

SCHOOL OF MECHANICAL & MATERIALS ENGINEERING
GRADUATE SEMINAR SERIES

Safety and Efficiency for Autonomous Vehicles Through Online Learning

Presented by
Dr. Zachary Sunberg,
Postdoctoral Scholar, University
of California, Berkeley

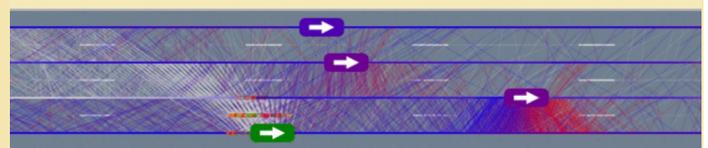
External States

Position
Velocity
Turn Signals
Conditions



Internal States

Intentions
Disposition
Distraction
Focus



Abstract

Autonomous systems have the potential to help humans in a variety of ways, from traveling to inhospitable destinations and performing tasks that are impossible for humans, to working directly alongside us. To be effective, these systems must accomplish tasks *efficiently* in terms of time and other resources and do so *safely*. Though these two goals are often opposed to one another, online learning and reasoning about uncertainty in the state of the world can result in simultaneous improvement of both safety and efficiency. The partially observable Markov decision process (POMDP) is an optimization framework that automatically incentivizes the online learning necessary to accomplish an objective. This talk will discuss formulating autonomous vehicle control problems as POMDPs and solving them approximately online. First, it will present an autonomous driving scenario that quantitatively demonstrates the safety and efficiency advantages of a POMDP approach, along with several other aerospace problems that can be naturally formulated as POMDPs. Next, it will introduce a new algorithm, POMCPOW, that is capable of finding approximate solutions to POMDPs with continuous state and observation spaces. Finally it will give a brief introduction to the POMDPs.jl software interface, which provides first-class speed and unprecedented flexibility for easily formulating and solving POMDPs in teaching and research contexts.

Biography

Zachary Sunberg is a Postdoctoral Scholar with Claire Tomlin at the University of California, Berkeley. He completed his PhD in Aeronautics and Astronautics with Mykel Kochenderfer at Stanford University in 2018 with a focus on planning under uncertainty for autonomous vehicles. Prior to his time in California, he earned BS and MS degrees in Aerospace Engineering from Texas A&M University, with research focused on helicopter autorotation and orbital object tracking. He received an NSF Graduate Research Fellowship in 2012, serves as the lead maintainer of the POMDPs.jl Julia package, grew up in Colorado, and is an avid skier.

Thursday, February 28, 2019

11:00am to Noon

ETRL room 101

Meet the speaker before the seminar in
ETRL room 119, 10:30am to 10:50am.
Light refreshments will be served.



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