Muhammed Uluyol

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Education

Ph.D. Computer Science, University of Michigan, Ann Arbor *2022*
Advisor: Prof. Harsha V. Madhyastha
Thesis: "Predictable Performance and Low Cost for Geo-Distributed Applications"

B.S. Computer Science & Mathematics, University of Minnesota, Twin Cities *2015*

Honors and Awards

- Outstanding Graduate Student Instructor 2021
- IRTF Applied Networking Research Prize 2018
- NSF Graduate Fellowship Honorable Mention 2016
- University of Michigan Computer Science & Engineering Full First-Year Fellowship 2015–2016
- University of Minnesota College of Science & Engineering Scholarship 2014
- Microsoft Coding Challenge Event First-Place Winner 2014
- CRA Outstanding Undergraduate Award Honorable Mention 2014
- Islamic Center of Minnesota Scholarship 2012–2014
- Dean's List 2010–2014

Research Experience

HEYP: Highly available bandwidth guarantees on highly utilized cloud WANs *2018–2022*
Advisor: Prof. Harsha V. Madhyastha

- Wide area networks (WANs) are a scarce but vitial resource for geo-distributed applications.
- For efficiency, state-of-the-art WANs reconfigure the network as demands change, but since this takes time, cloud tenants may be short on bandwidth for several minutes. HEYP (under submission, SIGCOMM'22) guarantees each tenant a baseline level of bandwidth while also maintaining the efficiency of current WANs.

Pando: Near-optimal latency–cost tradeoffs in geo-distributed storage *2017–2020*
Advisor: Prof. Harsha V. Madhyastha

- Showed that global web services incur unnecessary latency and cost to access data with strong consistency.
- Existing approaches suffer because they conflate multiple concerns (e.g. the detection and recovery of conflicting data). Pando (NSDI'20) separates these to achieve near-optimal performance across many workloads.

Identifying and tracking mesoscale ocean eddies *2012–2013*
Advisor: Prof. Vipin Kumar

- Mesoscale ocean eddies transport heat and nutrients across marine ecosystems and affect ocean dynamics.
- Published an algorithm to track ocean eddies (AAAI'13), investigated leveraging prediction to improve robustness, and evaluated different approaches to identify and track eddies.

Teaching Experience

University of Michigan, *Graduate Student Instructor* *Sep–Dec 2017, Sep–Dec 2019, Jan–Apr 2021, Sep–Dec 2021*

- EECS 498: Introduction to Distributed Systems (Fall 2017)
- EECS 491: Introduction to Distributed Systems (Fall 2019, Winter 2021, Fall 2021)

University of Minnesota, *Grader* *Feb–May 2014*

- Math 5251: Error-Correcting Codes & Finite Fields (Spring 2014)

University of Minnesota MathCEP, *Teaching Assistant* *Sep 2012–May 2013*

- UMTYMP Geometry and Precalculus

Work Experience

University of Michigan, *Research Assistant* *Sep 2015–Apr 2022*

- Developed new designs for cross-data center storage systems and wide area networks that offer near-optimal tradeoffs between predictable performance and low cost.
- Investigated using coordination to improve caching and reduce the impact of compactions in key-value stores.

Google, *Software Engineering Intern* *Jan 2019–Feb 2020, May 2021–Aug 2021*

- Teams: Traffic Engineering, Bandwidth Enforcer
- Proposed a software-defined WAN architecture that offers strong isolation guarantees between cloud tenants.
- Evaluated WAN architecture using a combination of discrete-event simulation and testbed experiments.

Nutanix, *Member of Technical Staff Intern* *May–Dec 2018*

- Outlined an inter-data center storage strategy and replication library for upcoming storage offerings.

Google, *Software Engineering Intern* *May–Aug 2014, Jun–Aug 2015*

- Teams: Kubernetes, Gmail (Site Reliability)
- Launched support for experimental APIs in Kubernetes to unblock feature work.
- Released a cluster-local container registry.
- Developed an internal service to inspect deployment configurations of production services.

University of Minnesota, *Research Assistant* *Nov 2012–Aug 2013, Sep 2014–May 2015*

- Improved data availability and reduced the impact of stragglers in a volunteer computing system.
- Published methods for tracking ocean eddies. Investigated leveraging prediction to improve robustness.

Adventium Labs, Minneapolis, MN, *Intern* *May–Aug 2012, Sep 2013–May 2014*

- Project: Remote attestation of client workstations
- Designed and implemented commissioning procedure for new workstations.
- Owned embedded Linux environment for running early boot checks.
- Implemented validation of several workstation components against known-good states.

ENC Mühendislik, Konya, Turkey, *Intern* *Jun–Jul 2011*

Publications

Highly Available Bandwidth Guarantees on Highly Utilized Cloud WANs *[Under Submission]*
M. Uluyol, A. Goel, C.-Y. Hong, H. V. Madhyastha, K. Mendelev, D. Papagiannaki, S. Singh, A. Vahdat, B. Zhang, and J. Zolla
ACM SIGCOMM'22

Near-Optimal Latency Versus Cost Tradeoffs in Geo-Distributed Storage
M. Uluyol, A. Huang, A. Goel, M. Chowdhury, and H. V. Madhyastha
USENIX NSDI'20

Bolt-On Global Consistency for the Cloud
Z. Wu, E. Wijaya, M. Uluyol, and H. V. Madhyastha
ACM SoCC'18

Vroom: Accelerating the Mobile Web with Server-Aided Dependency Resolution
V. Ruamviboonsuk, R. Netravali, M. Uluyol, and H. V. Madhyastha
ACM SIGCOMM'17
Awarded IRTF Applied Networking Research Prize

A Parameter-Free Spatio-Temporal Data Mining Model to Catalog Global Ocean Dynamics
J. H. Faghmous, M. Le, M. Uluyol, S. Chaterjee, and V. Kumar
IEEE ICDM'13

Multiple Hypothesis Object Tracking for Unsupervised Self-Learning: An Ocean Eddy Tracking Application
J. H. Faghmous, M. Uluyol, L. Styles, M. Le, V. Mithal, S. Boriah, and V. Kumar
AAAI'13