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# Data Science, Machine Learning, and Internet of Things

Electrical and Computer Engineering:  
Master's Degree in Electrical Engineering

# Machine Learning directions in MSEE:

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- Biomedical Engineering
- 5G/6G and Quantum Communications
- Sound, Image, and Video Recognition
- Sensor and Control Devices for the Internet of Things

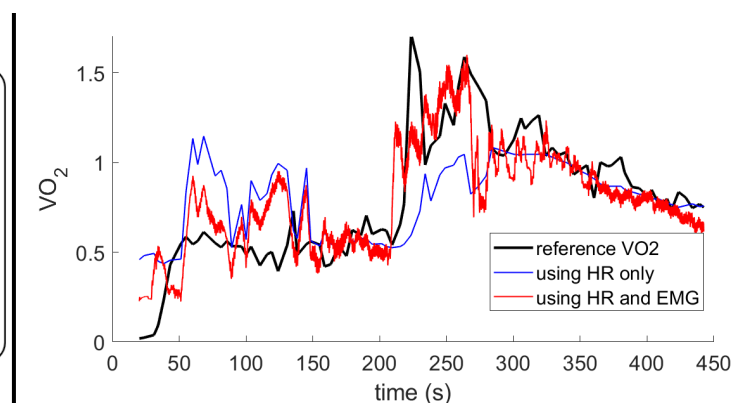
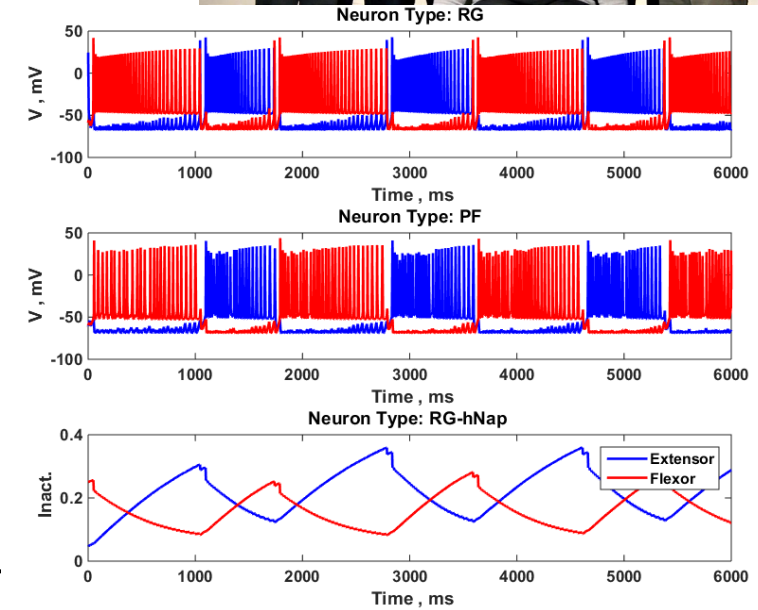
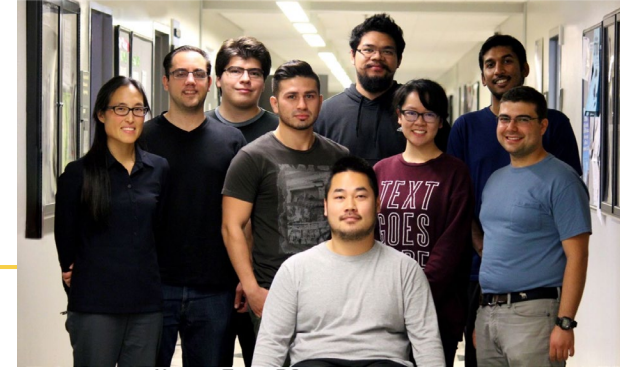
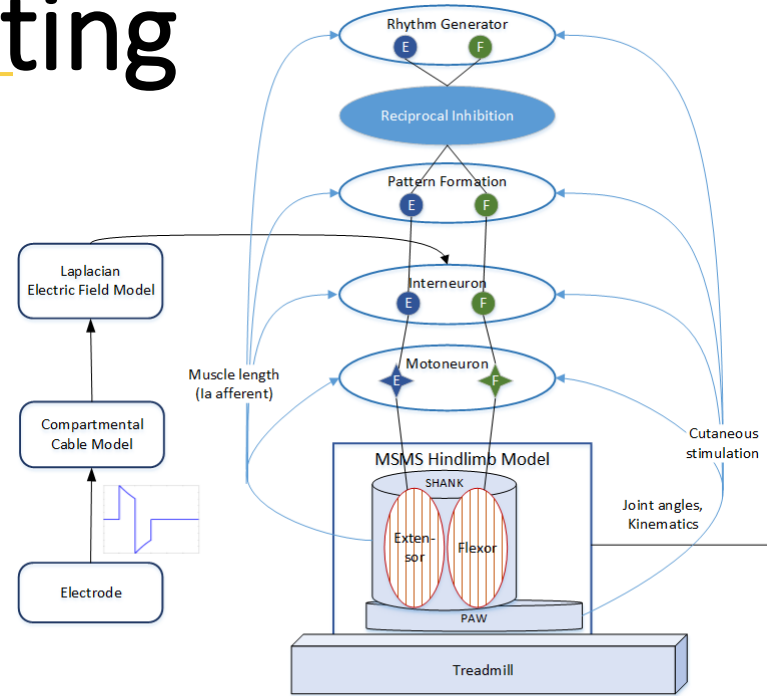
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# Machine Learning in Biomedical Engineering

Prof. Curtis Wang  
Prof. Deborah Won

# Machine Learning in Biomedical Devices and Computing

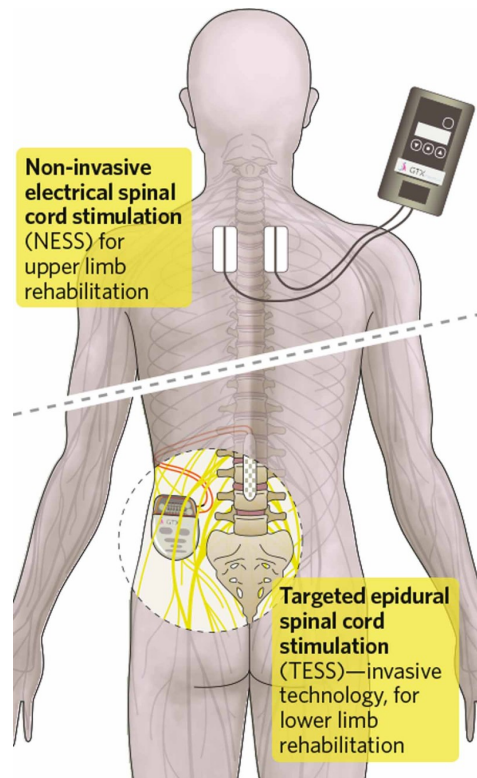
- Developing neuromuscular electrical stimulation control algorithms
- Estimating calories burned from wireless muscle sensors in a mobile fitness app for motor impaired individuals
- Recommender system for diabetes management (in collaboration with Drs. Amini and Pourhomayon)



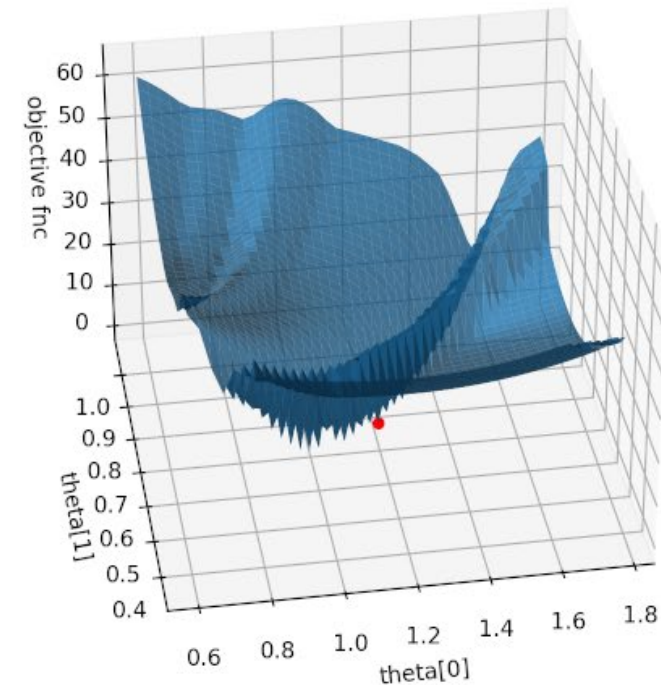
Sorry I couldn't be there! But feel free to email me:  
Deborah Won: [dwon@calstatela.edu](mailto:dwon@calstatela.edu)

# Machine Learning-Accelerated Therapy

## Neuronal Networks in Spinal Cords: Healthy and Injured



## Fast, Accurate Reconstruction of Circuits in Spinal Cord Injury



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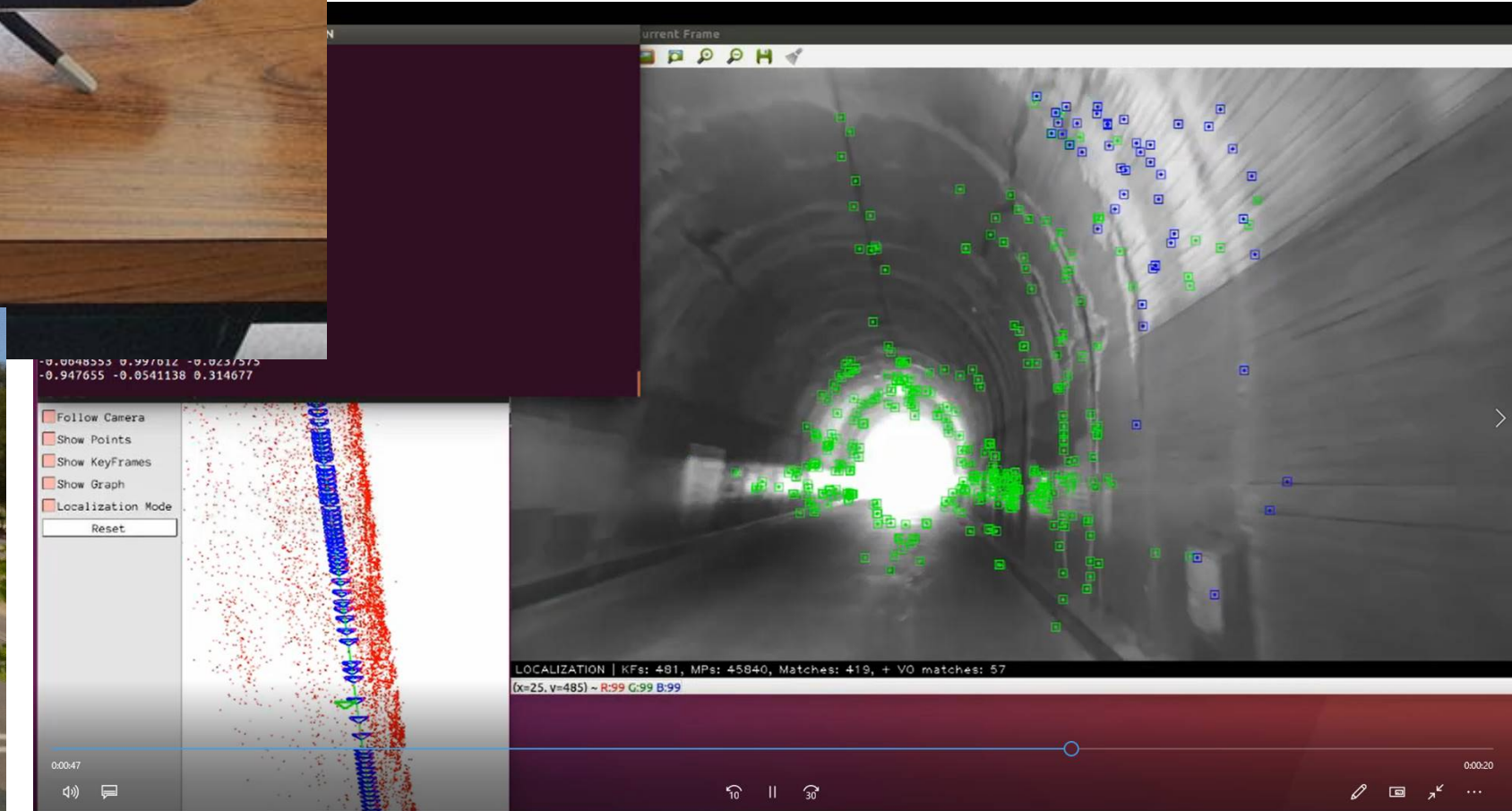
# Quantum Communications and Signal Processing Lab

Prof. Fred Daneshgaran  
Prof. Marina Mondin

# Research projects in Data Science and IoT

- ❑ **Machine Learning, Artificial Intelligence and Deep Convolutional Neural networks applied to Autonomous Robotics** (part of a **DOT center**)
- ❑ **Study of the drone and aerial vehicles to ground millimeter wave wireless channel** for beyond 5G applications (**NSF grant**)
- ❑ **Quantum Cryptography and Signal Processing for Security applications** (**NATO grant** and collaboration with Italy and Israel)
- ❑ **Signal processing for Gravitational Waves detection** (**NSF grant**, part of the LIGO scientific collaboration for the analysis of gravitational waves and collaboration with the Physics Department)

# *Autonomous Robotics and Machine Learning techniques applied to the analysis of cracks in tunnels*

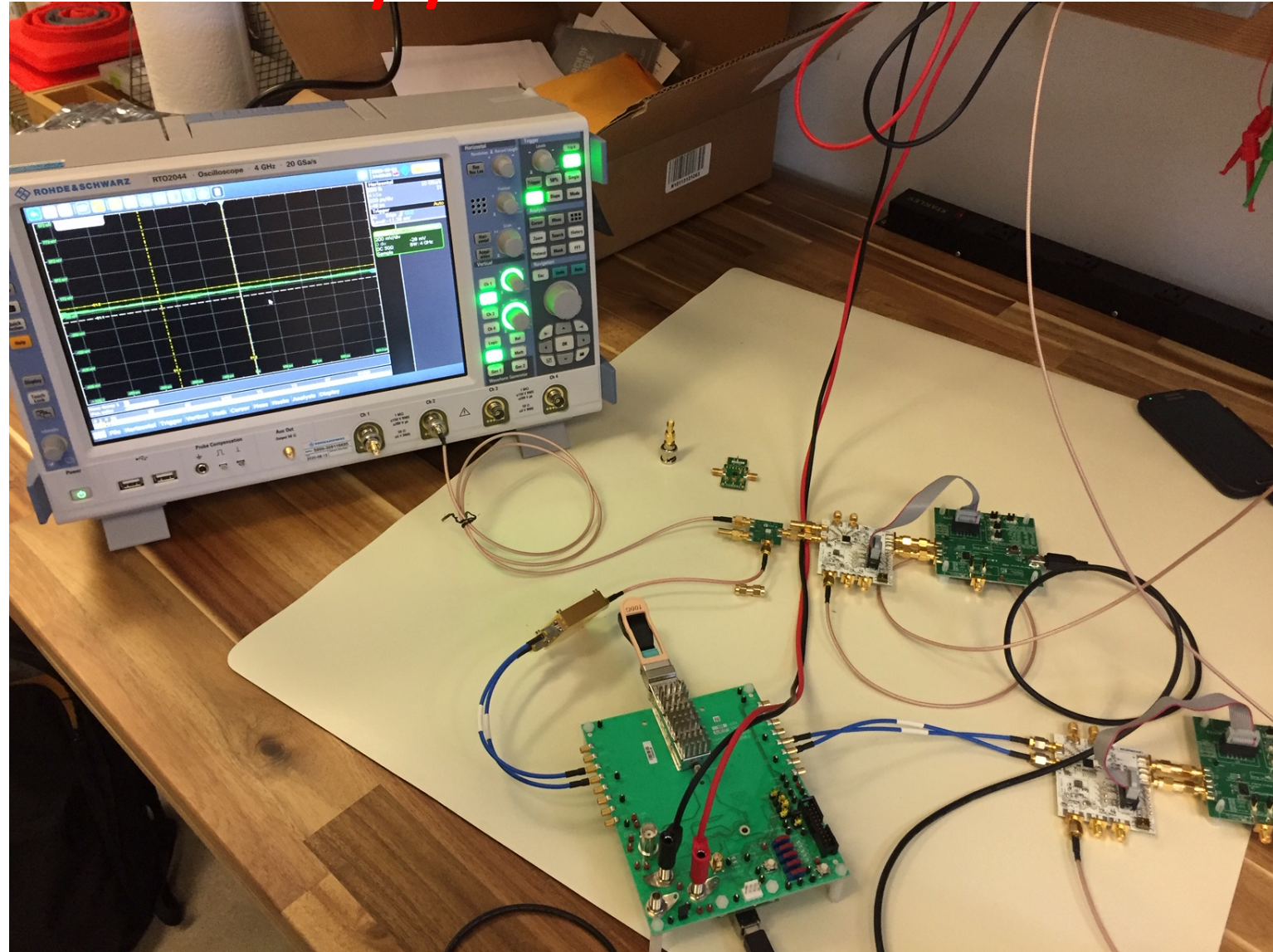




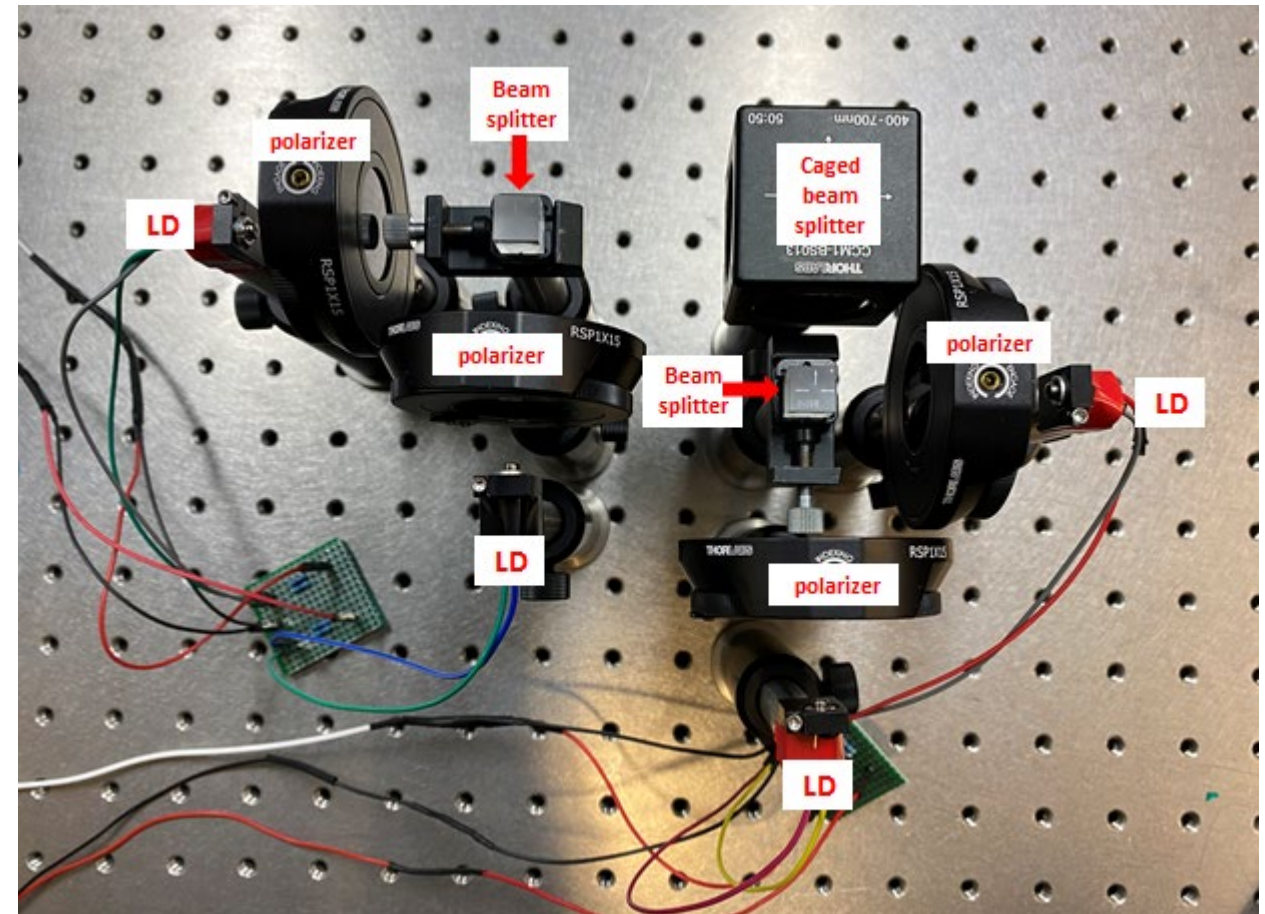
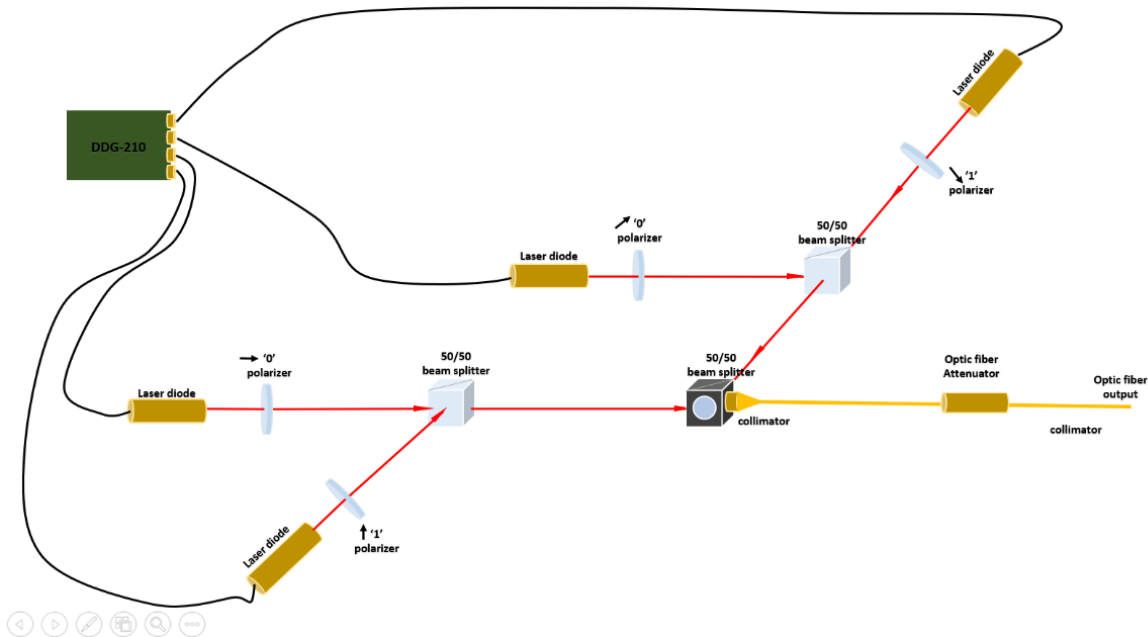
# *Study of the drone propagation channel for beyond 5G applications*



# *Millimeter wave electronics for beyond 5G applications*

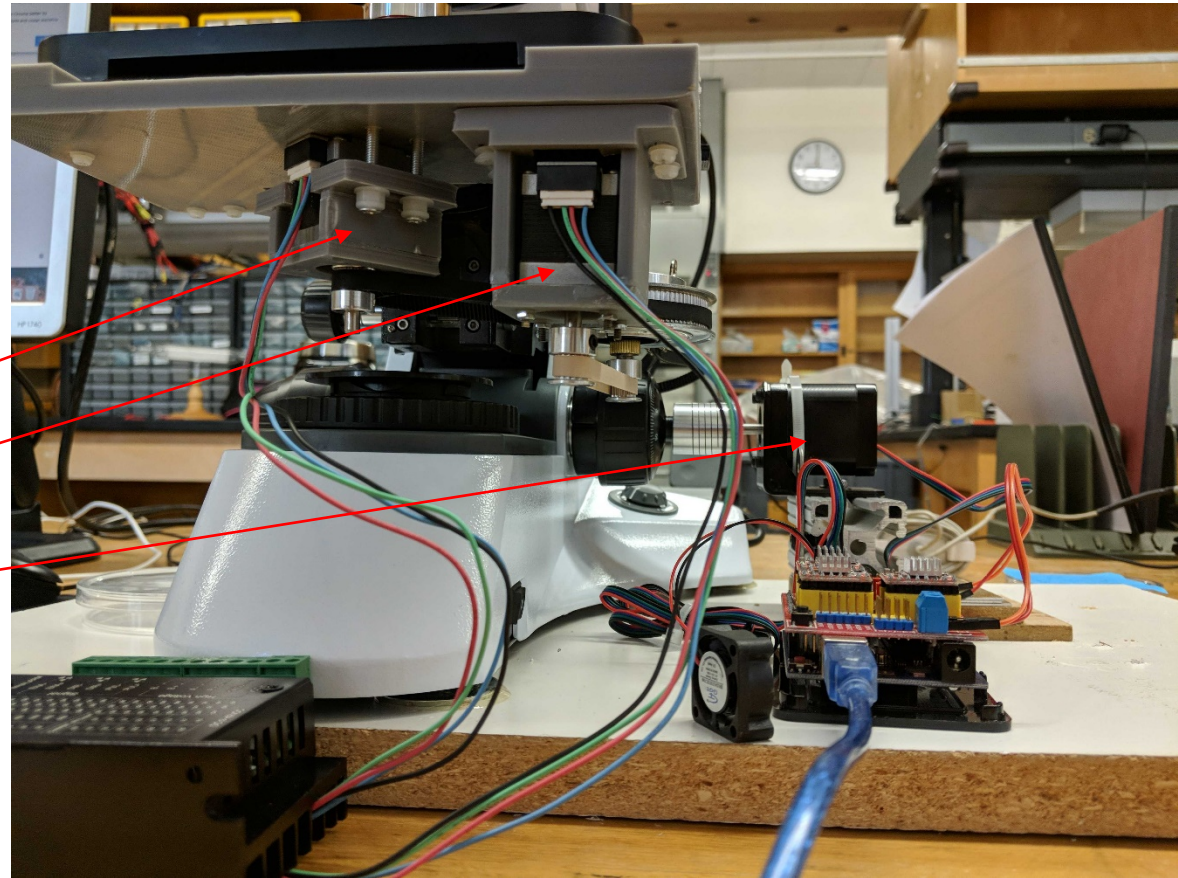


# Quantum communications (for cybersecurity applications)



*Microscope Automation and Control  
for Image Processing-based analysis of LIGO Mirrors (for  
Gravitational Waves detection)*

X, Y, Z



# *Experiment on Radiative Cooling (for applications to the detection of Gravitational Waves)*



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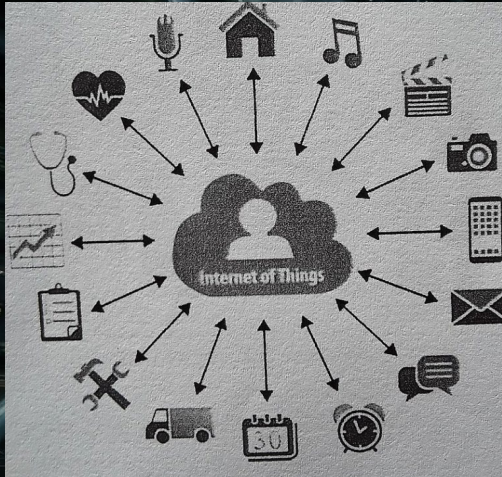
# Devices for the Internet of Things

Prof. Charles Liu

Prof. Airs Lin

Prof. Mo Zhang

# INTERNET OF THINGS



PICTURE FROM WIKIPEDIA

Medical and health care  
Transportation  
Building automation



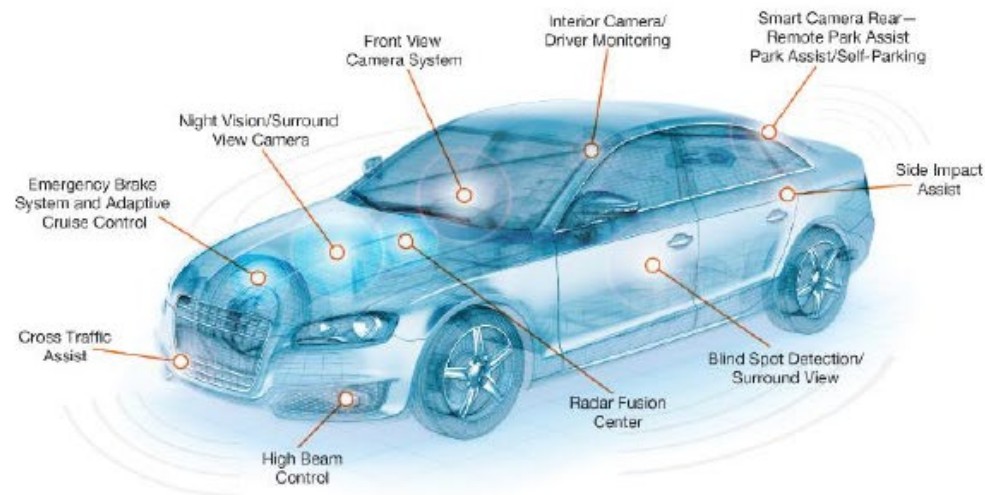
- Embedded programming
- Python, C languages
- Circuit design
- Communication, antenna
- 4G / 5G, Wi-Fi
- Signal processing
- Digital electronics
- Microcontrollers

# S32V Introduction

**REAL-WORLD  
APPLICATIONS**

**ADVANCED  
DRIVER'S  
ASSISTANCE  
SYSTEM**

**Safe, Secure & Reliable  
Single chip Solution  
ADAS  
Vision  
Data Fusion**



## Applications



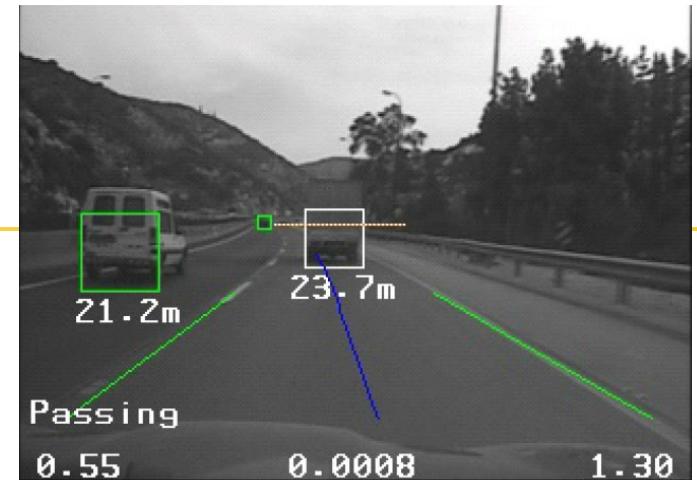
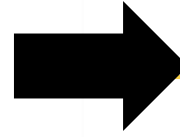
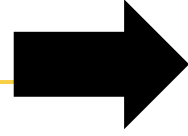
## ADAS application examples:

- ▶ *Autonomous Emergency Brake (AEB)*
- ▶ *Lane Departure Correction (LDC)*
- ▶ *Pedestrian Protection (PD)*
- ▶ *Sensor Fusion*

## NXP's S32V234:

- ✓ *Fully targeted at ISO26262 ASIL B*
- ✓ *Hardware security encryption (CSE)*
- ✓ *Designed for high performance vs power*
- ✓ *Manufactured for automotive reliability*





S32V Vision  
Processing Board

Outputs to display  
and/or video files

- Vision processing algorithm development support using MATLAB/Simulink's Computer Vision System Toolbox
- Other options can be used, but likely will not be actively supported by organizers/sponsors
- Examples available for:
  - Pedestrian detection
  - Lane detection
  - Sign detection
  - Vehicle identification



