Vahab Jabrayilov

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vjabrayilov.github.io

In US with work authorization (CPT/OPT)

Education

2023 - 2027 (Expected) **Ph.D., Computer Science**, *Columbia University*, New York, NY, USA
Advisor: Prof. Kostis Kaffes
Interests: Software Systems, Low Latency Systems, ML Systems, Systems Optimization

2023 - 2025 **M.Sc., Computer Science**, *Columbia University*, New York, NY, USA

2019 - 2023 **B.Sc., Computer Engineering**, *Middle East Technical University*, Ankara, Turkey
GPA: 3.8/4.0 Ranking: 7/305

Work Experience

Aug 2023 - Current **Columbia University**, *Graduate Research Assistant*, New York, NY, USA
- Architected and co-engineered Machnet, a DPDK-based kernel-bypass networking framework in C++, delivering sub-100 microsecond tail latency for financial and database applications.
- Designed and implemented a microsecond-scale Virtual Machine scheduler using the Linux sched_ext eBPF interface in Rust and C, enabling fine-grained control over thread placement and execution for latency-sensitive workloads.
- Conducted kernel performance analysis using bpftrace, perf and hardware counters to eliminate nanosecond-scale jitter and system noise from scheduling and networking data paths.

Jun-Sep 2024 **Microsoft Research**, *Research Intern*, Redmond, WA, USA
- Mentors: Srikanth Kandula, Sathiya Kumaran Mani @ Networking Research Group
- Engineered a high-throughput packet processor in *Rust* and *DPDK* for Azure's real-time data ingestion pipelines, processing millions of flow logs per second with deterministic, sub-millisecond latency.
- Developed a comprehensive stress-testing framework to validate and guarantee sub-millisecond latency and high-availability for private preview deployment of *Zero Trust Networking* service.

Jun-Aug 2023 **EPFL**, *Research Intern*, Lausanne, Vaud, Switzerland
- Advisor: Prof. Sanidhya Kashyap @ RS3LAB
- Analyzed and designed mitigations for metastable failures in distributed systems, a critical factor for ensuring the reliability and uptime of high-availability system, e.g. trading platforms

Publications

Under Review, 2025 Rorke: Black-box Microsecond-scale VM Scheduling
Vahab Jabrayilov, Teng Jian, Jason Nieh, Kostis Kaffes

Under Review & arXiv, 2025 Fast Userspace Networking for the Rest of Us
Alireza Sanaee*, **Vahab Jabrayilov***, Ilias Marinos, Anuj Kalia, Divyanshu Saxena, Prateesh Goyal, Kostis Kaffes, Gianni Antichi (* equal contribution)

VLDB, 2025 HoliPaxos: Towards More Predictable Performance in State Machine Replication
Zhiying Liang, **Vahab Jabrayilov**, Aleksey Charapko, Abutalib Aghayev

ACM SoCC, 2024 Rethinking the Networking Stack for Serverless Environments: A Sidecar Approach
Vishwanath Seshagiri, Abhinav Gupta, **Vahab Jabrayilov**, Avani Wildani, Kostis Kaffes

Projects

GitHub Repo **Machnet: Ultra-Low Latency Networking Library**
Designed and implemented a DPDK-based networking library for high-frequency low-latency communication. The system isolates applications from kernel overhead and achieves $750,000$ $1KB$ request-reply messages per second with $61\mu s$ p99 latency on a public cloud.

GitHub Repo **Replicant: Strongly Consistent Key-Value Store**
Designed and implemented a MultiPaxos-based key-value store to provide resource-efficient, strongly consistent cloud replication

Skills

Languages/Platforms Assembly(x86, Arm), C/C++, CUDA, Go, Java, Python, Rust, SQL

Tools Abseil, AWS, Azure, Boost, Docker, DPDK, eBPF, Git, Kubernetes, RDMA, TLA+, Tokio