Madhav Jivrajani

Champaign, IL, USA | Email: madhav.jiv@gmail.com
GitHub | **LinkedIn** | **Website**

Education

University of Illinois Urbana-Champaign — Champaign, USA
Masters of Science *in Computer Science* — *Aug. 2024 – May 2026*

PES University — Bangalore, India
Bachelor of Technology *in Computer Science and Engineering (CGPA: 9.36/10)* — *Aug. 2018 – May. 2022*
With Specialization In Systems and Core Computing

Skills

Programming Languages: Golang, Python, C, C++
Technologies: Kubernetes, etcd, AWS Lambda, AWS Dynamo, Kafka, Linux Kernel, Prometheus, eBPF
Technical Skills: Vector Databases, Distributed Systems, Resource Scheduling, Designing for Backward Compatibility, Systems Modelling and Verification (Queuing Theory and TLA+), Performance Debugging Go Systems
Non Technical Skills: Business Aligned Open Source, Open Source Governance and Sustainability

Work Experience

Member of Technical Staff - {1, 2} — Aug. 2021 – July 2024
VMware by Broadcom — *Bangalore, India*

Kubernetes and Etcd Maintainer, GitHub Admin for Kubernetes, TL for SIG Contributor Experience

- Improved Scalability and Reliability of The Kubernetes Storage Layer [contributions]
  - Successfully understood and identified bottlenecks in the *Kubernetes API Server watchCache*.
  - Implemented a solution to reduce lock contention in the *watchCache* and reduce the API Server's CPU and memory footprint by over 60% in large clusters.
  - Implemented a BTree based caching layer to evolve the *watchCache* reducing the time per operation by 25%.
- Helped Develop and Maintain Simulation Testing for The *Etcd* Distributed KV Store [contributions]
  - Successfully identified the API interactions between *Kubernetes* and the *etcd* client.
  - Developed simulation tests to verify the API guarantees provided by *etcd* to *Kubernetes*.
  - Reasoned about linearizability and durability violations in *etcd* with varying consistency guarantees.
- Helped Ensure Timeliness, Stability, and Security of Kubernetes Releases [contributions]
  - Ensured that the Kubernetes project bumps versions of *Go* in a backward compatible manner ensuring stability and security of Kubernetes releases.
  - Worked on getting early CI signal for Go version bumps and tracked release blocking failures and regressions.
  - Coordinated and worked with cross-cutting areas of the Kubernetes project like api-machinery, scalability, release and testing, to fix blockers and ensure that Kubernetes releases are on track.

Open Source Contributor — Mar. 2024 – Present
KubeRay [contributions] — *Remote*

- Improved observability for reported *Status* in *RayCluster CRs* when invoking Kubernetes APIs.
- Implemented a structured way to test event generation in the *RayCluster controller* for increased consistency and stability of generated events.

Research Experience

Distributed and Storage Systems Laboratory — Aug. 2024 – Present
University of Illinois Urbana-Champaign — *Champaign, USA*

- **Research Project**: Evaluated Performance and Bottlenecks of Disk Based Vector Indices
  - Deployed disk resident vector index implementations like *DiskANN*, *SPANN* and *Starling*.
  - Evaluated latency and I/O efficiency of these implementations using the *BIGANN* benchmark for varying caching policies.
  - Currently working on designing an I/O efficient, disk resident vector index for vector databases with adaptive caching policies.

Research Publications

- **Multi-Grained Specifications for Distributed System Model Checking and Verification**, Lingzhi Ouyang, Xudong Sun, Ruize Tang, Yu Huang, **Madhav Jivrajani**, Xiaoxing Ma, and Tianyin Xu: *EuroSys '25* [pdf]

Selected Talks and Interviews

- **Kubernetes Stale Reads**: *The Kubernetes Podcast by Google* [recording]
- **The Kubernetes Storage Layer: Peeling The Onion**: *KubeCon + CloudNativeCon, Nov. 2023* [talk][slides]
- **Looking at Computing Systems as a Conspiracy Theorist**: *Fireside Talks, HSP* [talk][slides]
- **Reliably Absorbing a Go Release**: *GopherCon 2023* [talk][slides]
- **Keep CALM and CRDT On**: *Papers We Love Bangalore, Oct. 2023* [slides]
- **Using eBPF To Debug the Performance of The Go Scheduler**: *Go Bangalore, July 2023* [talk][slides]
- **Control Theory and Concurrent Garbage Collection: The Go GC Pacer**: *GopherCon 2022* [talk][slides]
- **Queues, Fairness, and The Go Scheduler**: *GopherCon 2021* [talk][slides]

A full list of my talks can be found here.

Awards

- **Google Open Source Peer Bonus Award, 2023**: For contributions to the Kubernetes project
- **Kubernetes Contributor Award, 2021**: For contributions to SIG Architecture

Conference Volunteering

- **Chair**: *GopherCon 2024*
- **Paper Review Committee**: *GopherCon 2022, GopherCon 2023*
- **Paper Review Committee and Track Chair**: *KubeCon + CloudNativeCon NA 2022*

Selected Projects

gse: *Go Scheduler Exporter* [code][talk] Oct. 2021 – Dec. 2021

- Implemented a Prometheus exporter to export scraped and processed metrics from the *Go runtime*.
- Implemented detection of Goroutine preemption using both the *Linux Tracing Subsystem* and *eBPF*.
- Visualized work-stealing in action inside the *Go scheduler* using *Grafana*.

btree-indexer: *A BTree backed Kubernetes client-go Indexer* [code] Feb. 2022 – Aug. 2022

- Implemented a BTree based cache defined by Kubernetes client-go's *Store* interface.
- Implemented indexing on top of the BTree cache for efficient lookup.
- Used this to enable the *watchCache* to service paginated LIST requests.

locknt: *Concurrent and Lock-Free Data Structures In Go* [code] Jan. 2021 – May. 2021

- Implemented concurrent and lock-free data structures in Go.
- Wrote benchmarks to understand bottlenecks in the implementation.
- Profiled the code using *pprof* as well as *perf* to understand the effects of false sharing.