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CPRE 4940 — Cumulative Reflection Assignment

A Reflective Journey: Navigating My Cumulative Experience at Iowa State University

Iowa State University has presented me a clear opportunity to mix collaboration, professionalism, and leadership to continually push my boundaries to achieve substantive growth and teach me the requisite skills to solve the world's most pressing issues in my career to come. In traditional lecture-based classes I practiced the virtues of hard work and determination in studying difficult concepts and ultimately performing come exam day; in team-based project classes I learned effective co-operation and leadership skills; and in individual research and project development I continued to expand my knowledge beyond the classroom—indeed over 4,000 miles across three countries and two summer internships besides. My thoughts hereinafter reflect upon these experiences—both inside and outside of the lecture theater—to show how my journey through higher education at Iowa State has developed me as a person and aspiring engineer.

Seeking an early internship, I attended the Engineering Career Fairs on campus starting Freshman year, and by benefitting from ISU's superb resources for résumé review and interview preparation, have secured two professional engineering internships at John Deere. Developing engineering projects from start to finish at the workplace as an intern taught me to take on new information quickly and how to best utilize the resources at my disposal in a very different manner to classroom learning. Collectively, I have sharpened my creativity and problem solving skills and practiced my communication by presenting my findings to local leadership all while soaking in a plethora of new technical skills ranging everywhere from Python programming to ASP.NET/Blazor full-stack development to Okta/OAuth authentication. The experience also gave me a clear look into other aspects of engineering design. For example, in maximizing software performance and reliability, I could work to minimize energy overhead at the server and reduce diesel carbon footprint on the customer's machine. Or, in thinking about potential users of my software across cultures and societies, I learned to design a robust engineering solution to meet all defined needs for multipurpose uses whether it be in moving the earth with construction equipment or feeding its people with agricultural vehicles. Most importantly, however, my internships and college experience collectively have reminded me of the importance of lifelong learning: technology changes so rapidly that an effective method today may not even be

workable in one year's time. To develop scalable and maintainable solutions designed to cope with the problems of both today and tomorrow involves constant research to keep knowledge fresh and an unending desire for improvement.

In that mindset, I partook in the FHMP—first-year honors mentoring program—an undergraduate research opportunity under Dr. Henry Duwe in spring 2024. My group's project involved learning about and working on "bringing-up" a silicon-fabricated digital chip architected by former Iowa State senior design students. Facing a new domain, I passionately delved into my work by attending meetings, conducting research with curated on-line sources, and consulting media found within the Parks library archive. Having developed new skills, I felt prepared to take the risk to demonstrate my work and ultimately chose to compose and present a slide deck at the spring 2024 research poster sympsium. Through the process, I developed a strong professional working relationship with Dr. Henry Duwe, which would greatly behoove me just a few semesters later. My time spent researching additionally led on naturally to my partaking in the associated broader co-curricular: Chip ISU, now Chip Forge.

That semester, I had visited a study abroad fair at the Memorial Union and being a person interested in lifelong learning through a variety of avenues, wound up curious about a trip to Ireland come fall 2024, so around this time I received an official offer letter from the University of Limerick welcoming me for a semester's study. Full of eagerness but reigned in by uncertainty, I availed another of State's phenomenal resources: the student body. With total enrollment over 30,000, I easily found several people willing to speak about their engineering study abroad experiences and gleaned from them some helpful hints, potential pitfalls, and endless excitement about my approaching travels. That fall while abroad, I took on an equivalent engineering courseload and also a mind full of once-in-a-lifetime opportunities—ranging from world-class sightseeing to unique social, cultural, and educational experiences—and a heart full of students there who undoubtedly became my lifelong friends. It was this trip to Ireland that really put my life experience, both at and away from college, in perspective. In acclimating to a new way of living and learning, I honed my ability to accept challenge and adapt to unfamiliar circumstances to continue to deliver success in a timely manner, something that has proven useful time and again since.

In Limerick, I had taken a class equivalent to the lecture component of CPR E 3810, so I contacted Dr. Duwe to arrange the lab back on campus, and we decided I should pilot a curriculum change from MIPS to RISC-V. By this time, my learning strategies had evolved from a heavy emphasis on traditional coursework and lecture material as I adapted into largely a self-directed learner. In this manner, I worked independently and liaised among Dr. Duwe and the TAs to provide feedback on the new processes and helped to re-write several test programs for the updated platform. As a computer engineer, I am curious and passionate about low-level technology, so I created my own learning opportunities within the project while I combed official lecture material, textbooks found at the Parks library, and scientific journal articles published on-line (for example, *IRE Transactions on Electronic Computers*) to research relevant topics and

implementation strategies. In concert, they provided me with intimate knowledge and intuitive understanding of digital logic design and the RISC-V architecture, so I felt confident I could exceed project expectations and demonstrate the RISC-V transition. In this process, I developed an extraordinarily effective learning method in taking pre-existing knowledge and combining it with hands-on expertise to master complex new challenges. The greatest obstacle I overcame was in locating high-quality information, but by availing the excellent resources at my disposal from Parks, for example, I ultimately proved successful and developed my processor in good time. Importantly, I proved out the RISC-V pilot in doing so, which is actively being instituted for the class, and Dr. Duwe has recommended me a future TA position for it.

I took a similar approach to COM S 3090, which called for a team-based project to write an Android app from scratch. The lecture largely focused on questions of design, so I took to hand my own learning for key implementation details. I independently tested out new AI tools to establish baseline knowledge and dispel misconceptions I had about various technologies we used, like HTTP, WebSockets, and Springboot, which enabled me to work ahead self-directed on my own ideas and code at each checkpoint. This put me in an excellent position to exercise my creativity to design our system, a roommate finder application, from theoretical concept to prototype through to final implementation per potential user-oriented requirements, take on a notable leadership role by practicing effective communication for deadlines and expectations, and accountability to ensure we finished each feature in due time by regularly offering my assistance even if that meant working long hours. Collectively, the course introduced me to practical engineering and taught me how to reconcile everyone's individual goals with common team objectives to enable effective collaboration and formulate a well-architected solution amid time constraints. By the end, we developed a fully functional roommate finder application that won a class award and could serve as a basis to strengthen social communities at Iowa State in the future. A TA suggested me a class TA position in the future as a result, and I received strong, positive feedback from my teammates. My leadership not only advanced our project but also contributed to my peers' learning outcomes in the course.

Looking ahead, I now understand how continued professional growth requires deliberacy in sharping technical expertise and practicing leadership abilities. I aim to pursue certifications in software development, for example in the Agile process, and a further education to refine my understanding of business through an MBA program. I have already found that combining structured work with independent research and hands-on experimentation yields profound understanding, so it remains a strategy I intend to continue to avail and refine as I navigate challenges in my engineering future.

As I near the end of my undergraduate education, I look back and see one notable item I might do differently: extra-curriculars. Professional engineering, even at a primitive level, is a collaborative endeavor that benefits greatly from communicating clearly and frequently with others and engaging with them to work toward a common goal. I certainly utilized all such opportunities in the classroom and lab, but my brief stint as part of the IEEE Audio/Arduino club

and longer-term membership of the Chip Forge co-curricular showed me there were many more available outside of the classroom that I regrettably did not avail. I wish, in retrospect, that I allotted time each semester to partake, both for the growth opportunities they offer and the fun times I might have had.

Overall, I remain deeply satisfied with my undergraduate education. I consistently sought out and developed my own opportunities proactively rather than waiting for them reactively, which has defined my education inasmuch and shaped my growth as an engineer. My undergraduate experiences have not only taught me the principles of robust system design but also the importance of factoring the ethical and social, and environmental impacts, from minimizing carbon footprint to protecting user data to promoting inclusivity in software for diverse users. By combining co-operation and self-direction, I feel prepared for both academic and professional adaptability, and I cannot wait to see what my future holds. Armed with a battery of both technical and soft skills, I am certain it will be something rewarding!