Virag Shah

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Research Interests

- System optimization and algorithm design for scalable cloud computing systems
- Applied queueing theory
- Developing an agile learning paradigm suitable for dynamic machine-human interactions

Education

Ph.D. in Electrical and Computer Engineering The University of Texas at Austin, USA	2015
Master of Engineering in Telecommunications Indian Institute of Science (IISc), Bangalore, India	2009
Bachelor of Engineering in Electronics Sardar Patel College of Engineering, Mumbai, India	2007

Awards

- **Best Paper Award** at *IEEE INFOCOM*, 2014 at Toronto, Canada. One of two papers selected (tied) from the 1650 papers submitted, and 313 papers accepted to the conference.
- **MCD Fellowship** at The University of Texas at Austin, 2010-11. Awarded to about top 1% applicants by the graduate school.
- **Best Paper Award** at *National Conf. on Comm.* (NCC), 2010 at IIT Madras, India in communications track. 250 papers submitted, and 105 accepted to conference with 48 in communications track.

Research Experience

Microsoft Research-Inria Joint Centre	2016 - present

Agile machine learning for human-centric applications
Postdoctoral Researcher
Hosts: Drs. Laurent Massoulié, Marc Lelarge, and Milan Vojnović

- Ongoing work towards exploring alternate paradigms for machine learning for applications which interact dynamically with human consumers, eg., online Q&A platforms, crowdsourcing, hiring platforms, etc.

- The objective is to design an automated framework which efficiently learns (and 'unlearns') the evolving patterns.

The University of Texas at Austin Fall 2015
Leveraging coding and data dissemination in cloud clusters
Simons Postdoctoral Fellow
Host: Prof. François Baccelli

- We propose a recurrence equation as model for clusters which leverage coding and parallel server access to accelerate performance. Its captures evolution of workload for systems of all dimensions and for all statistical assumptions.

- We provide new insights into mean latency under stochastic loads, e.g., we show that it increases logarithmically in file size for small files but linearly for large files.

The University of Texas at Austin 2010 - 2015
High performance and robustness in content delivery systems
MCD Fellow, Research Assistant
Advisor: Prof. Gustavo de Veciana

- We show that allowing servers to collaborate in servicing file download jobs offers substantial gains in download speeds while achieving robustness to load variations without requiring complex caching strategies.

- We provide a scalable performance model which enables disciplined engineering and study of performance-energy-reliability tradeoffs.

- With enough content diversity, we show that large systems exhibit a concentration property where several worst-case scenarios become unlikely, thus reducing the need for over-provisioning.

The University of Texas at Austin 2010 - present
Discovering files/objects in distributed P2P networks
MCD Fellow, Research Assistant
Advisor: Prof. Gustavo de Veciana

- We provide a new approach towards discovering files/objects which achieves stability under query resolution QoS constraints while accounting for various heterogeneity in file demands, altruism of super-peers, file placement, etc.

Alcatel-Lucent Bell Labs, New Jersey 2013
Location oblivious low latency data access in data centers
Summer Research Intern
Hosts: Dr. Murali Kodialam and Dr. T. V. Lakshman

- We provide a data storage architecture that guarantees a fixed low latency for data access, irrespective of the location of the request, by distributing data among the different memory locations such that network bottlenecks are avoided.

- We formulate the design of such systems as a linear program and developed a fast primal-dual algorithm which is faster than generic LP solvers.

Indian Institute of Technology, Bombay,   2009 - 2010
In-network function computation via network flows
Research Fellow
Advisors: Prof. D. Manjunath and Prof. Bikash K. Dey

- We develop fast algorithms for distributed function computations over networks with service constraints at nodes and capacity constraints at interconnecting links.
- Applications include throughput optimization in sensor networks and cloud computing systems.

Indian Institute of Science, Bangalore,   2007 - 2009
Distributed algorithms for wireless relay selection
Masters Research Project
Advisor: Prof. Neelesh B. Mehta

- We develope and optimize distributed algorithms for wireless cooperative relay selection and demonstrated an order of magnitude performance improvement over the state of the art in several scenarios.
- We optimize tradeoffs between resource allocation for selection and for data transmission, and demonstrated robustness of our algorithms.

Journal Publications

- V. Shah and G. de Veciana "Asymptotic independence of servers' utilization in queuing systems with limited resource pooling," *Queuing Systems* (QUESTA), 2016

- V. Shah, G. de Veciana, and G. Kesidis "A Stable Approach for Routing Queries in Unstructured P2P Networks," *IEEE/ACM Trans. on Networking* (ToN), 2016.

- V. Shah and G. de Veciana "Impact of fairness and heterogeneity on delays in large-scale content delivery networks," *Queuing Systems* (QUESTA), 2016

- V. Shah and G. de Veciana, "High Performance Centralized Content Delivery Infrastructure: Models and Asymptotics," *IEEE/ACM Trans. on Networking* (ToN), 2015.

- V. Shah, B. K. Dey, and D. Manjunath, "Network flows for functions," *IEEE J. on Selected Areas in Comm.* (JSAC) Special Issue on In-Network Computation, Mar. 2013.

- V. Shah, N. B. Mehta, and R. Yim, "Optimal timer based selection schemes," *IEEE Trans. on Comm.* (TCOM), June 2010.

- V. Shah, N. B. Mehta, and R. Yim, "Splitting algorithms for fast relay selection: Generalizations, analysis, and a unified view," *IEEE Trans. on Wireless Comm.* (TWC), Apr. 2010.

- V. Shah, N. B. Mehta, and R. Yim, "The Relay selection and transmission trade-off in cooperative communication systems," *IEEE Trans. on Wireless Comm.* (TWC), Aug. 2010.

Peer-reviewed Conference Publications

- V. Shah and G. de Veciana "Impact of fairness and heterogeneity on delays in large-scale content delivery networks," in ACM SIGMETRICS, June 2015.

- V. Shah and G. de Veciana "Performance evaluation and asymptotics for content delivery networks," in IEEE INFOCOM, Apr. 2014. **(Best Paper Award)**

- V. Shah, G. de Veciana, and G. Kesidis, "Learning to route queries in unstructured P2P networks: Achieving throughput optimality subject to query resolution constraints," in IEEE INFOCOM, Mar. 2012.

- V. Shah, B. K. Dey, and D. Manjunath, "Network flows for functions," in IEEE International Symposium of Information Theory (ISIT), Aug. 2011.

- V. Shah, B. K. Dey, and D. Manjunath, "Efficient flow allocation algorithms for in-network function computation," in IEEE GLOBECOM, Dec. 2011.

- V. Shah, N. B. Mehta, and R. Yim, "A complete characterization of an optimal timer based selection scheme," in IEEE International Conference on Communications (ICC), May 2010.

- A. S. Teertha, N. B. Mehta, V. Shah, "On optimal timer-based distributed selection for rate-adaptive multi-user diversity systems," National Conference on Communications (NCC), India, Jan. 2010. **(Best Paper Award)**

- V. Shah, N. B. Mehta, and R. Yim, "Analysis, insights and generalization of a fast decentralized relay selection mechanism," in IEEE International Conference on Communications (ICC), June 2009.

- V. Shah, N. B. Mehta, and R. Yim, "Relay selection and data transmission throughput tradeoff in cooperative systems," in IEEE GLOBECOM, Dec. 2009.

Graduate Course Work

Engineering Courses
Analysis & Design of Comm. Networks,
Digital Communication, Wireless Networks,
Systems Theory, Detection and Estimation Theory,
Adv. Prob.: Learning, Inference and Networks.

Mathematical Courses
Stochastic Processes & Queuing Theory,
Convex Analysis and Optimization,
Theory of Probability, Matrix Theory,
Information Theory, Randomized Algorithms

Teaching Experience

Probability and Stochastic Processes   Fall 2013
Teaching Assistant, The University of Texas at Austin
Instructor: Prof. Gustavo de Veciana

Professional Services

Publicity Co-chair, ACM Mobihoc 2017
Reviewer for journals IEEE/ACM Trans. on Networking (ToN), Queueing Systems
(QUESTA) and IEEE J. on Selected Areas in Comm. (JSAC), and for several
conferences such as International Teletraffic Congress (ITC), IEEE International
Symposium on Information Theory (ISIT), WiOpt, etc.

References

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Prof. Milan Vojnović
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