Gender Inequality in HPC

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Introduction

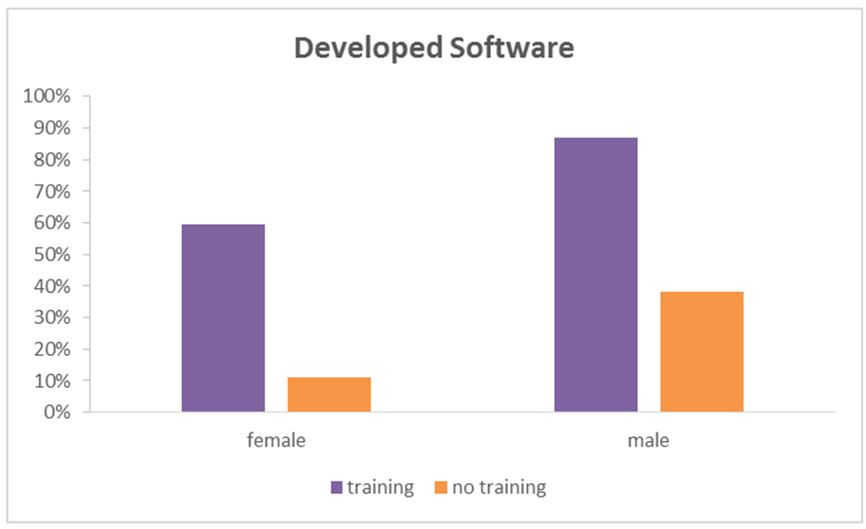
The lack of women working in science is a key problem across all scientific disciplines, both in academia and industry. Anecdotal evidence suggests that this problem is also prevalent in HPC. Initial analysis of the HPC community supports this assumption: only 17% of the UK national HPC service users are women, 9% of EASC 2013 and 5% of PGAS 2013 attendees were female and only 11 Supercomputing 2014 attendees were women.

Due to the interdisciplinary nature of HPC, spanning many traditional fields from Life Sciences to Informatics, it is plausible that HPC would take advantage of the range of gender proportions in the 'feeder fields', increasing the percentage of women from the traditional computing fields by incorporating the users from fields with a higher percentage of women. However, this does not appear to be happening. A study of US academics in 2013 showed that in the traditional scientific fields the proportion of academics that were female ranged from 20% (Computer Science) to 38% (Life Sciences), both much higher than the proportion of women in the HPC community.

Our work attempts to address why women are not engaging with HPC, irrespective of their 'traditional field'. Here we present preliminary findings obtained from an analysis of the Software Sustainability Institute's Russell group study on software development [2], containing 417 anonymised responses on the use of research software. Initial analysis by SSI found that 70% of the male researchers developed software compared to only 30% of the female researchers, but there was no difference in the percentage of men and women using software (92% and 91% respectively). This is perhaps not surprising when the survey also showed that 63% of the male researchers have had some form of training in software development compared to only 39% of women [2].

Gender differences in software training

Our analysis aims shows the problem is even more serious: of the women who have received training, 60% of them also develop software, whereas with men this rises to 87%. So not only are women less likely to have received training, even when they have received training, they still do not go on to develop software as often as men with training. A similar picture is true for those who have not received training: only 11% of the women who have not received training develop software, compared to 38% of the male respondents that reported to have had no training.

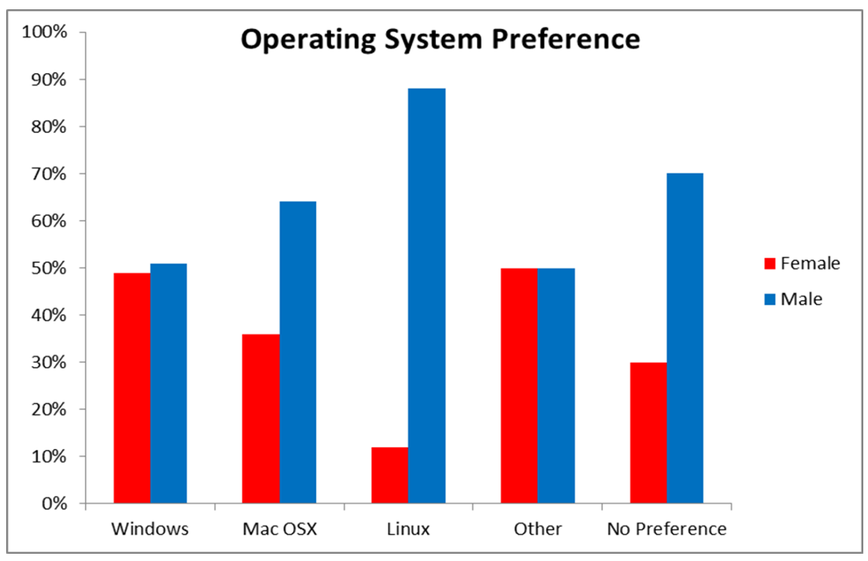


Operating Systems and HPC

Another aspect that may be affecting the propensity of women to develop software is in the respondents operating system of choice:

- 88% of the respondents who use Linux were male (26% of the male respondents compared to 6% of the female respondents);
- 61% of the female and 37% of the male respondents prefer Windows.

This has significant implications for the HPC community, both for users and software developers as the majority of HPC machines in the top500 (95.8%) are Linux based [3], thus familiarity with the Linux is an essential step towards using these technologies. Thus if women are less likely to use Linux than men, then this corresponds strongly with their likelihood to develop software.



Software Development by Discipline

The Survey asked the respondents to give their domain, which we have split broadly into two categories; sciences and social sciences/humanities and compared with training and gender:

- 65% of the scientists compared to only 29% of humanities/social scientists developed their own software;
- 59% of scientists have training compared to 37% of humanity/social scientists;
- 34% of the scientists are female compared to 44% of the humanities/social scientists.

Even though there are a greater proportion of the humanities/social scientists were female compared to the scientists, and there is less software development in the social sciences/humanities, this does not fully explain the lack of software development by women.

Conclusions

This work is the first step in understanding the lack of equal representation of men and women in the HPC community. There are many possible explanations for why women are less likely to work in HPC than men, but clearly there is a correlation demonstrated here between the proportion of academics who develop software and those who have received training in software development. As women are also less likely to receive training than their male colleagues this may be having an impact. However, we have shown that even when women receive training they are less likely than men to go on to develop software.

This may be influenced by discipline, as there are a greater proportion of women in the social sciences and humanities, subjects that are traditionally less likely to develop software, but as we have shown, this does not appear to explain the problem in its entirety.

This has major implications for the HPC community: there are clear gender differences in the way women approach work and diversity in teams has shown greater scientific output and increases GDP [4]. To enable the HPC community to move towards Exascale, this is a resource that we should be embracing, but to do so we need to understand why women seem less likely to work in software development and engage with HPC.

References

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