

**Improving Technical Interviewing Environments to Minimize Candidates' Stress and Anxiety**

(Technical Topic)

**Exploring the Effect of Personality Traits on Technical Interview Performance**

(STS Topic)

**A Thesis Project Prospectus Submitted to the**

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By  
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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## **Technical Assessments: Introduction and Problem**

In software development, technical interviews are designed with the intent to evaluate a candidate's programming, problem-solving, and interpersonal/communication skills (Ford et al., 2017, p. 1). These technical interviews consist of multiple stages, typically beginning with an initial screening or online assessment. Assuming a candidate performs well in these stages, they may move on to an onsite interview where they solve technical coding questions one-on-one with engineers at the company (Behroozi et al., 2019b, p. 1). At the end of this interview, a decision is made on whether or not the candidate receives an offer. According to Behroozi et al (2019b, p. 1), hiring managers find these kinds of technical interviews desirable because of the convenience, scalability, and standardization they provide. However, Behroozi has also discovered that many developers/candidates have an unfavorable view of technical interviews. They describe them as “broken,” “antagonistic,” “whiteboard algorithm hazing,” and “nothing to do with real day-to-day developer work” (p. 2). This level of hostility toward technical interviews is a cause for concern and suggests that there may be problems with these interviews that should be further researched and addressed. One significant issue with technical interviews that has been researched in a study by Behroozi et al (2020) is the effect of stress on interview performance. The results of this study show that stress-inducing factors, such as the physical presence of an interviewer, reduce the performance of the interviewee by more than half and significantly increase cognitive load as indicated by erratic eye movements (p. 2).

Work toward less stress-inducing technical interviewing environments and platforms is necessary in order to more effectively and fairly assess a candidate's problem solving and coding ability. The failure to do so can result in companies losing qualified hires that are significantly affected by performance anxiety. The technical topic of this prospectus will focus on various ways that technical interviewing environments may be improved to reduce the significance of

stress and anxiety on interview performance. Specifically, this prospectus will explore methods that companies can use to assess the significance of stress in their interviewing process. In addition, it will discuss various methods for minimizing stress-inducing factors present in whiteboarding interviews as well as online assessments. The STS topic of this prospectus will explore several personality traits that tend to make a technical interview candidate successful or unsuccessful. This is important in order for companies to reduce bias in hiring decisions. This bias may reduce the chances of candidates with desirable personality traits, such as conscientiousness and extraversion, from getting hired (Wyrich et al, 2019, p. 3).

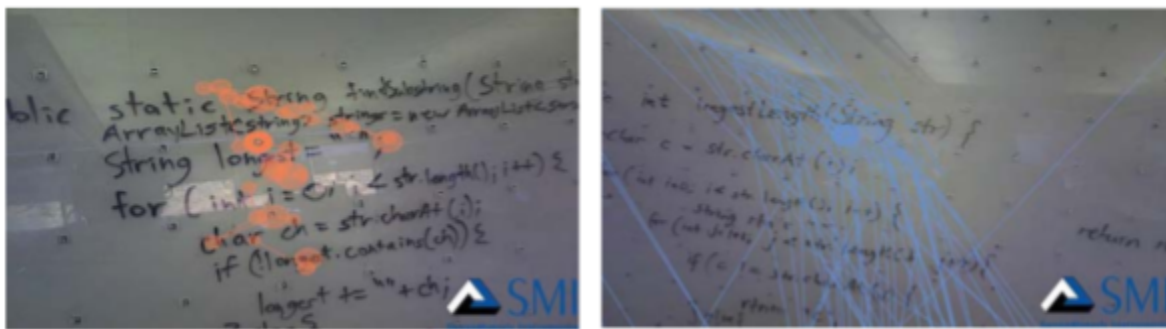
### **Technical Topic: Improving Technical Interviewing Environments**

As previously stated, it is important for companies to minimize stress-inducing factors in technical interviews in order to most accurately assess a candidate's problem-solving and coding ability. These technical interviews include online coding assessments, whiteboarding interviews, and more commonly remote coding interviews. Online coding assessments are administered automatically and can typically be done asynchronously within a specified time period.

Whiteboarding interviews, as described earlier, are onsite interviews where candidates solve a coding problem on a whiteboard with an engineer from the company. Due to COVID-19, coding interviews are more commonly conducted remotely between an interviewer and candidate on shared text editors such as CoderPad, HackerRank, or CodeSignal (Strazzulla, 2021, n.p.). In order to minimize the impact of stress and anxiety on the technical interview process as a whole, companies must focus on ways to improve each of these types of interviews or assessments.

Eye-tracking, as proposed in a study by Behroozi & Parnin (2018), is one way companies can identify stressful interview factors in order to minimize them. In this study, Behroozi & Parnin assess whether or not stressful interview settings can be predicted based on eye-tracking

data from interview candidates. Using machine learning classification algorithms, Behroozi & Parnin concluded that it was possible to accurately determine whether or not a candidate was stressed in a particular interview setting based on their eye movements (p. 4). However, I believe further research on the effectiveness of these models should be done due to the limited sample size of 11 participants in this study. If further research proves that eye-tracking and machine learning can be used to predict stressful interview settings, companies may be able to apply an eye-tracking machine learning model to determine the interview setting that causes the least stress. This would allow candidates to exhibit their problem-solving ability without the disadvantage of performance anxiety.



a) Eye-movements of a successful candidate      b) Eye-movements of an unsuccessful candidate

**Figure 1:** The eye-movement patterns of successful and unsuccessful candidates. Candidates who were more stressed and performed poorly had more erratic and widespread eye movements than less stressed candidates (Behroozi, 2019a, p. 1).

Another approach to minimizing stress and unnecessary cognitive load during a technical interview—specifically for remote coding interviews—is facilitating interactions between an interviewer and candidate over remote means of communication such as video conferencing. One possible way to accomplish this is by sharing the gaze between an interviewer and candidate in order to promote more natural and convenient communication. This would involve visualizing where the interviewer and candidate are looking on a shared screen. Kütt et al (2020) evaluate

the effect of shared gaze on collaboration performance over text-based as well as audio-based communication and find that a shared gaze significantly increases productivity between collaborators (p. 21).

The use of machine learning to predict stressful interviewing environments and gaze-sharing to facilitate remote communication are only a few of the many ways companies can improve the technical interview experience for their candidates. Computer scientists and those involved in the software engineering industry must conduct more research and experimentation before companies should widely adopt changes to their technical interviews. It is also important for companies to recognize that performance anxiety is only one of many other factors that can affect a candidate's technical interview performance. Considerable efforts should be made by companies to reduce the significance of irrelevant variables that may lead to inaccurate assessments of candidates.

### **STS Topic: Exploring the Effect of Personality Traits on Technical Interview Performance**

In order for companies to make the best hiring decisions, they must assess whether or not their hiring practices favor or disadvantage applicants with specific personality traits such as extraversion or conscientiousness. As previously mentioned, there may be biases in technical interviews that reduce the chances of candidates with desirable personality traits being hired. This would be a detriment to the company and its hiring goals. Wyrich et al (2019) develop a theory on the traits that make software engineering students successful or unsuccessful in coding challenges. Their study revealed a positive correlation between academic performance and coding challenge performance (p. 3). This is not surprising, since one would expect that high academic performers tend to do well in other cognitive tasks. However, this study also revealed a moderate negative correlation between conscientiousness and performance and a weak negative

correlation between extraversion and performance (p. 19). This is an issue for companies looking to hire qualified software engineers, since conscientiousness and extraversion are traits that promote productivity in software development teams (Yilmaz et al, 2017, p. 1).

Yilmaz et al. (2017) examine the importance of certain personality traits in software development teams. Their study revealed that extraversion and conscientiousness were among several other traits, such as agreeableness and emotional stability, that positively impact software development teams (p. 1). The study suggested that more productive, agile teams exhibit more extroverted qualities. The study explains that this may be due to the fact that extroverted people tend to be more effective at communication and less patient with complex software development tasks compared to introverts (p. 26). This makes extroverted people faster workers and more receptive to change. The study also observes that conscientiousness was a relevant trait in agile teams due to the necessity of organizational skills and adaptability in order to succeed in these teams (p. 24).

Another study by Acuña et al (2009) has studied how personality relates to job satisfaction and software quality. This study found that job satisfaction was positively correlated with conscientiousness and that extroverted teams produced higher software quality (p. 1). When it comes to the long-term success of software companies, satisfied employees and high-quality software are critical. According to Jain et al (2019), higher job satisfaction results in higher performance and lower turnover (p. 1). High-quality software is critical to minimizing future costs. A major problem with low-quality software is the technical debt it accrues, which is the cost associated with short-term workarounds or quick fixes (Wiese, 2021, p. 1). This technical debt can detriment companies in the long-term by making future changes more costly or even impossible. In short, it's important for companies to hire software engineers with desirable

personality traits, such as conscientiousness and extraversion, in order to minimize the costs of technical debt.

Extraversion and conscientiousness, according to multiple studies, are two important traits for success in software development teams. They are positively correlated with job satisfaction, software quality, and productivity. However, as observed by Wyrich et al (2019), they are traits that are biased against in technical interviews involving coding challenges. It may be worthwhile for companies to focus on preventing bias against these two traits, as well as other traits beneficial to software development teams, in their hiring decisions for the sake of their long-term success.

### **Conclusion and Intended Outcomes**

In order for companies to ensure fair and accurate assessments of a candidate's qualifications, there are several approaches that must be explored. First, more research is necessary in order to develop methods, such as eye-tracking and machine learning, that can identify stress-inducing interviewing settings. Second, the development of technologies that facilitate remote communication can allow candidates to perform in interviews more comfortably. In addition to the development of technical solutions, research on the relationship between personality traits and technical interviewing performance is necessary to mitigate bias in hiring decisions. There are certain desirable personality traits that may actually be disadvantaged due to the design of technical interviews. Excluding personality traits such as conscientiousness and extraversion may negatively impact software development teams and the long-term success of a company. Further research by academics involved in software engineering should be conducted to uncover biases in the technical interview process in order to enable companies to make the right hiring decisions. Ultimately, this research would lead to technologies that can be

used by companies to reduce the effects of stress in interviewing environments and improved technical interviews that minimize bias against candidates with desirable personality traits.



## References

- Acuña, S. T., Gómez, M. & Juzgado, N. J. (2009). How do personality, team processes and task characteristics relate to job satisfaction and software quality?. *Inf. Softw. Technol.*, 51, 627-639.
- Behroozi, M. (2019). Towards scientific study of technical interviews using eye tracking. IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC), 2019, pp. 229-230, doi: 10.1109/VLHCC.2019.8818900.
- Behroozi, M. & Parnin, C. (2018). Can we predict stressful technical interview settings through eye-tracking? In Proceedings of the Workshop on Eye Movements in Programming (EMIP '18). Association for Computing Machinery, New York, NY, USA, Article 3, 1–5. DOI:<https://doi-org.proxy01.its.virginia.edu/10.1145/3216723.3216729>
- Behroozi, M., Parnin C., & Barik, T. (2019). Hiring is broken: What do developers say about technical interviews?. IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC), 2019, pp. 1-9, doi: 10.1109/VLHCC.2019.8818836.
- Behroozi, M., Shirolkar S., Barik, T., Parnin, C. (2020). Does stress impact technical interview performance? In Proceedings of the 28th ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2020). Association for Computing Machinery, New York, NY, USA, 481–492. DOI:<https://doi-org.proxy01.its.virginia.edu/10.1145/3368089.3409712>
- Ford, D., Barik, T., Rand-Pickett, L., & Parnin, C. (2017). The Tech-Talk Balance: What technical interviewers expect from technical candidates. 2017 IEEE/ACM 10th International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE), 2017, pp. 43-48, doi: 10.1109/CHASE.2017.8.
- Jain, Dr & Gupta, Dr & Bindal, Dr. (2019). A study of employee motivation in organization. International Journal of Engineering and Management Research. 09. 65-68. 10.31033/ijemr.9.6.11.
- Kütt, H., Tanprasert, T., Rodolitz, J., Moyza, B., So, S., Kenderova, G., & Papoutsaki, A. (2020). Effects of Shared Gaze on Audio- Versus Text-Based Remote Collaborations. Proc. ACM Hum.-Comput. Interact. 4, CSCW2, Article 136 (October 2020), 25 pages. DOI:<https://doi-org.proxy01.its.virginia.edu/10.1145/3415207>

- Strazzulla, P. (2021, October 20). *Best Developer Assessment Tools* . SelectSoftware Reviews. Retrieved November 1, 2021, from <https://www.selectsoftwarereviews.com/buyer-guide/online-coding-interview-tools>.
- Wiese, M., Riebisch, M., & Schwarze, J. (2021), Preventing technical debt by technical debt aware project management. IEEE/ACM International Conference on Technical Debt (TechDebt), 2021, pp. 84-93, doi: 10.1109/TechDebt52882.2021.00018.
- Wyrich, M., Graziotin, D., Wagner, S. (2019). A theory on individual characteristics of successful coding challenge solvers. *PeerJ Computer Science* 5:e173 <https://doi.org/10.7717/peerj-cs.173>
- Yilmaz, M., OConnor, R., Colomo-Palacios, R., & Clarke, P. (2017). An examination of personality traits and how they impact on software development teams. *Inf. Softw. Technol.* 86, C (June 2017), 101–122. DOI:<https://doi.org/10.1016/j.infsof.2017.01.005>