

# Intent and Motivation

Colton Cunov (coltoncunov@gmail.com)

I have long been fascinated by complex systems, originating with familiar systems like flocks of birds and dense crowds. Seeing how seemingly minute changes can incite disproportional impacts in these systems inspired me to work with faculty of the Industrial and Chemical Engineering departments at the Indian Institute of Technology Kanpur. There I calibrated popular physics-inspired crowd models against Indian data to test how robust they were to different customs and cultures, including designing a fitness function to quantify model performance.

Several years later, after graduating and getting a job as a site-reliability engineer at a large technology company, I attended a complexity group meeting at a local university and subsequently their ComplexityCon conference in San Francisco. I met several PhDs from various disciplines, along with industry professionals and together we formed an independent working group, eventually applying for a DARPA grant. We were interested in applying complexity science techniques to physiological data collected from publicly available wearable devices. Because no two of our six members were from the same field, our skills echoed complexity themes related to robust collective function. I was captivated by the specificity and extent of the research I encountered during the early stages of our work: from journals on fractal physiology to thousands of citations on dynamical neuroscience, I knew that there would be endless avenues to satisfy my interests in the field.

In my industrial engineering curriculum, I found courses like operations research, numerical methods, and machine learning the most intriguing. This interest led me to work with Dr. Sergiy Butenko of Texas A&M to investigate how the ratings of 700 popular movies relate to the global structural properties of their character graphs (clique relaxations). Beginning with initial conditions and working towards desired outcomes challenges my creativity and I enjoy applying the probabilistic, computational, and optimization techniques in my courses to real-world problems.

One of my favorite opportunities in my B.S. was helping a professor teach his course. I liked that I could be an approachable aid during office hours or when I held exam review sessions. This inspired me to enroll in Big Brothers Big Sisters, a program in the US that matches underprivileged high school students with a college-educated mentor. I believe that when small changes in behavior (like those provided by education) are applied at scale large, collective differences in outcomes will emerge. As a doctoral student in Boulder's Computer Science department, I hope to serve as a teaching or research assistant where I will have a dedication towards education and service to all.

In my current role at Apple I have developed a proactive reputation, creating many automation scripts that reduce labor and increase insight into the health of our clusters and technologies. With no formal training on the technologies, these skills were attained through cultivated relationships with subject matter experts and sweat equity. By eagerly seeking out research relationships and areas for advancement I will be well-equipped to handle the academic and research stresses of Boulder's PhD CS program. After graduation, I plan to begin the professorship journey to tenure.

My primary research interests lie in applying computational techniques to complex social, biological, and economic systems. I want my research sphere to consist chiefly of computationally-minded faculty in computer science, and to leverage this with an outer sphere of faculty in the social (e.g. Dr. Liam Downey – inequality and elitism), biological (e.g. Dr. Christy McCain – elevational diversity), and economic (e.g. Institute of Behavioral Science) fields. I strongly believe this to be my ideal research environment. I will be a computational track facilitator and speaker at ComplexityCon 2020, where I will sync with active researchers to further cultivate the relationships required for my broad interests.

Although I am open to a variety of research, there are several complexity-inclined professors whose work interests me highly: Dr. Aaron Clauset (computational social science), Dr. Daniel Larremore (networks and malaria), and Dr. Chenhao Tan (computational social science and human-centered ML). Studying these professors' papers has given me a sense that Boulder's PhD in Computer Science is a great match for my interests and future ambitions.