Jiaxu Meng

jessie.mong@alumni.duke.edu https://yessyem.github.io
https://www.linkedin.com/in/jiaxu-meng-46a40a170/ +86 13764668608 +1 (213)492-4296

Education Background

MSc. Biomedical Engineering, Duke University (2018-2020)

Courses: bioelectronics, signal processing, bioelectricity, quantitative physiology, medical physics, biomedical statistics and data science, neuroengineering

BEng. Electrical Engineering *(First Class Honors)*, **University of Liverpool** (2014-2018)

BEng. Electrical Engineering *(First Class Honors),* **Xi'an Jiaotong – Liverpool University** (2014-2018)

Courses: electrical and electronics circuits, microprocessor, C/C++, signal and system, analog and digital communications, instrumentation and control system, integrated circuit design, electromagnetics and electromechanics, optimization

Job History

Scientist – Biophysics/Applied Physics, *Research,* **Philips** (2021-present)

Responsibilities: research and innovation on medical devices; patenting; prototyping; algorithm development; signal processing; computational modeling; clinical protocol designs; risk management; FMEA; product owner

R&D Engineer – Electronics/Biomedical, *Cardiac Rhythm Management,* **MicroPort** (2020-2021)

Responsibilities: leadless cardiac pacemaker R&D; wireless communication system design; computational modeling and simulation; sensing, pacing and demodulation circuit design; technical specialization for medical implants; in vitro/in vivo experiment; validation and verification; project management

Research Assistant (RA), *Electrophysiology Lab,* Duke University (2019-2020)

Research Assistant (RA), *3D Bio-printing Lab,* National University of Singapore (2017-2018)

Teaching Assistant (TA), *BME790L Advanced Signal Processing and Applied Math,* Duke University (2018)

Patents and Articles

1. Kelly, D., **Meng, J.** (2023). IPL hair depilator with electrically controllable window size. *2023P00253WO.*
2. **Meng, J.** (2022). A design to stabilize movable light bead intensity using dynamic balance for LLLT hair booster. Patent owned by *Koninklijke Philips N.V.*
3. Kong, T., **Meng, J.** (2021). Algorithms development for Philips smart mask. Restricted by *Philips Research.*
4. **Meng, J.** (2022). IPL with skin benefits. Restricted by *Philips Research.*

Research Projects

Electrophysiology/neuroscience

Project 1: Design of leadless cardiac pacemaker with size and power optimized implant and its communication system (2020-2021)

- Designed a prototype of a power- and size-optimized leadless cardiac pacemaker consisting of sensors, a current injector, a telemetry module for external programming, and an integrated battery unit.
- Established wireless intra-body communication (IBC) telemetry method between intra-cardiac implant and outside interface (programmer).
- Characterized transthoracic channel attenuation considering dielectric properties of human biological tissue, geometry network, and electromagnetic propagation based on computational electromagnetic modeling and equivalent circuit approximation simulation using COMSOL Multiphysics.
- Implemented in vitro experiment, animal trial and proposed communication system requirement and transceiver protocol.

Project 2: 2-Channel, low-power, wireless EEG system PCB design (2020)

- Designed, built, and tested a 2-channel low-power wireless scalp EEG system with analog front end and ADC by Altium Designer PCB design and demonstrated on P300 speller brain computer interface.
- Fabricated and tested an on-board design to achieve signal acquisition and amplification (4000x) among 0.1-50Hz with satisfactory CMRR, low power consumption, leakage current, input impedance, input-referred noise, and distortion.

Project 3: ADS1298 & PIC microcontroller development for ECG monitoring and pacing system (2019-2020)

- Developed an implantable ECG monitoring and pacing system based on ADS1298 (in C on MPLAB IDE).
- Designed electronic circuits involving ADS1298 & PIC chips in terms of cascade configuration and set up SPI between ADS1298 & PIC chips by implementing functions in MSSP control register modules of MCU.
- Programmed and configured DDD pacemaker (chambers sensing & pacing in terms of triggering/inhibiting) in C.

Project 4: 2D myocardial model and its application in simulating arrhythmias (2019)

- Developed a 2D cardiac muscle model based on Luo-Rudy model elucidating cardiac electrophysiology processes, featuring junctional resistance for anisotropy and membrane capacitance for transient response of intracellular, extracellular, and transmembrane stimulation based on C++.
- Investigated strength-interval curve to describe how defibrillation shock interacts with cardiac tissue in terminating fibrillation in terms of evaluating refractory tissue response to the defibrillation shock.

Project 5: Signal and imaging processing for communication modulation, ECG signal filtering and medical image reconstruction using MATLAB (2018)

- Configured Simulink block diagram to demonstrate AM, DSBSC, FM modulation with different modulation index.
- Identified noise of raw ECG signals based on Fourier Transform in frequency domain visualization and removed the noises by implementing filters without Gibbs ringing.
- Reconstructed chest CT and radiograph contaminated by noises based on spectrums under 2D Fourier Transform.

Project 6: Lead polarization measurement equipment circuitry design (2021)

- Designed an instrumentation to measure lead polarization at pacing delivery to distinguish polarization from evoke response of successful capture.

Biophysics/applied physics

Project 1: Medical beauty (aesthetic dermatology) new value stream – smart connected device (2021-2022)

- Researched on androgenetic alopecia (AGA) mechanism and developed a hair boosting device using low-level laser therapy (LLLT) in virtue of the advantage by my first-author invention on moveable light bead design with even illumination.
- Researched on dermatology and hair growth signaling pathways and added a feature of an on-device spectrophotometer to detect latent melasma on intense pulsed light (IPL) device.
- Performed LED-based photo-acoustics clinical evaluation and photodynamic therapy (PDT) monitoring of port-wine stain disease.
- Invented a virtual tactile sensation system to sync ultrasound transducers to make the scalp feel tactility.

Project 2: Algorithms development for Philips smart mask (2021)

- Identified three directions to deliver respiratory care using Philips active mask platform, including smart mask for sports (rhythmic breathing), diseases identification by respiratory sound recognition (respiratory sound as an approach to indicate diseases such as asthma and COPD) and body temperature detection (integrate artery temperature sensor to achieve body temperature monitoring as a supplement of vital signs) on mask.
- Developed a series of algorithms including respiratory rate, volume, inspiration:expiration ratio, inhaled CO_2

concentration, PM2.5 reduction etc., with some executed from firmware level (such as respiratory rate calculation, auto adaption etc.) and others on app (such as PM2.5 reduction, data analysis etc.).

Project 3: EHD jet printing of PCL scaffolds for 3D cell culture and tissue engineering (2017-2018)

- Achieved servo open-loop and closed-loop control of electrohydrodynamic jetting system precision stage.
- Investigated PCL solutions with diverse viscoelasticity as fabrication material and the relationship between fabrication process factors vs fiber characteristics in scaffolds morphologies.

Health data science

Project 1: Predicting mortality in diabetic ICU patients using machine learning (2020)

- Installed and extracted MIMIC-III in local Postgres database, using SQL to transform data to DCSI, Elixhauser, and CCS index by aggregating them in tabular formats in terms of assigning scores based on ICD-9-CM diagnosis code.
- Predicted and examined mortality risk on ICU patients with the influence of diabetes using predictive modeling approaches including Random Forest, Logistic Regression, and their optimization, regardless of whether HbA1c record is absent.
- Generated receiver operating characteristic (ROC) curves of the models and demonstrated their agreement with Charlson Comorbidity Index (CCI), Elixhauser Comorbidity Index, and Diabetes Complications Severity Index (DCSI).
- Estimated which coefficients have the largest impact on the models.

Electrical engineering

Project 1: MIPS-Lite single-cycle processor with Verilog (2017)

- Simulated the program to show waveforms for the PC, opcode, ALUResultOut, DreadData and relevant registers.
- Modified the design of processor in Verilog code for implementing Jump instruction, for simulating the operation of BEQ instruction, and for altering data bus width.
- Designed and implemented a digital clock based on Verilog HDL on DE1 board with the function of 4-digit minute and second display, time setting, and a stopwatch with 4-digit second and tenth of a second display.

Project 2: Characteristics test of DC choppers and PWM control drive circuit using MPE-19 and MPE-01 (2017)

- Conducted PWM control and drive circuit test using MPE-01 Power Control Panel and a dual-channel oscilloscope to observe waveforms, measure phase difference and minimum dead band time between two signals from PWM modulator SG3525 while adjusting pulse width regulator potentiometer.
- Conducted DC Chopper test using MPE-19 to plot and compare curves of Ui/Uo as a function of duty cycle for Buck, Boost, Boost-Buck, Cuk, Sepic, and Zeta choppers.
- Modified LED and bar display directions of ARM7 evaluation board on Keil uVision3 under simulator debug mode.

Project 3: Home surveillance system based on Raspberry Pi (2016)

- Configured and upgraded an operation system based on Raspberry-Pi with a camera unit connected.
- Applied face-detection algorithm derived from OpenCV (open-source computer vision library) to the home surveillance system owning the function of face tracking and motion detection.

Standardized Test

GRE: verbal: 152 (54th percentile), quantitative: 170 (96th percentile), AW: 3.5

Skills

Expertise: active implantable medical devices (AIMDs), wearables, electrophysiology

Professional skills: electronics, prototyping, algorithm development, signal processing, computational modeling

Programming and software skills: Altium Designer, LTSpice, Matlab, Arduino, C/C++, Python, Git, COMSOL