

### ***Impacts of Female Mentorship and Collaboration among DoD STEM Research & Development Roles***

Since the draft ended in 1973, representation of women in the U.S. military has slowly become more prevalent with women comprising about one sixth of service members.<sup>1</sup> Similarly, according to the American Physical Society, since 1967 women earning PhDs in STEM fields have increased by almost 40%.<sup>2</sup> Programs have been developed based on research to increase recruitment for women in areas like STEM and the military and because of such programs, women have more rapidly been able to break into careers and fields typically dominated by men. In 2018, the Defense Manpower Data Center reported of the 748,000 personnel in the Department of Defense (DoD) civilian labor force (CLF), 245,355 of which were women.<sup>1</sup> Using knowledge/research metrics and additional data, this analysis will evaluate the impact of female STEM researchers both employed by and affiliated with DoD.

Several motivations prompted this study. In 2018, RAND published an article that investigated the gaps in women's employment in the DoD CLF from the perspective of veteran employment rates. They concluded that since the hiring pool was a male dominated field, significant changes in hiring protocol would be required to increase CLF representation.<sup>3</sup> While the results of this study are tangential to the population I plan to investigate, it shows that very little research has been done looking at the civilian workforce of the DoD in this area, and more specifically, those who participate in R&D. The other inspiration for the study is that I am currently one of those representing women in this area and have been reflecting on some of my experiences with mentorship by and collaboration with other female researchers in the industry.

I would like to break this study into three different analytical approaches:

1. Use citation databases (via APIs through the GW Library or Google Scholar scraping library) to evaluate the backgrounds and research impact of female scientists associated with DoD institutions. The following metrics will be exploited:
  - a. The affiliation to compare and correlate research representation within DoD agencies, Federally Funded Research and Development Centers (FFRDCS),
  - b. The funding information to determine grant-funded academic/private research,
  - c. Co-authorships to generate understanding of collaborators
  - d. Theses and dissertations to determine academic mentorship as a baseline
  - e. Impact metrics like number of citations and h-index
2. Use the grant.gov database and other grant tracking databases for the government to access lists of funding recipients.
3. Create networking tools to characterize relationships and collaborations between female researchers in DoD and determine potential research impact.

The challenge of this analysis will be the data acquisition, merging, and validation steps. In order to automate this analysis, I will need to use supervised learning tools to determine gender based on the name of a researcher or potentially other data. This research will aim to answer questions about representation, support, and funding of female scientists in the defense and security sphere. It will also attempt to quantify their success in these areas based on not only discipline and affiliation-type, but possibly correlate this to their access to other female collaborators and mentors.

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<sup>1</sup> <https://dod.defense.gov/news/special-reports/Womens-History/>

<sup>2</sup> <https://www.aps.org/programs/education/statistics/fraction-phd.cfm>

<sup>3</sup> Schulker, D. and Matthews, M. *Women's Representation in the U.S. Department of Defense Workforce Addressing the Influence of Veterans' Employment*. (2018). RAND Corporation. doi: <https://doi.org/10.7249/RR2458>