# Future STEM Jobs

*Experts weigh in on emerging careers,
where to expect growth* BY ADRIENNE MAND LEWIN

With ever-changing economic factors, now is a daunting time to seek employment. Experts in several STEM fields — cybersecurity, medicine, technology and applied statistics — shared their insights on emerging career opportunities with *Diversity in Action*.

They include Dr. Kevin T. Kornegay, IoT security professor and director of the Cybersecurity Assurance & Policy Center at Morgan State University in Baltimore, and Dr. Annie J. Daniel, director of veterinary instructional design and outcomes assessment in the Office of Student and Academic Affairs, and associate professor of veterinary medical education at Louisiana State University. She also is founder of the National Association for Black Veterinarians and the founder and CEO of the nonprofit Institute for Healthcare Education Leadership and Professionals (iHELP).

Dr. Fay Cobb Payton is a University Faculty scholar and professor of information technology/analytics at North Carolina State University as well as a program director at the National Science Foundation. And Dr. Thomas W. Ilvento is a professor and former chair of the Department of Applied Economics and Statistics at the University of Delaware, which is a founding partner in the master's in data science program and offers an undergraduate statistics major, a master of science in statistics, and a master's in applied statistics that is administered online.

The thoughts expressed in this roundtable discussion represent their views and do not reflect those of any affiliated organizations.
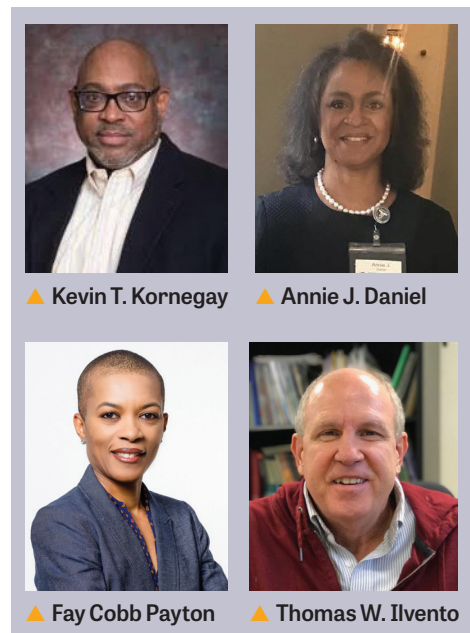
▲ Kevin T. Kornegay ▲ Annie J. Daniel

▲ Fay Cobb Payton ▲ Thomas W. Ilvento

What STEM careers do you see emerging in the next five to 10 years, and why are these fields growing?

The STEM careers I see emerging over the next 10 years include: software developer, IT manager, web developer, database administrator, security analyst, computer systems analyst, computer network architect, computer systems administrator, computer support specialist and computer programmer. These careers are dominated by the rapid and exponential growth of things and the convergence of social, communications and artificial intelligence technology. — *Kornegay*

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According to the "Occupational Outlook Handbook" by the U.S. Department of Labor's Bureau of Labor Statistics, the top three STEM careers in medicine are biomedical engineers, nurse practitioners and physician assistants.

Biomedical engineers combine engineering principles with medical sciences to design and create equipment, devices, computer systems and software. Employment of biomedical engineers is projected to grow 4% from 2018 to 2028, about as fast as the average for all occupations. Increasing numbers of technologies and applications to medical equipment and devices, along with the medical needs of a growing and aging population, will require the services of biomedical engineers.

Nurse anesthetists, nurse midwives and nurse practitioners coordinate patient care and may provide primary and specialty health care. Overall employment of nurse anesthetists, nurse midwives and nurse practitioners is projected to grow 26% from 2018 to 2028, much faster than the average for all occupations. Growth will occur primarily because of an increased emphasis on preventive care and demand for health care services from an aging population.

Physician assistants practice medicine on teams with physicians, surgeons and other health care workers. Employment of physician assistants is projected to grow 31% from 2018 to 2028, much faster than the average for all occupations. As the demand for health care services grows, physician

assistants will be needed to provide care to patients. — *Daniel*

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There are many, but to name a few emerging STEM careers, AI ethicist, AI auditor, AI/Machine Learning engineer, data scientist, data engineer, augmented reality designer, intelligent systems teamer and digital transformation expert come to mind. AI careers will require computational skills, such as mathematics, computing/IT/computer science and statistics. Interdisciplinary acumen and communications skills are central as these careers of the future address issues of bias, inclusive design, data quality/sourcing and social acceptability. Human-machine interaction and coordination are embedded in these emerging roles as organizations will experience additional digital, social and process transformation.

Health care IT is a critical focal area for those with skills in the above areas. These emerging roles will help shape and inform health care policy, decision-making, treatment, diagnosis, research and wellness, each of which shapes the state of health among populations. Think COVID-19. AI is helping with COVID-19 diagnosis, disease tracking and prediction, and medical imaging, but these systems remain subject to algorithmic bias.

While there are health care use cases poised for AI, the human perspective will be needed in order to better understand, account for and appreciate the patient and daily lived experience. — *Payton*

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Statistics is perhaps the name most often used with data analysis in the past, but it goes by many names in the current market. That includes analytics, data science, business analytics, data management, biostatistics, machine learning, among many others. There are many disciplines that heavily use statistics, such as economics, epidemiology, demography, operation research/management, data science and bioinformatics. *U.S. News & World Report* currently identifies statistics as the No. 1 Best Business Jobs; No. 6 in 100 Best Jobs; and No. 6 in Best STEM jobs. That is impressive. How did statistics emerge as this great opportunity in the job market? I would offer two related reasons.

1. We are surrounded by a data explosion, and everyone is looking to find opportunity, value or answers in this data.

2. Statistics (analytics) is a field that requires advanced mathematics; knowledge of data; some programming and a curiosity for working with data.

In other words, while there is great interest in making value from data, there are barriers to entering this field. I use the expression, "few are called and less are chosen." This is not a field for everyone. You have to be good in math, especially advanced calculus and linear algebra. You have to be willing to manage data using software and programming skills, and you have to have a curiosity and a cleverness to look for answers in data. I call the latter statistical imagination. If you have these inclinations, the field is wide open. — *Ilvento*

What majors and degrees should students consider to be prepared for these jobs?

The majors that best prepare students for these fantastic careers include cybersecurity, computer science, computer engineering, software engineering, information systems and electrical and computer engineering. There will be a massive paradigm shift in academia where apprenticeships will be the new degree norm. — *Kornegay*

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The "Occupational Outlook Handbook" provides this information:

Biomedical engineers: Biomedical engineers typically need a bachelor's degree in biomedical engineering or bioengineering or in a related engineering field. Some positions may require a graduate degree.

Nurse anesthetists, nurse midwives and nurse practitioners: Nurse anesthetists, nurse midwives and nurse practitioners must earn at least a master's degree in one of the Advanced Practice Registered Nurse roles. They must also be licensed in their state and pass a national certification exam. Some positions may require a graduate degree.

Physician assistants: Physician assistants typically need a master's degree from an accredited educational program. All states require physician assistants to be licensed. — *Daniel*

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The typical response is computer science with significant coursework in mathematics. This coursework would involve functional programming, robotics and data structures with calculus, linear algebra and matrices, differential equations and probability. If students are interested in human intelligence, neuroscience can be an option. Neuroscience often draws from coursework in computer science, mathematics, physics and even cognitive science theory. Note that this is a partial list of course content. Higher-education institutions have implemented, with some shifting to, a tracks or concentration model for undergraduate students with interest in AI. — *Payton*

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To prepare for a career in analyzing data you need a firm foundation in advanced mathematics. This would include probability, calculus, discrete mathematics and linear algebra. You also need tools in programming to aid in the management of data. Finally, you need a good foundation in statistics — understanding the logic of inference and how to model data using a variety of techniques. A major in statistics would have all of these things. Other relevant majors include actuarial science and applied mathematics. — *Ilvento*

What sector is poised to explode in growth but currently is under the radar?

To keep pace with the vulnerabilities and threats posed by the multitude of connected devices, the emergence of 5G communications technology and advances in artificial intelligence, the sector that is due to explode is security analysis. — *Kornegay*

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Biomedical engineers' projected growth is only 4%. However, with the growth of technology in this current global environment, telemedicine has become the norm for health care. This will require an increase in more advanced technology and software to

more accurately treat and care for patients at a distance. Recently, after thousands of dollars of health tests to rule out health issues, a man's Apple watch warned him of a possible heart attack and tests at the ER confirmed it. — *Daniel*

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Health care is poised for growth. Though it lags behind other industries in leveraging innovation, health spending accounts for 17.7% of the nation's gross domestic product. Robotic-assisted therapy for stroke recovery and virtual/digital assistance for Alzheimer's disease are but two clinical application examples for current and future health care roles for STEM majors while the investment in health care start-ups reached $11.1 billion in the first three quarters of 2018. — *Payton*

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Statistics and data analytics can be found in almost every field. It certainly is in demand in business, and that is why we see statistics as the No. 1 Best Business Jobs. Within business finance, marketing and sales are all heavy users of analytics. Other fields include health care, supply chains, transportation and survey research. — *Ilvento*

What advice do you have for students entering the 21st Century workforce?

A vital skill that is lacking in students today is critical thinking. I have the following advice to help you develop your critical thinking skills: ask basic questions; methodically gather information and accurately assess it; reach well-supported conclusions and evaluate them against counterevidence; understand the limits of your own competence, looking for things you don't understand or struggle to accept; and communicate with others in a productive, respectful way that gets results, even when tackling complex problems — *Kornegay*

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For students interested in a career in health care, I strongly suggest that you take advantage of the time you have while in school to learn about different careers. Visit the career centers in your school and talk with the counselors about career tests that will give you a better understanding of the types of careers that will match your personality,

talents and interests to real-life careers. This will not only focus you but help in planning courses you need to enroll in that will prepare you for that career. Take the time to improve your skills on the computer by participating in technology camps and shadowing opportunities to explore possible careers. There are also science camps and labs designed to help students learn about careers in STEM. If you see a STEM career is in your future, start early in your education to develop your math and science. — *Daniel*

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While the technical knowledge from college coursework is critical, internships and undergraduate (or graduate) research experiences can help to bolster career readiness for the 21st century workforce. IT and technical skills (as discussed earlier) are necessary but not sufficient. The 21st century skills (some call these soft skills but this naming is rooted in othering linguistics) must be sharpened.

While leadership, communication, information literacy, problem-solving, collaboration and others are included, relationship management should start from day one. Relationship management is about people networks (e.g., family, friends, mentors, sponsors and yes, even your professors) which can strengthen current and future opportunities in any career, be it industry, entrepreneurship or academe. — *Payton*

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I think it is great to pursue the fields that most interest you, including history, literature or art. However, what I would not do is neglect other fields in your pursuit of your passion. Mathematics is not something to avoid, it is essential. I can't think of a field where being good in math wouldn't give you an edge over your colleagues. I would also get some statistics and data skills. Data is everywhere, including history, literature or social work. — *Ilvento*

How are employers fostering diversity in hiring candidates and retaining underrepresented employees?

I think employers still miss the mark regarding diversity and retention. There are far too few companies that genuinely promote diversity. Until we have diversity at the

senior executive levels and diversity metrics link to employee performance and compensation, we won't begin to see the needle move in the right direction. — *Kornegay*

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First, I think employers are really trying to increase diversity and inclusion in their organizations. They are realizing that diversity in all areas strengthens the company and having a different point of view when trying to solve a really difficult problem is good. The researchers tell us that if underrepresented employees encounter difficulties with isolation, stereotyping and/or racism, a lack of mentoring, and do not present adequate structure for underrepresented employees to advance, they will leave to find a company that is more supportive. These common issues need to be addressed before increasing diversity because this will hinder future efforts when experiences are shared. Environmental and climate issues are primary reasons for underrepresented employees not being retained. — *Daniel*

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This is a complicated question. Fostering diversity is not a path to inclusion, equity or anti-racist hiring and retention. Employers often "lump" groups into an "underrepresented" category. This makes it challenging to know what works or fails with regard to specific groups. For example, a strategy focused on women does not necessarily capture the intersectionality associated with Black and other women of color. The diversity data from tech firms does not lend itself to demonstrated progress, particularly as one examines the data from entry-level to leadership. — *Payton*

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Diversity has been a priority in every workplace. We are finally beginning to realize the value of different cultures, perspectives and viewpoints in our work. In STEM fields, and particularly statistics, it has not been easy to realize a workplace that reflects our population. I believe employers will have to become more involved in the education of minorities. Any student who is turned off or discouraged by mathematics cannot enter into the field of statistics. We need to not let that happen. The Committee on Minorities in Statistics of the American Statistical Association is one such effort to reach younger students. — *Ilvento* ■