

# MANYA GHOBADI

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## RESEARCH INTERESTS

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Computer systems and networking, optical networks, transport protocols, hardware-software co-design.

## EDUCATION

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- 2007 - 2013 **University of Toronto**, ON, Canada. Ph.D. in Computer Science  
Thesis: TCP Adaptation Framework in Data Centers.  
Advisor: Prof. Yashar Ganjali
- 2005 - 2007 **University of Victoria**, BC, Canada. M.Sc. in Computer Science  
Thesis: Resource Optimization Algorithms for VPNs Using the Hose Model.  
Co-Advisors: Prof. Ali Shoja, Prof. Sudhakar Ganti
- 2001 - 2005 **Sharif University of Technology**, Iran. B.Eng. in Computer Engineering  
Thesis: Load Balancing in Hypermesh and  $k$ -ary  $n$ -cube Interconnection Networks.

## PROFESSIONAL EXPERIENCE

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- Fall 2018 **Massachusetts Institute of Technology**, Cambridge, MA  
**Assistant Professor**, Department of Electrical Engineering and Computer Science
- 2016 - 2018 **Microsoft Research**, Redmond Lab, WA  
**Researcher**, Mobility and Networking Research group
- 2014 - 2016 **Postdoctoral researcher**, Mobility and Networking Research group  
Leading research in programmable optical networks, optics in data centers and wide area networks, and congestion control in FPGA NICs.
- 2012 - 2014 **Google Inc.**, Mountain View, CA  
**Software engineer**, Platforms group. Designed and built algorithms in production data centers.
- 2011 - 2011 Intern. Designed a video rate limiting algorithm in YouTube streamers.
- 2009 - 2010 Intern. Researched TCP pacing in production data centers.
- 2009 - 2009 Intern. Designed algorithms for a system to identify the causes of changes in front-end latency.

## AWARDS & HONORS

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- 2017  $N^2$  Women rising stars in Networking and Communications
- 2016 Best dataset award, ACM Internet Measurement Conference
- 2016 Best paper award finalist, ACM CoNEXT conference
- 2012 Google Research Excellent Paper award for paper at USENIX Annual Technical Conference
- 2011 Google Research Excellent Paper award for paper at ACM Internet Measurement Conference
- 2009 Natural Sciences and Engineering Research Council of Canada (NSERC) award
- 2008 Best paper award, ACM Internet Measurement Conference

# PUBLICATIONS

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## Refereed articles

1. R. Singh, M. Ghobadi, K. Foerster, M. Filer, P. Gill, *RADWAN: Rate Adaptive Wide Area Network*, In Proc. of ACM SIGCOMM, 2018.
2. K. Foerster, M. Ghobadi, S. Schmid, *Characterizing the Algorithmic Complexity of Reconfigurable Data Center Architectures*, In Proc. of ACM/IEEE ANCS, 2018.
3. A. Caulfield, P. Costa, M. Ghobadi, *Beyond SmartNICs: Towards a Fully Programmable Cloud*, In Proc. of IEEE HPSR, 2018.
4. K. Bergman, J. Shalf, G. Michelogiannakis, S. Rumley, L. Dennison, M. Ghobadi, *PINE: An Energy Efficient Flexibly Interconnected Photonic Data Center Architecture for Extreme Scalability*, In Proc. of IEEE Optical Interconnects, 2018.
5. D. Zhuo, M. Ghobadi, R. Mahajan, K. Foerster, A. Krishnamurthy, T. Anderson, *Understanding and Mitigating Packet Corruption in Data Center Networks*, In Proc. of ACM SIGCOMM, 2017.
6. D. Zhuo, M. Ghobadi, R. Mahajan, A. Phanishayee, X. K. Zou, H. Guan, A. Krishnamurthy, T. Anderson, *RAIL: A Case for Redundant Arrays of Inexpensive Links in Data Center Networks*, In Proc. of USENIX NSDI, 2017.
7. R. Singh, M. Ghobadi, K. Foerster, M. Filer, P. Gill, *Run, Walk, Crawl: Towards Dynamic Link Capacities*, In Proc. of ACM HotNets, 2017.
8. M. T. Arashloo, M. Ghobadi, J. Rexford, D. Walker, *HotCocoa: Hardware Congestion Control Abstractions*, In Proc. of ACM HotNets, 2017.
9. M. Ghobadi, R. Mahajan, *Optical Layer Failures in a Large Backbone*, In Proc. of ACM IMC, 2016. **(Best Public Dataset Award)**
10. M. Ghobadi, R. Mahajan, A. Phanishayee, N. Devanur, J. Kulkarni, G. Ranade, P. Blanche, H. Rastegarfar, M. Glick, D. Kilper, *ProjecToR: Agile Reconfigurable Data Center Interconnect*, In Proc. of ACM SIGCOMM, 2016.
11. Y. Zhu, M. Ghobadi, V. Misra, J. Padhye, *ECN or Delay: Lessons Learnt from Analysis of DCQCN and TIMELY*, In Proc. of ACM CoNEXT, 2016. **(Best Paper Award Finalist)**
12. M. Ghobadi, J. Gaudette, R. Mahajan, A. Phanishayee, B. Klinkers, D. Kilper, *Evaluation of Elastic Modulation Gains in Microsoft's Optical Backbone in North America*, In Proc. of Optical Fiber Communication Conference (OFC), 2016.
13. M. Filer, J. Gaudette, M. Ghobadi, R. Mahajan, T. Issenhuth, B. Klinkers, J. Cox, *Elastic Optical Networking in the Microsoft Cloud*, In Proc. of Journal of Optical Communications and Networking (JOCN), 2016.
14. R. Mittal, V. Lam, N. Dukkupati, E. Blem, H. Wassel, M. Ghobadi, A. Vahdat, Y. Wang, D. Wetherall, D. Zats, *TIMELY: RTT-based Congestion Control for the Datacenter*, In Proc. of ACM SIGCOMM, 2015.
15. N. Kang, M. Ghobadi, J. Reumann, A. Shraer, J. Rexford, *Efficient Traffic Splitting on Commodity Switches*, In Proc. of ACM CoNEXT, 2015.
16. M. Ghobadi, Y. Ganjali, *TCP Pacing in Data Center Networks*, In Proc. of IEEE Hot Interconnects, 2013.
17. M. Ghobadi, Y. Cheng, A. Jain, M. Mathis, *Trickle: Rate Limiting YouTube Video Streaming*, In Proc. of USENIX ATC, 2012. **(Google Research Excellent Paper Award)**
18. M. Ghobadi, S. Yeganeh, Y. Ganjali, *Rethinking End-to-End Congestion Control in Software-Defined Networks*, In Proc. of ACM HotNets, 2012.
19. M. Ghobadi, G. Salmon, Y. Ganjali, M. Labrecque, G. Steffan, *Caliper: Precise and Responsive Traffic Generator*, In Proc. of IEEE Hot Interconnects, 2012.

20. N. Dukkipati, M. Mathis, Y. Cheng, M. Ghobadi, *Proportional Rate Reduction for TCP*, In Proc. of ACM IMC, 2011. (**Google Research Excellent Paper Award**)
21. M. Ghobadi, M. Labrecque, G. Salmon, K. Aasaraai, S. H. Yeganeh, Y. Ganjali, J. G. Steffan, *Caliper: a tool to generate precise and closed-loop traffic*, ACM SIGCOMM Demo, 2010.
22. A. Tootoonchian, M. Ghobadi, Y. Ganjali, *OpenTM: Traffic Matrix Estimator for OpenFlow Networks*, In Proc. of Passive and Active Measurement conference (PAM), 2010.
23. H. Rastegarfar, M. Ghobadi, Y. Ganjali. *Emulation of Optical PIFO Buffers*, In Proc. of IEEE GLOBECOM, 2009.
24. M. Labrecque, J. Steffan, G. Salmon, M. Ghobadi, Y. Ganjali. *NetThreads: Programming NetFPGA with Threaded Software*, NetFPGA Developers Workshop, 2009. (**2<sup>nd</sup> Place for Best Project Award**)
25. G. Salmon, M. Ghobadi, Y. Ganjali, M. Labrecque, J. Steffan. *NetFPGA-based Precise Traffic Generation*, NetFPGA Developers Workshop, 2009.
26. N. Beheshti, Y. Ganjali, M. Ghobadi, N. McKeown, and G. Salmon. *Experimental study of router buffer sizing*, In Proc. of ACM IMC, 2008. (**Best Paper Award**)
27. M. Ghobadi, S. Ganti, G. C. Shoja, *Resource Optimization Algorithms for Virtual Private Networks Using the Hose Model*, In Proc. of Journal of Computer and Telecommunications Networking, Elsevier, 52(16), 2008.
28. N. Beheshti, Y. Ganjali, M. Ghobadi, J. Naous, N. McKeown, and G. Salmon. *Performing Time-sensitive network experiments*, In Proc. of ACM/IEEE Architectures for Networking and Communications Systems (ANCS), 2008.
29. M. Ghobadi, S. Ganti, G. C. Shoja, *Hierarchical Provisioning Algorithm for Virtual Private Networks Using the Hose Model*, In Proc. of IEEE GLOBECOM, pages 2467–2471, Nov. 2007.
30. M. Ghobadi, S. Ganti, G. C. Shoja, *Resource Optimization to Provision a Virtual Private Network Using the Hose Model*, In Proc. of IEEE International Conference on Communications (ICC), pages 512–517, 2007.

### Technical reports

1. M. Ghobadi, R. Mahajan, A. Phanishayee, N. Devanur, J. Kulkarni, G. Ranade, P. Blanche, H. Rastegarfar, M. Glick, D. Kilper, *Design of Mirror Assembly for an Agile Reconfigurable Data Center Interconnect*, Microsoft Research Technical Report, 2016.
2. N. Devanur, J. Kulkarni, G. Ranade, M. Ghobadi, R. Mahajan, A. Phanishayee, P. Blanche, H. Rastegarfar, M. Glick, D. Kilper, *Stable Matching Algorithm for an Agile Reconfigurable Data Center Interconnect*, Microsoft Research Technical Report, 2016.

### Patents

1. M. Kotaru, E. Cuervo, K. Chintalapudi, M. Ghobadi, *Mixed Reality Offload using Free-Space Optics*, Patent pending, 2017.
2. M. Ghobadi, R. Mahajan, A. Phanishayee, D. Zhuo, X. Zou, *Data Center Topology Having Multiple Classes of Reliability*, US patent, 2016.
3. M. Ghobadi, A. Shraer, *Consistent Hashing Using Exact Matching with Application to Hardware Load Balancing*, US patent, 2014.
4. M. Ghobadi, Y. Cheng, *Bounding Congestion Window to Rate Limit Large Content Transfer*, US patent, 2011.

## RESEARCH IMPACT

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- 2018 The body of work on programmable optical networks moved Microsoft to invest in building an entire infrastructure for optical software-defined networking [ACM SIGCOMM'18, ACM HotNets'17, ACM IMC'16, OFC'16, JOCN'16].
- 2017 Our recommendation system that optimizes link failure recovery is deployed at Microsoft data centers worldwide [ACM SIGCOMM'17]
- 2016 Our measurement engine to monitor optical links' power levels is in production at Microsoft data centers worldwide [USENIX NSDI'17]
- 2015 Our algorithms on using hardware timestamps to enable a delay-based congestion control in RDMA networks are in production at Google [ACM SIGCOMM'15].

## STUDENT MENTORING

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- 10/18 - now Jeremy Bogle, M.Eng thesis advisor, MIT  
Thesis: Traffic Engineering with risk analysis
- 6/18 - 8/18 Maria Apostolaki (Ph.D. student at ETH Zurich), Microsoft Research  
Project: The state of data center traffic
- 6/17 - 1/18 Rachee Singh (Ph.D. student at UMass Amherst), Microsoft Research  
Project: Programmable bandwidth in wide-area backbones [HotNets'17, SIGCOMM'18].
- 6/17 - 9/17 Mina Tahmasbi Arashloo (Ph.D. student at Princeton University), Microsoft Research  
Project: Programmable NICs in Azure data centers [HotNets'17].
- 6/15 - 2/17 Danyang Zhuo (Ph.D. student at University of Washington), Microsoft Research  
Projects: CorrOpt – Analysis of packet corruption in data center networks [SIGCOMM'17]  
RAIL – Inexpensive optics in the data center [NSDI'17]
- 6/14 - 9/14 Denis Pankratov (Ph.D. student at University of Chicago), Google  
Project: TIMELY – RDMA Congestion control [SIGCOMM'15]
- 7/14 - 12/14 Nanxi Kang (Ph.D. student at Princeton University), Google  
Project: Niagara – Load-balancing in software-defined networks [CoNEXT'15]

## PROFESSIONAL SERVICE

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- 2018 Program Committee: ACM IMC, ACM HotNets, ACM CoNext, ACM Symposium on SDN Research (SOSR), ACM HotMobile, OSA Photonic Networks and Devices, APNet, HPSR  
General chair: ACM SOSR
- 2017 Program Committee: ACM SIGCOMM, ACM IMC, ACM SOSR, ACM CoNEXT, IEEE ICNP, IEEE/IFICO TMA, IEEE MASCOTS, PAM, APNet  
Mentoring co-chair:  $N^2$ Women Workshop at ACM SIGCOMM
- 2016 Program Committee: USENIX NSDI, ACM CoNEXT, IEEE Hot Interconnects  
Co-chair: Optical Networks for the Cloud, Microsoft Research faculty summit
- 2015 Program Committee: ACM SOSR, ACM CoNEXT, IEEE Hot Interconnects