

## Yiyan Li, PhD

Assistant Professor of Electrical and Computer Engineering

Fort Lewis College

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## Summary

- ❖ Active scholar (h-index of 11) whose research is focused on:
  - High-speed interfaces for electro-optics, mixed-signal, and analog integrated circuits.
  - Biomedical instrumentation prototyping. Past member of an NIH R01 (2016 - 2017) project, current senior personnel of an NSF project, and current student mentor of an NSF project.
  - Image processing and machine learning.
  - Delivery of circuit design education to off-campus students/engineers via the Internet.
- ❖ Mentor to:
  - Approximately 34 graduate and undergraduate students  
<http://yilelectronics.com/People.html>
  - Engineers locally, nationally, and internationally
- ❖ Extensive leadership experience including:
  - Chair, FLC Digital Design Competition
  - Chair, Student Association at Henan University of Science and Technology (3 years)
- ❖ Author of over 20 published research articles. More than 300 citations worldwide.
- ❖ Experienced integrated circuit designer and educator with significant industry experience.
- ❖ Outstanding educator, drawing significant interest in undergraduate integrated circuit design courses offered live and, on the internet.

## Education

- **PhD in Electrical Engineering (Major: Microelectronics, Minor: Computer Engineering)** from the University of Nevada, Las Vegas (April 2016).
- **MS in Biomedical Engineering (Major: Bioelectronics)** from Chongqing University, China (January 2012).
- **BS in Biomedical Engineering (Major: Bioelectronics)** from Henan University of Science and Technology, China (June 2009).

## Employment History

From: 2017      **Fort Lewis College**

To:      Present      Durango, CO

Position      *Assistant Professor of Electrical and Computer Engineering*

Teach Engineering Circuit I/II, Analog Electronics, Digital Electronics (Digital IC Design), Computer Logic, Python Programming, MATLAB Programming, Robotics, Microcontrollers, Embedded Systems, Junior/Senior Design, and Computer Architecture.

From: 2016      **University of California, Irvine.**

To:      2017      Irvine, CA

*Postdoc Fellow*

- Project I: The development of a portable and highly sensitive antibiotic resistant bacteria detection system.

Project II: The development of an ultra-fast droplet sorter for cell isolation.

From: 2016      **Velox Biosystems**

To:      2017      Irvine, CA

- *Project Scientist (part-time)*

From: 2012      **University of Nevada, Las Vegas**

To:      2016      Las Vegas, NV

*Teaching/Research Assistant*

Taught microelectronics, computer engineering fundamentals, signal and systems, communications, and digital integrated circuit design. Mentored student research projects in analog/digital integrated circuit design, computer logic basics, signals and systems, and the corresponding labs with CMOS integrated circuit fabrication, microcontrollers, AD/DA converters, FPGAs, circuit simulations, and system integration on PCBs. Industrial project experiences include interfacing sensors, actuators to the microcontroller and embedded systems. Familiar with I2C, SPI, RS232, and USB protocols.

### **Additional Details on University and Industry Employment:**

Areas of Interest: Integrated circuits and sensors, biomedical equipment, digital electronics, FPGAs, digital microfluidics, sequencing, biosensors and bioelectronics, electromagnetics computation, neural modulation, semiconductor fabrication, medical instrumentation prototyping.

2020, January – March (\$10,000)

Temperature Sensing, Displaying, Monitoring, and Analyzing for the Spring Resort and Spa in Pagosa Springs, CO. Project Scope:

- 24 nodes (temperature sensing, displaying, and data logging) for 24 pools.
- The third-party website shows 24 panels with 24 pools' temperature on them in real-time.
- The data analysis script pulls the data from the website and plot the temperature on the local drive (a desktop/laptop Windows computer in their office).

System Specs: Two ATmega 328p chips were used for the system. The Master 328 chip does temperature sensing and communicate with the ESP8266-01 module for sending data to ThingSpeak in real-time. The Slave 328p receives the temperature data from the Master through the embedded I2C protocol and scan four seven segment display units for temperature display. The entire system was sealed by an outdoor waterproof box to keep the vapors/moisture outside of the box to protect the circuits. A PyQt GUI is used for data plotting and downloading at the client end.

2016-Present

- Portable and highly sensitive antibiotic resistant bacteria detection.  
Using a 3D counting technology to pick up single bacteria from a raw blood sample. The system design integrates an electrowetting mixer (wirelessly controlled), a high throughput droplet generator (1000 nozzles on a single chip), and a highly sensitive 3D counting system.

2012-2015

- Design a high throughput digital microfluidic chip.  
Including digital microfluidic chip design and fabrication; system design for pico-amps level current sensing; capacitive sensing system and its GUI monitoring system. Wireless controller (WiFi to serial converter) ESP8266 is used for real-time experiment control.
- Design an ultrafast capacitive to digital converter for droplet sensing in digital microfluidics.  
Using GFUS SiGe 8HP (0.13  $\mu\text{m}$ ) technology to fabricate an ultrafast capacitive to digital converter for droplet sensing in digital microfluidics.
- Design a high precision DMF top plate height controller using a PZT actuator.  
Including mechatronic design, vibration control, PZT precise positioning, PZT deflection modeling, displacement sensing, 12-bit digital-to-analog converter (DAC) MCP4921, PIC24fJ96 16-bit MCU, and intelligent DMF control.
- Develop an on-chip integrated digital color-sensor based droplet PH value measurement system.  
Including DMF patterning, TCS34725 RGB sensor, MCU interfaces, PIC24fJ96 16-bit MCU, and serial communications.
- Investigation of the droplet motion under a beak-like non-parallel DMF device.  
Including PZT bimorph actuator positioning, Omron Z4M-W40 laser displacement sensor, amplifier design, feedback control, DAC MCP4921, PIC24fJ96 16-bit MCU, and mechatronics. This work also includes droplet contact angle measurement, c.a. hysteresis evaluation, surface engineering, and dynamic droplet trajectory tracking.

- Design a capacitance-to-digital sensor-based droplet composition measurement system. Use a 24-bit capacitive-to-digital converter (CDC) for droplet position monitoring in a DMF system. The system includes AD7745, Altera DE2 FPGA system, PCB design, and real-time monitoring by serial communications.
- Design an ultra-thin flat lens with metamaterials for wave front shaping. Electromagnetic numerical computation for a negative index nano-antenna array. The simulation is conducted by moment method, FDTD, and FEM.
- Investigation on behavioral and pathological effects of transcranial direct current stimulation in a rat model of Alzheimer's disease. Including design, layout, and fabricate the brain stimulator. Design feedback motor evoked potential monitoring system for the cortex excitability evaluation. Build neural disorder models of Alzheimer's disease. This study includes immunohistochemistry, H&E, silver staining experiments, and tissue engineering-related study.
- Design an electrowetting DMF chip on a CMOS ASIC chip. Use high voltage ON's C5 technology, design an electrowetting surface directly on the passivation layer of a CMOS chip. Use the top metal layer as the electrode. Use on-chip decoders to address the electrodes. Use Cadence, ElectricVLSI, LtSpice for circuit design, simulation, and chip layout.
- Design a continuous time  $K$ -Delta- $I$ -Sigma modulator for broadband analog-to-digital conversion. Design a time-interleaved oversampling delta-sigma modulator with ON's C5 technology. Use Cadence, ElectricVLSI, LtSpice for circuit design, simulation, and chip layout.
- Design a commercial software for Hunter-Schmidt Meta-Analysis. This tool is coded with VBA and multimedia Authorware for Meta-Analysis experiments. This work includes algorithm implementation, software development, and on-line promotion.
- Modeling the long-range ordered, broccoli-like SERS arrays for the detection of endocrine disrupting chemicals. FDTD modeling for broccoli-like gold particle SERS fields.

#### 2009-2012

- Investigated behavioral and pathological effects of transcranial direct current stimulation in a rat model of Parkinson's disease. Stimulator circuit design, voltage booster design, skull electrode design, and rat PD model design; rat behavioral experiments and tissue staining.
- Design an ultra-low power sleep monitoring device. Use low-power MCU TI MSP430 to monitor and analyze the pulse wave for sleep quality evaluation.
- Design a portable ECG defibrillation overload recovery testing instrument. Develop a C8051 controlled, LabView interfaced ECG electrode testing equipment.

#### 2008-2009

- Undergraduate research on a low cost and high resolution intelligent on-line ECG system. PCB fabrication with in-house drills and copper boards; Circuit design and simulation using Altium PCB designer; ECG monitoring using National Instruments AD converters

and LabView based online GUI.

## **Teaching Experience**

### **Courses Taught at Fort Lewis College:**

CE 433, Embedded Devices

CE 496, Computer Engineering Senior Design

CE 432, Robotics II

CE 351, Microcontrollers

CE 315, Computer Engineering Design Practice (Junior Design)

CE 341, Fundamentals of Computer Logic

ENGR 201, Electric Networks I (Circuit I)

ENGR 201L, Electric Networks I Labs

TRIO Program, Computer Programming and Embedded Systems

ENGR 338, Digital Electronics

ENGR 338L, Digital Electronics Laboratory

CE 232, Programming with Python

ENGR 104, Engineering Fundamentals II (data analysis/MATLAB)

ENGR 337, Analog Electronics

ENGR 337L, Analog Electronics Labs

### **Courses Taught at University of Nevada, Las Vegas (TA):**

EE 221, Circuits II

EE 420L, Engineering Electronics II Lab

EE 421, Digital Integrated Circuit Design

EE 421L, Digital Integrated Circuit Design Laboratory

EE 420, Engineering Electronics II and Analog Integrated Circuit Design

EE 460L, Communications

CPE 200L, Computer Logic Design Lab II

EE 320, Engineering Electronics I,

CPE 200L-S2, Computer Logic Design Lab II

CPE 100L-S2, Computer Logic Design Lab

CPE 100-S1, Computer Logic Design

EE 360, Signal and Systems

## Student Advising

- **2019 – 2020**, EPA P3 (refer to the Research Grant section), 2 Computer Engineering students.
- **2019 – 2021**, NSF REU (refer to the Research Grant section), 1 Engineering student and 1 Computer Engineering student.
- **2019 – 2021**, NSF PREM (refer to the Research Grant section), 1 Engineering student and co-advised 5 Engineering students on the team.
- **2019 – 2020**, FLC senior seminar, co-advised 6 Engineering students.
- **2019 Summer**, Department of Education, TRIO, 1 computer engineering student.
- **2017 – 2020**, NIH MARC, 1 Biochemistry student.
- **2017 – 2018**, FLC senior seminar, co-advised 3 Engineering students.
- **2017 – 2019**, FLC 1<sup>st</sup> Digital Design Contest, 1 Engineering student and 1 Computer Engineering student.
- **2015 – 2017**, 3 MS students at Chongqing University, 2 Undergraduates at Henan University of Science and Technology, 14 Undergraduates at UC-Irvine, and 2 Undergraduates at UNLV.

## Research Grants

Pending:

2020, Sep – Dec, NSF MRI (\$160,000)

2020, Aug – Dec, FLC First Year Launch (\$1,000)

2020, Feb – June, FLC TIPA (\$2,000)

2020 – 2021, Reed Library Open Educational Resources (OER) at FLC (\$9,000)

Awarded:

- 2020, Jan – May, **Co-PI**, GY6 BLaST Equipment Purchase Proposal (\$23,999.5).  
*Title: Acquisition of a Raman Spectrometer for Biological Sample Characterization.*
- 2020, Feb – Jun, **PI**, FLC TS/R (traditional research/scholarship) Foundation (EPA P3 Expo travel fund, \$1,640).
- 2019 – 2021, **PI**, NSF REU (NSF: 1757953, \$388,486).  
*Title: REU Site: Enriching the Undergraduate Research Experience for Native American Students.*
- 2019, Dec, **PI**, FLC Mellon Faculty Development Funds (\$1,000).
- 2019-2020, **PI**, EPA (United States Environmental Protection Agency) P3 (SU83988001, \$24,864).  
*Title: A Field-Deployable Droplet Digital PCR System for the Rapid Detection of Waterborne Bacterial Pathogens.*
- 2019-2025, **Senior Personnel**, NSF PREM for functional nanomaterials (NSF: 1827847, \$1,230,000).  
*Title: The Partnership in Research and Education for Materials (PREM) project for Functional Nanomaterials*
- 2016-2021, **Senior Personnel**, NSF, Science and Technology Center on Real-Time

- Functional Imaging (STROBE) (NSF: 1548924, \$16,386,868)
- 2019 – 2020, **PI**, FLC TS/R (traditional research/scholarship) Foundation (\$2,000).
- 2017-2018, **PI**, FLC Teaching Empowerment Project (\$1,500).  
*Title: Application-oriented topics in math courses for computer engineering/science students in the early college semesters.*
- 2018, Feb – Jun, **PI**, FLC TS/R (traditional research/scholarship) Foundation (\$1800).  
*Title: Mapping the Airborne Radiation Profile of a Large Area Using an Embedded-System-Based Smart Unmanned Aerial Vehicle (UAV).*
- 2017-2018, Dec – Jun, **PI**, FLC Foundation (\$1800).  
*Title: Fort Lewis College Annual Digital Electronics and Computer Engineering Design Competition.*
- 2017-2018, **PI**, Research/development grants from Amberstone Biosciences, LLC (\$2000).  
*Title: Development of Optical Detectors for Immune Cell Detecting and Sorting.*
- 2016-2018, drafted the proposal, NSF CBET (collaborated with Cornell), an intelligent on-chip electrowetting based microbial fuel cells (\$469,988).  
*Title: Collaborative Research: Microbial Fuel Cell Optimization through Digital Microfluidic Electrochemistry in Single-Bacterial Drops.*
- 2016-2017, **PI**, UNLV FOA research fund (\$29,991).  
*Title: Microbial Fuel Cell Optimization through Digital Microfluidic Electrochemistry in Single-Bacterium Drops.*
- 2016-2017, group leader and postdoc fellow, NIH R01, at the Zhao Lab at UC-Irvine (\$5,000,000).
- 2016, **PI**, GPSA Graduate research fund (\$1,000).
- 2016, **PI**, Howard R. Hughes College of Engineering research fund (\$990).
- 2015, **PI**, GPSA Graduate research fund (\$1,250).
- 2013, **PI**, NSF EPSCoR fellowship (\$30,000).
- 2011, **PI**, Chongqing University research fellowship (\$5,000).

Submitted and not Awarded:

- 9/1/2018 – 8/31/2019 (NSF, Requested: \$910,981)  
MRI: Acquisition of A Versatile Nano-Fabrication and Characterization Platform for The Development of The Next Generation Microelectromechanical Systems (MEMS).
- 9/2/2019 – 8/31/2020 (NSF, Requested: \$453,401)  
MRI: Acquisition of a Thin Film Deposition System and a Mask Aligner for the Development of the Next Generation Biological Microelectromechanical Systems and Functional Nanomaterials.
- 9/1/2016 – 8/31/2019 (Requested: \$210,000)  
Cornell Atkinson's Sustainability Postdoc Fellowship:  
*Microbial Fuel Cell Optimization through Digital Microfluidic Electrochemistry in Single-Bacterial Drops.*

## Review Activities

- IEEE Transactions on Circuits and Systems II (3 times)
- Sensors and Actuators A: Physical
- IEEE Solid-State Circuits Magazine
- Biosensors (3 times)
- Micromachines (Serving on the Editorial Board and reviewed 7 articles)
- Sensors
- Materials (twice)
- Applied Science (twice)
- Analyst
- Energies (twice)
- Batteries
- Brain, Behavior, and Immunity
- IEEE COMCAS 2017
- IEEE Texas Symposium on Wireless and Microwave Circuits and Systems
- IEEE DCAS 2016
- IEEE EMBC 2011
- IEEE MWSCAS 2014

## Professional Services

### ❖ Service to the college:

- Department website updates. (11/1/2019)
- NICA State Championship, served at the FLC booth. (10/20/2019).
- FLC Electrical Engineering faculty search committee (2019 – present).
- FLC Computer Engineering faculty search committee (2019 – present).
- FLC Teaching and Learning Committee (2018 – 2019 school year).
- FLC Math Department Algebra Prep Course STEM Path interview faculty member (2018).
- FLC Computer Engineering faculty search committee (2017-2018).
- 1<sup>st</sup> FLC Digital Design Contest, Chair, 2018.
- FLC 2017-2018 Teaching Empowerment Project PI.

### ❖ Service to the community:

- 2018 – Present, On the Advisory Board of Computer Science Education in Durango.
- 11/12/2019, Computer Science demonstration to 52 middle school students from St. Columba Middle School.

- 11/5/2019 Invited talk on Computer Engineering / Computer Systems at Durango High School (at Tara Haller's computer science class).
- Summer of 2019, student mentor to 40 high school students in the TRIO program (supported by the Department of Education).
- 3/14/2019 Meeting at Durango High School to 'Help Shape Durango's Future'.
- 1/30/2019 Durango High School Computer Science Career & Technical Education Advisory Council.

❖ **Service to the professional society:**

- Editorial Board member for the journal of *Micromachines* (2019 – present).
- IEEE COMCAS 2019 (6th International IEEE Conference on Microwaves, Communications, Antennas and Electronic Systems, Tel-Aviv, Israel, 4-6 November 2019).
- The 13th IEEE Dallas Circuits and Systems Conference 2018.
- The GRS-AHI'18, Hong Kong, June 2018, Steering Committee.
- IEEE COMCAS 2017 (6th International IEEE Conference on Microwaves, Communications, Antennas and Electronic Systems, Tel-Aviv, Israel, 13-15 November 2017).
- Texas Symposium on Wireless and Microwave Circuits and Systems, Waco, Texas, 30-31 March 2017.

## **Publications**

### **Submitted Articles**

J. Ferguson, J. Duran, W. Killinen, J. Wagner, C. Kulesza, C. Chatterley, and **Y. Li\***. Rapid detection of e. coli using a field-deployable and low-cost pcr (flc-pcr) thermocycler. *IEEE EMBC (42nd Annual International Conferences of the IEEE Engineering in Medicine and Biology Society in conjunction with the 43rd Annual Conference of the Canadian Medical and Biological Engineering Society)*, (2020).

### **Published Journal/Conference Articles**

**Y. Li**, H. Cherukury, J. Zimak, J. Harrison, E. Peterson, and W. Zhao. Enumeration of Ampicillin-Resistant E. coli in Blood Using Droplet Microfluidics and High-Speed Image Processing. *IEEE ISBI 2020 International Symposium on Biomedical Imaging*, (2020).

T. Abram,\* H. Cherukury, C. Ou, T. Vu, M. Toledano, **Y. Li**, J. Grunwald, M. Toosky, D. Tifrea,

- A. Slepentin, J. Chong, L. Kong, D. Vanessa Del Pozo, K. La, L. Labanieh, J. Zimak, B. Shen, S. Huang, E. Gratton, E. Peterson, and W. Zhao\*. Rapid bacterial detection and antibiotic susceptibility testing in whole blood using one-step, high throughput blood digital PCR. *Lab Chip*. (2020).
- Y. Li**, X. Yang, and W. Zhao. Emerging microtechnologies and automated systems for rapid bacterial identification and antibiotic susceptibility testing. *SLAS Technology*. 22 (2017) 585-608. **(Cover)**
- Y. Li** and R. Jacob Baker. Improving the performance of electrowetting on dielectric microfluidics using piezoelectric top plate control. *Sensors and Actuators B*. 229 (2016) 63-74.
- Y. Li**, H. Li and R. Jacob Baker. A low-cost and high-resolution droplet position detector for an intelligent electrowetting on dielectric device. *Journal of Laboratory Automation*. 20 (2015) 663-669.
- Y. Li** and R. Jacob Baker. Precise EWOD top plate positioning using inverse Preisach model based hysteresis compensation. *IEEE Dallas Circuits and Systems*. (2015).
- Y. Li** and R. Jacob Baker. A highly efficient and reliable electrowetting on dielectric device for point-of-care diagnostics. *IEEE Dallas Circuits and Systems*. (2015).
- Y. Li** and R. Jacob Baker. Computer vision assisted measurement of the displacements of a bimorph piezoelectric cantilever beam. *IEEE Biomedical Circuits and Systems*. (2015).
- Y. Li**, R. Chen and R. J. Baker. A fast fabricating electro-wetting platform to implement large droplet manipulation. *IEEE International Midwest Symposium on Circuits and Systems*. (2014) 326-329.
- Y. Li**, H. Li and R. J. Baker. Volume and concentration identification by using an electrowetting on dielectric device. *IEEE Dallas Circuits and Systems*. (2014).
- Y. Li**, X. Tian, L. Qian, X. Yu and W. Jiang. Anodal transcranial direct current stimulation relieves the unilateral bias of a rat model of Parkinson's disease. *IEEE Engineering in Medicine and Biology Society*. (2011) 765-768.
- K. Huang, **Y. Li**, X. Tian, D. Zeng, X. Gao. Design and analyses of an ultra-thin flat lens for wave front shaping in the visible. *Physics Letters A*. 379 (2015) 3008-3012.
- X. Yu, **Y. Li**, H. Wen, Y. Zhang, X. Tian. Intensity-dependent effects of repetitive anodal transcranial direct current stimulation on learning and memory in a rat model of Alzheimer's disease. *Neurobiology of Learning and Memory*. 123 (2015) 168-178.
- T. Wang, Z. Zhang, **Y. Li**, G. Xie. Amplified electrochemical detection of mecA gene in methicillin-resistant *Staphylococcus aureus* based on target recycling amplification and isothermal strand-displacement polymerization reaction. *Sensors and Actuators B: Chemical*. 221 (2015) 148-154.
- J. Chen, G. Qin, W. Shen, **Y. Li** and B. Das. Fabrication of long-range ordered, broccoli-like SERS arrays and application in detecting endocrine disrupting chemicals. *Journal of Materials Chemistry C*. 3 (2015) 1309-1318.

- J. Chen, W. Shen, B. Das, **Y. Li** and G. Qin. Fabrication of tunable au SERS nanostructures by a versatile technique and application in detecting sodium cyclamate. *Rsc Advances*. 4 (2014) 22660-22668.
- X. Jing, X. Cao, L. Wang, T. Lan, **Y. Li** and G. Xie. DNA-AuNPs based signal amplification for highly sensitive detection of DNA methylation, methyltransferase activity and inhibitor screening. *Biosensors and Bioelectronics*. 58 (2014) 40-47.
- C. Ma, M. Liang, L. Wang, H. Xiang, Y. Jiang, **Y. Li** and G. Xie. MultisHRP-DNA-coated CMWNTs as signal labels for an ultrasensitive hepatitis C virus core antigen electrochemical immunosensor. *Biosensors and Bioelectronics*. 47 (2013) 467-474.
- J. Li, X. Tian and **Y. Li**. Design of temperature control system for burn-avoiding infrared physiotherapy apparatus based on fuzzy PID. *Transducer and Microsystem Technologies*. 1 (2012) 120-123.
- L. Luo, X. Tian, P. Zhang and **Y. Li**. Defibrillation overload recovery performance test system for ECG electrode. *Chinese Journal of Scientific Instrument*. 32 (2011) 1981-1986.
- L. Li, X. Tian and **Y. Li**. Amplitude and phase measurement circuit design used on neuromuscular disease assessment system. *Application of Electronic Technique*. 37 (2011) 1-8.
- J. Zhang, X. Tian and **Y. Li**. Design on MSP430-based portable sleep monitoring instrument. *Transducer and Microsystem Technologies*. 30 (2011) 118-121.