# Mingkai Zheng

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## EDUCATION BACKGROUND

**Cornell University** 08/2021 – Present
MEng in Electrical and Computer Engineering
**University of Liverpool (UoL) & Xi'an Jiaotong-Liverpool University (XJTLU)** 09/2016 – 07/2020
BEng in Electrical Engineering | Overall GPA: 3.94 / 4.0 GRE: 323 + 4.0 IELTS: 7.0

## PUBLICATION & PATENT

- **M. Zheng**, H. Wen, Q. Bu, and H. Shi, "Dynamic Response Improvement for DAB Converter with Constant Power Load under Extended-Phase-Shift Control Based on Trajectory Control," IPEMC2020-ECCE Asia
- Q. Bu, H. Wen, H. Shi, and **M. Zheng**, "Constant Power Load Stabilization Based on Trajectory Control in Dual-Active-Bridge DC-DC Converter," IPEMC2020-ECCE Asia
- **M. Zheng,** H. Wen, H. Shi, Y. Hu, Y. Yang and Y. Wang, "Open-Circuit Fault Diagnosis of Dual Active Bridge DC-DC Converter With Extended-Phase-Shift Control," in *IEEE Access*, vol. 7, pp. 23752-23765
- D. Zheng, W. Wu, S. Wang, H. Yang, K. Xie, C. Wang, Y. Liu, G. Zheng, S. Wu, **M. Zheng**, J. Wu, *Boiler System of Condensing Thermal Power Generator Unit*. Patent: CN203703941U, 2014. 07. 09

## AWARDS AND HONORS

- Best Final Year Project Poster Award, The Institution of Engineering and Technology 2019
- China National Scholarship 2019
- Provincial Outstanding Student of Jiangsu Prov., China 2019
- Outstanding Students Award, XJTLU (Top 1%) 2017 & 2018 & 2019
- Academic Excellence Award, XJTLU (Top 1, department-wide) 2018 & 2019
- National Academic Encouragement Award (Top 1%) 2018
- Academic Achievement Award, XJTLU (Top 10, department-wide) 2017
- Outstanding Award, Lego Design Competition, XJTLU 2016

## RESEARCH AND PROJECT EXPERIENCES

**Improvement on xv6 operating system**
**6.s081: Operating System Engineering, lab assignments, MIT** 05/2021 – 7/2021
Self-studied the introductory level operating system course provided by MIT online and finished most of the lab assignments in C language, which includes implementing new system-calls, improving the speed of fork function by using lazy allocation and copy-on-write scheme, and writing multithreading code from scratch.

**Bear Map application based on A* shortest path algorithm**
**CS61B: Data Structure and Algorithms course project, UC Berkeley** 08/2020 – 11/2020

- Coded the A* shortest path algorithm for graphs by using Java and implemented bear maps with the front-end code provided by the lecturer. This bear map application has following features: highlight the shortest path between two selected positions on the map, autocomplete the string in the search box with locations that match, and label the locations that user is searching for.

**Deep Learning & Traditional Machine Learning algorithms**
**Deep learning and Machine Learning course projects, Coursera** 08/2020 – 10/2020

- Systematically studies the basic deep neural network knowledge and built a sign language decipher, and implemented fundamental machine learning algorithms by using MATLAB, including 1) linear regression for house price prediction, 2)logistic regression algorithm for separating points in different colors, 3) standard neural network with logistic regression algorithm for recognizing one-digit numbers, 4)support vector machine for spam classification and data separation, 5) K-means algorithm for clustering and image compression, 6) anomaly detection algorithm, and 7) recommender system for recommending movies based on a dataset of ratings

**Boundary Control for DAB Converter Feeding Constant Power Load**
**Undergraduate Researcher, Final Year Project, XJTLU** 08/2019 – 06/2020

- Using a nonlinear control method called boundary control to improve system stability and dynamic performance of dual-active-bridge (DAB) dc-dc converter feeding constant power load
- Finished the simulation (MATLAB Simulink) on using boundary control method for DAB converter under both single-phase-shift (SPS) control and extended-phase-shift (EPS) control
- Implemented DAB converter with PI controller as a comparison to reflect the advantages of using boundary control
- Finished a first-author paper and a fourth-author paper and submitted to IPEMC2020-ECCE Asia

**Design of a Multifunctional Digital Watch**
**Individual, Digital System Design with HDL course project, XJTLU** 10/2019 – 11/2019

- Designed a digital watch with multiply functions on Altera FPGA board by using Verilog HDL, including an alarm clock, a stopwatch, and a 24-hour clock with stop, rest, and time-setting functions.

**Design of a Central Processing Unit (CPU) based on MIPS32 ISA**

**Individual, Digital System Design with HDL course project, XJTLU** 11/2019 – 12/2019

- Implemented and verified MIPS ISA based single-cycle processor, multicycle processor, and pipeline processor on Altera Quartus by using Verilog HDL.

**Improvement on Dynamic Performance of Modular Multilevel Converter (MMC)** 06/2019 – 08/2019

**Main Researcher, Department of Electrical and Electronic Engineering, New Energy Research Office, XJTLU**

- Adopted two types of controller to achieve capacitor voltage balance: 1) used small signal modelling to build a feedback controller that generates the SPWM reference voltage, which could guarantee the stability of the circuit, but require for a long time; 2) applied capacitor voltage balancing method based on sorting algorithm to control the capacitor charge and discharge sequence to accelerate the dynamic equilibrium
- Verified that capacitor voltage balancing algorithm could quickly switch the circuit to a new stable state, in case of circuit imbalance, to ensure stable circuit operation

**Open-Circuit Fault Diagnosis of Dual Active Bridge DC-DC Converter** 06/2018 – 08/2018

**Main Researcher, Department of Electrical and Electronic Engineering, New Energy Research Office, XJTLU**

- Proposed a simple, cost-effective and fast open-circuit fault diagnosis strategy for bidirectional isolated dual-active-bridge (DAB) dc-dc converter under extended-phase-shift (EPS) control to improve system reliability
- Derived an open circuit faults diagnosis strategy based on the alternation of the mean value of voltages on the middle-point of the bridge arms
- Validated the strategy through both simulation (MATLAB Simulink) and experimental test (DSP-driven converter)
- Published a first-author research article in IEEE ACCESS

**Development of a University Student Management System using C++**

**Team Leader, *C Programming* Course Project, XJTLU** 02/2018 – 05/2018

- Coordinated a team of four to design, implement and test a university student management system, covering student information management, curriculum management, fast information query, etc.
- Optimized database query data structure and algorithm to reduce space and time complexity

**Development of a Library Management Application**

**Team Leader, *C Programming* Course Project, XJTLU** 10/2017 – 12/2017

- Coordinated a team of three to design, implement and test a C-based software application for managing university library, allowing management of 1) new print and digital additions to the collection, 2) items circulation, 3) check-in/check-out activities, 4) barcoding and barcode scanning, 5) online access to public libraries, etc.
- Practiced an array of software engineering principles and design patterns to enhance the application's modularity, extensibility, maintainability, and robustness
- Prototyped a fit-for-purpose book recommendation system based on content filtering and collaborative filtering
- Employed Unified Modeling Language to streamline software architecture design and debugging

## WORK EXPERIENCES

**Design Verification Engineer Intern, Biren Technology, Shanghai** 11/2020 – 04/2021

- Gained knowledge of cutting-edge GPU design verification methodology and modern computer architecture
- Wrote Python scripts for various purposes, including comparing the data generated by C model and RTL design, and generating a systemic report based on the comparison result
- Increased familiarity with Linux OS commands and project development procedures

**Electrical Engineer Intern, Datang Huazhong Electric Power Research Institute, China** 07/2017 – 10/2017

- Gained familiarity with power generation technology and the associated electrical equipment testing and maintenance at a thermal power plant
- Systematically studied automatic control mechanisms (e.g. PID, Fuzzy Logic Adaptive Control, etc.) associated with an array of critical components for thermal power generation, including boiler, cooling tower, coal handling system, superheater, reheater, steam turbine, condenser, economizer, and air preheater

## EXTRACURRICULAR EXPERIENCES

**Volunteer, Suzhou Jinji Lake International Marathon Event, China** 03/2017

- Collected and managed registration information of participants and volunteers
- Assisted in on-site traffic control; provided route guidance to contestants and audiences

## PROGRAMMING SKILLS

**Programming:** C/C++, Java, Python, MATLAB, Verilog HDL, AHDL, ARM ISA, MIPS ISA, X86 ISA, RISC-V ISA, HTML, CSS

**Software:** OrCAD PSpice Designer, Altera Quartus Ⅱ, Keil μVision, Multisim, Latex