

Cadet summer training, United States Military Academy (West Point), August 2020: as I plowed through the woods, constantly checking my water-damaged and tattered map to locate the grid coordinate of the enemy force, I thought back to how much easier it was to position units when I competed in the video game StarCraft II.

The obvious answer was that this was *actual* combat (or, at least, real flesh-and-blood training), whereas StarCraft II was just a video game, albeit one that I had played professionally. But that didn't entirely explain the discrepancy I was experiencing.

StarCraft II is one of the most competitive and challenging strategy video games of all time. In fact, the near-infinite tactical and strategic possibilities prompted Google to use it to train its most advanced DeepMind AI. Significantly, the game display includes an ever-present mini-map detailing not only the layout of the terrain but also recent events and unit dispositions, all within a single visual field. This map allows players to make split-second decisions without diverting their attention from the ever-changing details at play. Professional StarCraft players, myself included, averaged upwards of 300 actions per minute, rapidly switching between critical tasks like a modern CPU switches between threads. Data-display systems are under incredible user stress in a game where such minute actions matter. Yet the elegant design of systems such as the mini-map evokes almost an autonomic response in skilled players, allowing us to act without demanding significant processing time. These memories of my youthful gaming pursuits flashed through my mind as I returned to my position in the woods, attempting to locate our objective.

During my West Point summer training, I began connecting my seemingly disparate interests in competitive video gaming, military service, and computer science. That convenient display feature I'd relied upon for success in gaming was more than a simple video design feature; the mini-map was the product of 30 years of intelligent data and computer scientists continually improving and refining a single product based on countless amounts of *real* user feedback. That summer, it became clear that growing up immersed in complex gaming systems had uniquely prepared me to help design effective data-centric systems for the next generation of squadron-level military tactics: namely, through data visualization.

So, I got to work, putting my computer science knowledge into physical applications. I experienced unique excitement in contributing novel ideas to complex spaces such as combinatorial testing; I was immediately captivated by the process of acquiring knowledge, iteratively testing systems, and struggling with complicated concepts. With my confidence as a researcher bolstered, I wondered if I could improve any problems I encountered in the field during my Army training. My research goals crystallized further upon being approached by my software development instructor to spearhead a new project to develop a West Point-specific application program interface for the Microsoft HoloLens.

This project presented me with several challenges yet also provided me with unforeseen opportunities. First, Microsoft had closed their mixed-reality forums as the product hadn't achieved commercial traction. Second, development required knowledge of C#, Unity, and C++, all of which I was unfamiliar with. Third, debugging was far from trivial as the blank HoloLens screen provided little insight to where coding deficiencies were. These obstacles also came with an unexpected opportunity; there were few applications for the device, and those that existed did not present information in the efficient ways I had grown to expect in my extensive gaming career. Regarding the shareable map software I was designing, many opted for a three-

dimensional map rather than creating a clear and effective 2-dimensional map. Remembering the mini-map that I had relied upon to succeed in StarCraft II, however, I knew a clear 2-dimensional map would be far easier to parse with a glance. If the mini-map had been three-dimensional, I would have been significantly less efficient, and my slower gameplay would have left me vulnerable to defeat by my quick-witted opponents. In the crucible of modern ground combat, it is critical to streamline presented information. The stakes are no longer lost games but lost lives.

By pursuing a master's degree in information technology strategy at Carnegie Mellon University, I hope to build upon my experience designing such systems and continue researching methods to aid US Army soldiers and the country as a whole. With a concentration in data analytics, I would be afforded the opportunity to engage in classes such as "Machine Learning Large Data Sets" and "Applied Deep Learning," allowing me to integrate my uniquely formed data visualization background with cutting-edge generative AI methods. I would apply the knowledge from these classes to the various interdisciplinary capstone projects from prior years, such as the "TCS Automated Driving Project" or the "Automated Threat Modeling Analysis" projects. These projects would allow me to impact society directly—the core reason I resolved to pursue higher-level education. I hope to deepen my understanding of the intersection between data representation and computer science while producing impactful applications for civilian and military contexts.

When I began training at West Point, our cadet training programs centered on learning the terrain and positioning ourselves appropriately to serve our fellow soldiers, our mission, and our country. As I approach graduation, I must position myself again to best serve my peers. Pursuing a master's degree in information technology strategy at Carnegie Mellon would provide an excellent opportunity to deepen my understanding of data representation and computer science while allowing me to apply this knowledge to improve the lives of those around me. This formative experience would give me a robust technical background to excel as a Cyber Officer in the United States Army and, ultimately, influence industry at large. With the support of the experts in the Institute for Strategy & Technology, I am confident that I can contribute to the innovative research at Carnegie Mellon while positioning myself to be an effective military officer.