

EDUCATION LIFE

# Where Non-Techies Can Get With the Programming

By STEVE LOHR   APRIL 4, 2017

When the Georgetown University Law Center offered computer programming last year, it was an experiment, a single class for about 20 students. It was filled almost instantly, and the waitlist swelled to 130. This semester, the law school has five programming classes, and the waitlist still overflowed.

“They aren’t going to become programmers, but they realize these are skills that will make them better lawyers,” said Paul Ohm, the Georgetown law professor who teaches the course. His students, for example, learn to write short, tailored programs that can identify clusters of words and concepts in Supreme Court rulings more accurately than a Google search or standard legal software.

It’s the same in every field, from marketing to manufacturing to medicine. Code, it seems, is the lingua franca of the modern economy.

So you have no plans to become a computer engineer, no dreams of being code wizard at Google or Facebook. But you’ve decided it’s time to pick up practical technology knowledge and skills, including writing some code. There are options aplenty, in college classes, online courses and boot camps. The offerings range widely in terms of time required, skills mastered and price tag, from free to more than \$20,000 for some six-month programs.

## In College

Enrollment in computer science courses has exploded in recent years, with both

majors and nonmajors fueling the surge — so much so that many schools now restrict enrollment by nonmajors.

One recent institutional adaptation is the creation of so-called CS+X initiatives at schools like Stanford, Northwestern and the University of Illinois. These programs are hybrid majors that combine computing with other disciplines, including anthropology, comparative literature and history — a nod to the reality that software skills can advance research in nearly every field.

But the main on-ramp to computing for non-techies is an introductory computer science class. Today, at many universities, at least half of the student population takes the intro courses. At Stanford, it's 90 percent.

These classes include coding as a window to “computational thinking,” which involves abstract reasoning, modeling and breaking down problems into the recipelike steps of an algorithm. That kind of thinking, said Ed Lazowska, professor of computer science at the University of Washington, has become “an essential component of a 21st-century liberal arts education.”

“Programming,” he said, “is the hands-on, inquiry-based way we teach computational thinking.”

The programming language for an introductory course, professors say, is not so important, though Python, JavaScript and Java are widely used.

David J. Malan, a computer science professor at Harvard, has students work in several different languages in his popular introductory course for majors and nonmajors, CS50. The main goal, he says, is to demystify technology and provide a foundation for students who want to go further. “You come to realize it's just one idea after another, layered on top of each other,” Dr. Malan said.

No matter what your academic or career path, he has this advice: Take at least one course in computer science. “It's just so useful and empowering,” he said.

## At Boot Camp

At the nation's coding boot camps, the pitch has nothing to do with a liberal

arts education. This thriving niche of the for-profit education business tightly links courses to the job market.

Jim Deters, chief executive of Galvanize, which operates eight coding campuses, compares boot camps to accelerated graduate programs. “Except when you graduate here, you get a job, not a piece of paper,” he said. Galvanize, whose six-month web development course costs \$21,000, says that 91 percent of its graduates land jobs using their newly acquired skills within six months. According to *Course Report*, which tracks coding camps, the industry average is 73 percent; median post-camp salary is \$65,000.

Today, there are 91 coding campuses across the country, producing 18,000 graduates last year, up from fewer than 2,200 in 2013, *Course Report* says. Programs vary, but the average length is 13 weeks and average cost \$11,500.

Most boot camp programs are full-time immersives, and the curriculum is tightly focused on the skills most in demand in the marketplace — these days, web development and data analysis.

But this young industry is evolving and adding short introductory sessions and online courses. At General Assembly, which operates 20 boot camp campuses, one of the most popular offerings is “Programming for Non-Programmers,” said Jake Schwartz, the chief executive. The two-day version of the course costs \$525. General Assembly also has a free online course, “Dash,” which covers the basics of writing software for the web.

When considering a boot camp, first sample the free offerings. “Try it out before you commit your money,” said Liz Eggleston, co-founder of *Course Report*.

Coding camps are not regulated or accredited. Within the industry, initiatives are underway to establish standards for required reporting of graduation and job placement rates. The leading boot camps are disclosing those numbers already.

Some universities have started their own coding camps. Their efforts are mainly courses added to continuing education programs, and tap the expertise of outside partners.

Trilogy Education Services, which manages skills-based training programs, is

working with the continuing education arms of more than 20 universities, including Northwestern, Rutgers, the University of North Carolina at Chapel Hill and the University of California, Berkeley. The six-month courses, with classes held evenings and weekends, cost nearly \$10,000. The initial course is on web development, but a new one on data analysis and data visualization is being added.

Students graduate with new skills and a portfolio of work, said Dan Sommer, chief executive of Trilogy, and they can qualify for certificates that verify they took and completed the curriculum.

## Online

Coursera, edX and Udacity, three major providers of MOOCs, or massive open online courses, have evolved into hubs for teaching computing skills. Their most popular courses are nearly all programming and technical. On edX, the lone nonprofit, the course taken by more people than any other is the online version of Harvard's introduction to computer science, CS50. The course is free, but for \$90 students get a certificate of completion.

Labor market demand largely explains the dominance of computing offerings. But Richard C. Levin, the former president of Yale and chief executive of Coursera, suggests another factor. Digital subjects, he said, are more naturally suited to being taught online. "You really can do it yourself with technology courses," Dr. Levin said. "Or at least you don't lose as much by not having the classroom experience as you do with the liberal arts."

Coursera's classes can be taken free, but the track for earning a certificate costs \$39 to \$79 a month, depending on the course. Udacity has developed more than a dozen certificate-bearing programs it calls nanodegrees, including digital marketing, Android programming, artificial intelligence and self-driving car engineering. The course work is created in partnership with leading companies in those fields, like Facebook, Google, IBM and Mercedes-Benz. A nanodegree course typically costs \$200 a month, but if you complete it within 12 months you get half your money back.

Sebastian Thrun, the co-founder and chairman of Udacity, who is a former

Stanford professor and Google scientist, said his company has found a way to improve the notoriously low completion rates for online courses. Add people.

Last year, the company started a service called Udacity Connect for face-to-face work with mentors on weekends, for \$100 a month when added to any nanodegree program. “A self-service website is not enough,” Dr. Thrun said. “Having a human companion can have an enormous effect on finishing rates,” as much as tripling the chances of success.

And as he sees it, success in programming requires a certain kind of human empathy. “It’s a people skill,” said Dr. Thrun, who created and led the self-driving car project at Google, “getting your brain inside the computer, to think like it does and understand that it’s just a little device that can only do what it’s told.”

Steve Lohr is a technology reporter for The Times.

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