Stanford

Balaji Prabhakar

VMware Founders Professor, Professor of Electrical Engineering and, by courtesy, of Operations, Information and Technology at the Graduate School of Business

Bio

BIO

Prabhakar's research focuses on the design, analysis, and implementation of data networks: both wireline and wireless. He has been interested in designing network algorithms, problems in ad hoc wireless networks, and designing incentive mechanisms. He has a long-standing interest in stochastic network theory, information theory, algorithms, and probability theory.

ACADEMIC APPOINTMENTS

- Professor, Electrical Engineering
- Professor, Computer Science
- Affiliate, Precourt Institute for Energy

PROFESSIONAL EDUCATION

- PhD, UCLA (1994)

Teaching

COURSES

2018-19

- Introduction to Statistical Signal Processing: EE 278 (Aut)
- Technology for Financial Systems: CS 349F (Spr)

2017-18

- Introduction to Statistical Signal Processing: EE 278 (Aut)
- Self-Programming Networks: EE 392K (Win)

2016-17

- Big Data and Learning Systems for Large-Scale Networks: EE 392K (Win)
- Probabilistic Systems Analysis: EE 178 (Spr)

2015-16

- Analysis and Modeling of Big Data from Things That Move: EE 392K (Win)
- Introduction to Statistical Signal Processing: EE 278 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Pan Hu

Master's Program Advisor

Bryce Cai, Alejandro Dobles

Publications

PUBLICATIONS

- **Deconstructing Datacenter Packet Transport**
  Alizadeh, M., Yang, S., Katti, S., McKeown, N., Prabhakar, B., B., S., Shenker
  2013
- **EyeQ: Practical Network Performance Isolation for the Multi-tenant Cloud** *REM*
  Jeyakumar, V., Alizadeh, M., Mazieres, D., Prabhakar, B., Kim, C., Greenberg, A.
  2013; 1005 (A1): A2
- **INSINC: A Platform for Managing Peak Demand in Public Transit** *Land Transport Authority, Journeys*
  Pluntke, C., Prabhakar, B.
  2013
- **The Regulation of Ant Colony Foraging Activity without Spatial Information** *PLOS COMPUTATIONAL BIOLOGY*
  Prabhakar, B., Dektar, K. N., Gordon, D. M.
  2012; 8 (8)
- **Asymptotic independence of queues under randomized load balancing** *QUEUEING SYSTEMS*
  Bramson, M., Lu, Y., Prabhakar, B.
  2012; 71 (3): 247-292
- **EyeQ: Practical Network Performance Isolation at the Edge**
  Jeyakumar, V., Alizadeh, M., Mazieres, D., Prabhakar, B., Kim, C., Azure, W.
  2012
- **Less Is More: Trading a Little Bandwidth for Ultra-Low Latency in the Data Center**
  Alizadeh, M., Kabbani, A., Edsall, T., Prabhakar, B., Vahdat, A., Yasuda, M.
  2012
- **Stability Analysis of QCN: The Averaging Principle**
  Alizadeh, M., Kabbani, A., Atikoglu, B., Prabhakar, B.
  2011
- **Analysis of DCTCP:Stability, Convergence, and Fairness**
  Alizadeh, M., Javanmard, A., Prabhakar, B.
  2011
- **Data Center TCP (DCTCP)** *ACM SIGCOMM 2001 Conference 2010*
  Alizadeh, M., Greenberg, A., Maltz, D. A., Padhye, J., Patel, P., Prabhakar, B., Sengupta, S., Sridharan, M.
  ASSOC COMPUTING MACHINERY.2010: 63–74
- **AF-QCN: Approximate fairness with quantized congestion notification for multi-tenanted data centers**
  Kabbani, A., Alizadeh, M., Yasuda, M., Pan, R., Prabhakar, B.
  2010
- **Data Center TCP (DCTCP)**
  Alizadeh, M., Greenbergh, A., Maltz, D., A., Padhye, J., Patel, P., Prabhakar, B.

2010

- **Incentive mechanisms for decongesting roads**
  Merugu, D., Gomes, N., R., Prabhakar, B.
  2009
- **Approximate bandwidth partitioning—from academia to industry**
  Pan, R., Bonomi, F., Prabhakar, B.
  2008
- **ElephantTrap: A low cost device for identifying large flows**
  Lu, Y., Wang, M., Prabhakar, B., Bonomi, F.
  2007
- **Detailed network measurements using sparse graph counters: The theory**
  Lu, Y., Montanari, A., Prabhakar, B.
  2007
- **Analysis of randomized load balancing with general services using the cavity method**
  Bramson, M., Lu, Y., Prabhakar, B.
  2007
- **Optimal throughput-delay scaling in wireless networks - Part II: Constant-size packets** *IEEE International Symposium on Information Theory and Its Applications*
  El Gamal, A., Mammen, J., Prabhakar, B., Shah, D.
  IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC.2006: 5111–16
- **Optimal throughput-delay scaling in wireless networks - Part I: The fluid model** *IEEE TRANSACTIONS ON INFORMATION THEORY*
  El Gamal, A., Mammen, J., Prabhakar, B., Shah, D.
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- **Randomized gossip algorithms** *IEEE TRANSACTIONS ON INFORMATION THEORY*
  Boyd, S., Ghosh, A., Prabhakar, B., Shah, D.
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- **Congestion control in networks with no congestion drops**
  Lu, Y., Pan, R., Prabhakar, B., Bergamasco, D., Alaria, V., Baldini, A.
  2006
- **Optimal throughput-delay trade-off in wireless networks – Part II: Constant-size packets** *IEEE Transactions on Information Theory*
  Gamal, A., El, Mammen, J., Prabhakar, B., Shah, D.
  2006; 11 (52): 5111-5116
- **SHRiNK: A method for enabling scaleable performance prediction and efficient network simulation** *IEEE-ACM TRANSACTIONS ON NETWORKING*
  Pan, R., Prabhakar, B., Psounis, K., Wischik, D.
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- **Systems with multiple servers under heavy-tailed workloads** *International Symposium on Computer Performance Modelling, Measurement and Evalution*
  Psounis, K., Molinero-Fernandez, P., Prabhakar, B., Papadopoulos, F.
  ELSEVIER SCIENCE BV.2005: 456–74
- **Belief propagation based multi-user detection**
  Montanari, A., Prabhakar, B., Tse, D.
  2005
- **Systems with multiple servers under heavy-tailed workloads**
  Psounis, K., Fernandez, P., Molinero, Prabhakar, B., Papadopoulos, F.
  2005
- **SIFT: A simple algorithm for tracking elephant flows and taking advantage of power laws**
  Psounis, K., Ghosh, A., Prabhakar, B., Wang, G.

2005

- **Mixing times for random walks on geometric random graphs**
  Boyd, S., Ghosh, A., Prabhakar, B., Shah, D.
  2005
- **Network hardware algorithms**
  Prabhakar, B.
  2005
- **Bloom filters: Design innovations and novel applications**
  Lu, Y., Prabhakar, B., Bonomi, F.
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- **Near-optimal depth-constrained codes** *IEEE TRANSACTIONS ON INFORMATION THEORY*
  Gupta, P., Prabhakar, B., Boyd, S.
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- **Modeling correlations in web traces and implications for designing replacement policies** *COMPUTER NETWORKS*
  Psounis, K., Zhu, A., Prabhakar, B., Motwani, R.
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- **Delay bounds for combined input-output switches with low speedup** *2nd Internet Performance Symposium*
  Giaccone, P., Leonardi, E., Prabhakar, B., Shah, D.
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- **A new proof of Parisi's conjecture for the finite random assignment problem**
  Nair, C., Prabhakar, B., Sharma, M.
  2004
- **Analysis and opti+A69mization of randomized gossip algorithms**
  Boyd, S., Ghosh, A., Prabhakar, B., Shah, D.
  2004
- **Delay bounds for combined inputoutput switches with low speedup** *Performance Evaluation*
  Giaccone, P., Leonardi, E., Prabhakar, B., Shah, D.
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- **The existence of fixed points for the ./GI/1 queue** *ANNALS OF PROBABILITY*
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- **The attractiveness of the fixed points of a ./GI/1 queue** *ANNALS OF PROBABILITY*
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- **Randomized scheduling algorithms for high-aggregate bandwidth switches** *IEEE INFOCOM 2002 Meeting*
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- **Approximate fairness through differential dropping** *COMPUTER COMMUNICATION REVIEW*
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  Giaccone, P., Prabhakar, B., Shah, D.
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- **The attractiveness of the fixed points of a ·/GI/1 queue** *Annals of Probability*
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- **The existence of fixed points for the ·/GI/1 queue** *Annals of Probability*
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- **Randomized scheduling algorithms for highaggregate bandwidth switches** *IEEE Journal on Selected Areas in Communications*
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  Psounis, K., Pan, R., Prabhakar, B., Wischik, D.
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- **An implementable parallel scheduler for input-queued switches** *IEEE MICRO*
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- **On Parisi's conjecture for the random assignment problem**
  Sharma, M., Prabhakar, B.
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- **Flow table-based design to approximate fairness**
  Pan, R., Breslau, L., Prabhakar, B., Shenker, S.
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- **A study of the applicability of a scaling hypothesis**
  Pan, R., Psounis, K., Sharma, M.
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- **An implementable parallel scheduler for input queued switches** *IEEE Micro*
  Giaccone, P., Shah, D., Prabhakar, B.
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- **Towards simple, high-performance schedulers for high aggregate bandwidth switches**
  Giaccone, P., Prabhakar, B., Shah, D.

2002

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  Shah, D., Giaccone, P., Prabhakar, B.
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  Pan, R., Breslau, L., Prabhakar, B., Shenker, S.
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- **Approximate fair dropping for variable-length packets** *IEEE MICRO*
  Psounis, K., Pan, P., Prabhakar, B.
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  Leyton-Brown, K., Porter, R., Venkataraman, S., Prabhakar, B.
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  Pan, R., Nair, C., Yang, B., Prabhakar, B.
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- **An efficient randomized algorithm for inputqueued switch scheduling**
  Shah, D., Giaccone, P., Prabhakar, B.
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- **The synchronization of Poisson processes and queueing networks with service and synchronization nodes** *ADVANCES IN APPLIED PROBABILITY*
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- **Invariant rate functions for discrete time queues**
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  Gallager, R., Prabhakar, B.
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  Prabhakar, B., Gupta, P., Boyd, S.
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- **On the synchronization of Poisson processes and queueing networks with service and synchronization nodes** *Stanford University Computer Science Department Technical Report, STAN-CS-TR-98-1613*
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- **A large deviations characterization of the fixed point of a ·/G/1 queue**
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- **Multicast scheduling for input-queued switches** *IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS*
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  Prabhakar, B., McKeown, N.
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- **Convergence of departures from an infinite sequence of queues**
  Mountford, T., S., Prabhakar, B.
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- **The asymptotics of traffic processes in large queueing networks**
  Prabhakar, B., Mountford, T., S., Bambos, N.
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- **On infinite queueing tandems** *Systems & Control Letters*
  Bambos, N., Prabhakar, B.
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- **Estimation of wind profile from laser beam propagation distortion**
  Balakrishnan, A., V., Prabhakar, B.
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