students, arming them with "the precise support that specific groups of young people need," says Saremzadeh. The CUNY/Basta Career Readiness Partnership, available to all CUNY students interested in financial services careers, draws on that framework, incorporating monthly employer-hosted meetups to provide students with career exposure, networking opportunities, and industry knowledge. Several CUNY colleges participate, but only one of the colleges allows students to get course credit. "The thing that's most helpful for young people directly is if they get credit for participating in Basta's programs," Saremzadeh says.

Additionally, she says that equipping all of CUNY's career services offices with Basta's framework could help overcome their lack of industry engagement and knowledge of the tech sector. "I wish we would professionalize and rethink the college career center and the kinds of supports that are available. I think these folks are doing the best they can, but some of them have never had to get a job outside of the one they have. They're not necessarily current on how to support first-generation college students. More important than our direct service work is how we support college advisors and counselors and make sure they're sharing the right guidance with students along their college journey, and that's where I think this framework becomes really powerful."

## MODELS FROM OTHER CITIES

### UNIVERSITY OF CALIFORNIA SAN DIEGO: TECH SAN DIEGO JACOBS TALENT INITIATIVE

Tech San Diego, the trade association for San Diego's tech sector, has successfully established a strong presence at local universities, offering career guidance and opportunities to students who hope to pursue high-paying tech careers. Through their Jacobs Talent Initiative, Tech San Diego provides students with resources such as summer internships, networking events, career advising, and faculty and alumni mentoring. These opportunities allow students to gain valuable experience and form relationships with the organization's 84 employer members, which include major national and local tech employers such as Qualcomm, Teradata, and Certona.

To encourage individuals from diverse backgrounds to seek out careers in tech, the Jacobs Talent Initiative has partnered with on-campus organizations such as Women in STEM groups and the Latino Resource Center. For the fall, the Talent Initiative is planning to organize an "Intercollegiate Tech Tour" that will bring together Women in STEM groups from five local universities for a meet-and-greet event, networking session, and behind the scenes tour of multiple local firms. "The companies in Tech San Diego want to meet women engineer students," says Christy Quiogue, the director of Jacobs Talent Initiative. "Having unique and signature events like that brings both parties together. They both win."

Central to the success of Jacob Initiative's mission are its relationships with both engineering departments and university career centers. Before serving as the Talent Initiative's director, Quiogue worked as a career counselor and internship coordinator at multiple local universities including UCSD and San Diego State.

By leveraging existing relationships with university organizations, which in turn advertise the initiative's events and refer students to the program, Tech San Diego is able to attract students who might not otherwise hear about the organization's on-campus work. Outside of acting as a job connector, Tech San Diego goes further by helping students conquer imposter syndrome and fears of entering an unfamiliar industry. Through their mentoring efforts, which include arranging meetings with tech employers and introducing students to university alumni who work at local firms, the Talent Initiative familiarizes students with the companies and subindustries that make up San Diego's tech ecosystem and encourages them to pursue tech careers.

"At the end of the day, we want our students, our next generation of talent, to feel their sense of belonging in the tech world," says Quiogue. "It all starts with that human piece."

## MIAMI DADE COLLEGE TECH: INDUSTRY PARTNERSHIPS

MDC Tech, born out of a partnership between Miami Dade College, the city's Mayor's Office, and local technology firms, has established a pipeline for students to gain access to flexible, high-paying job opportunities in Miami's burgeoning tech sector by hosting networking events, providing scholarships to local students, and funding faculty upskilling. Since its inception, MDC Tech has raised over $20 million from local philanthropic foundations and from Miami Dade County. The organization's most popular initiatives have been those that appeal both to students already studying computer science and those interested in tech careers but still unfamiliar with the industry. One event, Miami for Everyone, an MDC Tech sponsored Hackathon, organized coding competitions and workshops to teach amateur students the basics of computing and Web3. The event drew over 1,300 jobseekers and students as well as representatives from 74 companies.

MDC Tech has been proactive in forming relationships with industry partners, which include both national firms such as Microsoft and IBM as well as local companies like CityCoins, the group behind MiamiCoin, the United States' first municipal-based cryptocurrency. Miami's local government has been a persistent ally in supporting MDC Tech as well as the city's broader tech aspirations. MDC Tech has partnered with groups such as Venture Miami, an organization created by Miami Mayor Francis Suarez, to attract businesses migrating to Miami and recruit local talent for jobs. In April 2022, these companies, which included Amazon, Blockchain, Zumper, and Blackstone, hosted a job fair at the college that consisted of on-site interviews and on-the-spot hiring. Additionally, Antonio Delgado, MDC Tech's vice president of innovation and technology partnerships, also serves as a senior advisor for Tech Talent Development in the Miami Mayor's Office. Delgado stresses the importance of proactive outreach to encourage companies to seek out and hire from local communities and public universities.

"The biggest challenge is perception…they [employers] are not going to come to you. You need to show off yourself what you're building, and the way that you have degrees aligned with the skills that the companies are looking for," Delgado says. Through events like hackathons, scholarships for students pursuing degrees in STEM, and investment in faculty training, MDC Tech is helping to establish this alignment. Delgado also notes that MDC Tech, by helping residents of Miami—one of the nation's most multicultural cities—enter the tech workforce, will increase diversity within the sector. "Everything we do has that impact on minorities… at the end of the day it's about how to make the talent that is needed with the local community, not bringing communities from the outside to take advantage."

# How to Unlock CUNY's Full Potential and Build a More Inclusive Tech Sector

**FOR NEW YORK CITY AND STATE**

**INVEST $20 MILLION TO SCALE UP CUNY INITIATIVES FOCUSED ON EXPANDING ACCESS TO TECHNOLOGY CAREERS.** New York City has supported several important programs in recent years that are succeeding in helping CUNY students pursue and succeed in technology careers, but these programs are only meeting a fraction of demand and lack funding commitments beyond 2022. Mayor Adams and the City Council should launch a new $20 million CUNY Tech Success initiative to sustain and scale these effective programs, including CUNY 2X Tech, CUNY Tech Prep, the Tech-in-Residence Corps, and the Tech Talent Pipeline Residency internship program. The most successful of these programs should be baselined in the city's annual budget, with additional funding allocated to expand these initiatives to the colleges that lack them today, including City Tech and most of CUNY's community colleges.

**SUPPORT A MAJOR EXPANSION OF CAREER SERVICES AND EMPLOYER RELATIONS STAFF AT EVERY CUNY COLLEGE.** There is a lot more that CUNY needs to do to strengthen career services and employer engagement across every college in the system, but CUNY cannot do this alone. City and state leaders should work together to boost funding for full-time CUNY staff and specifically support a major expansion of career services and employer relations professionals on campus. Currently, the average CUNY college makes do with a ratio of 2 to 3 career counselors for 10,000 students and few colleges employ any full-time staff focused on building and maintaining relationships with employers. CUNY should make strengthening these core functions a top priority and will need a new level of public investment to do so.

**PARTNER WITH TECH INDUSTRY LEADERS TO LAUNCH 2,500 PAID TECH INDUSTRY INTERNSHIPS BY 2025.** There are few changes that could have a more powerful effect on the career outcomes of CUNY technology graduates than a massive expansion of paid internships. Today, only 10 percent of CUNY students report participating in a paid internship at any point in their college careers. While competition with students from other universities and a lack of on-campus career counseling contribute to the challenge, our research shows that the supply of paid tech sector internships available in New York City is simply insufficient. Mayor Adams should work directly with industry leaders to secure commitments to launch 2,500 new paid tech industry internships by 2025, including spring and fall semester internships and microinternships, and partner with CUNY to ensure that as many students as possible are able to access these opportunities.

**COMMIT TO DOUBLING THE NUMBER OF CUNY TECHNOLOGY GRADUATES FROM UNDERREPRESENTED BACKGROUNDS BY 2027.** New York City has made major strides in enabling CUNY to boost the number of students earning technology degrees each year. But to cultivate a more representative tech talent pool, much more needs to be done to help increase the number of women and Black and/or Hispanic students earning technology degrees and credentials at CUNY. City leaders should build on the highly successful CUNY 2X Tech initiative, which helped double the number of technology graduates at CUNY over the span of five years, and launch a new effort committed to doubling the number of tech graduates from underrepresented backgrounds by 2027. This effort should scale up powerful existing programs like Break Through Tech; expand support for peer and industry mentorship for women, girls, and students of color interested in computer science and technology; and invest in long-term commitments to equip every teacher with the skills needed to integrate computing education into every school and classroom across New York City's public education system.

**ALLOCATE FUNDING FOR CUNY TO HIRE 250 NEW COMPUTER SCIENCE AND TECHNOLOGY FULL-TIME FACULTY OVER THE NEXT FIVE YEARS.** Even as demand for computer science classes has skyrocketed in recent years, faculty hiring has struggled to keep pace. A hiring moratorium, growing reliance on adjuncts, and a wave of retirements have made matters worse, resulting in a university-wide decrease in full-time faculty of 5.5 percent over the past three years. To reverse these concerning trends and improve both the quality of computer science classes and the capacity of these programs, city and state leaders should work together to baseline funding for 250 new computer science and technology faculty over the next five years— approximately two new faculty hires per college per year.

**LAUNCH AN ADVERTISING CAMPAIGN THAT ELEVATES THE REPUTATION OF CUNY STUDENTS, ALUMNI, AND TECH PROGRAMS.** Even CUNY students with strong resumes and internship experience struggle with imposter syndrome and say that too few hiring managers and recruiters see CUNY as a reliable source of top-tier talent. New York City can do more to correct this misperception by rolling out an advertising campaign that elevates the success of CUNY students, alumni, and programs in tech fields. More than just marketing CUNY to prospective students, this campaign should focus on making the case for CUNY talent to prospective employers across New York City.

**BOOST THE NUMBER OF TEACHERS EQUIPPED TO INTEGRATE COMPUTING EDUCATION ACROSS THE K–12 SYSTEM.** CUF's previous research finds that closing gaps in the availability of early childhood computing education could have the greatest impact on expanding access to technology degrees and careers over the long term—especially for women and Black and/or Hispanic students who are underrepresented at each step of the journey toward technology careers. This will require continued expansion of successful initiatives like Computer Science for All (CS4ALL) and the city's P-TECH high schools, but it also requires the city to significantly expand computing education in grades K-5. By building excitement about technology pathways from the earliest years of a child's life, New York City can encourage far more underrepresented students to pursue computing as they grow older.

**SCALE UP CAREER SERVICES AND EMPLOYER RELATIONS ACROSS EVERY CUNY CAMPUS.** One of the major factors limiting access to jobs and internships for CUNY students is a striking lack of career counseling and employer relations staff at CUNY's 25 colleges. A ratio of 2 to 3 career services counselors per 10,000 students is the norm across most of the CUNY system and has changed little over the past decade. At the same time, few CUNY colleges have dedicated employer relations staff, limiting most to fielding incoming requests from employers rather than doing outreach and building relationships. To change this, CUNY should prioritize a major expansion and overhaul of career services and employer relations teams. Each college should hire additional career services staff, including employer relations specialists and full-time liaisons to the technology sector; create lookbooks of student resumes and GitHub profiles for employers; facilitate volunteer opportunities for tech workers and recruiters who want to meet with CUNY students; and connect with start-ups that may not be able to provide paid internships, but can offer mentorship, career exploration, and other opportunities. These efforts could create a consistent pipeline of CUNY students into technology jobs and internships, expand students' networks and social capital, and build their confidence before graduation.

**MAKE IT FAR EASIER FOR EMPLOYERS TO PARTNER WITH CUNY AND EXPAND OPTIONS FOR EMPLOYER ENGAGEMENT.** Nearly every employer interviewed for this report described the process of attempting to partner with CUNY as inefficient and cumbersome. More than just a link to an online job board, employers are looking to build relationships with a single point of contact who can present them with a menu of options for partnering with and recruiting from CUNY. In addition to expanding the number of employer relations specialists on staff at each college, CUNY should launch a centralized point of entry for employers to engage with CUNY, staffed with relationship managers familiar with each of the city's fastest-growing industries. CUNY should also develop additional services for employers and roll them out across every college, including social media takeovers, university-wide branding opportunities, industry meetups, on-campus coffee chats, sponsorship of career hubs and hackathons, and ongoing support from a dedicated relationship manager.

**LAUNCH A TECH INDUSTRY FELLOWSHIP TO EMBED CURRENT FACULTY IN THE TECH SECTOR FOR ONGOING PROFESSIONAL DEVELOPMENT AND NETWORKING.** As helpful as the Tech-in-Residence Corps has been for bringing industry professionals into the classroom, CUNY also needs to take new steps to ensure that current technology program faculty have opportunities to refresh their skills and build relationships with industry. Today, such options are severely limited, with some departments only able to offer $25 per year in conference support. To help address these issues, CUNY should launch a Tech Industry Fellowship for current faculty, embedding CUNY instructors in the tech sector for ongoing professional development and networking.

**INCORPORATE NONPROFIT PROGRAMS INTO THE ON-CAMPUS EXPERIENCE TO EXPAND OPPORTUNITIES FOR WORK-BASED LEARNING AND HELP STUDENTS GROW SOCIAL CAPITAL.** Work-based experience and networking are critical for gaining entry into technology careers. But CUNY students, who commute to class and often work while attending college, often struggle to build the professional and peer networks on their own that can lead to internships, fellowships, and job offers down the line. To overcome these barriers, CUNY should take new steps to partner with relevant nonprofit programs; bring them on-campus into careers services offices; ensure their programs and services are marketed widely to CUNY students; and make nonprofit training and coaching programs eligible for college credit wherever possible.

**CONTINUALLY UPDATE CURRICULA TO ALIGN WITH THE NEEDS OF TECH EMPLOYERS.** While making permanent curriculum changes can be a drawn-out process, there are faster ways for CUNY to align learning objectives with the needs of technology sector employers. Even small shifts to existing courses for computer science and tech-related majors could have significant impacts, helping prepare students for the hiring process. For instance, technical interviewing should be woven into computer science programs, such as a mandatory one-credit seminar, building awareness of online resources like Leapcode. Partnerships with philanthropy and industry could also cover the cost of technical interview prep bootcamps for students.

**CREATE NEW PATHWAYS FOR CONTINUING EDUCATION STUDENTS INTO THE TECHNOLOGY SECTOR.** CUNY already has more than 100 technology-focused continuing education training programs for working and underemployed adults, representing vital onramps into well-paying jobs for New Yorkers without college degrees. But there's more CUNY could do to integrate tech skills learning and work-based experience into continuing education programs. This should include partnering with industry leaders to expand the number of industry-recognized credentials offered through CUNY's continuing education programs and ensuring that each one is eligible for college credit and can stack toward associate's, bachelor's, and even master's degrees.

**DEVELOP A TECH CONSULTANCY STAFFED BY CUNY STUDENTS TO EXPAND ACCESS TO WORK-BASED EXPERIENCE.** Many CUNY students who need the income from their retail or service jobs cannot afford to quit their jobs to do a semester-long or summer internship, even one that would improve their chances of being able to get a full-time technology job later on. CUNY should help ensure that more students are able to gain relevant work-based experience needed before they graduate by launching a tech consultancy—potentially focusing on relatively accessible and in-demand web/app and front-end development, cloud systems, and software quality assurance consulting—and targeting companies that typically outsource that work overseas.

## FOR NYC'S TECH SECTOR

**LAUNCH A MAJOR CAMPAIGN TO EXPAND THE NUMBER OF PAID INTERNSHIPS OFFERED IN NEW YORK CITY, AND PRIORITIZE CUNY STUDENTS FOR THESE OPPORTUNITIES.** Perhaps the single most powerful step that New York's tech sector can take to expand access to careers for CUNY students is to ramp up the supply of paid internships in New York City and market them directly to CUNY students. Tech firms should work with Mayor Adams and CUNY leaders to launch a sector-wide internship campaign designed to bring online 2,500 new internships by 2025 and ensure that as many of these internships as possible are going to CUNY students. Tech firms can expand the supply of internships by launching microinternships to supplement more intensive programs, offering internships in the spring, fall, and winter as well as over the summer, and partnering with other companies to create CUNY-specific fellowships, following the model of investment firm Centerbridge and its CUNY Investment Industry Fellowship.

**EXPAND RECRUITMENT EFFORTS AT CUNY.** CUNY colleges host career fairs multiple times per year and offer employers other ways of getting in front of students, ranging from on-campus interviews to office visits to informal networking events. But to date very few tech companies have participated in these activities. Companies in New York City's tech sector should commit to adding CUNY to the mix of colleges where they focus recruiting efforts and greatly expand their presence at career fairs and other hiring events. Recruiters hiring interns or seeking candidates for full-time entry-level roles should start their search at CUNY and hiring managers should encourage their HR partners to present CUNY candidates for consideration whenever new positions become available.

**PARTNER WITH CUNY TO CREATE A FLAGSHIP TECH CAREERS HUB.** New York's tech sector should work with the city's tech industry association and individual tech sector leaders to launch a Tech Careers Hub at CUNY. Modeled on a successful initiative underway in San Diego, the Tech Careers Hub would be both a physical center embedded in at least one CUNY college campus, as well as a virtual portal where tech employers, CUNY students, administrators, and faculty can meet to build relationships, exchange opportunities, and facilitate connections between CUNY and industry. The Tech Careers Hub should help expand opportunities for students to interact with industry professionals at in-person talks, off-campus site visits, networking events, pitch competitions, and mock technical interviews, as well as recruiting events, where tech employers share their industry knowledge and insights.

**PARTNER WITH CUNY TO LAUNCH A CUNY TECH ALUMNI NETWORK.** For CUNY students and graduates trying to break into the technology sector, the lack of an alumni network represents a major barrier. Most private colleges invest in alumni relations efforts that help graduates and students build relationships, whether for mentorship, career advice, internship opportunities, or introductions to hiring managers at the companies where they work. But CUNY has very limited resources to stand up this network on its own. To help overcome this challenge, the city's tech sector should collaborate with CUNY to launch a CUNY Tech Alumni Network comprised of current tech workers and industry leaders who are CUNY alums, and develop a continuous slate of programming designed to strengthen relationships among CUNY alumni in tech and introduce current students to CUNY alumni working across the industry.

## ENDNOTES

1. "Ten-Year Trends in Degrees Granted in Science, Technology, Engineering, and Math (STEM) Disciplines," CUNY Office of Institutional Research and Assessment, June 16, 2020, https://www.cuny.edu/wp-content/up-loads/sites/4/page-assets/about/administration/offices/oira/institutional/data/current-student-data-book-by-sub-ject/STEM_deg_trends_ay18-19_final_rev.pdf

2. Data about the race/ethnicity of CUNY students in STEM programs is from "Enrollment in STEM Disciplines by Race/Ethnicity" by the CUNY Office of Institutional Research and Assessment. Data about household income for those students is from the CUNY 2016 Student Experience Survey.

3. Center for an Urban Future analysis of publicly available data from LinkedIn.

4. "2018 Student Experience Survey," CUNY Office of Institutional Research and Assessment, February 6, 2020, https://public.tableau.com/app/profile/oira.cuny/viz/2018StudentExperienceSurvey/CoverPage

5. Center for an Urban Future interviews with officials at NYC Tech Talent Pipeline and CUNY.

6. Center for an Urban Future analysis of data collected from CUNY college websites and through interviews with career services staff.

7. Center for an Urban Future analysis of data from the Bureau of Labor Statistics Quarterly Census of Employment and Wages. This analysis uses the Federal Reserve Bank of New York's narrow definition for measuring employment in the tech sector—one that doesn't include tens of thousands of additional tech workers employed at banks, hospitals, and in other non-tech industries.

8. To examine the racial/ethnic composition of the city's tech sector, CUF analyzed 17 tech-specific occupations, such as database administrators, web developers, and computer network architects, using data from the 2019 American Community Survey.

9. Data on earnings for CUNY graduates is from the CUNY Wage Dashboard. Data on median occupational wages is from the New York State Department of Labor.

10. Center for an Urban Future analysis of data from Lightcast.

11. Center for an Urban Future analysis of data from the U.S. Census Post-Secondary Employment Outcomes Explorer.

12. "Tech Hiring Trends," Accenture Research and Tech:NYC, May 2022, https://www.accenture.com/content/dam/ac-centure/final/industry/high-tech/document/Accenture-re-search.pdf#zoom=40

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