Personal, Background, and Future Goals Statement

Despite the popular perception of ADHD as a children's disorder [1], I was not diagnosed with ADHD until my junior year of my bachelor's degree. I know that I'm not alone in my late diagnosis, especially among other women; the ratio of boys to girls diagnosed with ADHD is 3:1, whereas the ratio becomes closer to 1:1 in adulthood [2]. I have always been without a roadmap for my own cognition, and I was interested in my ADHD diagnosis as a lens for my strengths and weaknesses. It is fitting that the resolving chord of my diagnosis was a "hyperfixation" (a period of intense focus common to people with ADHD [3]) for two days on research *about* ADHD, resulting in a 17-page paper qualitatively analyzing difficulties I'd experienced under the framework of the DSM-V. (My therapist was unamused.) Despite my intention to understand myself, I quickly learned that the primary reactions to diagnosis are medication and non-binding waivers for a meager assortment of ineffective, vague accommodations. I tried many stimulant medications, all with their own side effects, and used accommodations which did not address the quotidian inattention I had while programming. I realized that accommodations I could receive were bandages on much larger problems. Still, I have seen that with some support for my learning style (e.g., gamified learning or collaborative teaching), I flourish in computer science.

Based on the low support for marginalized populations in computer science and my own experiences, I want to not only "accommodate" a diverse range of people in software engineering, but also help them *thrive*. My goal is to research tools, social structures, and methods of communication that allow people to more naturally create software. Informed by my experience with interdisciplinary and mixed-methods approaches and my background as a researcher with ADHD, I have done, and plan to do, research on **software engineering** with focuses on **accessibility**, **program comprehension**, and **cognition**. I have found my qualities of **resilience**, **diplomacy**, and **creativity** in my personal and professional life to be crucial to the success of my research. These qualities have assisted me in publishing two papers at ICSE, a top-tier software engineering conference.

Resilience: The first time I tried to do qualitative analysis, I got so overwhelmed that I had to take a walk. My quality of resilience, helpful in this instance, is essential to multiple aspects of research: from *information gathering*, to *data collection*, to *data analysis*. In both research projects I have completed thus far, I have written the background sections. Assessing the validity of conflicting claims to motivate a background section requires perseverance, especially when the norms of a field are unfamiliar. Although my inattentive ADHD is characterized by distractability, my ability to *hyperfocus* [3] allows me to get "in the weeds" and invest extranormal time into literature reviews. Especially in our most recent project using *Transcranial Magnetic Stimulation* (TMS), a medical neurostimulation technique, I substantially pulled from outside areas, including psychology, medicine, and pedagogy. Understanding the use of TMS in other fields allowed me to write convincing and creative background and discussion sections where I could hypothesize which brain regions or TMS protocols may be effective for a second paper. In both my research projects, my resilience helped me *gather information* critical to successful publications.

My first published paper, "From Organizations to Individuals: Psychoactive Substance Use by Professional Programmers", required me to be resilient when *collecting data*. Participants were hesitant about a drug study, but I wanted to recruit professional software developers. I recruited from online forums, creating community-specific posts based on my interactions with local moderators. For example, the *r/microdosing* moderators were highly concerned about the privacy of our participants. In a 25-message chain, I explained our data management plan, verified our lab account, and restructured the post. My resilience when interacting with these moderators led to 121 prescreening survey responses, over half of our participants for this study.

In my experience, resilience is also an essential quality in the *data analysis* and validation process. When I gave our first interview, I realized that the participant was a scammer. I ended the meeting and we were left to regroup. We looked at the prescreening responses and noticed inconsistencies in some other responses. We needed to determine from the prescreening form which answers were likely legitimate. I could have felt defeated after an experience like that. Instead, I handled scammers by refactoring the prescreening survey by using side channels such as response rates and name repetitions to more easily betray when responses were disingenuous. In the *data analysis* phase, I was resilient to project obstacles.

In my experience as a researcher, I've found that resilience is critical to push through when encountering obstacles. To combat imposter syndrome, I prioritize long-term learning and success over short-term failure, even if that priority requires that I err in public or encounter negative feedback. I have seen repeatedly that it benefits me to try and fail fast, so I put myself in unfamiliar situations to gain experience with them. At past lab lunches and in my graduate classes, I am often the first person to take a shot at a question or contribute to a discussion, unless I'm deliberately holding back to let someone else speak. I can say with certainty that I will not quit, and that has made my Ph.D. and my research thus far all the more rewarding.

Diplomacy: I think the essence of software engineering and its research is the negotiation of differing ideas among different stakeholders. I am used to diplomatically navigating situations among *peers*, *co-researchers*, and *those outside my field*. At the cooperative house I lived in for three years, I satisfied many political, financial, social, and safety-related disagreements as elected president. During the COVID-19 pandemic, I led house meetings to discuss and vote on safety protocols regarding exposure or infection, including masking, isolation, and illness-care policies. Despite being a house of 20, with many visits to loved ones, we were the only cooperative house among 16 to not have a case for two years. I attribute this to the consensus I helped build for safety-critical policies, since people are more likely to follow policies that they helped devise. For example, I brokered a compromise that allowed people one recurring houseguest per month (optimizing for safety and happiness); I find that diplomacy *among peers* benefits from such individualization to unique concerns.

My diplomatic approach in the cooperative house transferred well to my qualitative analysis with *coauthors*. Resolving thematic categorization conflicts between annotators was intensive and required iterative refinement of terms. As we analyzed over 160,000 words, we first came up with relevant themes that would generalize well across participants and then agreed on which sentences exemplified these themes. We intentionally met in groups of two or three over the course of months to merge our coded documents by hand. I explained my perspective behind each annotation we were in conflict on, but listened to others' ideas and reverted to our research questions as a guide. I merged around 1,400 annotations with others (20/26 transcripts), 77% of the total. I've found in communication with *research coauthors* that the best way to get on the same page is having open discussions about semantics. The balance I struck meant that we never had an irreconcilable conflict when merging transcripts.

I also use my diplomacy to interact with *people outside my research area*, especially when doing interdisciplinary work. I believe that people can tell when you are authentically interested in what they have to say and learning about their passions, whether work- or hobby-related, makes for better communication. Fortunately, my ADHD-related impulsivity has been correlated with curiosity [4] and helps me get excited about, and connect with others on, these passions. For example, communicating with psychology researchers and learning how to use medical imaging equipment for the TMS project required adapting to a field-specific domain. Some participants were hesitant about the effects of the equipment. Leveraging my communication with psychology researchers, I determined that showing how the equipment worked on my own body first would put participants at ease. All candidate participants who saw my demonstration continued in the study. This skill has also helped me in conferences and when networking with professors to decide which Ph.D. offer I would accept. I read about a variety of unfamiliar topics, such as liquid types or SMT solvers, but I found that rapport based on personal interests, such as classical music or ultrarunning, was just as important. Ultimately, I believe that genuine connections are critical to building relationships *outside my research area*.

Creativity: I have found my enjoyment and ease with divergent thinking (common to those with ADHD [5]) to be a boon for my creativity in brainstorming. I think that finding the intersection of two ideas by asking comparative questions is often how useful research questions crop up, and I use this approach to generate new topics based on *prior work* and *my own experience*. Before I started my graduate program, I generated more than 20 research ideas based on previous work I'd done, conversations I'd had with other researchers, and my own curiosity. I rigorously weighed the risk, potential impact, and research fit for me to narrow down these ideas to those that would be actionable. My advisor green-lit these ideas, so I gave a

talk on these ideas to gather feedback to choose the project that would have the greatest impact. The result of this process combining *prior ideas* to generate novelty can be seen in my research proposal.

I also rely on novel ideas that derive from *my unique perspective*. For example, I was involved in a study focused on the effects of recreational substances in software workplaces, but I was more curious about substances prescribed for mental health-related symptoms during programming, especially for ADHD. Because I was more concerned with how software developers like me navigate their neurodivergence at work, I pushed for broadening our scope to cover prescription medications. My initiative on this was important to our study, as 15/26 of our final participants were diagnosed with ADHD and were prescribed stimulant medications. In the final analysis that I did, 25% of the themes were related to mental health. Skills I honed in this first project are helping me with two other projects with qualitative analyses that I am working on now. *My experiences* with being a researcher and with having ADHD have been instrumental for creative idea generation.

Intellectual Merit: I have demonstrated the ability to generate and act on novel and publishable research. My first paper was a novel investigation into how software developers use medications while on the job. Similarly, my second paper was the first to use TMS to investigate causal relationships between brain regions and programming tasks. Further research I do in psychology, education, and software engineering will take advantage of my past interdisciplinary, human-centered research and collaborations, as well as the domain-specific knowledge I've gained. As a neurodivergent person, I am profoundly, personally invested in advocating for neurotype-aware research design.

Research is a cycle of gathering information, synthesizing and negotiating perspectives within that information, and identifying gaps to address in the current narrative. My **resilience** enables me to gather information and not be cowed by bitter truths about myself or the world. Through my **diplomacy** with fellow researchers and community members, I am able to build consensus in and carry out research. Using my **creativity** in idea generation, I effectively notice discrepancies, similarities, and gaps in the state of the art to come up with novel and worthwhile research directions.

Broader Impacts: My research will benefit adult developers of different neurotypes and will result in non-diagnostic, non-medicalized assistive approaches and tools. While identifying difference is important for equity and inclusion, diagnosis of neurodivergence is usually done for the purpose of accessing medication or, to a lesser extent, existing accommodations. Existing support is not sufficient for software-specific contexts. Because of this low support, neurodivergent people are an underrepresented and underutilized population (in fact, more than 80% of autistic adults are unemployed [6]). My research will uncover more about what strengths neurodivergent developers have and will help remove social and structural barriers they face, regardless of whether they are diagnosed.

My concrete plans for future projects, as described in my research proposal, will focus on learning how people of different neurotypes understand, reason, and communicate about code. My research directly addresses the inclusion, societal well-being, and STEM workforce NSF broader impact outcomes. I believe that my focus on communication and mutual understanding in software workplaces is not only ethically sound, in terms of increasing access, but also effective – diverse teaming in software production lines makes developers happier and more productive [7].

References. [1] A.K. Mueller *et al.* (2012). [2] A.G. da Silva *et al.* (2020). [3] K.E. Hupfeld *et al.* (2019). [4] C.B. Marvin *et al.* (2020). [5] H.A. White and P. Shah. (2016). [6] A.M. Roux *et al.* (2017). [7] B. Vasilescu *et al.* (2015).