

# Women in Data Science

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The field of Data Science is booming, yet comparatively few women are entering it. Why? What are the obstacles and opportunities facing them if they do? The path to change is challenging, but as a woman who has happily worked in data science for many years, I can say with confidence that it's possible. Women have made an incredible impact in this industry, and we have the resources to follow in their footsteps.

## Past

Historically, women have been very influential in the STEM disciplines of computer science, mathematics, data technology, visualization, and statistics — as can be seen in Figure 1 (presented in 2014 by a woman, Mamatha Upadhyaya, in [Impact of Big Data on Analytics](#)).

In the mid-19th century, the mathematician [Ada Lovelace](#) was the first person to write a computer program. In 1860, [Florence Nightingale](#), a statistician and nurse, founded modern nursing and the world's first secular nursing school. In 1940, [Gertrude Mary Cox](#) founded the Experimental Statistics department at NC State University. A few years later, [Grace Hopper](#), while serving in the US Navy as a computer scientist, invented the first compiler. These women were at the forefront of computer science, mathematics, and statistics, and their achievements shaped the opportunities available today to women working within data science.

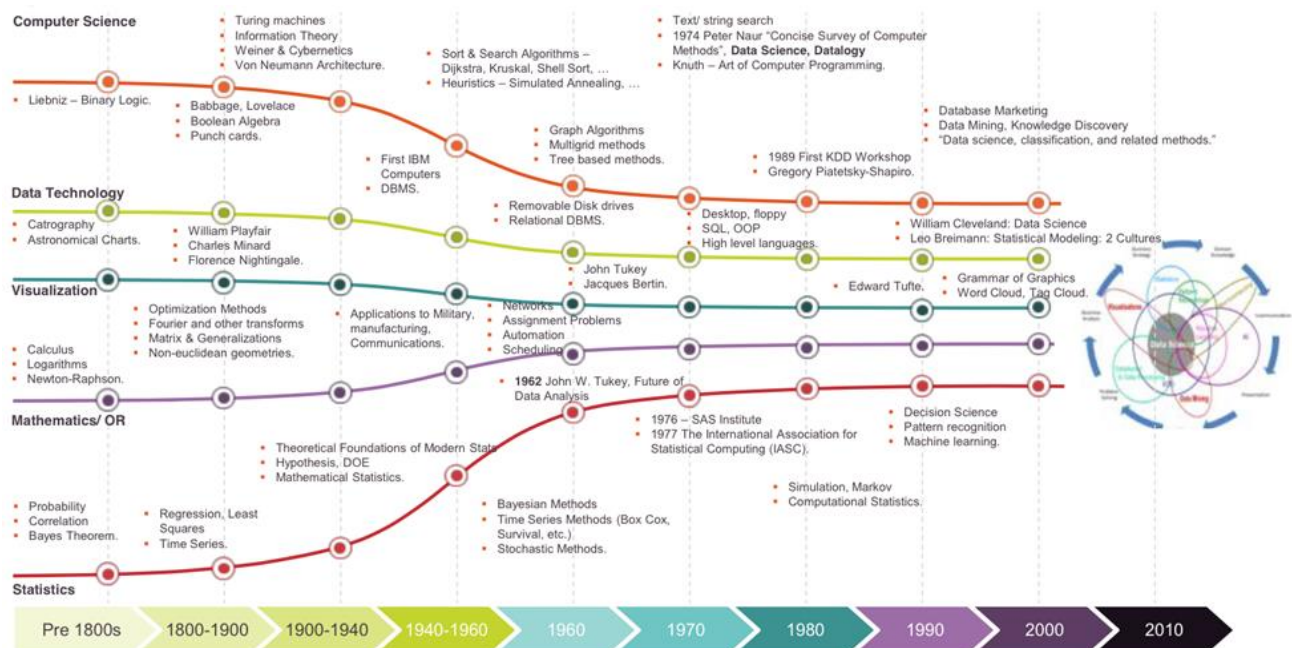


Figure 1 Infographic of the history of data science (Upadhyaya, 2014)

## Present

It has been nearly four years since Data Scientist was named “the sexiest job of the 21<sup>st</sup> century” [1] by [The Harvard Business Review](#). Women have always been a minority in the field, but oddly, their numbers may actually be *decreasing*. For example, as shown in Figure 2, women comprised 35% of computing and mathematical occupations in 1990, but only 26% by 2013, according to a [study](#) performed by the American Association of University Women (AAUW) [2] — despite women currently making up 57% of the [labor force](#) [3]. Why is that?

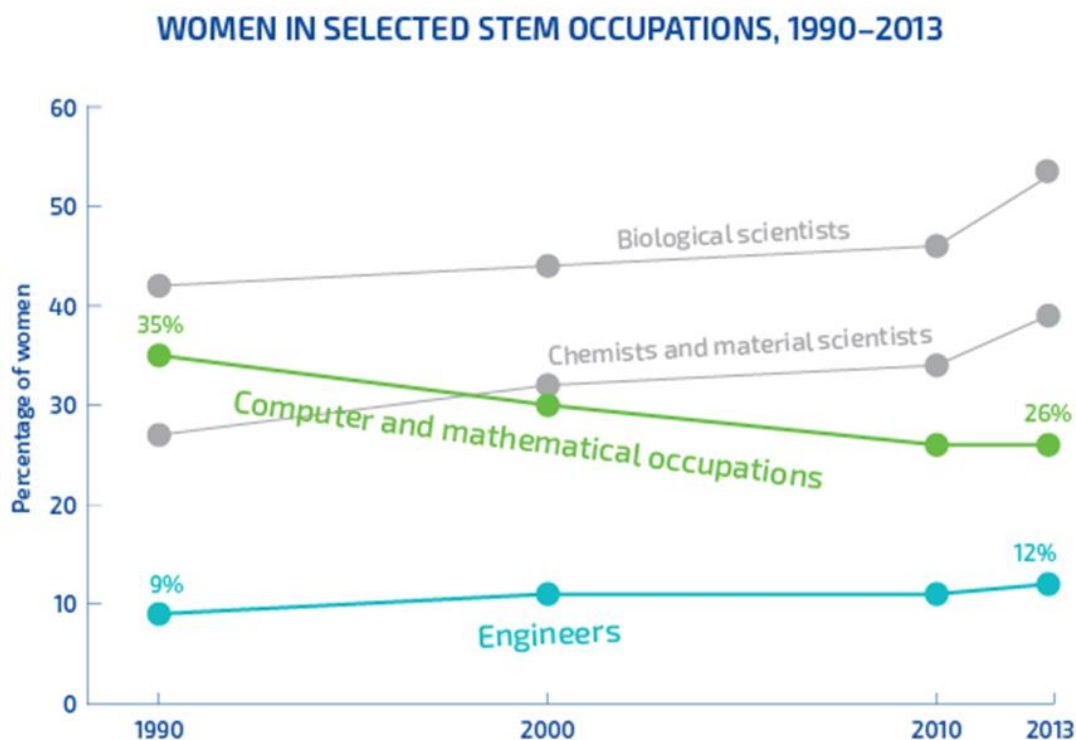


Figure 2 The percentage of women in selected stem occupations between 1990 – 2013. [2]

35% to 26% is a significant change for women in the field of computer science and mathematics. What are the challenges facing women and the opportunities available to increase their number in data science?

## Closing the Gap: a Path for Change

Closing the gender gap is a challenge for many female data scientists today. Women like Claudia Perlich, one of the top data scientists in the world, are an inspiration, and a mentor by sharing their personal stories on women in data science. I was inspired to share my perspective by Claudia’s must-read [article](#), *Women in Data Science Are Invisible. We Can Change That*. In the article, Claudia tells her story and highlights how women can make an impact on the future. [4] I have been inspired to join other influential and [inspiring women](#) in data science to encourage women that we can indeed close the gap. A path has already been laid out for us

that identifies the challenges and opportunities to draw more women into data science, and STEM as a whole.

## More Women in Data Science

Since high school, I have been aware of challenges that could arise for me as a woman in a STEM field. Yet, only recently have I given much thought to why I continue to pursue data science, knowing that I would be, in some ways, an outsider. After reading [Claudia Perlich's article](#), I started to reflect on my journey; I have overcome some challenges and also been given many opportunities to grow and develop.

I spent high school focusing on advanced mathematics, chemistry, and physics before earning a bachelor's degree in mathematics and a master's degree in systems engineering. In choosing a career in the field of data science, I recognized that I would be one of the very few women around. It did not bother me one bit; it just seemed normal. Because I expected to be outnumbered, I never felt discouraged, but instead have been delighted to be in a field where I can pursue my passion and apply my background and skills to real world problems. Even still, I sometimes wondered if doors were closing because of my gender rather than my qualifications. These thoughts and feelings would bring down my confidence and prevent me from feeling that I had a voice. Despite it being challenging at times, my passion drives me to overcome these worries and look for opportunities. Opportunity came to me with open arms, and I believe that is available for other women in data science. I have Elder Research to thank for providing me with many opportunities to grow and develop in all variations of data science, while also enjoying a healthy life-work balance. As I have been blessed with a husband and two wonderful daughters in my personal life, I have also grown steadily in my career and responsibilities, with my team valuing my contributions and continuing to invest in my growth.

Women currently in or aspiring to be in data science should be aware of challenges that they may face, though they can also look forward to opportunities for growth, development, and success.

## The Challenges

Some key challenges facing women in data science include gender bias, stereotypes, and perception. Gender bias and stereotypes are shaped by culture. The [AAUW study](#) brought to light how gender biases and stereotypes can have a negative effect on women in the STEM industry from two angles: the employer, and the woman herself.[5] Employers may unconsciously underestimate the performance of women compared to men. Women, in turn, may allow cultural perception to affect how they perceive themselves, their abilities, and their potential for future growth. For instance, the AAUW study demonstrated ways in which some bias still exists:

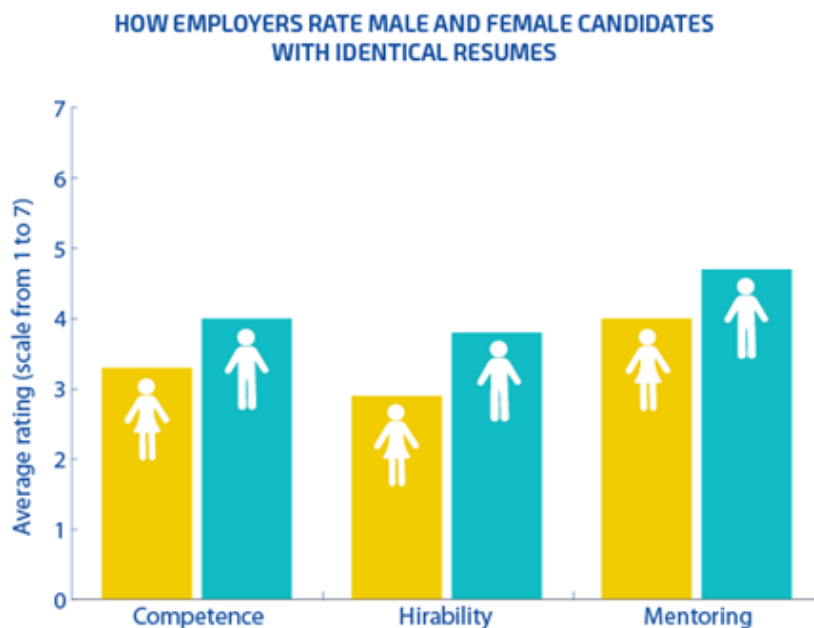


Figure 3 Example of stereotypes and biases on how employers rate candidates of opposite sex and identical resumes. [6]

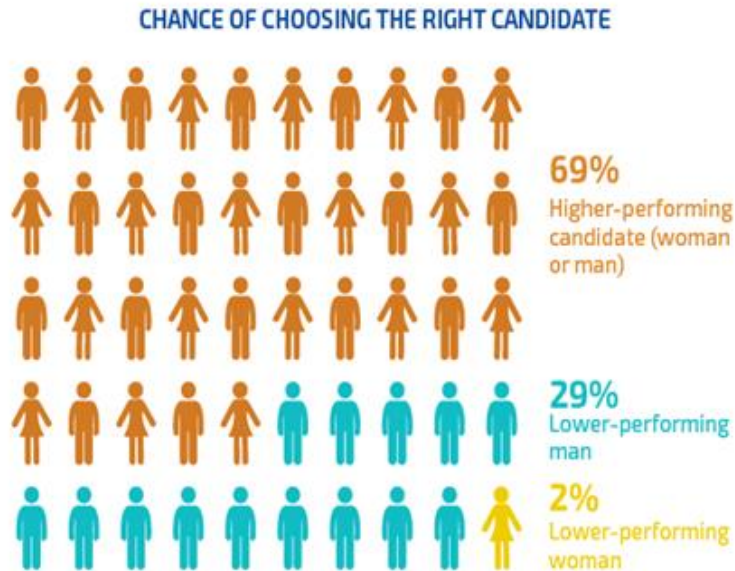


Figure 4 Example of stereotypes and biases on the chance of choosing the right candidate. [6]

How women perceive themselves can be discouraging and hinder them from growth and advancement in areas where they think themselves to be less likely to succeed than their male counterparts. Two main types of self-perception hindering have been named the “because I am a woman” mentality and “the over-achiever” expectation. The former happens when a woman feels that opportunities have been lost to her because of her gender, which can be very discouraging.



The latter refers to a woman's hesitancy to take on a project unless she is highly qualified, even over-qualified. (Men, apparently, don't tend to have that problem!) These perceptions allow fear to hold women back from taking risks. In order to overcome these challenges, women should learn to be confident, passionate, self-aware, and able to share experiences with other women in order to encourage and motivate them.

## The Opportunities

There are plenty of opportunities for women in data science to thrive. The best start is to seek out a welcoming environment and culture that can support life choices in addition to providing flexibility with career and family. Once established, women can begin to explore the opportunities available to them in data science. A welcoming environment that recognizes the great benefits of diversity can significantly increase a woman's ability to pursue personal growth in all areas of data science, including skills development, continual learning, training, and networking.

The benefits of diversity are many. First, bringing women onto a data science team increases the variety of perspectives, thought processes, and voices, which actually makes the team smarter.[7] Creativity increases, and it is possible to create a rich and continuous learning environment with the merging of disciplines, skills, and backgrounds. Also, diversity improves the culture and communicates a welcoming environment. For a look at how employers are benefiting from increasing diversity, read about how [Airbnb](#) succeeded by recognizing the importance of diversity in data science[8], how [Jawbone](#) hired a top women data scientist as VP of Data [9], and how Google learned to pursue diversity in their teams[10].

The opportunities for women in data science are continually growing with the help of the many networking events available. These events allow women to grow in influence, and to encourage, motivate, develop, and educate. [American Statistical Association](#), [Stanford Institute for Computational and Mathematical Engineering](#), and [Anita Borg Institute's Grace Hopper Celebration \(GHC\) of Women in Computing](#) are some of the institutions that present tremendous value and hold some of the top conferences for women in data science.

## A Path for Change

Unfortunately, employer bias and a lack of confidence contribute to the challenges facing women in STEM today. But, as a data scientist, I recognize the importance of testing alternate hypotheses to any data question. What other factors are significant? One example is the educational pursuits of women in STEM. Based on the [National Center of Education Statistics](#), the gender gap is not as significant for women with math and statistics bachelor's degrees as it is for computer science and engineering degrees. In my next article, I hope to study more closely how the fields contributing to data science are evolving, and also consider the impact of different hypotheses.

We can draw more women into the field of data science by working against remaining bias women may face and by making known the breadth of opportunities they have for success. Thanks to the many role models like [Claudia Perlich](#) and [Karen Matthys](#), current and aspiring

women in data science have expert women scientists to look up to for inspiration, advice, mentorship, encouragement, and motivation. By celebrating the role of women, their impact on data science and history, the challenges women face, and the opportunities for advancement, we can expand the opportunity for all women in data science and STEM. I am grateful for the women who are already leading the way, continuing to inspire current and future generations of women in data science.

## About the Author



Data Scientist Brittany Pugh of [Elder Research](#) is honored to contribute to challenging solutions in the Intelligence and Federal community by providing leadership in pioneering data mining and predictive analytics process to support various clients. Brittany worked in Counterintelligence, where she focused on insider threat detection, threat deterrence, investigative lead generation, anomaly detection, cluster analysis, text mining, forecasting, predictive analytics, and data visualization as well as workers compensation, where she focused on survival analysis and predictive analytics.

Brittany has strong communication and analytical skills. Brittany graduated from George Washington University with a MS in Systems Engineering, and from the University of Virginia with a BA in Mathematics.

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