Krithik Ranjan

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Research Interest

Redesigning creative computing applications to be more accessible to people with physical or mental capability limitations and people with limited access to technologies.

EDUCATION

University of Colorado Boulder, CO   2022-PRESENT

Ph.D. Creative Technology and Design, ATLAS Institute
Advisors: **Prof. Ellen Do** and **Prof. Michael Rivera**

Cornell University, NY   2018-2022

B.Sc. Electrical and Computer Engineering, College of Engineering — GPA 4.07/4.3

RESEARCH EXPERIENCE

Hybrid Body Lab, Cornell University — Undergraduate Research Assistant

Research Advisor: Prof. Cindy Kao

hybridbody.human.cornell.edu   FEBRUARY 2021 - MAY 2022

- Supported PhD researcher in developing and prototyping a new construction toolkit for on-skin interfaces consisting of flexible plug-and-play modules that can be connected in different ways for a range of applications.
- Implemented the extensions of the modules for different sensors and actuators like vibration motor, shape-memory alloy, thermochromic module, capacitive touch, and temperature sensor.
- Developed a novel fabrication method for stretchable electrical wire connections for on-skin and wearable technologies.

Meta Design and Technology Lab, Cornell University — Undergraduate Research Assistant

Research Advisor: Prof. Jay Yoon

mdtl.human.cornell.edu   JANUARY 2021 - JANUARY 2022

- Researched the impact and efficacy of UX writing in voice-based AI assistants with respect to UX writing style and user's decision-making experience.
- Designed the experiment and formulated the research questions with PhD researcher.
- Developed a custom smart speaker for the study using the Raspberry Pi platform with voice recognition and speech synthesis systems.
- Conducted user studies with the prototype speaker to analyze users' satisfaction against their maximization tendency.

Batten Research Group, Cornell University — Undergraduate Research Assistant

Research Advisor: Prof. Christopher Batten

csl.cornell.edu/~cbatten   JUNE 2020 - MAY 2021

- Worked on a PyTorch port in C++ for a novel manycore computer architecture under Professor Christopher Batten, Cornell University.
- Designed a templated data-parallel function with customizable static loop-unrolling using C++ meta-programming for element-wise kernels in PyTorch.
- Created a Python tool to help members develop efficient kernels by analyzing and visualizing cycle-level performance of the manycore.

- Developed a matrix-vector multiplication kernel with systolic execution to take advantage of data reuse and parallelism in the manycore.
- Built analytical models of kernel execution on a CGRA offloaded from the manycore and developed a CGRA configuration for the PyTorch euclidean distance function; optimized the kernel offloading to CGRA using C++ techniques resulting in 70% improvement in overall execution time.

RESEARCH PUBLICATIONS

Pin-Sung Ku, Md. Tahmidul Islam Molla, Kunpeng Huang, Priya Kattapurath, **Krithik Ranjan**, Cindy Hsin-Lu Kao. **"SkinKit: Construction Kit for On-Skin Interface Prototyping".** Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 5.4 (2021): 1-23.

Lin Cheng, Peitian Pan, Zhongyuan Zhao, **Krithik Ranjan**, Jack Weber, Bandhav Veluri, Borna Ehsani, Max Ruttenberg, Dai Cheol Jung, Preslav Ivanov, Dustin Richmond, Michael Taylor, Zhiru Zhang, Christopher Batten. **"A Tensor Processing Framework for CPU-Manycore Heterogeneous Systems."** IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems 41.6 (2021): 1620-1635. doi: 10.1109/TCAD.2021.3103825.

PROFESSIONAL EXPERIENCE

Qualcomm Technologies Inc, QCT-SW Team — Embedded Software Engineering Intern
qualcomm.com   JUNE 2021 - AUGUST 2021
- Analyzed and visualized critical timeline and memory constraints in 5G using AWS QuickSight.
- Developed a Python debugging tool for detecting invalid 5G configurations in logs.
- Created a new log in 5G layer 1 software for logging essential information.

Cornell University Autonomous Underwater Vehicle — Electrical Subteam Lead
cuauv.org   OCTOBER 2018 - PRESENT
- Built fully autonomous robotic submarines to participate in the International Robosub Competition held annually in San Diego, CA. Placed 5th out of 60 teams in 2019.
- Designed and programmed circuit board to measure the magnetic heading, linear acceleration and angular velocity of the AUV by communicating with a Bosch IMU sensor using I2C protocol.
- Developed an original integrated testing platform that connects to other boards in the electrical system and monitors the input, output and power signals to check the functionality and safety of the boards.

Cornell University Sustainable Design, Sustainable Mobility Team — Electrical Lead
cusd.cornell.edu/projects/bus   JANUARY 2019 - MAY 2020
- Prototyped a modular, sustainable, informative bus shelter to increase public transport ridership in Ithaca as a member of the student-run Sustainable Mobility project.
- Configured the shelter's electrical system consisting of solar panels, batteries, solar charge controller, lights, sensors, and a display unit.
- Built a Raspberry Pi-based control system for the shelter for motion-based lighting, solar metrics collection, and an intuitive LED indication system.

TEACHING EXPERIENCE

Computer Systems Programming — Teaching Assistant   AUGUST 2020 - DECEMBER 2020
Introduction to Circuits — Teaching Assistant   JANUARY 2020 - MAY 2020
Calculus I and II — Course Assistant   AUGUST 2019 - MAY 2020

PROJECTS

AroundSound
- Designed a novel assistive device for the visually impaired that helps them navigate through their surroundings using pleasant 3D sounds to help perceive the distance of objects in different directions.
- Implemented using the PIC32 microcontroller as the final project of ECE 4760 Designing with Microcontrollers.

PiDog
APRIL 2021 - MAY 2021
courses.ece.cornell.edu/ece5990/ECE5725_Spring2021_Projects/May_14/PiDog/Wednesday_kr397_avp34/website/index.html
- Developed an interactive pet robot dog that follows voice commands, can be trained to recognize hand gestures, and taught new voice commands with the help of speech recognition, computer vision, and machine learning.
- Built the system on a Raspberry Pi as the final project of ECE 5725 Designing with Embedded OS.

CroK64
pages.github.coecis.cornell.edu/ece3140-sp2020/avp34-kr397   APRIL 2020 - MAY 2020
- Built an online multiplayer Croquet game using NXP's FRDM-K64 microcontroller board as the gaming device for the final project of ECE 3140 Embedded Systems course.
- Programmed the Arm microcontroller in C to configure multiple game states and communicate with the IMU sensor and a computer through I2C, serial respectively.

Cadence
FEBRUARY 2019
- Designed an intuitive, visual training tool for pianists that analyzes music files to map the notes onto keys on an actual keyboard in real-time.
- Worked on the conversion of an audio sample to piano notes in MIDI format through signal processing and Fast-Fourier Transforms.
- Finalist at the Cornell University Make-a-thon 2018.

Writing Aid for the Blind
DECEMBER 2017 - JANUARY 2018
- Developed a C++ program that takes Braille-like input from a conventional QWERTY keyboard and converts to English text in real-time using an intuitive pairing of Braille alphabet to keyboard keys.

HONORS
Dean's List, College of Engineering, Cornell University - Earned all semesters
Tata Scholarship for Indian Students at Cornell University - Awarded for the complete undergraduate program
Tau Beta Pi, NY Delta Chapter at Cornell University - Inducted into the National Honors Engineering Society for being in the top 12.5% of the Junior class in the College of Engineering; elected as the Professional Development Chair of the society.

SKILLS
Programming in C, C++, Python | Microcontroller and Embedded Firmware Programming | Parallel and Multithreaded Systems | PCB Schematic and Layout Design with KiCAD | Prototyping with Arduino and Raspberry Pi | Hardware Modeling with PyMTL and Verilog HDL | Comm. Protocols Serial, SPI, I2C

Innovative Problem-Solving and Critical Thinking | Engineering Design Methodologies | Persuasive Design | Critical and Speculative Design | Language proficiency in English, Hindi, German