VINAY KOLAR

Department of Computer Science,
Carnegie Mellon University,
Doha, Qatar.

Ph: +974 682 3947
Email: **vkolar@cmu.edu**
http://cs.binghamton.edu/~vinkolar/

RESEARCH SUMMARY:

Analysis, modeling, system design and development in wireless networks. Current research areas include scheduling, routing and rate-control in multi-hop wireless networks, with focus on realizing mathematical models in realistic networks.

EDUCATION :

SUNY Binghamton, NY — 08/2004 - 12/2007
Ph.D. (Computer Science) *GPA: 4.0/4.0*

SUNY Binghamton, NY — 08/2002 - 08/2004
M.S. (Computer Science), *GPA: 4.0/4.0*

B.M.S College of Engineering, Bangalore, India — 10/1996 - 08/2000
B.E. (Information Science & Engineering), First class with Distinction,
9^{th} *rank for Bangalore University.*

EXPERIENCE :

Department of Computer Science, Carnegie Mellon University, Qatar — Nov 2009 - Present
Post-doctoral research assistant
Next-Generation Challenges in Multimedia over Wireless Networks.

Department of Wireless Networks, RWTH-Aachen University — Jan 2008 - Oct 2009
Post-doctoral research assistant
Cross-layer optimization of wireless networks with cognitive radios.

San Diego Supercomputer Center, University of California, San Diego — May 2006 - Aug 2006
Programmer/Analyst II
Analysis, design and development of a Real-time Data Streaming Architecture for wireless networks.

Computer Science Department, SUNY Binghamton — Aug 2002 - Dec 2007
Teaching Assistant and Research Assistant
Handling lectures and lab sessions, designing and supporting course projects, and grading. Courses include Graduate level Networking, Operating Systems and Undergraduate Assembly Language Programming.

IBM Global Services, India, Pvt. Ltd. — Oct 2000 - Oct 2002
Software Engineer
Middleware design and development using J2EE components in Websphere.

PUBLICATIONS:

Book Chapters:

- *V. Kolar* and N. B. Abu-Ghazaleh, *"Congestion Control in Wireless Ad Hoc Networks"*, Handbook of Wireless Ad Hoc and Sensor Networks, Springer, March 2009.
- *V. Kolar* and N. B. Abu-Ghazaleh, *"The Effect of Interference and Link Quality on Routing in Multi-Hop Wireless Networks"* . Handbook on Algorithms and Protocols for Wireless Ad hoc and Sensor Networks, Wiley, Nov 2008.

Journals:

- *V. Kolar*, K. Bharath, N. B. Abu-Ghazaleh and J. Riihijarvi, *"The Effect of Contention in CSMA Networks: Model and Fairness Protocol"*, Elsevier Performance Evaluation (to appear).
- S. Razak, *V. Kolar* and N. B. Abu-Ghazaleh, *Modeling and Analysis of Two-Flow Interactions in Wireless Networks*, Ad Hoc Networks, Elsevier, Volume 8, Issue 6, Aug 2010.
- *V. Kolar* and N. B. Abu-Ghazaleh, *"Globally Aware Routing in Multi-Hop Wireless Networks: A Formulation and Analysis"*, Journal of Interconnection Networks (JOIN), Vol 9., No. 3, Sep 2008.

Conferences and Workshops:

- *V. Kolar*, S. Razak, P. Mahonen and N. B. Abu-Ghazaleh, *Measurement and Analysis of Link Quality in Wireless Networks: An Application Perspective*, 2nd International Workshop on Carrier Grade Wireless Mesh Networks (CARMEN), March 2010.
- *V. Kolar*, S. Razak, N. B. Abu-Ghazaleh, P. Mahonen and K. Harras, *"Interference across Multi-hop Wireless Chains"*, IEEE International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob) 2009.
- *V. Kolar*, K. Bharath, N. B. Abu-Ghazaleh and J. Riihijarvi, *"Contention in Multi-hop Wireless Networks: Model and Fairness Analysis"*, ACM-IEEE International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM) 2009.
- S. Razak, *V. Kolar*, N. B. Abu-Ghazaleh and K. Harras, *"How do Wireless Chains Behave? The Impact of MAC Interactions"*, ACM-IEEE International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM) 2009.
- J. Riihijarvi, P. Mahonen, M. Petrova and *V. Kolar "Enhancing Cognitive Radios with Spatial Statistics: From Radio Environment Maps to Topology Engine"*, Cognitive Radio Oriented Wireless Networks and Communications (CrownCom) 2009.
- M. Ahmed, *V. Kolar*, M. Petrova, P. Mahonen and S. Hailes, *Component based architecture for Cognitive Radio Resource Manager"*, Cognitive Radio Oriented Wireless Networks and Communications (CrownCom) 2009.
- *V. Kolar*, P.Mahonen, M.Petrova, M. Sooriyabandara, J. Riihijarvi and T.Farnham, *"A Case for Generic Interfaces in Cognitive Radio Networks"*, ICT-Mobile Summit, Santander, Spain, June 2009.
- *V. Kolar*, N. B. Abu-Ghazaleh and P. Mahonen, *"Decomposition for Low-complexity Near-Optimal Routing in Multi-hop Wireless Networks"*, IEEE International Conference on Communications (ICC-2009).
- S. Razak, *V. Kolar* and N. B. Abu-Ghazaleh, *"Modeling of Two-Flow Interactions Under SINR Model in Multi-Hop Wireless Networks"*, IEEE Conference on Local Computer Networks (LCN) 2008 .

- *V. Kolar* and N. B. Abu-Ghazaleh, *"Scheduling Aware Network Flow Models for Multi-hop Wireless Networks"*, IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WOWMOM) 2008.
- S. Razak, *V. Kolar* and N. B. Abu-Ghazaleh, *"Modeling and Analysis of Two-Flow Interactions in Wireless Networks"*, IEEE/IFIP International Conference on Wireless On-demand Network Systems and Services (WONS) 2007.
- *V. Kolar* and N. B. Abu-Ghazaleh, *"Towards Interference-Aware Routing for Real-time Traffic in Multi-hop Wireless Networks"*, IEEE Distributed Simulation and Real Time Applications 2007, (invited paper).
- *V. Kolar* and N. B. Abu-Ghazaleh, *"A Multi-Commodity Flow Approach to Globally Aware Routing in Multi-Hop Wireless Networks"*, IEEE Pervasive Computing and Communications, 2006 (PerCom'06), (acceptance rate: 8%).
- *V. Kolar*, P. Rogers and N. B. Abu-Ghazaleh, *"Route Compaction for Directional Route Discovery in MANETs"*, IEEE International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob 2005).
- *V. Kolar*, S. Tilak and N. B. Abu-Ghazaleh *"Avoiding Head of Line Blocking in Directional Antennas"*, Proc. 29th IEEE Conference on Local Computer Networks (LCN 2004).
- S. Tilak, *V. Kolar*, N. B. Abu-Ghazaleh and K. D. Kang *"Dynamic Localization Control for Mobile Sensor Networks"*, IEEE International Workshop on Strategies for Energy Efficiency in Ad Hoc and Sensor Networks (IEEE IWSEEASN'05).

Demonstrations:

- J. Nasreddine, V. Kolar, *et al. Cognitive Radio for Home Networking*, Demonstration at IEEE International Symposium on New Frontiers in Dynamic Spectrum Access Networks (DySPAN), April 2010.
- *V. Kolar*, A. Greco, T. Milcher, *V. Kolar*, M. Petrova, P. Mahonen, *"Capacity Estimation and Adaptation in Cognitive Radio Networks: Software Defined Radios in Action"*, Demonstration at ACM International Conference on Mobile Computing and Networking (Mobicom) 2009.
- A. Greco, T. Milcher, *V. Kolar*, M. Petrova, P. Mahonen, *"CSMA Interaction Detection and Capacity Estimation in Cognitive Radio Networks"*, Demonstration at ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc) 2009.

PATENTS :

K. Pal, S. K. Chaudhary, *V. Kolar*, ***"Software testing"***, United States Patent 20020138787, Sep 2002 (A white-box testing tool).

PROFESSIONAL ACTIVITIES :

Techical Program committee member:
PerNets 2009, WiMob 2009, Mobiuitous 2009, MobiCare 2009, SDR 2009, PM2HW2N 2009, IEEE SenseApp 2009, ICT-Mobile Summit 2009, WoWMoM 2009, WCNC 2009, MACOM 2009, ACM PM2HW2N 2008, IEEE SenseApp 2008
Conference/Journal Reviewer:
To several ACM/IEEE conferences and other international journals. **Teaching Activities:**
1. Mentored two Diploma (similar to M.S. in USA) students for their final thesis work. The work involves bandwidth estimation in cognitive radio network and evaluation of a routing protocol that is derived from a decomposition based

optimization model.
2. Mentor for a student under the NSF "**Research Experiences for Undergraduates (REU)**" program in Summer 2007. The REU program is aimed at introducing academic research to undergraduate students. The project was to *characterize the interference patterns in IEEE 802.11 protocol using Artheros based chipsets*.
3. Teaching a subset of lectures and designing course work for Graduate level "Mobile Computing and Networking" course (Under Dr. Nael Abu-Ghazaleh). Design of kernel projects, handling a subset of lectures and assisting graduate students in kernel programming for the graduate level "Operating Systems" course (Under Dr. Michael Lewis).

TECHNICAL SKILLS :

Networking: Madwifi wireless drivers/ath5k, WARP software defined radios, Xilinx ISE Design Suite, Click modular router, Open WRT, Qualnet, NS-2.
Modeling tools: MATLAB, CPLEX (Optimizer), Mathematica.
Languages: C, C++, Java, scripting languages (perl, sed and awk).
Operating system: Linux, Solaris, AIX, Windows.
Middleware and Servers: CORBA(in Java), J2EE, Websphere, Agent Technologies(Aglet, Cougaar).
Database: DB2, Oracle(as developer).

SELECTED RESEARCH PROJECTS :

Cross-layered optimization and protocol design in Cognitive Radio Network:
The main goal is to enable practical protocol design that are derived from, possibly cross-layered, optimization models in Cognitive Radio Networks. My focus is on (1) Modeling the application utility, routing and MAC layer; (2) Translating the model into protocol design; and (3) Evaluate the resulting protocol in network testbeds with software defined radios.

Routing and Traffic-Engineering in Multi-hop Wireless Networks (Ph.D. Dissertation topic):
Quantifying the effect of interference, scheduling and wireless propagation on the network performance using optimization theory and stochastic processes. The aim of this research project is to formulate a near-optimal and feasible routing protocol that is aware of the interference and MAC layer interactions. Such a model serves as a framework for an comprehensive understanding the cross-layer interactions. The long-term goals of this research is to: (1) Develop an online tool for enabling efficient static multi-hop wireless networks; and (2) Formally characterize the properties of protocol stack in multi-hop wireless network and deploy near-optimal protocols.

Challenges in Directional Antennas (M.S. Thesis):
Analyzing the behavior of Ad-hoc network under a directional antenna and proposing two heuristic protocols : (1) A MAC protocol that avoids "Head-of-line" blocking; and (2) A routing protocol that "compacts" the routes to take advantage of longer ranges of directional antenna.

PROFESSIONAL EXPERIENCE :

IBM Global Services, India, Pvt. Ltd. Oct 2000 - Oct 2002
Software Engineer

Design and development of middleware for web applications using a J2EE framework. Experience with international client interactions for requirements collection. Investigated and implemented a proof-of-concept research project on enabling mobile agents in Websphere.

IBM Global Services, India, Pvt. Ltd. Mar 2000 - Aug 2000
Internship

Development of a Testing Tool for White-Box testing of Java classes.