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Kavi Dey

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Education

Harvey Mudd College (HMC) — **Claremont, CA** — **Aug 2022 – May 2026**

- B.S. in Physics, Dean's List FA22-SP25, Major GPA: 3.91, Overall GPA: 3.88

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

Research

Spring 2025 - Current — **Computational Orbit Modelling** — **Dan Tamayo, POEL Lab, HMC**

Using machine learning and optimization techniques to model planet and asteroid orbits and find transforms to action-angle coordinates. Active research on using dimensionality reduction algorithms to find conserved quantities. One publication in preparation on using classical ML to predict proper orbital elemnents for asteroid.

Spring 2024 - Current — **Variational Deep Learning** — **Gabe Hope, Hope Lab, HMC**

Foundational ML research using graphical models as a prior for variational autoencoders (SVAE). Developing and implementing novel algorithms for Multi Object Tracking and non-linear sequence modeling. Working towards publication.

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

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.

Spring 2023 — **Embedded Programming** — **Matthew Spencer, ACE Lab, HMC**

Revised and tested 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.

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

Developed novel online alignment algorithms for 3 way audio alignment of piano concertos [IEEE ICASSP 2025 First Student Author Paper]. Lead data collection and created new audio tampering detection algorithms.

Fall 2022 — **Zero-shot Image Classification** — **Morgan Carr-Markell, Bee Lab, HMC**

Implemented pollen detection and classification algorithms (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 (`kavidey.com/l/bee-post`)

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

Developed accessible robot tele-operation interfaces. Led interface design and studies of interface alternatives and ran 200+ person online user study. Co-first authored [IEEE IROS 2021 Co-First Authored Paper]. Modeled interaction pattern analysis [IEEE RO'MAN 2021 Paper]. Led research in programming by demonstration & human-in-the-loop object grasping and manipulation approach. Mentored 5 undergraduates across 3 different projects.

Summer 2019 — **Deep Learning** — **Jon Froehlich, Makeability Lab, University of Washington**

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

Employment

2024 - Current — **Engineering TA & Grader** — **Machine Shop, HMC**

Responsibilities: TA'd several intro and advanced engineering classes. Organized grading for 100 person class. Developed a new lab for advanced digital engineering class.

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. Spring 2024: additional role as *Shop Improvement Proctor* (weekly machine maintenance and repair, and upgrading tooling).

2023-2024 — **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 homework and created midterm study guide

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.

Publications

Kavi Dey, Leia Shen, Kat Volk, Sam Hadden, and Dan Tamayo. Predicting Asteroid Proper elements with linear estimation and regression. The Astrophysical Journal. **In preparation, author order & title not finalized.**

Kate Glazko, Margaret Seehorn, Medina Lamkin, JunHyeok Cha, **Kavi Dey**, Ben Kosa, Sudheesh Singanamalla, and Jennifer Mankoff. Prompt injections as a tool for agency and expression in multi-user gai systems. (CSCW2), 2026. **In revision.**

Tj Tsai, **Kavi Dey**, Yigitcan Özer, and Meinard Müller. Dense-sparse dynamic time warping for customizing piano concerto accompaniments. In *ICASSP 2025 - 2025 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 1–5, 2025. doi: 10.1109/ICASSP49660.2025.10890080. URL `https://doi.org/10.1109/ICASSP49660.2025.10890080`. **First student author. Presented in person.**

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

2026 **CRA Honorable Mention**
2024 & 2025 **Astronaut Scholar**
2024 **HMC J. R. Phillips Award** Awarded for doppler velocity log
2023 **HMC Davies Engineering Prize**
2022 **Harvey S. Mudd Merit Award**
2020 **FRC Dean's List Semi-Finalist**

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).
- Worked with HMC chemistry department to manufacture opals. Actively working with HMC engineering department to design 7 MPa, 300 °C autoclave for sintering opals

Lab Manual `kavidey.com/l/opal-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 ADC.
- Implementing I2C communication and FFT on an FPGA which will control the circuit and transducers

Report `kavidey.com/l/e80-report` Documentation `kavidey.com/l/dvl-docs`

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 `kavidey.com/l/camera-video` Documentation `kavidey.com/l/camera-docs`

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, liveness analysis, and using the stack.
- Designed a processor in Verilog with support for the compiler's assembly language

Compiler Github `kavidey.com/l/compiler-code` Processor Github `kavidey.com/l/processor-code`