



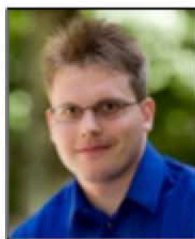
# CPS: Synergy: Collaborative Research: Control of Vehicular Traffic Flow via Low Density Autonomous Vehicles



Prof. Benedetto Piccoli



piccoli@camden.rutgers.edu  
piccoli.camden.rutgers.edu  
CNS-1446715



Prof. Benjamin Seibold



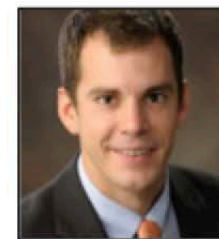
seibold@temple.edu  
math.temple.edu/~seibold/  
CNS-1446690



Prof. Jonathan Sprinkle



sprinkle@ece.arizona.edu  
ece.arizona.edu/jonathan-sprinkle  
CNS-1446435



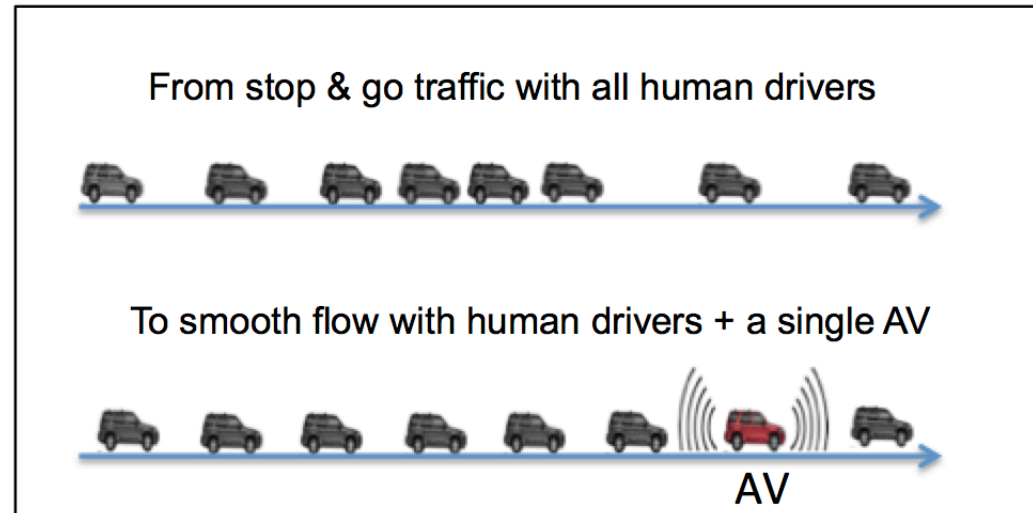
Prof. Dan Work



dbwork@illinois.edu  
publish.illinois.edu/dbwork  
CNS-1446702

# Description

- **Context:** Increasingly *automated vehicles (AVs)* are being deployed
- **Core idea:** AVs can stabilize traffic flow, even at low penetration rates of AVs
- **Project contributions:**
  - Mathematical models of mixed AV/human traffic
  - Control laws for AVs to stabilize traffic
  - Testing in simulation
  - Field deployments with real humans and real AV



**Software in the loop:**  
Test controllers in  
simulation



**Hardware in the loop:**  
Test controllers on *CAT  
Vehicle (Arizona AV)*

# Findings

Autonomous capable vehicle

Test begins with vehicles evenly spaced



AV under human control, stop & go waves appear



AV control activated, stop & go waves disappear



Benefits of controlling human agents via an AV:

- Fuel: 40% ↓
- Braking: 99% ↓
- Vel. std. dev.: 81% ↓
- Throughput: 14% ↑

*See poster & demo  
for details and videos of  
experiments*

