

Vinay S Banakar

Dept. of Computer Science
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EDUCATION

University of Wisconsin-Madison
Ph.D in Computer Science

2020 (ongoing)
Advisors: Prof. Andrea Arpaci-Dusseau
Prof. Remzi Arpaci-Dusseau

PES University
B.E in Computer Science and Engineering

2013-2017
CGPA: 8.26/10

AREAS OF INTEREST

Byte-Addressable Storage, Data-Intensive computing, distributed storage systems and systems for ML.

PUBLICATIONS

- [1] **WiscSort: External Sorting for Byte-Addressable Storage** *In submission*
Vinay Banakar, Kan Wu, Yuvraj Patel,
Kimberly Keeton, Andrea Arpaci-Dusseau, and Remzi Arpaci-Dusseau
- [2] **Understanding and Benchmarking the Impact of GDPR on Database Systems** *VLDB'20*
Supreeth Shastri, Vinay Banakar, Melissa Wasserman,
Arun Kumar, and Vijay Chidambaram
- [3] **CIED - Rapid Composability of Rack Scale Resources Using Capability Inference Engine Across Datacenters** *IEEE Infra'20*
Vinay Banakar, Pavan Upadhyaya, and Maneesh Keshavan
- [4] **Analyzing the Impact of GDPR on Storage Systems** *HotStorage'19*
Vinay Banakar, Aashaka Shah, Supreeth Shastri,
Melissa Wasserman, and Vijay Chidambaram

PATENTS

- [1] **Intent driven hardware placement using rack capability inference engine across datacenters, 2019** *US20210014998A1*
Vinay Banakar, Pavan Upadhyaya, and Maneesh Keshavan
- [2] **Intelligent orchestration of disaggregated applications based on class of service, 2019** *US20200249999A1*
Tom Golway, Vinay Banakar, and Sandeep Panda
- [3] **Preemptive compatibility failure detection using graph structure learning in datacenters, 2018** *US10938623B2*
Vinay Banakar, Pavan Upadhyaya, and Maneesh Keshavan
- [4] **Topology based root cause triangulation of hardware issues** *US10831587B2*
Pavan Upadhyaya, Maneesh Keshavan, Naveena Kedlaya, and Vinay Banakar

ONGOING WORK

UW Madison	- Building new data-intensive computing paradigms for modern storage The aim is to evaluate feasibility of existing scale-up architectures on CXL storage and propose new efficient data access and concurrency mechanisms.
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RECENT COURSE PROJECTS

- *Disaggregated-PM aware datastructures*: Explored the performance v/s functionality trade-offs and skewed read/write performance of a disaggregated-PM architecture by implementing a B+-tree and distributed external sort over InfiniBand RDMA [Fall'21].
- *RecoverKV*: Strongly consistent, partition tolerant Key-Value store built in Go using quorum protocol [Spring'21].

- *DIAS*: Distributed machine learning Inference as A Service [Spring'21].
- Improved lookup in learned LSM based KV store (*Bourbon*, *OSDI'20*) by replacing piece-wise linear regression with different ML indexes (radixSpline and PGM) [Fall'20].
- *AutoTune-IO*: Optimizing Linux IO scheduler parameters using Bayesian Optimization [Fall'20]

TEACHING EXPERIENCE

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| • CS739: Distributed Systems | TA (UW Madison, Spring 2022) |
| • CS537: Operating Systems | TA (UW Madison, Fall 2021) |
| • ECE252: Computer Organization | TA (UW Madison, Spring 2021) |
| • CS220: Data programming | TA (UW Madison, Fall 2020) |

RESEARCH & INDUSTRY EXPERIENCE

UW Madison Research Assistant <i>Summer 2021 - Present</i>	Advisors: Prof. Andrea Arpaci-Dusseau and Prof. Remzi Arpaci-Dusseau - Conducted performance characterization of Intel Optane DC PMEM. - Evaluated fast copying mechanisms on PMEM. - Designed and built <i>WiscSort</i> , a high-performance concurrent sorting system for byte-addressable storage (BAS) which is 2x-5x faster than competing state-of-the-art approaches. Proposed BRAID model for efficient BAS utilization. - Projected WiscSort performance on future CXL devices through emulation.
HPE RnD Labs Systems Engineer 2 <i>2017-2020</i>	Advisors: Dr. Kimberly Keeton and Dr. Sharad Singhal Focus: Disaggregated memory and resource orchestration - Developed applications+benchmarks for disaggregated persistent Fabric Attached Memory (<i>openFAM</i>) to evaluate it against traditional cluster-based HPC programming models (<i>openSHMEM</i> and <i>MPI</i>). - Designed and built features for large scale datacenter infrastructure management software (HPE OneView). - Developed a Redfish compliant server hardware simulator.
UT Austin Research Fellow <i>2018-2019</i>	Advisor: Prof. Vijay Chidambaram - Investigated the impact of privacy policies (<i>GDPR</i>) on storage systems. - Modified Redis, Postgres and OracleDB to strictly comply with GDPR requirements and found up to 20x drop in throughput. This illustrated how retro fitting existing storage designs to work efficiently with new privacy policies is inadequate, and demonstrated how GDPR is a compliance spectrum. - <i>GDPRBench</i> , a GDPR benchmark that let users to assess compliance level of a storage system and helps evaluate compliance-performance tradeoff.
HPE RnD Labs Research intern 2017	Implemented a virtual host simulation platform that mimics ESXi instances as hosts in a VMware vCenter cluster. Scaled up to 1000+ simulated hosts that were leveraged for performance evaluation in OneView.

AWARDS AND ACCOMPLISHMENTS

- *Silver award* for innovation at Hewlett Packard Enterprise, 2020
- First prize in TechnoBiz track at *8th IEEE conference on Cloud Computing in Emerging Markets*, 2019.
- Awarded 2018 ReportBee Research Fellowship.
- Distinction award at PESIT, semester wise cash prizes for excellent academic performance.
- Second place at MyWired Open hack 2016 and SimpliHack 2015.

CONTRIBUTIONS

- Poster presentation: Database Affiliates 2022, UW Madison.
- Review committee: *HPE TechCon 2020*
- Artifact Evaluation Committee: *ASPLOS 2020*, *SOSP 2019*
- Book Contribution: *Effective Cybersecurity - Understanding and Using Standards and Best Practices*, Dr William Stallings 2018.
- Open source contributions: *Apache Ratis*, *Postgresql* and *YCSB*
- Invited Talks: Virtue insight Blockchain 2019 conference *How GDPR is a double edged sword for Blockchain*, *HPE Technical Symposium'18 and 19*.