# Yufeng Chi

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## Research Interest

**Computer architecture**: Domain-Specific Architecture, Machine Learning Systems, Design Methodology, Hardware Prototyping
**Robotics**: Robot Learning, Reinforcement Learning, Locomotion Control, Robot Foundation Model

## Education

### University of California, Berkeley
May 2023 – Present
Ph.D. Electrical Engineering and Computer Science
GPA: 3.875/4.0

Advisor: Yakun Sophia Shao, Borivoje Nikolic

Relevant Coursework:

**CS285** Deep Reinforcement Learning, **EE221A** Linear System Theory, **EECS227AT** Optimization Models in Engineering, **EE249** Embedded System Design

### University of California, Berkeley
May 2019 – Dec 2022
B.S. Electrical Engineering and Computer Science
GPA: 3.783/4.0

Relevant Coursework:

**EE194/290C** IC Design Project: 16nm SoC for IoT, **EECS151/EECS151LB** Digital Design and Integrated Circuits, **CS162** Operating Systems, **EECSC106A** Robotics

## Publications

2024    **DiffuseLoco: Real-Time Legged Locomotion Control with Diffusion from Offline Datasets**
X Huang, Y Chi, R Wang, Z Li, XB Peng, S Shao, B Nikolic, K Sreenath
Conference on Robot Learning
[Paper][Website]

2023    **Creating a Dynamic Quadrupedal Robotic Goalkeeper with Reinforcement Learning**
X Huang, Z Li, Y Xiang, Y Ni, Y Chi, Y Li, L Yang, XB Peng, K Sreenath
IEEE/RSJ International Conference on Intelligent Robots and Systems
[Paper][Video][Featured by IEEE Spectrum, TechXplore, TechCrunch]

2022    **Collaborative Navigation and Manipulation of a Cable-towed Load by Multiple Quadrupedal Robots**
C Yang, GN Sue, Z Li, L Yang, H Shen, Y Chi, A Rai, J Zeng, K Sreenath
IEEE Robotics and Automation Letters 7 (4), 10041-10048
[Paper][Video][Spotlighted by IEEE Spectrum]

## Experience

### Research Assistant
Aug 2022 – May 2023
Berkeley Wireless Research Center, UC Berkeley
Advisor: Prof. Kristofer Pister, Prof. Borivoke Nikolic

Working with Prof. Kristofer Pister on bringing up the research chips OsciBear, BearlyML, and SCuM-V.
- Experimented with JTAG, QSPI, and serialized-TileLink communication to the chip, and successfully established communication with OsciBear using an STM32 microcontroller running software emulated serialized-TileLink over UART interface
- Wrote driver libraries and tested the on-chip RISC-V core, RF Baseband, Advanced Encryption Standard (AES) accelerator, and sparse-dense matrix multiplication accelerator
- Designed the digital and RF layout of the 6-layer PCB for the chips in Intel BGA package

Working with Prof. Borivoje Nikolic on improving the Chipyard System-on-Chip (SoC) framework.
- Writing detailed documentation and tutorials for the generator components inside the testchipip and sifive-block repo
- Working on automated C driver code generation from the source Chisel code
- Porting Chipyard to Arty Cmod board to serve as a UART to serialized-TileLink adapter

### Bringup Engineer
NeuralAccel Corporation – Internship

June 2022 – Aug 2022

Worked on designing a sparse-sparse matrix multiplication accelerator.
- Implemented the serialized TileLink communication over UART for communication between host computer and the accelerator memory on Arty FPGA
- Implemented a small single stage RISC-V core with MMIO devices as the controller of the accelerator
- Worked on implementing an Ethernet controller supporting UDP protocol on Arty FPGA for streaming data between host computer and accelerator

### Independent Undergraduate Researcher
Hybrid Robotics Lab, UC Berkeley

Jan 2022 – May 2023

Advisor: Prof. Koushil Sreenath

Working on developing a human-sized high degrees of freedom humanoid robot with 3D printed cycloidal gear actuator and proprioceptive motor driver from scratch.
- Researched and designed a 15:1 proprioceptive cycloidal actuator with Autodesk Fusion 360
- Researched and designed the body of the robot with two 7 degrees of freedom legs and two 4 degrees of freedom arms.
- Designed and manufactured a field-oriented control (FOC) motor controller which supports up to 90V and 50Amps driving capability
- Designing Controller Area Network control system as the communication system on the robot

Participated in developing a model-based reinforcement learning control algorithm in Mujoco and OpenAI Gym environment for training the robot dog to learn a specific set of motions.

### Research Assistant
Ma Lab, UC Berkeley

Sep 2021 – Jun 2022

Advisor: Prof. Eric Y. Ma

Assisted and worked with Prof. Eric Y. Ma in setting up the newly established Ma Lab.
Built a real-time cloud-synced lab environment monitoring and inventory management system.
- Implemented Bluetooth Low Energy (BLE) communication between sensor nodes and host computer
- Designed and implemented QR Code-based inventory logging system
- Integrated Python backend server to real-time updating PlotlyJS frontend data visualization

### System Engineer
Formula Electric at Berkeley – Student Club

Jan 2021 – Present

In charge of the electrical control and communication system on the formula racing car.
- Implemented firmware code for multiple modules on the car with GPIO, ADC, DAC, SPI, I2C, USB, and Ethernet functionalities
- Designed and implemented the Controller Area Network Flexible Data-Rate (CAN-FD) communication system on the car
- Designed and manufactured the steering wheel PCB and implemented the graphical display functionalities with Raspberry Pi Compute Module
- Prototyped the data streaming system between car and pit station with WiFi and 900MHz XBee connectivity

### Ecosystem Technical Supporting
Intel Corporation – Internship

Jun 2020 - Dec 2020

Worked as technical consultant to analyze strength and weakness of Intel's potential technical partners.
Contributed to designing the Intel Nanjing Smart Technology Business Park.

## Selected Projects

**Designing and manufacturing a 3-phase field-oriented control brushless DC motor controller**
Independent project

Aug 2022 – Feb 2024

- STM32 controller with 1Mbps Controller Area Network (CAN) 2.0 bus communication
- 3-phase shunt current sampling with IIR filter
- Absolute magnetic encoder for position feedback with All-digital Phase Locked Loop (ADPLL) filter
- Coordinate Rotation Digital Computer (CORDIC) processor for Field-Oriented Control (FOC) computation
- 16 kHz current loop control
- 8kHz torque, velocity, and position control with optional acceleration and velocity limit
- PCB design and assembling

[Assembly Video][Testing Video]

**Designing and building a 1/2 scale humanoid robot to play xylophone**  Aug 2021 – Nov 2021
Group project for EECS 106A

Designed the mechanical structure and actuator integration of the robot.
Implemented the control system first on Arduino, and then ported to the RISC-V Red-V development board.
Integrated inverse kinematics and animation control of the robot with Blender.
Awarded as Showcase Winner in the class final presentation.

**Contributing to GD32VF103 RISC-V Processor Baremetal Library**  Oct 2020 – Dec 2020
Collaboration with Nuclei Inc.

Contributed to bug fixes of the existing Controller Area Network (CAN) bus library code.
Proposed a better hardware abstraction layer library interface.

**Educational RISC-V Processor Video Series**  Apr 2020 – June 2020
Independent personal project

Published a series of videos introducing RISC-V processor ISA and logic design to viewers on Bilibili and YouTube.
Gained 800k views on both video platforms and inspired many to start learning RISC-V ISA.
[Project Video][Education Video (Chinese)]

## Skills

**Programming / Scripting (ordered by proficiency):** C, RISC-V assembly, Python, Verilog, Javascript, Scala/Chisel, C++, C#
**Embedded Systems:** STM32 Programming and Debugging, CAN2.0/CAN-FD/EtherCAT Protocol, PCB design with Altium and LCEDA
**Robotics:** Mechanical design with Autodesk Fusion 360, Mujoco Simulation,
**Prototyping Skills:** 3D printing, Harnessing, Electronics Bench Testing, FPGA prototyping with Vivado
**Multimedia:** Audio/Video Editing, 3D Modeling and Production with Blender and Unreal Engine

## Honors and Awards

2022    Dean's List of College of Engineering
2021    EECS C106A Final Project Showcase Winner
2021    "Hack To The Moon" Winner in CalHacks hello:world (CalHacks 8.0)
2019    Honors to Date

## Teaching

2022    **ELENG 194 Bringup Class: Test Integrated Circuit Chips Designed in Previous Tapeout Classes**
        Teaching Assistant, UC Berkeley