



# ME Department Seminar

## Perceiving Complex Scenes for Autonomous Driving



### Mark Campbell

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**4:00 p.m.**

**1200 EECS**

#### **Abstract:**

Autonomous driving has made great strides since the 2007 DARPA Urban Challenge (DUC). In particular, the ability to perceive complex scenes is perhaps the greatest challenge for these vehicles — from driving with no GPS coverage or new environments, to driving in scenes with cars, cyclist, pedestrians, poor weather, and even new and changing construction. This talk will start with an overview of the 2007 DUC, including Cornell's well received LocalMap - a tracking and data association scheme which uses a Rao-Blackwellized Particle Filter to fuse lidar, radar and vision to accurately track other cars, even during fast viewpoint changes and in close proximity. Then, several new and complementary algorithms will be presented, including the development and use of "negative information" (expected, but not included measurements), shape estimation, and probabilistic anticipation of dynamic scene changes including those of other cars. Each of these approaches can be then used as critical belief information for subsequent probabilistic planning and decision making.

#### **Bio:**

Mark Campbell is the John A. Mellowes '60 Professor and the S. C. Thomas Sze Director of the Sibley School of Mechanical and Aerospace Engineering at Cornell University. He received his B.S. in Mechanical Engineering from Carnegie Mellon, and his M.S. and Ph.D. in Aeronautics and Astronautics from MIT. His research interests are in the areas of autonomous systems including robots, UAVs and spacecraft, probabilistic models of human decision making, nonlinear estimation theory, cooperative control and estimation, and sensor fusion.