

# The Cybersecurity Pipeline



Or: How I Learned to Start Worrying and Love a Chicken and Egg Problem

Emily E. Reid

# How I Got Interested in this Problem



girls who  
CODE

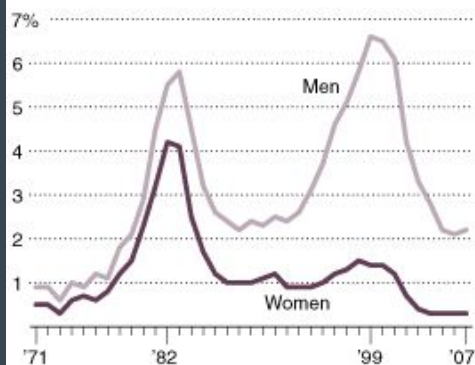
**Tufts**  
UNIVERSITY



# By the Numbers: Computer Science Pipeline

## Widening Gap

The percentage of female college freshmen who list computer science as a probable major is 0.3 percent, down from 4.2 percent in 1982.



Source: U.C.L.A. Higher Education Research Institute

THE NEW YORK TIMES

Table B3. Bachelor's Degrees Awarded by Ethnicity

	CS	
Nonresident Alien	884	9.0%
Amer Indian or Alaska Native	35	0.4%
Asian	2,079	21.1%
Black or African-American	315	3.2%
Native Hawaiian/Pac Islander	21	0.2%
White	5,687	57.7%
Multiracial, not Hispanic	168	1.7%
Hispanic, any Race	672	6.8%
Total Residency & Ethnicity Known	9,861	
Resident, Ethnicity Unknown	413	
Residency unknown	1,954	
Grand Total	12,228	

<http://cra.org/resources/crn-online/>

## GOOGLE'S WORKFORCE



GLOBAL TOTALS	OVERALL	TECH	NON-TECH	LEADERSHIP
<b>MEN</b>	<b>70%</b>	<b>83%</b>	<b>52%</b>	<b>79%</b>
<b>WOMEN</b>	<b>30%</b>	<b>17%</b>	<b>48%</b>	<b>21%</b>
U.S. TOTALS	OVERALL	TECH	NON-TECH	LEADERSHIP
<b>WHITE</b>	<b>61%</b>	<b>60%</b>	<b>65%</b>	<b>72%</b>
<b>ASIAN</b>	<b>30%</b>	<b>34%</b>	<b>23%</b>	<b>23%</b>
<b>BLACK</b>	<b>2%</b>	<b>1%</b>	<b>3%</b>	<b>1.5%</b>
<b>HISPANIC</b>	<b>3%</b>	<b>2%</b>	<b>4%</b>	<b>1%</b>
<b>OTHER*</b>	<b>&lt;1%</b>	<b>&lt;1%</b>	<b>&lt;1%</b>	<b>&lt;1%</b>
<b>TWO OR MORE**</b>	<b>4%</b>	<b>3%</b>	<b>5%</b>	<b>1.5%</b>

Source: Google Inc. Totals and % denominators do not include unknown, null, or "decline-to-state" fields. \* "Other" category includes: Native Hawaiian, Native American, and Pacific Islander. \*\* "Two or more races" category includes all Googlers who identify with more than one race.

# By the Numbers: Cybersecurity Pipeline

- Women comprise only **11%** of the global information security workforce. [Center for Cyber Security Education/(ISC)<sup>2</sup>, 2017]
- In adults aged 18-26 in the US, **24%** express an interest in **cybersecurity**, compared to **32%** with an interest in being an **app developer**. [Raytheon/Zogby Analytics, 2013]
- **67%** of US men & **77%** of US women said **no teacher/guidance counselor** mentioned a cybersecurity career. [Raytheon & National Cybersecurity Alliance, 2015]
- Globally, **62%** of men and **75%** of women said **no secondary or high school computer classes** offered the skills to help them pursue a career in cybersecurity. [Raytheon & National Cybersecurity Alliance, 2015]

# A turn in the tide, or just an ebb?

Year	Total (x1000)	% Women	% Black or African-American	% Asian	% Hispanic or Latinx
2016	89	21.8	9.2	7.7	8.9
2015	70	19.7	3	3.4	5.2
2014	68	18.1	9.7	5.7	6.1
2013	48	-	-	-	-
2012	52	15.1	11.8	14.2	4
2011	44	-	-	-	-

Globally, adults aged 18-26 were more likely in 2016 than 2015 to consider a cybersecurity career:

- Women:
  - 24% in 2015
  - 30% in 2016
- Men:
  - 33% in 2015
  - 43% in 2016

[Raytheon/National Cybersecurity Alliance, 2016]

# Idiosyncratic Barriers in Cybersecurity

## Ada Initiative

Supporting women in open technology and culture 2011–2015

[ABOUT THE ADA INITIATIVE](#)

[CONTINUE OUR WORK](#)

[BLOG ARCHIVES](#)

[ABOUT ADA LOVELACE](#)

## DEFCON: Why conference harassment matters

This weekend was [DEFCON 20](#), the largest and most famous hacker[1] conference in the world. I didn't go to DEFCON because **I'm a woman, and**

## MOTHERBOARD

SEXISM

## Female Hackers Still Face Harassment at Conferences

JOSEPH COX  
Apr 21 2016, 5:00am



## Schneier on Security

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## Sexual Harassment at DefCon (and Other Hacker Cons)

Excellent [blog post](#) by Valerie Aurora about sexual harassment at the DefCon hackers conference. Aside from the fact that this is utterly reprehensible behavior by the perpetrators involved, this is real problem for our community.

The response of "this is just what hacker culture is, and changing it will destroy hackerdom" is just plain wrong. When swaths of the population don't attend DefCon because they're not comfortable there or fear being assaulted, we all suffer. A lot.

## Harassment rife at hacker conference

*From Ms Emily E Reid.*

Sir, Hannah Kuchler's article on DefCon ("Can they hack it?", Life & Arts, August 16) misses one important reality about the famous hacker conference: its notoriety for sexual harassment of female attendees. I am a previous cyber security engineer, current computer science graduate student and instructor for Girls Who Code. In an age when the number of female computer science majors amounts to only about 17 per cent (compared with 37 per cent about 20 years ago), attention must be paid to the circumstances that deter women from technology, especially in those growing fields such as cyber security.

I respect DefCon's emphasis on creativity, open technology and breaking technical barriers. But the only reason I have never attended myself is its terrible record on sexual harassment. I would have liked to encourage my Girls Who Code students with an interest in security to take advantage of such events, but I cannot in good confidence recommend this conference to young women.

The article made no mention of this important issue, but bringing such concerns to light is the only way to solve them.

Emily E Reid,  
New York, NY, US

# The Stakes

- The cybersecurity market is expected to grow from **\$75 billion** in 2015 to **\$170 billion** in 2020. [Forbes, 2015]
- More than **209,000** cybersecurity jobs in the U.S. were unfilled in 2015, and postings were up **74%** 2010-2015. [Bureau of Labor Statistics, 2015]
- Cisco estimated the global gap in cybersecurity jobs at **1 million** in 2014. [Cisco, 2015]
- Regular reporting on hacks affect **crucial systems & information**, including home security systems, DNS access, personally identifiable information, industry secrets, and politics.
- **Diverse groups make better decisions**, which we might assume will create better cybersecurity products & systems.

# My Experience





# What Is Needed?

- More **exposure/mentorship programs & high quality courses** for at least high school level, especially for students from underrepresented racial/ethnic groups.
- More **high quality data & analysis** of the pipeline.
- Continued **scrutiny** of the challenges keeping would-be cybersecurity engineers/analysts out of the industry.

# What Can You Do?

- Volunteer to **mentor or teach** for programs on the following slide, or at a local middle/high school or community program.
- Offer to **visit middle/high schools** to tell students about your career.
- **Start your own program!** And share the ones you know. There is still a need for widespread quality programming.
- **Be vigilant:** Watch for your own/organization's biases, and **take action**.

# Programs & Resources [beginners & underrepresented groups]

## Security specific:

- [SANS CyberTalent Immersion Academy for Women](#)
- [International Consortium of Minority Cybersecurity Professionals](#)
- [Women's Society of Cyberjutsu](#)
- [Women in Cyber Project](#)
- [WiCyS Conference](#)
- [NSA GenCyber Camp](#)
- [Hacker High School](#)
- [DHS Cybersecurity Training & Exercises](#)
- [National Institute for Cybersecurity Education \(NICE\)](#)

## General computer science/tech:

- [Girls Who Code](#)
- [Black Girls Code](#)
- [NCWIT](#)
- [Code2040](#)
- [All Star Code](#)
- [Code.org](#)
- [Girl Develop It](#)
- [Google CS First](#)

# Data Sources

- Center for Cyber Security & Education/(ISC)<sup>2</sup>, [The 2017 Global Information Security Workforce Study: Women in Cybersecurity](#), 2017.
- Raytheon/Zogby Analytics, [Preparing Millennials to Lead in Cyberspace](#), 2013.
- Raytheon & National Cybersecurity Alliance, [Securing our Future: Closing the Cybersecurity Talent Gap](#), Oct. 2016.
- Forbes/Steve Morgan, [“Cybersecurity Market Reaches \\$75 Billion in 2015; Expected to Reach \\$170 Billion by 2020”](#), 2015.
- Bureau of Labor Statistics, [Labor Force Statistics from the Current Population Survey](#), 2017.
- Cisco, [Mitigating the Cybersecurity Skills Shortage](#), 2015.

# Thank you! Questions?



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