

Confidence in Programming Skills: Gender Insights From StackOverflow Developers Survey

Karina Kohl Silveira, Soraia Musse, Isabel H. Manssour, Renata Vieira and Rafael Prikladnicki
School of Technology, PUCRS
Porto Alegre, Brazil
karina.kohl@acad.pucrs.br,
{soraia.musse,isabel.manssour, renata.vieira, rafael.prikladnicki}@pucrs.br

Abstract—Diversity is being intensively discussed by different knowledge areas of society and discussions in Software Engineering, are increasing as well. There are unconscious bias and lack of representativeness and when we talk about characteristics as ethnicity and gender, to mention a few. Studies say that diversity builds better teams and delivers better results, among other benefits. StackOverflow is a popular community questionanswer forum, with a high engagement of software developers. Yearly, they apply a survey, present straightforward results, and made the anonymized results available for download, so it is possible to perform additional analysis beyond the original ones. Using data visualization techniques, we analyzed 2018 data to extract some insights about how genders see their confidence in programming skills. Results show that respondents from underrepresented groups tend to believe they are not as good as their peers. From that, we propose a discussion about the unconscious bias, stereotypes, and impostor syndrome and how to provide support on that.

Index Terms—Software engineering, Software Development, Diversity, Data Visualization, StackOverflow

I. INTRODUCTION

More than ever, software development is a collaborative task. Software development teams are built on people and, lately, the area is becoming aware of the problem of underrepresented groups, like gender, racial, cultural, etc. As mentioned in Vasilescu [1] previous work, gender representation in Science, Technology, Engineering, and Mathematics (STEM) related subjects raises the significant attention of researchers and academics, as well as of policy-makers, all noting a significant under-representation of women.

However, how diverse are software engineering environments and how confident diversity is in their skills? With this poster we are interested in exploring the following research question:

RQ. How confident developers, by different genders, are in their programming skills?

To achieve that, we analyzed the 2018 StackOverflow Developers' Survey data. We found out that respondents that identified themselves as women, non-binary and transgenders tend to doubt more their programming skills and believe they are not as good as their peers than the respondents identified as men. A discussion about the unconscious bias, stereotypes, and impostor syndrome and how to provide support on that is provided in the Results and Discussions in Section III.

II. METHODOLOGY

To answer our research questions, we combined data visualization and data analysis techniques. This utility of visualization does include usability goals but ultimately revolves around the visualizations ability to help people better understand data [2]. In this work, we chose to use Tableau Desktop [3] as the tool to support our visual data analysis and to present the data visualization that aims to provide support to answer the research question.

The dataset we used is provided by StackOverflow [4] and based on a survey of 101,592 software developers from 183 countries around the world. Their survey methodology is described at their page [5] and the data is anonymized and available for download in CSV format, and under the Open Database License (ODbL). In the III Section, we present the quantitative results that answer our research question. We analyze the aspects regarding the respondents' confidence in programmings skills split by gender.

III. RESULTS AND DISCUSSION

In this section, we aim to answer our research question "*How confident developers, by different genders, are in their programming skills?*". We can see in Figure 1, the answers distribution for the affirmation: "*I am not as good as my peers*". Most of the answers, no matter the gender, are on the disagreement range or in the neither agree nor disagree. However, men tend to disagree more with the affirmation. On the scale of agreeing and strongly agreeing, we have 29.73% of women that agree or strongly agree that is not as good as their peers, versus 17.28% of men that share the same belief. 24.5% on non-binary and 19.61% of transgenders also believe that are not as good as their peers.

In 2016, Google published a study about the diversity gap in computer science [6] where they identified that male student are more interested and more confident in learning computer science, and that female students rate themselves lower in skills related to Computer Science. Another point identified by the study is that stereotypes may influence implicit beliefs about who can study computer science and might introduce unconscious bias in educators and parents, who may disproportionately and unconsciously encourage students who fit the computer scientist stereotype to pursue Computer Science. Teachers and parents may reinforce stereotypes by telling more

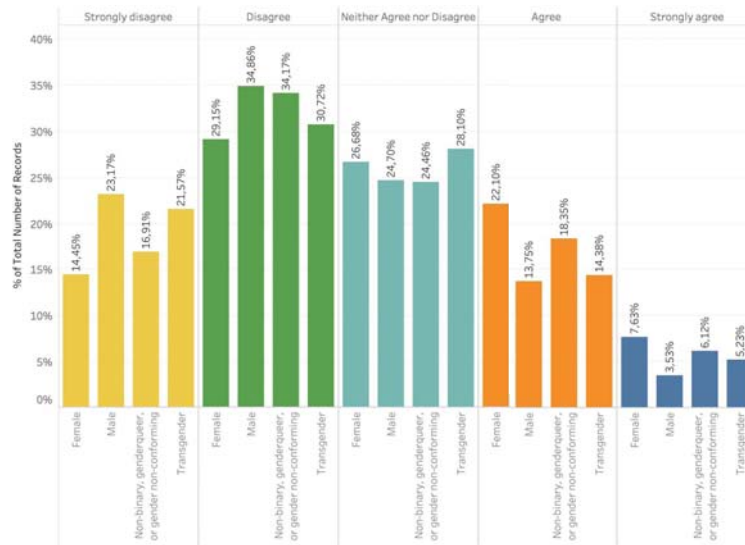


Fig. 1. Not as good programming as the peers

male students they think they would be good at Computer Science, thus furthering the underrepresentation of females in Computer Science.

Also, we can mention the impostor syndrome. Jackson and Heath [7] says that impostor syndrome is defined as a psychological phenomenon in which people are unable to internalize their accomplishments. Impostor syndrome affects most people at some point during their careers across all races, all genders, and all ages. Sukhai [8] mentions that impostor syndrome is common within the academic environment, particularly at the graduate level student - in STEM fields, mainly, where productivity is a significant measure of a students success. Impostor syndrome presents itself as a series of feeling or thoughts, and one of them is the frustration with the inability to meet self-set standards (“*I will never be as good as I want to be, so why bother trying?*”). Churchill [9] points out that this feeling was prevalent among high-achieving women.

IV. CONCLUSION

Using the anonymized data from StackOverflow Developer’s Survey, we performed analysis and correlations beyond their original ones with the support of data visualization techniques that implied in insights to our recommendations. Results show that respondents that identified themselves as women, non-binary and transgenders tend to doubt more their programming skills believing they are not as good as their peers. A discussion about unconscious bias, stereotypes, and impostor syndrome was done.

For future work studies, we see opportunities when we selected more specific aspects in the spectrum of the diversity. For example, for cognitive diversity, since there has been an increase in computer science students with the Asperger Syndrom [10] [11], it is also important to tackle this issue

globally in Software Engineering. There is also a need for teaching institutions and software companies to work together to understand these differences better to include them.

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