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Kavi Dey

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Education

Harvey Mudd College (HMC) — **Claremont, CA** — **Aug 2022 – May 2026**
- B.S. in Computer Science

Seattle Academy High School (SAAS) — **Seattle, WA** — **Jan 2019 – June 2022**
- High School Diploma, High Honor Roll

Employment, Internships, & Research

2024 - Current — **Variational Deep Learning** — **Prof. Hope, Hope Lab, HMC**

Goal: Learned about and implemented SVAEs with a variety of priors. Integrated state space models with linear dynamical system prior in SVAE. Working towards publication

Summer 2024 — **fMRI to Image Brain Decoding** — **Prof. Helen Zhou, MNNDL Lab, National University of Singapore**

Goal: Improve fMRI conditioned diffusion image generation; ML interpretability
- Developed several novel fMRI encoder and diffusion training strategies to improve reconstruction performance
- Reverse engineered fMRI encoders for model interpretability and understanding
- One publication in preparation

2023 - Current — **Machine Shop Proctor** — **Machine Shop, HMC**

Responsibilities: Ensuring student safety while teaching usage of metal manufacturing (Mills & Lathes, both CNC & manual) and wood working (bandsaws, routers, planers, etc.). Starting spring 2024: additional role as *Shop Improvement Proctor*. Responsibilities include weekly machine maintenance and repair, and upgrading tooling

2023 — **Embedded Programming** — **Prof. Spencer, ACE Lab, HMC**

Goal: Revise and test ultrasonic beam forming sonar sensor. Led low level embedded development on SAM-4 MCU. Implemented embedded communication protocol for talking to an Ethernet chip using SPI

2023 — **Makerspace Steward** — **Makerspace, HMC**

Responsibilities: Helping students learn and use 3D printers (FDM, SLS, Carbon, & Resin), laser cutters, sewing & embroidery machines, looms, welders, spray paint, and more; running workshops (15+ people). Starting spring 2024: Additional role as *Makerspace Repair Steward*, weekly preventative maintainance and repair on laser cutters and 3d printers

2023 — **Computer Science TA & Grader** — **CS Department, HMC**

Responsibilities: Taught new and experienced students computer science concepts (low level programming, classes, functional programming, data science, graphics, etc.). Graded weekly homework assignments and created midterm study guide

Summer 2023 — **Audio Information Retrieval** — **Prof. Tsai, MIR Lab, HMC**

Goal: To train large language models to understand and classify music data; Audio tampering detection
- Developed novel online alignment algorithms for 3 way audio alignment of piano concertos
- Lead data collection and created new audio tampering detection systems

2022 — **Zero-shot Image Classification** — **Prof. Carr-Markell, Bee Lab, HMC**

Goal: Pollen detection and classification (translational ML work with biologists). Trained zero shot classifier using Siamese Net & ResNet transfer learning. Developed public website to share the model and blog post explaining the basics of siamese nets and auto encoders

2020-2022 — **Robotic Tele-Operation** — **Prof. Cakmak, HCR Lab, University of Washington**

Goal: To develop accessible robot tele-operation interfaces
- Performed data analysis of user studies [IEEE RO'MAN 2021 Paper].
- Led interface design and studies of interface alternatives. Co-first authored [IEEE IROS 2021 Co-First Authored Paper].
- Led research in programming by demonstration & human-in-the-loop object grasping and manipulation approach
- Mentored 5 undergraduates across 3 different projects

2020-2021 — **Full Stack Web Development** — **WA State Hospital Association**

Goal: Develop custom Personal Protective Equipment exchange website to help address COVID shortages. Engineered custom PPE-Distribution algorithm with input from MultiCare Hospital.

2019 — **Deep Learning** — **Prof. Froehlich, Makeability Lab, UW**

Goal: Integrate deep learning into curb-ramp detection to improve temporal tracking of sidewalk quality to improve transparency about sidewalk accessibility [ACM ASSETS 2021 Poster]

2018 — **Voice Activity Detection** — **Adobe**

Goal: Develop ultra-lightweight ML speech detection classifier for Character Animator. Added to developer credits

Publications

Ather Sharif, Paari Gopal, Michael Saugstad, Shiven Bhatt, Raymond Fok, Galen Weld, **Kavi Dey**, and Jon E. Froehlich. Experimental crowd+ai approaches to track accessibility features in sidewalk intersections over time. In Jonathan Lazar, Jinjuan Heidi Feng, and Faustina Hwang, editors, *ASSETS Adjunct Proceedings*, pages 65:1–65:5. ACM, '21. doi: 10.1145/3441852.3476549. URL https://doi.org/10.1145/3441852.3476549

Maria E. Cabrera*, **Kavi Dey***, Kavita Krishnaswamy, Tapomayukh Bhattacharjee, and Maya Cakmak. Cursor-based robot telemanipulation through 2d-to-se2 interfaces. In *IEEE/RSJ IROS*, pages 4230–4237. IEEE, '21. doi: 10.1109/IROS51168.2021.9636008. URL https://doi.org/10.1109/IROS51168.2021.9636008. ***Co First Authors**

Maria E. Cabrera, Tapomayukh Bhattacharjee, **Kavi Dey**, and Maya Cakmak. An exploration of accessible remote tele-operation for assistive mobile manipulators in the home. In *30th IEEE RO-MAN*, pages 1202–1209. IEEE, '21. doi: 10.1109/RO-MAN50785.2021.9515511. URL https://doi.org/10.1109/RO-MAN50785.2021.9515511

Additional Experience and Awards

2024 **Astronaut Scholar**
2023 **HMC Davies Engineering Prize** Awarded for trebuchet design
2022 **Harvey S. Mudd Merit Award**
2021 **World Championship Top 10** MATE Telepresence Competition
2020 **Rookie All Star Award**, FRC: Redshift 8032
2020 **FRC Dean's List Semi-Finalist**
2018 **Regional Competition Top 5** MATE Pacific Northwest Region

Significant Projects

2024 - Current **Synthetic Opals** **HMC**

Goal: Manufacture synthetic opals

- Learned about science behind opals and nano particles (Stöber process, Bragg diffraction, and structural color) and wrote lab manual.
- Working with HMC chemistry department to carry out procedure and make opals and HMC engineering department to design 7 MPa, 300 °C autoclave for sintering opals

Lab Manual

2024 **Doppler Velocity Log** **HMC**

Goal: Design and manufacture doppler velocity log

- Designed and manufactured custom piezoelectric transducer with good acoustic properties
- Created circuit with high speed h-bridge driver, TX/RX switch, differential analog receive circuitry, and high speed (10 Msps) ADC.
- Implementing I2C communication and FFT on an FPGA which will control the circuit and transducers

Report Documentation

2023-2024 **Digital Camera Sensor** **HMC**

Goal: Design and manufacture digital sensor completely from scratch

- Designed and soldered pcb with grid of 1200 phototransistors to form digital camera sensor
- Led 3 person team in implementing QOI image compression and debayering on an FPGA
- Interfaced with camera sensor and FPGA using an STM32 microcontroller to use it as a USB webcam.

Video Demo Documentation

Spring 2023 **Trebuchet Design** **HMC**

Goal: Worked for external client with limited budget to design method of removing waste equipment from abandoned uranium mine. Led team of 4 students; simulated, prototyped and designed a 10ft tall trebuchet capable of launching 25 lb projectile 300 ft.

2022-2023 **Compiler & Silicon Design** **HMC**

Goal: Design and implement a C to assembly compiler and associated processor in Verilog

- Designed and implemented a compiler for a subset of C. Compiler supports control flow, recursion, register allocation, and stack allocation.
- Designed a processor in Verilog with support for the compiler's assembly language

Compiler Github Processor Github

2020-2023 **Electronic Speed Control (ESC) Design** **SAAS**

Goal: Design and manufacture custom brushless motor ESC. Led team (3 high school students); Taught college level electrical engineering and brushless motor control theory, schematic design, PCB design, microcontroller programming

Github

2019-2022 **Team Lead; ECE Lead** **MATE & FRC Robotics, SAAS**

Goal: Build for and compete in national robotics competitions

- Led 30+ person team in remote and in person settings with focus on culture, education and diversity
- Developed multi-node realtime communication system and UI, enhanced documentation and process, led team effort to build underwater robot.

GitHub

Languages and Technologies

- **Expert:** Python, Typescript, Svelte, Pytorch, JAX,Pandas/Matplotlib
- **Intermediate:** THREE.js, C++, ROS, Unix, Compiler Design, LaTeX, Verilog, MATLAB
- **Engineering:** Schematic Capture, Board Layout, Altium, I2C, Trapezoidal and Field-Oriented ESC Design, PIC Programming, MOSFETs, Solidworks
- **Advanced studies including:** Real Analysis; Linear Algebra; Multivariable Calculus; Quantum Theory; Inverse Kinematics; Optimization; Machine Learning; Quantum Mechanics; Variational Baysian Methods