Sultan Muratbek

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github.com/sultan-muratbek

Education

University of California, Berkeley — Berkeley, CA
B.A. Computer Science; B.A. Legal Studies — *Expected May 2027*

- **CS GPA**: 3.97/4.00
- **Relevant Coursework**: Advanced Topics in Computer Systems *(graduate)*, Database Systems, Operating Systems, Algorithms, Computer Networks, Security, Programming Languages & Compilers, Machine Learning, Deep Neural Networks
- **Honors**: EECS Honors Program, Upsilon Pi Epsilon (UPE) Computer Science Honor Society, Dean's Honors List

Experience

Sky Computing Lab, UC Berkeley — Berkeley, CA
Undergraduate Researcher, advised by Prof. Alvin Cheung — *May. 2026 – Present*

- **Co-first author**, *Concord: A Video Relational Algebra for Cross-Modal Query Optimization* (arXiv:2609.05756; accepted to CIDR 2027). Co-designed Video Relational Algebra (VRA), a nested algebra over videos, transcripts, frames, detections, and tracks that enables query rewrites across modality, temporal extent, and processing granularity.
- Co-developed and evaluated cross-modal temporal pushdown that sent only **2.47–5.32%** of source-video duration to the MLLM across **8.5 hours** of footage, reducing estimated MLLM cost by up to **87.2%** and cold-start query time by up to **80.9%**.

Berkeley Artificial Intelligence Research Lab (BAIR) — Berkeley, CA
Undergraduate Research Assistant, advised by Prof. Narges Norouzi — *Jan. 2026 – Present*

- Develop and maintain a lecture-feedback platform in **Python (Flask), JavaScript, and Azure SQL** that ingests slides, transcripts, and interaction signals to produce instructor-facing insights, deployed in **6 UC Berkeley courses**.
- Design a per-lecture knowledge-graph pipeline that extracts concepts, definitions, and prerequisite dependencies to identify logical gaps and pacing issues across **55+ lectures**.
- Conducted structured interviews with **5 UC Berkeley CS professors** and translated findings into product requirements and system features for actionable instructor feedback.

UC Berkeley EECS — Berkeley, CA
Head Teaching Assistant – CS 61A — *Jun. 2025 – Present*

- Maintain course infrastructure and build internal automation and assessment tooling for a course serving **1,000+ students** per semester.
- Lead instruction on recursion, data structures, OOP, interpreters, and functional programming; earned a **4.40/5.00 teaching effectiveness rating**.

Projects

Relational Database Management System | Java — *Jan. 2026 – May 2026*

- Built core components of a relational DBMS, including B+ tree indexing, cost-based query optimization, two-phase locking, and ARIES-style crash recovery.
- Implemented Grace Hash Join, Sort-Merge Join, and Page Nested Loop Join, integrating physical execution operators into a relational query engine.

Pintos OS Kernel | C — *Jan. 2025 – May 2025*

- Extended the Pintos instructional OS kernel with a priority scheduler, synchronization primitives, system calls, and a buffered file system; diagnosed race conditions and low-level memory bugs to improve kernel correctness.

Transformer Architecture | PyTorch — *Nov. 2025*

- Implemented a Transformer encoder-decoder with multi-head attention, residual connections, positional encoding, and masked autoregressive decoding; trained a decoder-only variant on TinyStories for next-token prediction.

Skills

Languages: Python, Java, C, Go, OCaml, SQL, JavaScript/TypeScript

Technologies: Linux/Unix, Git, Docker, PostgreSQL, Azure SQL, Flask, PyTorch, AWS, GCP