




US Perspective on Universal Computing Literacy

Mark Guzdial
School of Interactive Computing

Georgia Tech College of Computing

Emphasis in US: Jobs

The Washington Post

Capital Business

To create a pipeline of STEM workers in Virginia, program starts with littlest learners

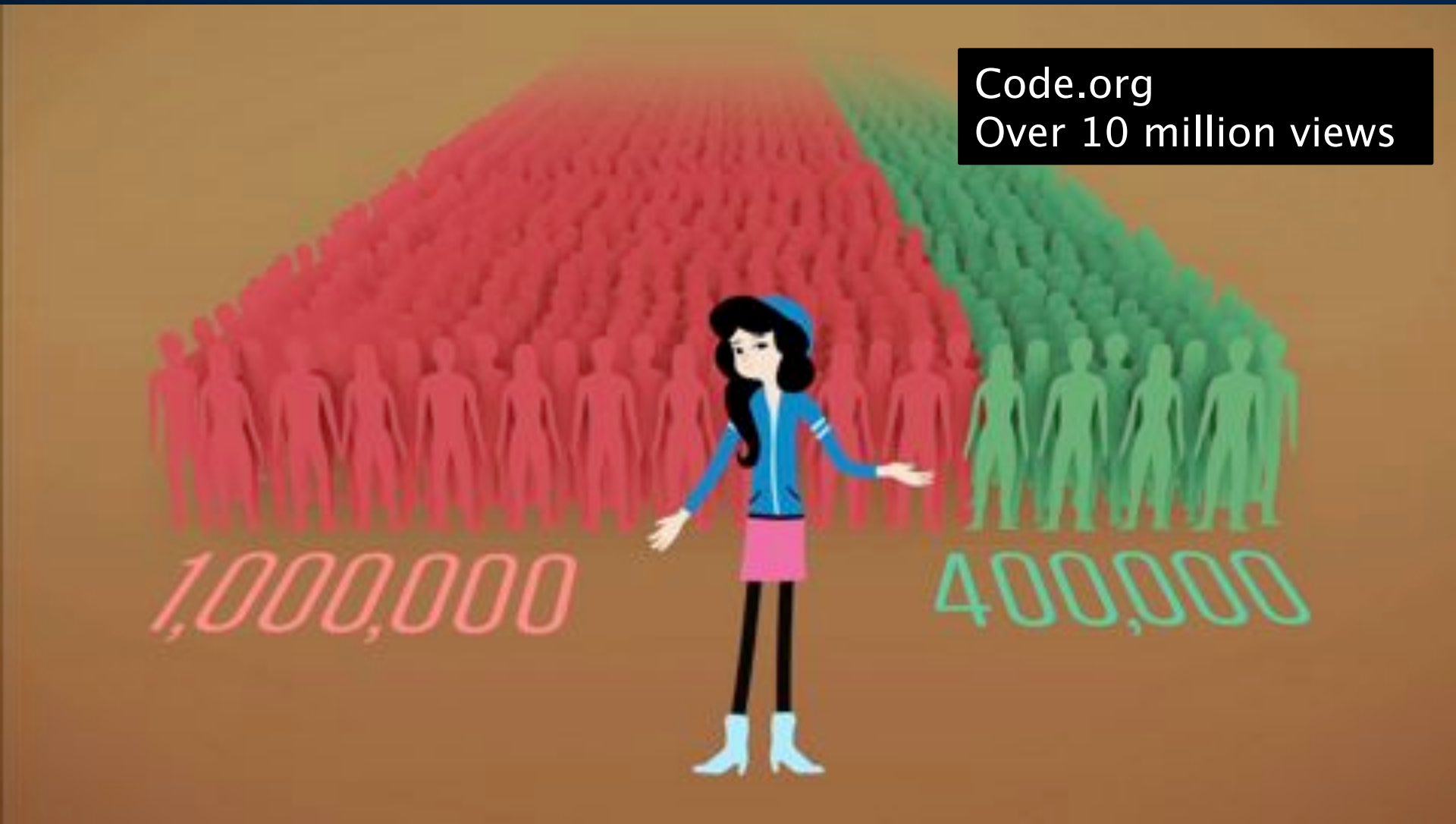
The New York Times

Adding Coding to the Curriculum

By BETH GARDINER MARCH 23, 2014

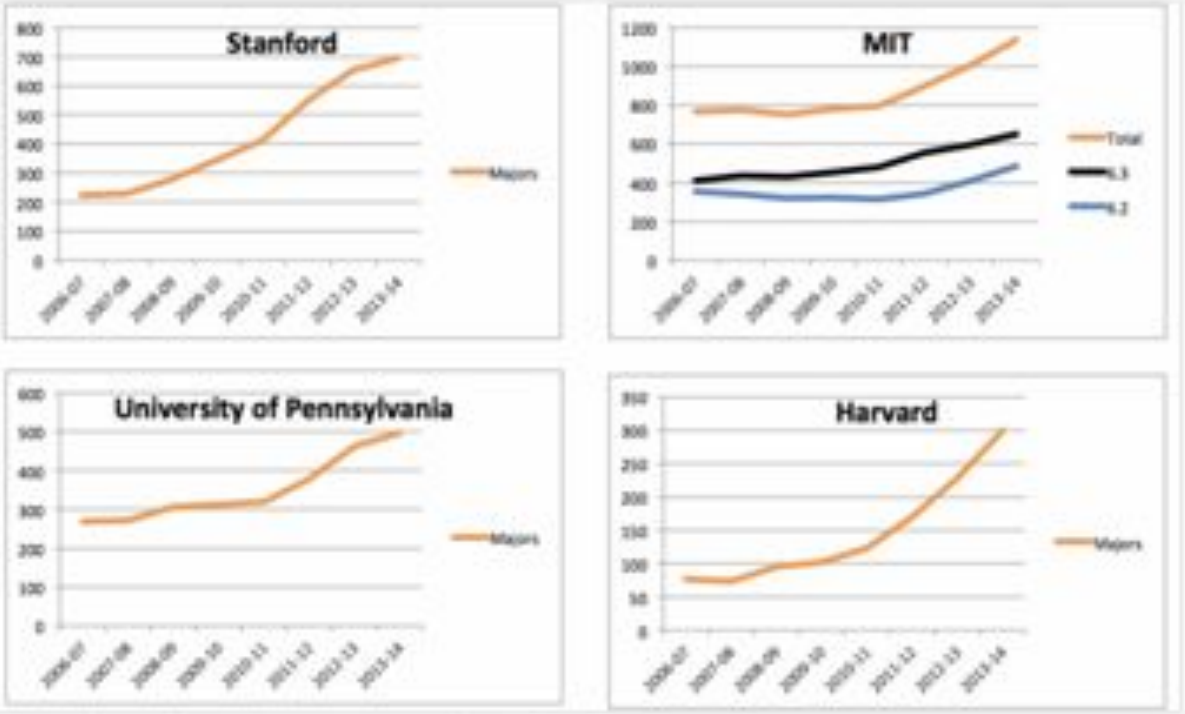
Such knowledge, the advocates say, is important not only to individual students' future career prospects, but also for their countries' economic competitiveness and the technology industry's ability to find qualified workers.

1.4M IT jobs in US
400K graduates



From The Ivy League To State Schools, Demand For Computer Science Is Booming

*Posted May 25, 2014 by **Colleen Taylor** (@loyalelectron)*



Number of CS majors at Harvard, Stanford, MIT, and UPenn

Ed Lazowska

Eric Roberts

Georgia Tech College of Computing



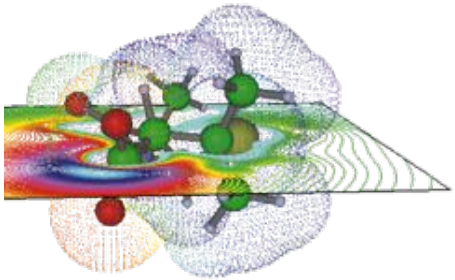
3 Million Software Developers

1:4 Developers to End-User Programmers

1:9 Developers to (Unknown) Programmers

The learning needs of computational scientists and engineers

- To use computation as a tool to enhance *understanding*.
- To write programs of (at most) 100 lines (most often, 10 lines) for themselves.



The learning goals are different than for software developers

US picture from Code.Org

9 out of 10 schools don't even offer computer programming classes.

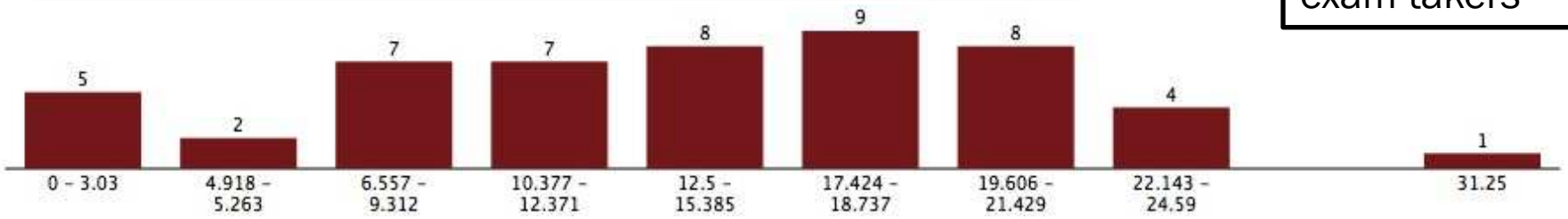
Mississippi

Maryland

Count of the States in AP CS

Each bin labeled with number of states in that bin

% female exam-takers



published Monday, February 24th, 2014

GPS teacher responsible for state's top rank for female students in AP computer science classes

by Casey Phillips
view bio »

Research Questions

1. How do we develop more CS teachers?

2. How do we teach *everyone* computing?

3. What is the *impact* of teaching computing?

1. How do we develop more CS teachers?

- What skills do CS teachers need?
  - Our studies suggest that the best CS teachers *read and comment* on student code – but rarely write code.

- How do we make CS learning more efficient?
  - How do fit CS learning into a busy teacher's day?

- How do we motivate teachers to learn CS?

2. How do we teach *everyone* computing?

- What will motivate non-CS students to pursue computing?
  - A media context for liberal arts majors.

- What about average and below-average students?
  - How much of computing is accessible to *everyone*?
  - How much of computing does *everyone need?*

2. How do we teach *everyone* computing?

- Is learning computing more like mathematics or more like science or something else?
  - Should we be using inquiry-based learning methods?
  - Are issues of “misconceptions” the same when we’re talking about a science of the artificial?
  - What are developmental progressions for computing?



3. What is the *impact* of teaching computing?

- Can we expect general, transferable problem-solving skills from learning to program?

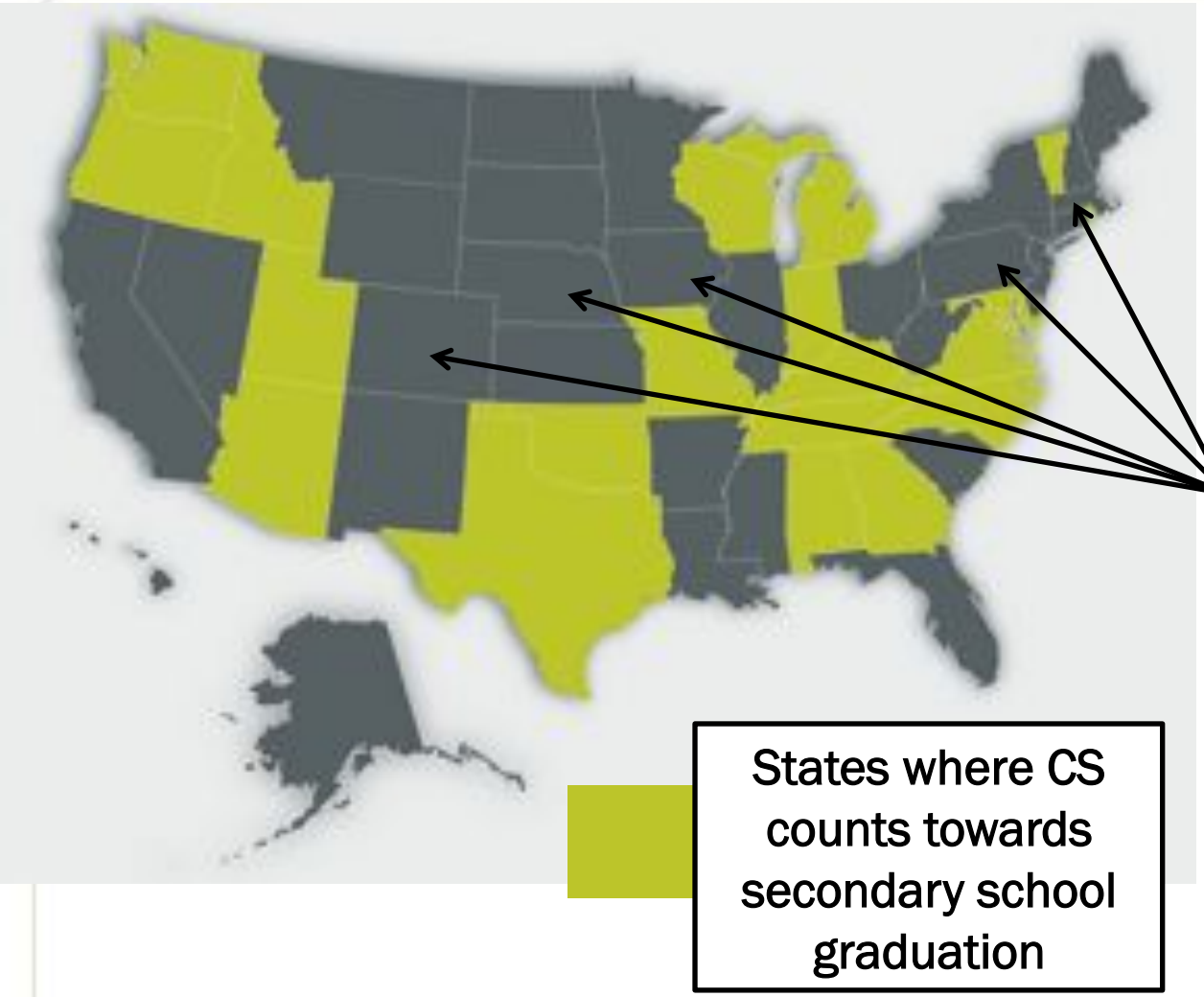
- Can we expect *application* of computing to improve learning in other disciplines?
  - Programming helps computational scientists and engineers understand. Students, too?



3. What is the *impact* of teaching computing?

- Can we expect that learning computing *improves* interactions with computers?
  - Are computing-savvy users more productive?
  - Fewer errors? Better recover?
    More secure?

Beyond research to policy



Who decides?

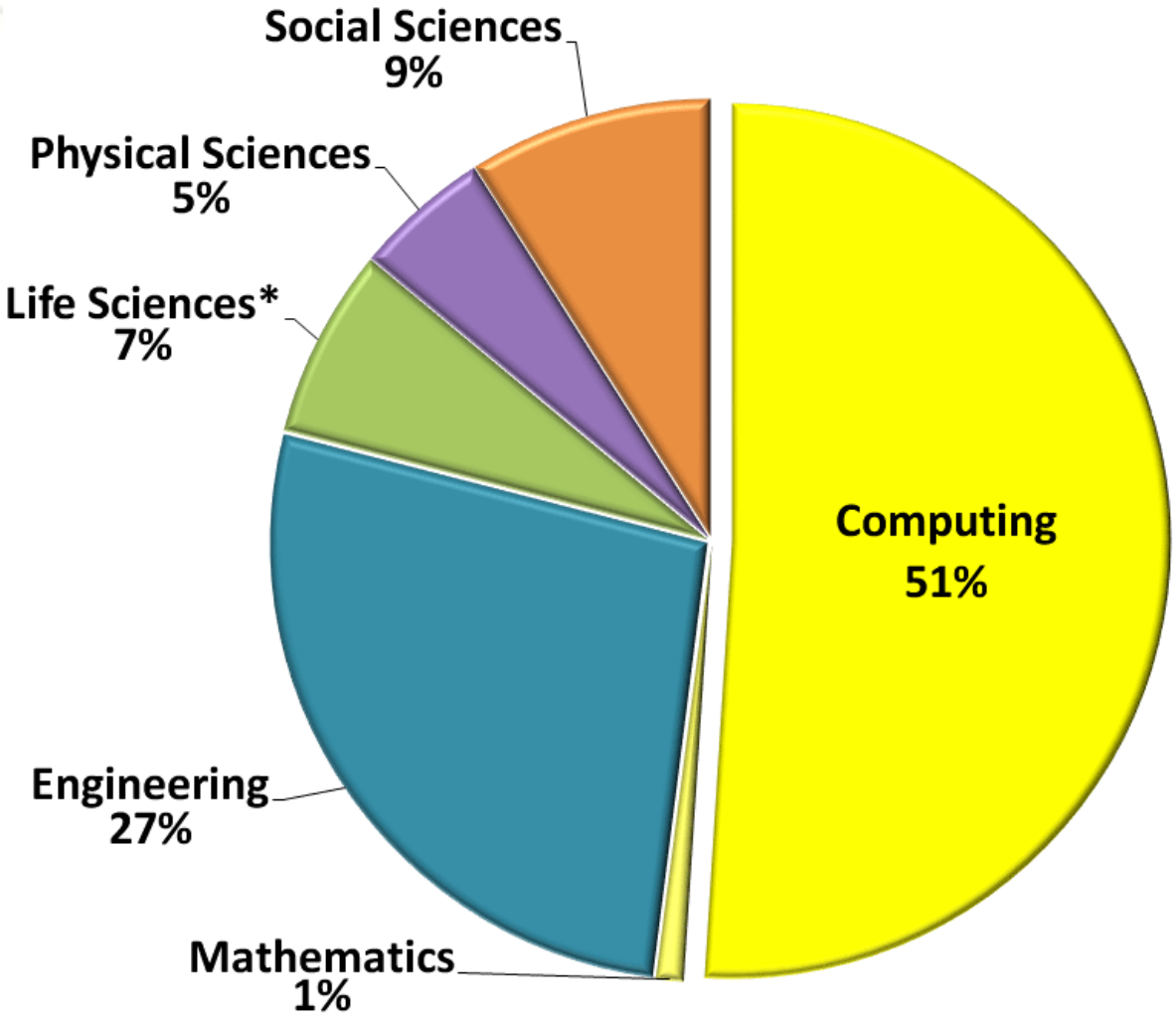
In some US states, *no* statewide secondary school requirements.



SPARE SLIDES

Where US STEM Jobs Will Be

Projected Annual Growth of Total STEM Job Openings 2010-2020

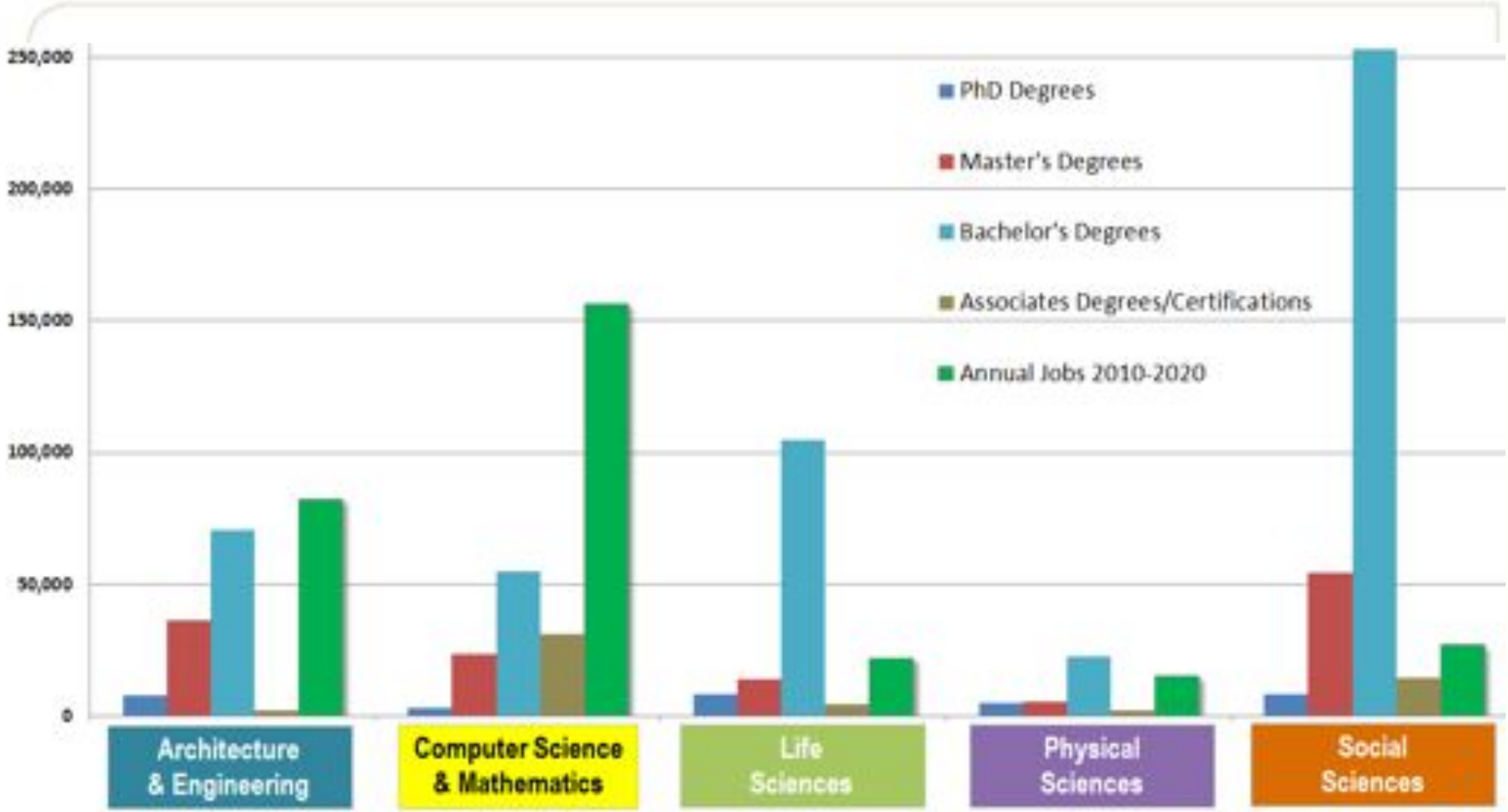


* STEM is defined here to include non-medical occupations.

Source: Jobs data are calculated from the Bureau of Labor Statistics (BLS), Employment Projections 2010-2020, available at http://www.bls.gov/emp/.

Where the STEM Jobs Will Be

Degrees vs. Jobs Annually



Sources: Degree data are calculated from the National Science Foundation (NSF), Science and Engineering Indicators 2012, available at http://www.nsf.gov/statistics/seind12/appendix.htm. Annual jobs data are calculated from the Bureau of Labor Statistics (BLS), Employment Projections 2010-2020, available at http://www.bls.gov/emp/. STEM is defined here to include non-medical degrees and occupations.

Georgia Tech College of Computing