The Viewpoint Column

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Removing the Barriers: Overcoming Impostor Phenomenon as a Community

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Abstract

The *impostor phenomenon* (aka *impostor syndrome*) is a wide-spread problem in academia, especially in fields that (supposedly) require "natural talent" or "genius". The phenomenon is particularly prevalent among underrepresented groups and early-career researchers. Overcoming feelings of self-doubt and perceived inadequacy is often left to the individual, which exerts a heavy mental load and a competitive disadvantage. In this article, I argue that any efforts to make our research community more diverse should especially aim to mitigate impostor phenomenon for all current and future members. To this end, I offer concrete suggestions for community members wishing to contribute to this endeavor.

As for many young researchers, self-doubt was a constant companion throughout my PhD. Now that I am coming to grips with these concerns myself, I keep wondering about the broader impact of self-doubt on our field. If I experienced these feelings despite many privileges and a very supportive environment, how does self-doubt impact those less privileged? Why is self-doubt so concentrated in certain demographic groups and academia in general? What can we, as a research community, do for future researchers? In this article, I want to share some of my (partial) answers to these questions. In the first part, I summarize recent literature and argue why the community should take more responsibility. In the second part, I derive concrete suggestions for change.

The Impostor Phenomenon, Its Impact, and our Responsibility

The *impostor phenomenon*, first described by Clance and Imes [1978], is a psychological phenomenon where individuals, despite external evidence of their competence and accomplishments, believe they do not deserve the success they have achieved. A person experiencing impostor phenomenon (Slank [2019] calls them "IPP") feels like they are just pretending to be competent. As a consequence, they fear that others will eventually discover their supposed inadequacies. IPPs attribute their accomplishments to luck or external factors and their failures to

their assumed lack of competence. This phenomenon is also frequently referred to as the "impostor syndrome". However, in line with the psychology literature [Clance and Imes, 1978], I prefer the term "impostor phenomenon", since it avoids the connotation of an individuals' psychological deficit. In contrast to this connotation, I will argue below for an understanding of the phenomenon as a natural reaction to certain environments and biases faced by people from underrepresented groups. Similar arguments have been put forward, e.g., by Olah [2019] and Tulshyan and Burey [2021].

Effects and consequences. Individuals experiencing impostor phenomenon witness increased fear of failure and psychological distress. For example, this may include anxiety about exams, presentations, but also casual research conversations. IPPs are less likely to ask questions, be proactive, and expand their professional network. Impostor phenomenon has also been related to a decreased sense of *belonging* [Muradoglu et al., 2022], i.e., feeling connected to others, which is a basic need that is closely connected to motivation, interest, and persistence. IPPs also appear to pursue qualitatively different goals: Kumar and Jagacinski [2006] found that IPPs have a higher tendency to pursue *performance goals*, i.e., they derive feelings of competence from outperforming others or avoiding failure compared to others. In contrast, individuals not experiencing impostor phenomenon have a higher tendency to purse *task goals*, i.e., they focus on learning and understanding the task; for them task mastery is motivated intrinsically. Even without considering the negative psychological effects resulting from pursuing performance goals, it seems evident that pursuing task goals is much more effective for building a career in theoretical computer science and also for the progress of our field as a whole. Lastly, impostor phenomenon has been found to be strongly correlated with perfectionism [Henning et al., 1998]. Perfectionist behavior, which is pursued in order to make up for the perceived lack of ability, can lead to overwork and prioritization issues. Ironically, pairing perfectionism with a performance mindset can fuel the impostor phenomenon even more, as spending more time than others on a task is interpreted as proof of intellectual inferiority. All in all, impostor phenomenon decreases an early-career researcher's quality of life and sets hurdles in the way of accessing their full academic potential. In particular, impostor phenomenon thus quite directly limits the scientific progress of our field.

Impostor phenomenon in academia, brilliance, and stereotypes. Since the 1970s, the impostor phenomenon has been extensively studied in psychology. Key findings are that the risk of experiencing impostor phenomenon varies by demographic group, amount of experience in a field, and work environment. In general, impostor phenomenon has been found to be prevalent in academia, es-

pecially among early-career researchers. In a survey of over 4000 academics, Muradoglu et al. [2022] moreover identified a strong correlation between the occurrence of impostor phenomenon and the amount to which a research field values "innate talent" or "brilliance". Clearly, theoretical computer science falls into this category [Leslie et al., 2015]. Even more concerning, the authors found that underrepresented groups in these fields (such as women and some ethnic groups) are significantly more likely to experience impostor phenomenon, and that this disparity grows as a function of the extent to which the research field is brilliance-oriented. Interestingly, brilliance-orientation is also closely related to the number of researchers from these groups. Leslie et al. [2015] uncovered this correlation in their seminal study and conclude that "the extent to which practitioners of a discipline believe that success depends on sheer brilliance is a strong predictor of women's and African American's representation in that discipline". Hence, brilliance-orientation and impostor phenomenon can be hypothesized to discourage underrepresented groups from joining or staying in academia. Leslie et al. [2015] explain this effect with stereotypes of women and some ethnic groups possessing less innate talent. Such stereotypes not only lead to biases of evaluators, but also make these groups prone to stereotype threats[1] and self-selection biases. Sadly, these stereotypes appear to persist. For example, Napp and Breda [2022] recently confirmed that girls are still stereotyped to possess less innate talent – paradoxically – even more so in gender-egalitarian countries.

Responsibility. If the community leaves the responsibility of overcoming impostor phenomenon to the individual, this induces an additional burden and a competitive disadvantage that might be too large to compensate for in some cases. Hence, it is evident that interventions have to take place. The research summarized above indicates that the prevalence of impostor phenomenon among certain demographic groups is not a fact of life but a reaction to persisting stereotypes about what is thought to be one of the crucial prerequisites for success in their fields, i.e., "natural talent". Yet, the most common interventions against impostor phenomenon are targeted at the underrepresented groups rather than their environment. These initiatives serve an important purpose, as they can in particular increase the sense of belonging. Nevertheless, I believe that restricting ourselves to these group-targeted initiatives would be problematic for multiple reasons: Targeted groups can get the impression that they have a "condition" that needs to be fixed, whereas we should in fact fix the environment. Second, as previously stressed, all early-career researchers in our field are at increased risk of experiencing impostor phenomenon, albeit not equally. Hence, any strategy that solely

[1] Stereotype threat describes the well-studied theory that negative stereotypes can decrease the performance of individuals, even without the individual needing to subscribe to the stereotype.

targets specific demographic groups is at danger of overlooking early-career researchers that come from groups that are targeted less often. For example, first-generation students are at increased risk of experiencing impostor phenomenon, nevertheless they are rarely targeted by initiatives. Last, the traditional approach does not promise to be sustainable if it has to address each new generation of junior researchers, without improving the underlying conditions. Complementing existing interventions, I therefore want to discuss actions that we all can take, which might reduce impostor phenomenon in early-career researchers in the first place. This allows the community to take responsibility for a problem that is not caused by an inadequacy of affected groups, but rather by our stereotype-prone society. I am not alone in this assessment, as Muradoglu et al. [2022] conclude that "brilliance-oriented fields have failed to create an environment in which women, particularly those from groups underrepresented in academia, and early-career academics feel capable of succeeding. Thus, the onus of reducing impostor feelings should be on the fields, not on the academics themselves."

What Can We Do? Overcoming Impostor Phenomenon as a Community

Hopefully, the preceding discussion has convinced the reader that overcoming impostor phenomenon is in the shared interest of all members of the theoretical computer science community. Not only does impostor phenomenon have a negative impact on life quality and mental health of many of our colleagues, but it also inhibits the development of many early-career researchers, reduces scientific progress, and hinders efforts of increasing the field's diversity. In the following, I suggest actions we can take as educators, advisors, and colleagues that can mitigate impostor phenomenon in students and researchers. I am not claiming that this list is exhaustive, nor that it should be followed blindly. Rather, I aim to initiate (and support ongoing) discussions. I derived some of the suggestions from reflecting on the literature discussed above; others stem from personal experience of colleagues and myself.

1. **De-emphasizing brilliance and innate talent:** The question to which extent innate talent is necessary to succeed in theoretical computer science is up for debate and certainly out of scope for this article. However, we can at least acknowledge that (over)emphasizing the role of talent can work against the aim to diversify our research field and carries the risk of worsening the situation for groups that are negatively stereotyped to have less innate talent. Leslie et al. [2015] even go one step further by concluding that "[their] data suggest that academics who wish to diversify their fields might want to downplay talk of innate intellectual giftedness and instead highlight the importance of sustained effort for top-level success in their field."

2. **Creating an environment of growth:** Individuals who view intelligence as a fixed entity which cannot be changed are more likely to experience impostor fears (see, e.g., [Kumar and Jagacinski, 2006]). Luckily, this "entity theory" has been frequently challenged, e.g., by Dweck [2006] who offers the idea of a *growth mindset*. In a nutshell, the idea is that abilities are developed and that learning, challenges, and setbacks should be embraced as a source of growth. I believe that it is vital that research groups and collaborators communicate the core ideas of a growth mindset. For example, this can mitigate the issue that individuals experiencing impostor phenomenon are often hesitant to ask questions, as they assume that every other person in the room knows the answer and their question will expose their assumed intellectual inferiority. In contrast, a "growth environment" would not judge questions but rather welcome them in order to jointly derive a deep understanding of the problem at hand.

3. **Giving constructive and specific feedback:** One might be tempted to think that individuals experiencing impostor phenomenon would just need enough praise and cannot deal with criticism. I strongly disagree and believe that advisors should empower students to objectively assess their own work. Specifically, mindless praise might make an IPP believe that they "fooled yet another person." On the other hand, specific and honest positive comments about their work are easier to accept and more helpful. Similarly, constructive feedback coming from a growth mindset is extremely powerful. Ideally, (if true), the advisor can communicate that they believe in the students ability to succeed in the field despite seeing areas for improvement, and that their feedback aims to support the scientific development of the student. Moreover, I believe it is important to introduce students to techniques for receiving and giving constructive feedback early on. I learned about such techniques within a masters' seminar and found them extremely helpful later on.

4. **Detecting perfectionism:** Many individuals experiencing impostor phenomenon tend to overcompensate by spending enormous time on perfecting their work (e.g., posters and recorded talks). In the short run, this behavior rarely appears to be disadvantageous, it can provide a feeling of security, and it is often even encouraged. However, if students struggle prioritizing, this behavior can lead to overworking, inefficient allocation of efforts, and high opportunity costs. Here, I think that advisors and collaborators can play a crucial role in communicating clear expectations and giving feedback on what is "good enough." Personally, I do remember the relief I felt when my PhD advisor protected me from my own overly high expectations

regarding unimportant tasks by simply saying "let's try to finish this today, it really doesn't have to be perfect."

5. **Creating awareness:** Discussing the impostor phenomenon and its impact with students at an early stage serves at least two purposes: (i) Those students experiencing impostor phenomenon understand that these feelings are – unfortunately – rather common and should not be interpreted as a signal regarding their abilities but as a reaction towards their environment. Also, hearing that even successful researchers have experienced similar feelings at some point in their careers (even if not labeled as "impostor phenomenon") can be empowering. (ii) Those students that do not experience impostor phenomenon can help to improve the situation for their fellow students by acting more empathically and not interpreting others' insecurities as a lack of competence. Personally, I remember a discussion with a fellow PhD student who had never heard of impostor phenomenon before and who could not imagine why someone would be hesitant to ask a question in front of an audience.

6. **Encouraging applications:** Clearly, students and early-career researchers who doubt their own abilities are less likely to apply for scholarships, awards, selective workshops, or prestigious jobs. By the Matthew effect[2], this can have a long lasting negative effect on their careers. Here, advisors, mentors, and colleagues can make a vital difference by nominating the student or proactively pointing towards calls and emphasizing that they are confident about the suitability of the student. Related to this, decision makers should keep this effect in mind when evaluating academic profiles.

7. **Normalizing failure:** Whereas all academics encounter failures, setbacks, and rejections, individuals experiencing impostor phenomenon might interpret them as "proof" for their lack of competence. Thus, it is important for more established researchers to share their failures, in particular with early-career researchers. A prominent example are "CVs of failure"[3], but also occasional examples in casual conversations can be very helpful.

8. **Avoiding judgmental comments:** Researchers often have different and strong opinions about the quality of journals and conference proceedings, or even entire subfields, and discussions about these are popular. When

[2]The Matthew effect describes a hypothesis stating that small initial advantages can build up disproportionately over the course of a career, also summarized by the phrase "the rich get richer".

[3]See, for example https://www.uni-goettingen.de/de/document/download/bed2706fd34e29822004dbe29cd00bb5.pdf/Johannes_Haushofer_CV_of_Failures[1].pd or http://everydayscientist.com/CV/sjl_CV-failures.pdf.

engaging in such discussions, we should be careful with judgmental comments, especially when early-career researchers are around. First, by doing so we might implicitly disparage other researchers work, for example, if they publish at the discussed venues, or even worse, their work got rejected from these venues. Second, the perception of a journal or conference can vary enormously across subfields. Regardless of the reason, disparaging comments can make early-career researchers doubt their accomplishments. Instead, we could emphasize that despite the fact that publication venues are often used as a proxy for the quality of a work, they are by no means a perfect indicator for such.

9. **Avoiding stereotypes:** There are many stereotypes about theoretical computer scientists. (ChatGPT summarizes us as "introverted", "nerdy", "unrelatable", and "male".) While joking about these stereotypes can be empowering for some people, overemphasizing these characteristics can decrease the sense of belonging in individuals that do not match this narrow image.

10. **Reflecting on discussions about affirmative actions:** Several times, some of my fellow students confronted me with the preconception that I was given higher chances of being selected for scholarships or jobs because I was a woman. This is a tricky point, as there is no denial that, in some situations, affirmative action does take place. While I think it is important to maintain an open discussion about the necessity and implementation of these actions, these discussions can also quickly fuel impostor phenomenon among underrepresented groups. It is therefore essential that we reflect on the context and our own intentions before engaging in these discussions. Lastly, we should keep in mind that, even though individuals of underrepresented groups might be prioritized at a handful of moments during their careers, there are good arguments for doing so. Just to name two: As exemplified in this article, it probably took them significantly more struggles to reach this point in their career compared to their peers. Moreover, the visibility and representation they create can pave the way for generations to come, who will hopefully experience less impostor phenomenon.

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