

## TEACHING STATEMENT

Tim Bretl

I am interested in teaching courses across the fields of engineering (dynamics and control, estimation and sensor fusion), computer science (motion planning, machine learning, localization and mapping), and applied mathematics (convex optimization). I would also like to introduce courses directly related to my research, which might focus on humanoid robotics, grasping and manipulation, or the aesthetics of motion.

Although these interests may vary over time, I expect my philosophy of teaching to remain consistent. Three aspects of teaching are particularly important to me:

- *Teaching is a process of discovery.* Students have different backgrounds, skills, and levels of motivation. Learning styles that work for some may not work for others. The challenge is to find, for each student, a way of thinking about the material that reveals basic concepts and makes them relevant. I believe that a strong integration between teaching and research often helps this process. For example, as a teaching assistant for a graduate course in modern control theory, I created a series of homework questions focused on estimation and control for autonomous rovers, a research problem on which I was then working. Not only did this make the course more exciting for students, but their observations and questions suggested new directions for my research.
- *Teaching is an opportunity to learn.* As an undergraduate student, I participated in a seminar-style mathematics course (basic point-set and algebraic topology) in which material was presented first by students, not the professor. This process quickly revealed knowledge gaps (which could be embarrassing) but ultimately brought the type of deep conceptual understanding that is necessary to apply mathematics to real problems. Since then, I have favored courses that provide a chance to teach. Now, I expect teaching will give me a chance to look at my research with a broader perspective, and to collect results that may first appear unrelated into well-articulated frameworks that may together have more lasting impact. This interpretation of teaching as learning has particular resonance because my future interests involve the conceptual understanding of complex mechanical and biological systems.
- *Teaching is a way to foster collaboration.* My colleagues in the graduate department of aeronautics and astronautics had a variety of backgrounds,

including electrical and mechanical engineering, computer science, physics, and mathematics. “Analysis of Structures” was one of our first courses – each of us had been exposed to this material, but each in a different way. This course did not teach us new facts so much as give us a common framework in which to share our knowledge, so we could work together. Because my research is highly interdisciplinary, such communication of ideas and concepts between heterogeneous groups has been very important outside of the classroom as well.

Most importantly, as role models teachers have a profound impact on the lives of their students. I welcome this chance to provide leadership, and to inspire positive and creative visions for the future.