Department of Electrical and Computer Engineering

MERGING LEARNING AND INNOVATION TO SERVE THE NEEDS OF THE STATE, THE NATION, AND THE GLOBAL COMMUNITY

UNIVERSITY OF MARYLAND 18 56

A. JAMES CLARK SCHOOL OF ENGINEERING

Overview

Educational Updates:

- BS in Embedded Systems and Internet of Things
- Academy of Machine Learning
- Professional MS in Machine Learning

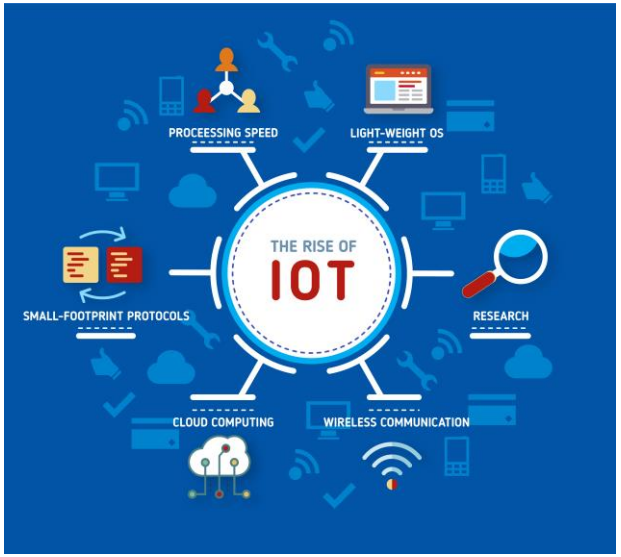
Faculty Hiring:

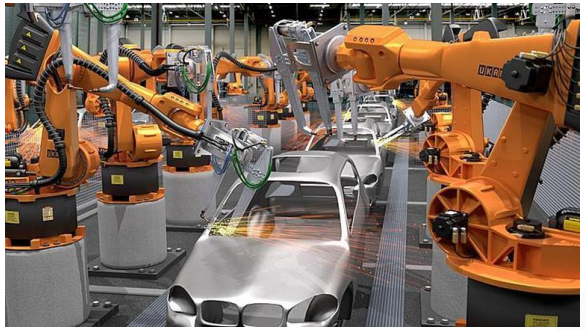
- Ron Walsworth (Harvard)
- Cheng Gong (Berkeley)

Answers to Board Questions

Challenges Facing the Department

Internet of Things (IoT)





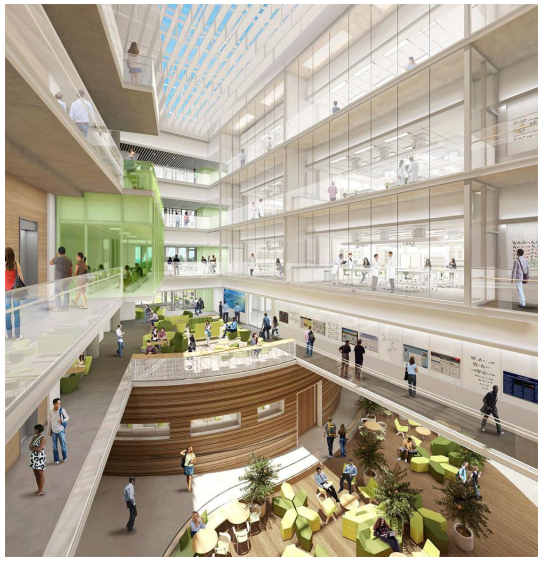
New Academic Major

- B.S. degree in Embedded Systems & IoT will address the high demand for IoT engineers
- The program will provide students with:
    - A solid foundation in key emerging technologies of IoT
    - The ability to integrate devices into complete IoT systems
    - An understanding of how IoT fits within the wider context of IT/Communication, including power, security and privacy issues
    - Intended to be the first Embedded System program in the U.S. at a top-tier institution

Program Structure

- Located at the Shady Grove campus
- Cohort style with fall-only admissions
- First cohort to be admitted in Fall 2020
- Transfer program
- Total degree requirements: 121 credits
    - 60 credits from transfer institution
    - 61 credits taken at Shady Grove
- Suited for students who have completed an associate's degree at a MD public community college.

Universities at Shady Grove



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SCHOOL OF ENGINEERING

Academy of Machine Learning Starting Fall 2019

Undergraduate concentration with transcript citation.

Main Requirements:

- Probability and Statistics
- Algorithms, Data Structures, and Programming
- Fundamental Machine Learning Algorithms
- *Capstone Design Course with team projects suggested by industrial partners*

Professional MS in Machine Learning

- Joint ECE and Computer Science Program to start Fall 2019.

- Degree Requirements:
  - 30 CREDITS TOTAL: 6 CORE COURSES, 4 ELECTIVES, SCHOLARLY PAPER

Overall MS Program

- Core courses:
  - MSML 601: Probability and Statistics
  - MSML 602: Introduction to Optimization
  - MSML 603: Computing Systems for ML
  - MSML 604: Algorithms and Data Structures for ML
  - MSML 605: Applied Machine Learning
  - MSML 606: Data Science
- Electives:
  - ENML 610: Advanced Machine Learning
  - ENML 612: Deep Learning
  - ENML 620: Estimation and Detection
  - ENML 621: Digital Signal Processing
  - ENML 630: Numerical Methods
  - ENML 640: Computer Vision
  - ENML 650: Cloud Computing
  - ENML 651: Big Data Analytics

Dr. Ronald Walsworth

Education

- 1991: Ph.D. in Physics, Harvard University
- 1984: B.S. in Physics, Duke University

Research Interests:

- **Quantum Sensing**
- **Precision astrophysical spectroscopy**
- **New optical and magnetic imaging tools for brain science**
- **Novel approaches to NMR and MRI**

http://walsworth.physics.harvard.edu/

Company Scientific Advisory Board

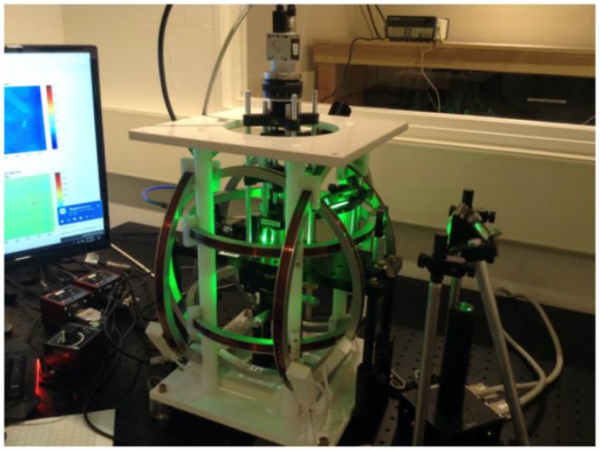
- 2014-present: 4-Catalyzer
- 2014-2017: Hyperfine Research, company co-founder
- 2013-2016: Quantum-SI 2012-present: Quantum Diamond Technology Inc. (QDTI), company co-founder
- 2011-2016: Butterfly Network

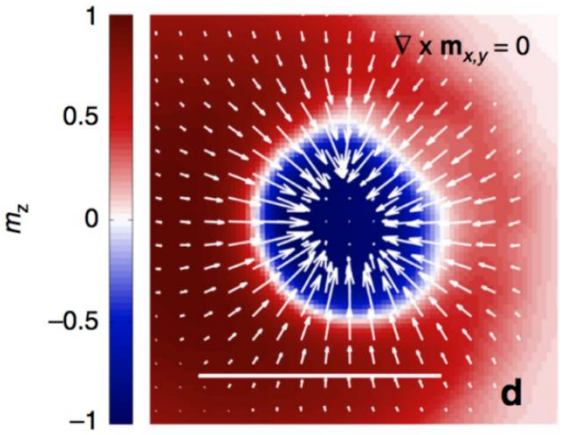
Total valuation of companies >$1.25 billion

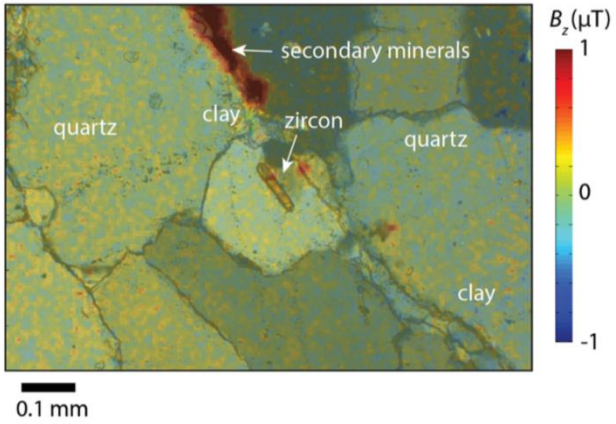
Publications

- ISI
  - 216 publications
  - Total citations > 11,000
  - H-index: 52
- Google scholar
  - H – index 61
  - Total citations: > 17,000
- Top 3 papers cited > 1000 times

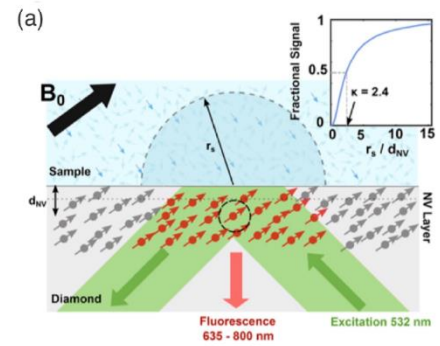
Quantum sensing with solid-state spin

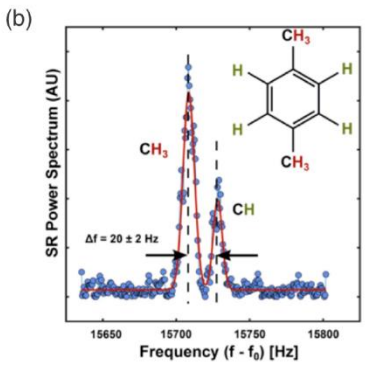


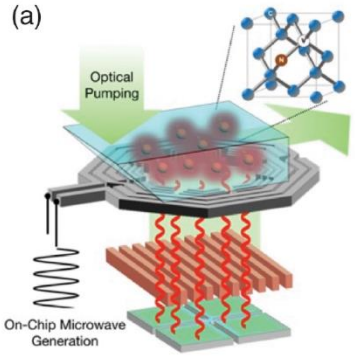


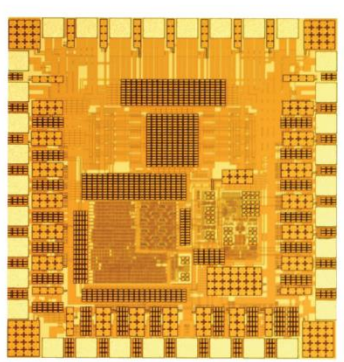


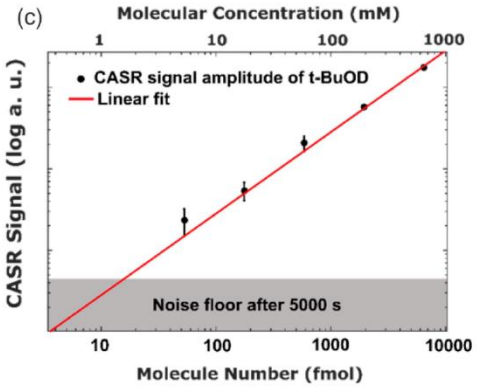
Chip Scale NMR

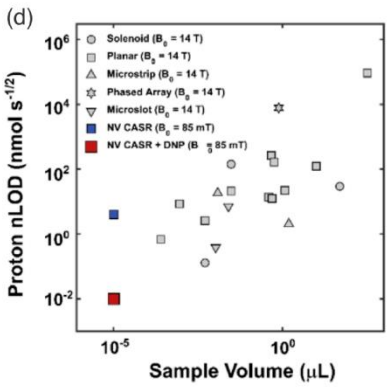


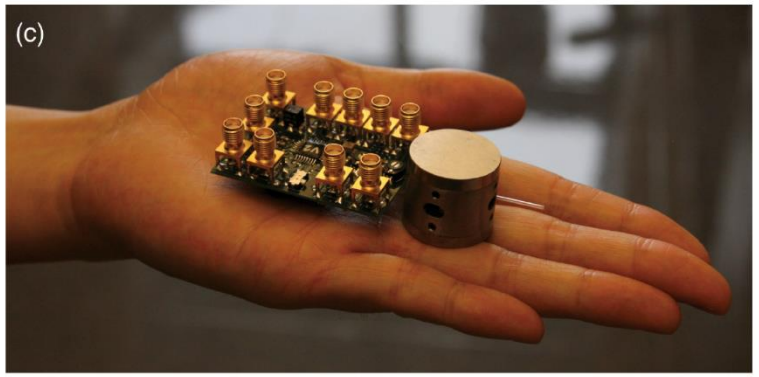












Funding

- 32 grants
  - 6 currently active
  - ARO, DOE, AFOSR, NASA, NSF, DARPA, …
- > $28M in total external awards

Advising

- Current group
  - 14 Postdocs, research scientists
  - 8 Graduate students
  - 2 Undergraduate students

- Over 30 graduate students Advised
- Over Forty postdocs advised

Cheng Gong

Education

2008 B.Sc. Huazhong University of Science and Technology, Electronics Engineering

2013 Ph.D. University of Texas, Dallas. Material Science
Advisor: Yves Chabal, Professor of Physics

Postdoctoral work

2014 - Postdoctoral Fellow, University of California, Berkeley
Faculty Advisor: Xiang Zhang

Atomically thin magnets

nature
International journal of science

Letter | Published: 26 April 2017

Discovery of intrinsic ferromagnetism in two-dimensional van der Waals crystals

Cheng Gong, Lin Li, Zhenglu Li, Huiwen Ji, Alex Stern, Yang Xia, Ting Cao, Wei Bao, Chenzhe Wang, Yuan Wang, Z. Q. Qiu, R. J. Cava, Steven G. Louie ✉, Jing Xia ✉ & Xiang Zhang ✉

Nature **546**, 265–269 (08 June 2017) | Download Citation ⬇

Cited >400 times since 2017!

Growth of quantum materials

nature electronics

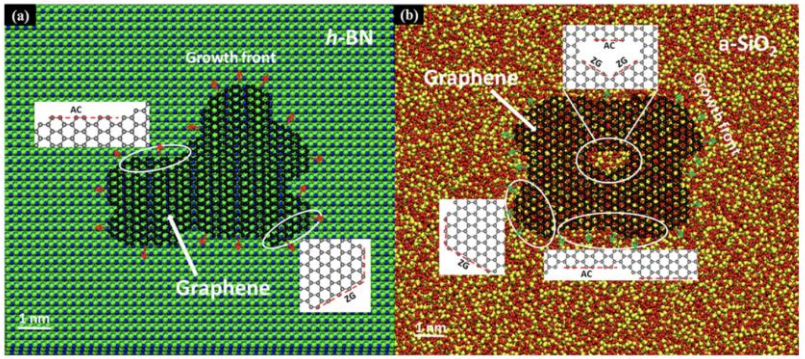
Article | Published: 13 July 2018

Single-crystalline layered metal-halide perovskite nanowires for ultrasensitive photodetectors

Jiangang Feng, Cheng Gong, Hanfei Gao, Wen Wen, Yanjun Gong, Xiangyu Jiang, Bo Zhang, Yuchen Wu ✉, Yishi Wu, Hongbing Fu ✉, Lei Jiang & Xiang Zhang ✉

Photon-Assisted CVD Growth of Graphene Using Metal Adatoms As Catalysts

Cheng Gong†, Luigi Colombo*‡, and Kyeongjae Cho*†
† Department of Materials Science and Engineering, The University of Texas at Dallas, Texas 75080, United States
‡ Texas Instruments Incorporated, Dallas, Texas 75243, United States



Publication record

32 publications

16 as 1st author or co-1st author

Top rated journals

1 in *Nature*

1 in *Nature Electronics*

Nature Communications, ACS Nano …

Citation numbers: > 2600 google

h-index: 18 by google

Updates based on Board Questions

Cybersecurity Updates:

- Adversarial machine learning in ENEE457 and 657
- More work on side channels in light of recent attacks on Intel CPUs using speculative execution
- Secure encrypted databases
- Post Quantum cryptography in ENEE456

Update on EV Formula Team

Team Milestones

Over the past year the inaugural Terps Racing EV team has successfully converted the Formula internal combustion (IC) 2017 chassis into our first prototype formula electric vehicle. This overhaul required the completion of the following tasks:

- The design and manufacturing of PCB's for power distribution (HV & LV systems), CAN control systems, and sensor interfacing for the car.
- Fabrication of various custom enclosures for PCB's and high voltage tractive system components including a HV enclosure for inverter circuitry and a separate battery accumulator container.
- The complete redesign of the IC powertrain packaging, so that we could accommodate an electric motor instead of combustion engine.

Goals to be Completed by Fall 2019

Over the summer more strides will be made to enhance next years electric vehicle through an internship program. During this time student interns will complete several research and design projects. These projects include:

- A battery cell study and selection. As well as the design of battery modules, a battery management system PCB and a custom enclosure for this design.
- The redesign of power distribution PCB’s so we can reduce the weight and overall size of our HV enclosure.
- The development of a CAN transceiver and integrated dashboard. Creating the in-house transceiver will allow us to reduce the size of our LV wiring harness, and the integrated dashboard will allow us to display vehicle diagnostics and driver feedback in real time.
- There will also be a total frame redesign to better suit the packaging and distribution of HV systems, and our electric motor.

Challenges/Opportunities

- Faculty and Research Balance:
  - 48 Full Professors, 8 Associate Professors, and 4 Assistant Professors!
- Attracting Students and Improving Diversity
  - Changing demographics and current trends
  - Improving diversity is a big challenge.
- Online and Remote Education
  - Scalable, Sustainable, Life Long Education?
- Serious Infrastructure Issues: Space and Staffing