University of Washington Tacoma
UW Tacoma Digital Commons

Sociology Student Work Collection | School of Interdisciplinary Arts and Sciences

Fall 2020

Women in Computer Science

Jorge Aguilar-Flores
jlaf4120@uw.edu

Follow this and additional works at: https://digitalcommons.tacoma.uw.edu/gender_studies

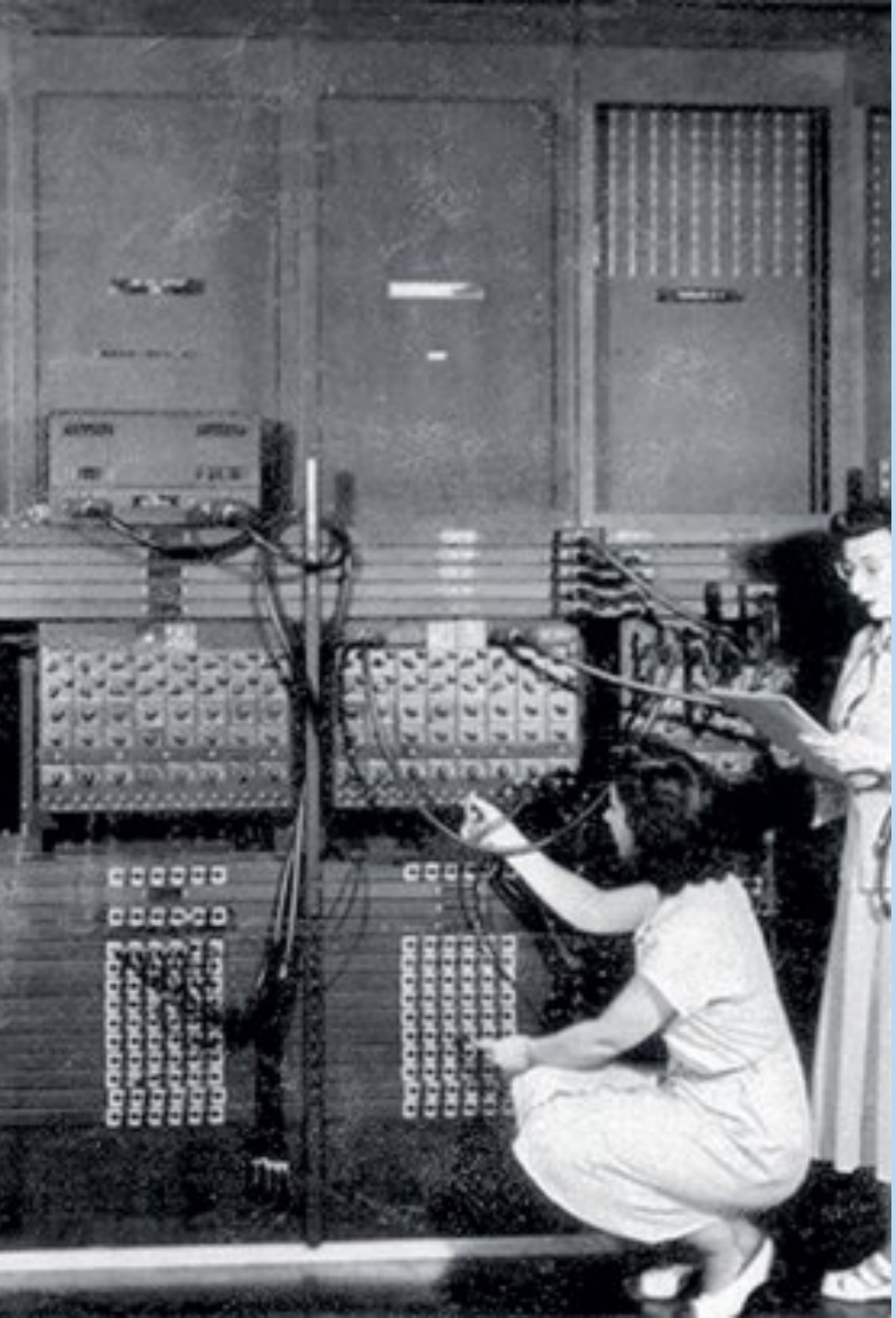
Recommended Citation

Aguilar-Flores, Jorge, "Women in Computer Science" (2020). *Sociology Student Work Collection*. 71.
https://digitalcommons.tacoma.uw.edu/gender_studies/71

This Undergraduate Presentation is brought to you for free and open access by the School of Interdisciplinary Arts and Sciences at UW Tacoma Digital Commons. It has been accepted for inclusion in Sociology Student Work Collection by an authorized administrator of UW Tacoma Digital Commons.

Women in Computer Science

Jorge Aguilar



Abstract

For this week's unit, Gender at work, I chose to focus my investigation on gender in the computing industry. More specifically, the goal of my research was to uncover some of the reasons behind the lack of female representation in the computer science world. As a minority in computer science, this investigation has been very personal to me because it has allowed me to learn more about some of the institutional oppressors that have been adopted over time to further marginalize minority populations and allow a certain demographic to flourish. As you may have learned from our previous discussions and explorations in Sociology, that demographic is the average white, able-bodied, Christian male. I have reviewed a plethora of scholarly articles and have made note of some of the frequent themes that have led to the lack of female representation in computer science, and have compiled all these claims and conversations into this presentation. My findings have been astonishing, to say the least, and I am happy to share this information with you in the slides to come.

The History of Woman in Computer Science

Ada Lovelace

In the 1840's, Ada Lovelace (dubbed "The Enchantress of Numbers") became the first computer programmer and the developer of one of the first computer algorithms, which inspired much of computing today. Lovelace was a knowledgeable mathematician and pioneer of computer science. Although she was alive before the .com boom and the golden age of technology, she predicted that computers could "compose music, produce graphics, and be useful to science" through the was in which they compiled and manipulated numbers (e.g., binary) (Cellania, 2015).

Computers During World War II

Before the word "computer" became the term to define the machines and technologies that we use in our everyday lives, a "computer" was "actually a job description for a woman or man who used a mechanical calculator to solve equations" (Palmer, n.d.). While this title was gender-neutral in its beginnings, "computers" were quickly becoming a woman's profession due in part to the events of World War II and the cost effectiveness of paying women a smaller salary. Regardless of the social influences that plagued this profession, computing was an essential part of life, and one of the key contributors to ensuring the success of the United States of America in World War II (Palmer, n.d.).

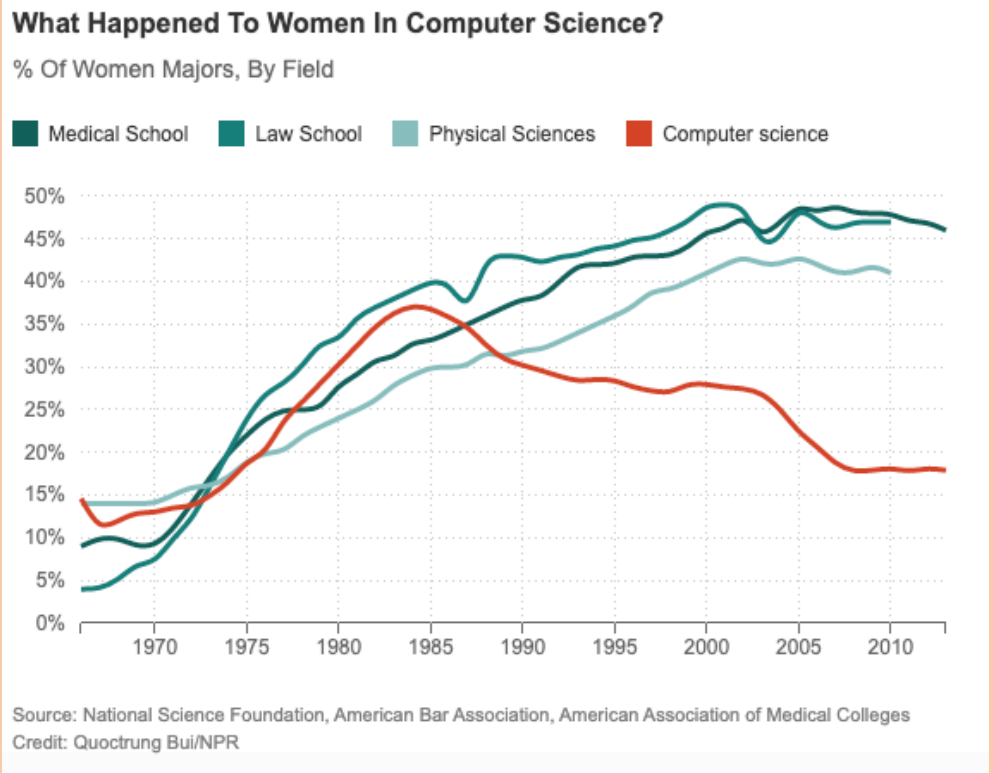
The Electronic Numerical Integrator and Computer (ENIAC)

The ENIAC has been recognized as the world's first general purpose computer and has paved the way for modern day devices (Lightfoot, 2016). It is widely known that the ENIAC was designed and developed by John Mauchly and J. Presper Eckert, but these men were only a fraction of the team that lead to the creation and implementation of the ENIAC. History has left out the remaining six key figures, all of which were women. The original developers of the ENIAC machine were Jean Jennings, Marlyn Wescoff, Ruth Lichterman, Betty Snyder, Frances Bilas, and Kay McNulty. These six women were tasked with the job to "figure out how the machine works and then figure out how to program it," essentially making something revolutionizing out of nothing (Lightfoot, 2016).

The Decline of Women in CS

As the previous slides present, women have been key figures on the creation and evolution of computer science. From the first Analytic Engine designed by Ada Loveless, to the six female pioneers of the ENIAC, women have made significant strides in computer science and have essentially kickstarted modern day computing.

In the early years of computer science, women held positions in this field in great quantities. So much so that between the 1950's and 1980's universities in the United States of America began to see an increase in women pursuing computer science degrees, reaching 37% of all female students at its peak (STEM Women, 2019). However, that number quickly dropped to just around 18% after 1984, the year that most researchers believe initiated the rapid decline of women in computer science.



The chart above is provided by NPR's Planet Money and shows the percentage of women majors by field between 1960 and 2020. You may access this chart at: https://www.npr.org/sections/money/2014/10/21/357629765/when-women-stopped-coding

For every 88 male computer network architects in the US, there are 12 female computer network architects

But those women who do enter, tend to leave in much greater numbers than men

Quit rates for men and women in Technology in the US, 2008

Women

Men

1984 (No, not George Orwell's… but kinda)

In the mid 1980's, the market began to see that computing was a profitable industry, and just like the United States of America has done with other profitable industries, the world of computing became gendered and sexualized, appealing more to young men. From the strategic and sexist marketing techniques that new software companies adopted emerged computer science stereotypes of men and their proficiency with computers (e.g., the term "geek") (STEM Women, 2019). As a result, women were not as motivated to pursue computer science degrees because of the lack of representation of women in these marketing campaigns.

Computers were soon at the top of every young boy's Christmas list for their 8-bit gaming abilities and entertainment. Because most boys grew up playing with computers, they soon became well experienced with these machines, which gave them a greater advantage while in college. However, this was not the case for women and young girls. Since computers were so exclusive to boys, women who hoped to pursue a computer science degree in the future were quickly turned down due to their lack of experience (Fischer, 2016). This further demoralized women from becoming a part of the computing industry and cemented the idea that computer science is a man's profession.

Apple Computer Ad 1985

The video above is a commercial from Apple in 1985. Commercials like these contributed to the idea that computers were built for the development and career advancement of young boys.
https://www.youtube.com/watch?v=rxNjx_VWJ8U&ab_channel=JeffHeaviside

Two Bytes Are Better Than One

THE FULL POWER OF THE **16-BIT TMS 9900 MICROPROCESSOR** IS NOW AVAILABLE WITH THE UNIQUE COMBINATION OF RELIABLE HARDWARD AND FAST, EASY TO USE SOFTWARE IN THE **TECHNICO SS-16**. WITH MINICOMPUTER PERFORMANCE THE **TECHNICO 16-BIT MICROCOMPUTERS** ARE AVAILABLE FROM THE **SINGLE BOARD SUPER STARTER SYSTEM AT UNDER $400** TO THE FULL **SS-16 WITH UP TO 65K BYTES OF MEMORY, MINI-FLOPPY OR FULL FLOPPY DISKS, A 4800 BAUD DIGITAL CASSETTE, 64 COLOR VIDEO BOARD OPTION, RS232 AND 20 MA CURRENT LOOP** ALL COMBINED WITH ONE OF THE INDUSTRY'S FASTEST BASICS AND A FULL ASSEMBLER EDITOR,

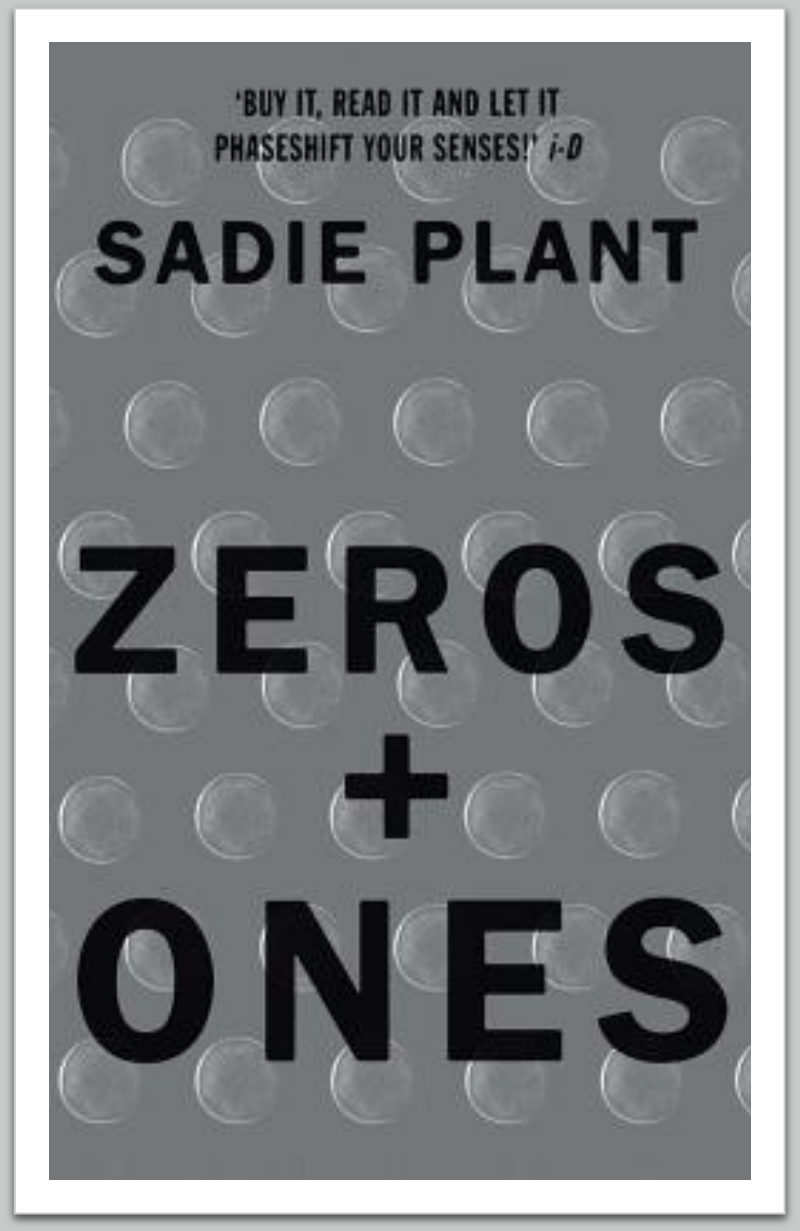
VERSATILE
DEPENDABLE
COMPATIBLE
(MAYBE EVEN SEXY)

CALL IT WHAT YOU WANT...

We call it a PENRIL MODEM!

Penril's modems are all performers – with a family ranging from teletype (Bell 101C) modems and single card LSI 1200 BPS (Bell 202C) modems up to our adaptively equalized 4800 BPS models.

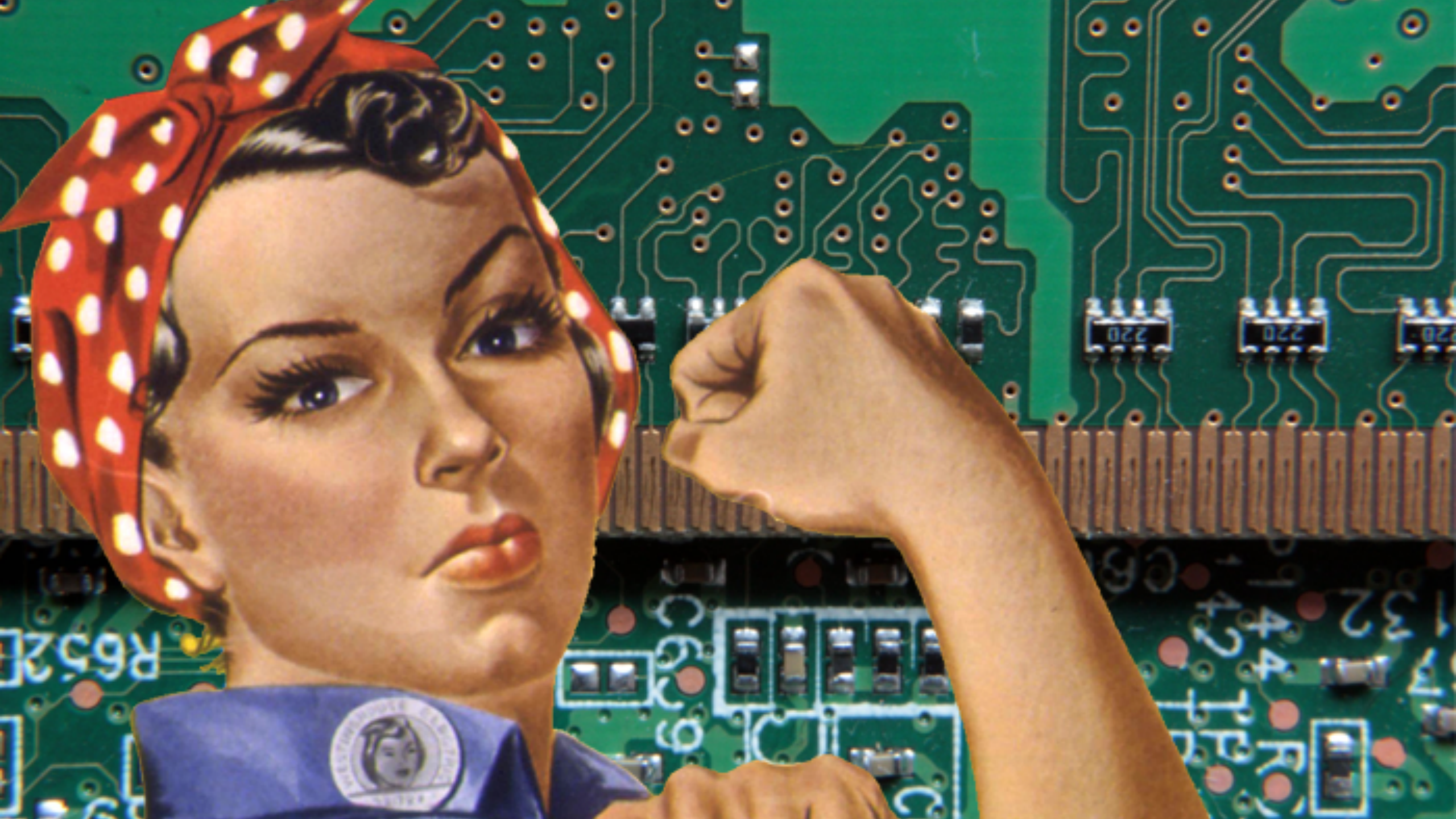
Penril



Cyberfeminism

As the inequalities of the computing world became more widespread and overwhelming, many opposition groups surfaced to combat the idea that computer science and technology was an industry exclusive to men. Cyberfeminism was one of those forces that sought to restore the representation of female figures in the computing industry. Cyberfeminism saw technology as “an epicenter of money and power” from which hate speech and misogynism could emerge (Goldberg, 2019). Cyberfeminism “combined feminist energy with a philosophical bent, producing art and manifestos with an irreverent, raucous tone that stressed the need to interrogate technology” (Varghese, 2019).

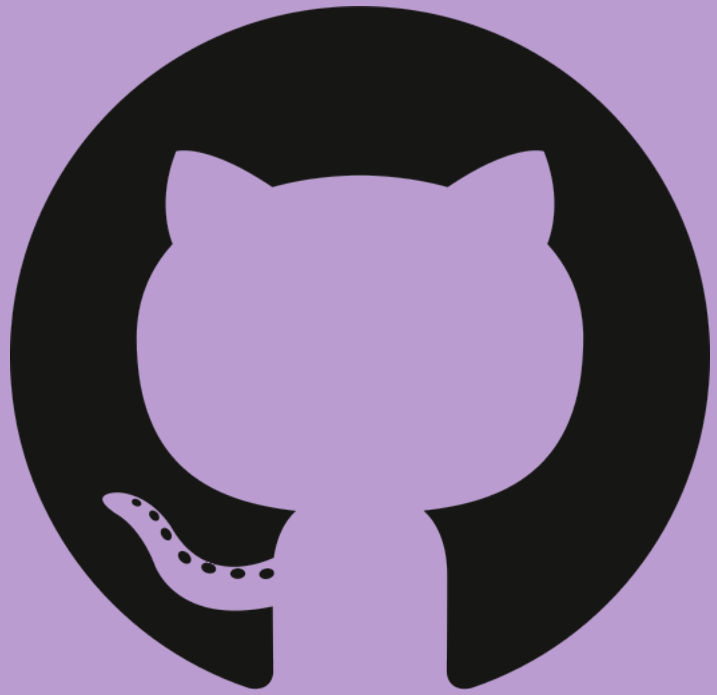
Researchers like Sanjana Varghese believe that cyberfeminism in modern day can allow us to promote a safe and inclusive environment online. Varghese claims that nowadays the “internet has become a fertile petri dish for hate” and it must be reformed to promote a motivating environment. Varghese quotes So Mayer (a cyberfeminist author) in her article, “Why the internet needs cyberfeminists more than ever,” claiming that “Technology can enable us to build an archive and care for the work of those who have gone before us. Cyberfeminism is about making things which help us to connect to each other, further our communities and heal each other.”



Women are better coders than men when they are not women.

A recent research conducted at GitHub, a hosting company that allows programmers to collaborate and manage software versions, found that women are better coders than men… as long as they hide their genders (Wong, 2016). The researchers of this study examined over 3 million pull requests, which is a tool for contributing code changes to the Github, and found that “code written by women was approved at a higher rate (78.6%) than code written by men (74.6%)” when women did not make their gender’s known (Wong, 2016). Women who had gender neutral profiles, such as gender-neutral names and pictures, received more pull request approvals than women who had feminine profiles.

This research shows us that gender inequality is still very much alive in the computing world even though women are more proficient coders than men. These attitudes and prejudices can have a significant effect on the development of software and halt the creation of new technologies that can improve our lives. It has often been said that Computer Science is one of those fields with the most flexibility, because the quality of your work depends on the code you produce, but this study introduces a new dimension that can hinder one’s success in the field.



Conclusion

Despite the adversity that women have encountered over the years, within the computing world, women continue to carry the torch and have made significant contributions in their place of employment and to the computer science industry as a whole. Woman have dominated the computing world from the beginning and continue to outperform men in software development, as the Github research in the previous slide has shown. Unfortunately, society continues to promote the idea that computer science is a field exclusive to men, and this has been reflected in classrooms and technology companies all across the United States. It is important that we promote an inclusive and welcoming environment to all genders in the world of computing, so that we can advance as a society and bring about new ways of communicating and producing as a nation.

You Cannot be What You Cannot See | Reshma Saujani
https://www.youtube.com/watch?v=JAeA1hQ_vgk&ab_channel=AppNexus

Further Readings & Interesting Learning Material

“Facial Recognition Is Accurate, if You’re a White Guy” by Steve Lohr:
https://www.nytimes.com/2018/02/09/technology/facial-recognition-race-artificial-intelligence.html

“Amazon’s sexist AI recruiting tool: how did it go so wrong?” by Julien Lauret:
https://becominghuman.ai/amazons-sexist-ai-recruiting-tool-how-did-it-go-so-wrong-e3d14816d98e

“When Women Stopped Coding” by Steve Henn:
https://www.npr.org/sections/money/2014/10/21/357629765/when-women-stopped-coding

If you would like to learn more about the decline of women in computer science, I found the article, “When Women Stopped Coding,” by NPR’s Steve Henn, rather informative and enjoyable. It is a short read, but it is packed with information about the changing culture of computer science as it relates to gender. National Public Radio (NPR) is a reputable media and news organization, and Steve Henn has been a long-time contributor of some of NPR’s Planet Money podcast. Visit my bibliography page to learn more about this source.

In addition, the videos on the right discuss the history of women in computer science and their contributions that made this field possible. You may access the videos by searching their titles on YouTube or copying the links underneath.

Women Pioneers in Computing – Who are they? By **The Economic Link**
https://www.youtube.com/watch?v=z9ZLYIbOZe0&ab_channel=TheEconomicLink&t=0s

Where Are The Women in Computing? | Planet Money | NPR
https://www.youtube.com/watch?v=vPuyDbQwfHs&ab_channel=NPR&t=1s

Annotated Bibliography

Cellania, M. (2015, October 13). Ada Lovelace: The First Computer Programmer . Retrieved from Mental Floss: https://www.mentalfloss.com/article/53131/ada-lovelace-first-computer-programmer

Miss Cellania's article, "Ada Lovelace has been called the world's first computer programmer," documents the legacy of Ada Lovelace, one of the early female pioneers of computing. This piece provides a brief biography into Ada Lovelace personal life, career, and relationship with Charles Babbage, who was another significant figure that inspired modern day programming. Cellania discusses the journey of this power couple and reports some of their discoveries. Miss Cellania is an author and contributor of Mental Floss, a digital magazine, and an editor of Neatorama. This source was helpful in my research because it helped me learn a lot about women's contributions to the evolution of computing. This source allowed me to teach my audience about the history of computing and the many ways in which women led the computer science efforts.

Fischer, S. (2016, January 5). 1984: The Year Women Left Coding . Retrieved from Code Fellows: https://www.codefellows.org/blog/1984-year-women-left-coding/

"1984: The Year Women Left Coding" by Sarah Fischer analyzes the climate of the computing world around 1984, the year that sparked the decline of women's interest in computer science. This article discusses the many ways in which computing became increasingly gendered and more appealing to young boys over time. Throughout this article, Fischer provides clear examples of the marketing techniques used to establish the idea that computers were a toy and a tool for men. This was an instrumental piece in my research because it pinpoints the year that initiated the decline of women in computer science. This article is centered around the events that took place during and after 1984 and provides great detail and analysis of the role of gender in computing.

Goldberg, E. (2019, February 19). Women built the tech industry. Then they were pushed out. . Retrieved from The Washington Post: https://www.washingtonpost.com/outlook/2019/02/19/women-built-tech-industry-then-they-were-pushed-out/

Emma Goldberg's article, "Women built the tech industry. Then they were pushed out," provides a brief history of the contributions of women in the advancement of computers and technology and uncovers the many obstacles that led to the eventual removal of women from the computing world. Towards the end of the article, Goldberg reports on some of the early efforts done by women to overturn the idea that computing and technology was exclusive to men. Among these efforts was the cyberfeminism movement that aimed to increase the representation of women in the computing world. My main takeaway from this piece was the motivations and advancements of cyberfeminism in the computing world. This article taught me a lot about the social climate of the time and the significance of computers and technology in women's lives.

Annotated Bibliography

Henn, S. (2014, October 21). When Women Stopped Coding . Retrieved from NPR: https://www.npr.org/sections/money/2014/10/21/357629765/when-women-stopped-coding

Steve Hann's piece, "When Women Stopped Coding," describes the post 1984 world and the attitudes towards computer science from the perspective of gender. Hann discusses the outcomes of the beliefs that computers were a man's tool. Hann expands on this idea and discusses how these attitudes provided men with a significant advantage when navigating school and society. This article was one of the more significant readings that I have had the pleasure of reading in this investigation. This article was actually the first that I read and inspired me to further my research.

Lightfoot, J. (2016, July 31). Introducing ENIAC Six: Atomic's Room Named for the Women who Programmed the ENIAC . Retrieved from Atonic Object: https://spin.atomicobject.com/2016/07/31/eniac-programmers/#:~:text=The%20ENIAC%20Programmers,Frances%20Bilas%2C%20and%20Kay%20McNulty.

"Introducing ENIAC Six" by Jaime Lightfoot is an article about the development and creation of the ENIAC computer, the predecessor of modern-day technologies. Lightfoot discusses how the ENIAC was a revolutionary device for its time and how it provided the United States of America with a technological advantage over its adversaries. More importantly, Lightfoot documents the efforts of the six women behind the development of the ENIAC and the work they had done to make this machine possible. This article introduced me to more female figures in early technology and taught me more about the gender inequality that exists in the computing world.

Palmer, R. (n.d.). The Women Who Shaped the Computer Age. Retrieved from World Science Festival: https://www.worldsciencefestival.com/2014/10/women-tech-since-beginning/

Roxanna Palmer's article, "The Women Who Shaped the Computer Age," provides a brief history of computing and how it was once a female dominated field. In the early 1900's, a "computer" was the term for the job description of a person who uses a calculator to solve problems. A "computer" was typically a female exclusive job title. World War II required that more men enlist into the military, which allowed women to take over the title of a "computer" at home. This was another important article into my investigation of the history of women in computer science. Without women, the field of computer science would not exist. My research has shown me that women have made significant advancements in technology and have essentially paved the way for modern day computing.

Annotated Bibliography

STEM Women. (2019, August 26). Solving the Gender Gap in Computer Science and Gaming . Retrieved from STEM Women: https://www.stemwomen.co.uk/blog/2019/08/solving-the-gender-gap-in-computer-science-and-gaming

The article, “Solving the Gender Gap in Computer Science and Gaming,” published on the STEM Women website is an investigation into the gender gap in technology and gaming. This article explores some of the events that led to this gender gap, and the consequences that they have had on the confidence of women. The idea that technology and gaming are industries exclusive to men have made it difficult for women and girls to pursue their potential interests in developing software or video games. I consider this to be another key piece in my investigation because this article documents the ways in which women have been affected from the gendering of technology. Learning about the consequences from the gendering of technology is an important step towards healing.

Varghese, S. (2019, September 27). Why the internet needs cyberfeminists more than ever . Retrieved from New Statesman: https://www.newstatesman.com/science-tech/internet/2019/09/why-internet-needs-cyberfeminists-more-ever

Sanjana Varghese’s article, “Why the internet needs cyberfeminists more than ever,” expands on the cyberfeminist movement and the inequalities that forced women to take a stand against the male domination of technology. Varghese defines cyberfeminism to be a combination of “feminist energy with a philosophical bent, producing art and manifestos with an irreverent, raucous tone that stressed the need to interrogate technology.” Varghese documents some of the changes to the computing world that have been made possible by cyberfeminism and argues why cyberfeminism is needed today. This article has taught me a lot about how women have stood up against the inequality and underrepresentation of women in technology for the purpose of promoting a more welcoming and inclusive workplace. I have incorporated some of the ideas Varghese has made in my research to explain how cyberfeminism can promote a safer environment online.

Annotated Bibliography

Williams, G. (2017, October 3). 7 Inspirational Women in Tech: A Timeline. Retrieved from Evolution: https://www.evolutionjobs.com/uk/media/7-inspirational-women-in-tech-a-timeline-118012/

Gemma William's article, "7 Inspirational Women in Tech: A Timeline," is a timeline and a short history lesson of seven great women pioneers of computing and technology. William's article talks about Ada Lovelace, Grace Hopper, and Margaret Hamilton, among many other important female technology figures, and documents the work they have done to better our lives and move our society one step closer toward the world we know today. This article introduced me to the women responsible for designing and developing modern-day computers and computing techniques, for putting a man on the moon, and for revolutionizing the gaming industry.

Wong, J. C. (2016, February 12). Women considered better coders – but only if they hide their gender . Retrieved from The Guardian: https://www.theguardian.com/technology/2016/feb/12/women-considered-better-coders-hide-gender-github

Julia Carrie Wong's article, "Women considered better coders – but only if they hide their gender," comments on a research conducted at Github, a hosting company for collaborative software development, and reports some interesting discoveries that resulted from this research. According to Wong's article, women had a higher percentage of code change approvals compared to men, but only if they had gender-neutral profiles. This research is significant towards the efforts to uncover the kinds of prejudices that women face in computer science and technology. I have used the information from this article in my investigation to show that women continue to dominate the computer science world, despite the many obstacles that are set up against them.