

## Changhee Joo

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### Education

Ph.D. of Electrical Engineering and Computer Science, Seoul National University, Korea, Feb. 2005.  
M.S. of Electrical Engineering and Computer Science, Seoul National University, Korea, Feb. 2000.  
B.S. of Electrical Engineering and Computer Science, Seoul National University, Korea, Feb. 1998.

### Research Interests

- **Wireless network:** resource allocation in multi-hop networks, wireless scheduling and power control, end-to-end network performance, cross-layer optimization with distributed algorithms, network stability and scalability, congestion control, queue management.
- **Wireless sensor network:** in-network data aggregation, energy efficiency and delay performance of network systems, network reliability, sleep and wake scheduling, fundamental tradeoffs in large network systems.
- **Performance analysis and optimization:** stochastic analysis and modeling of network system, algorithm complexity, queueing system, network pricing.

### Honors and Awards

- **Best Paper Award**, IEEE INFOCOM 2008, Apr. 2008.
- Fellowship from Korea Institute of Information Technology Assessment, Oct. 2005.
- Post-doctoral fellowship from Brain Korea 21 Program, April 2005.
- Scholarship for studying aboard from Brain Korea 21 Program, Aug. 2000.

### Professional Activities

- *Technical Program Committee:*  
**IEEE INFOCOM** (2009 and 2010), **ICOIN** (2010), **ACM MOHIHOC** (2008 and 2009), **IEEE GLOBECOM** (2007, 2008, and 2009), **IEEE COMSNETS** (2009), **ICUFN** (2009), **CHINACOM** (2008), **IEEE COMSWARE** (2007 and 2008), **IEEE ICON** (2006), **IEEE IWCMC** (2006).
- *Session Chair* of **ACM MOBIHOC** (2008).
- *Designated Reviewer* of **IEEE INFOCOM** (2008).

## Research Experience

<b>Research Scientist</b> , the Ohio State University, OH, USA	March 09 – Present
Post-doctoral Researcher, the Ohio State University, OH, USA	July 07 – Feb. 09
Post-doctoral Researcher, Purdue University, IN, USA	Sept. 05 – June 07
Post-doctoral Researcher, Seoul National University, Seoul, Korea	March 05 – Sept. 05
Research Assistant, Seoul National University, Seoul, Korea	March 00 – Feb. 05
Visiting Scholar, University of Illinois at Urbana-Champaign, IL, USA	Aug. 00 – June 01

- Characterized the capacity region of greedy scheduling in multi-hop wireless networks.
- Obtained a sharp performance bound of wireless scheduling in geometric network graphs.
- Devised local greedy algorithms with high performance and low complexity.
- Designed distributed cross-layer solutions with provable end-to-end performance guarantees for joint congestion control and scheduling.
- Developed queue length-based random access scheduling with constant time complexity.
- Studied fundamental tradeoffs between delay and reliability in lossy wireless networks.
- Analyzed delay performance of joint solution for data aggregation and scheduling in wireless sensor networks.
- Implemented practical sleep and wake scheduling on Mica testbed.
- Designed efficient queue management algorithms and evaluated performance on Linux testbed.
- Analyzed the start-up dynamics of TCP congestion control.

## Invited Talks and Lectures

- “Understanding the Capacity Region of the Greedy Maximal Scheduling Algorithm in Multi-hop Wireless Networks”
  - Duke University, Durham, North Carolina, USA, May 2009.
  - Seoul National University, Seoul, Korea, Jan. 2009.
  - Korea University, Seoul, Korea, Jan. 2009.
  - Yonsei University, Seoul, Korea, Jan. 2009.
  - Pusan National University, Pusan, Korea, Jan. 2009.
  - GIST, Gwangju, Korea, Jan. 2009.
  - University of Illinois at Urbana-Champaign (UIUC), Urbana, Illinois, USA, Nov. 2008
- “Cross-layer Protocol Design with Random Access Scheduling Schemes”
  - Korea University, Seoul, Korea, Jan. 2008.
  - Seoul National University, Seoul, Korea, Dec. 2007.
  - CSE colloquium at Purdue University, West Lafayette, Indiana, USA, July 2007.
- “Cross-layer Optimization with Random Access Scheduling Schemes in Multi-Hop Wireless Networks,” the 36th IEEE Communication Theory Workshop, Sedona, Arizona, USA, May 2007.
- “NS-2 Tutorial”
  - KICS TAG on Communications Switching and Routing, Seoul, Korea, July 2004.
  - Samsung Electronics, Kyungki-do, Korea, Jan. 2004.
  - Information and Communications University, Daejeon, Korea, Jan. 2004.
  - KICS TAG on Communications Switching and Routing, Seoul, Korea, July 2003.
- “TCP transmission control protocol,” Samsung Secu-I, Seoul, Korea, July 2004.

## Publications

### Journal Publications

- J9.** C. Joo, X. Lin and N. B. Shroff, "Understanding the Capacity Region of the Greedy Maximal Scheduling Algorithm in Multi-hop Wireless Networks," *IEEE/ACM Transactions on Networking*, Vol. 17, No. 4, pp. 1132--1145, Aug. 2009 (fast-track).
- J8.** C. Joo, X. Lin and N. B. Shroff, "Greedy Maximal Matching: Performance Limits for Arbitrary Network Graphs Under the Node-exclusive Interference Model," *IEEE Transactions on Automatic Control*, accepted for publication.
- J7.** C. Joo, and S. Bahk, "Performance of Random Access Scheduling Schemes in Multi-hop Wireless Networks," *IEEE/ACM Transactions on Networking*, accepted for publication.
- J6.** D. Lee, J. Choi, C. Joo, and S. Bahk, "Hierarchical Markov Chain Analysis of Adaptive Bandwidth Reservation Algorithm in Wireless Communication System," *Performance Evaluation*, Vol. 65, No. 8, pp. 573--585, July 2008.
- J5.** J. Hong, C. Joo, and S. Bahk, "Active Queue Management Algorithm Considering Queue and Load States," *Computer Communications*, Vol. 30, No. 4, pp. 886--892, Feb. 2007.
- J4.** C. Joo, S. Bahk, and S. S. Lumetta, "A Hybrid Active Queue Management for Stability and Fast Adaptation," *Journal of Communications and Networks*, Vol. 8, No. 1, March 2006.
- J3.** C. Joo and S. Bahk, "Scalability Problems of RED," *IEE Electronics Letters*, Vol. 38, No. 21, 2002.
- J2.** C. Joo and S. Bahk, "Analysis of Start-up Transition Dynamics of TCP NewReno," *Computer Networks*, Vol. 36, No. 2, pp. 237--250, 2001.
- J1.** C. Joo and S. Bahk, "Start-up Transition behaviour of TCP NewReno," *IEE Electronics Letters*, Vol. 35, No. 21, 1999.

### Conference Publications

- C16.** C. Joo and N. B. Shroff, "On the Delay Performance of In-Network Aggregation in Lossy Wireless Sensor Networks," *the 46th Annual Allerton conference on Communications, Control, and Computing*, Sept. 2008. (Invited)
- C15.** C. Joo, "A Local Greedy Scheduling Scheme with Provable Performance Guarantee," *ACM MOBIHOC*, May 2008. (Acceptance Ratio ~ 15%)
- C14.** C. Joo, X. Lin, and N. B. Shroff, "Understanding the Capacity Region of Greedy Maximal Scheduling Algorithm in Multi-hop Wireless Networks," *IEEE INFOCOM*, Apr. 2008. (**Best Paper Award**; Acceptance Ratio ~ 21%)
- C13.** C. Joo, X. Lin, and N. B. Shroff, "Performance Limits of Greedy Maximal Matching in Multi-hop Wireless Networks," *IEEE CDC*, Dec. 2007. (Invited)
- C12.** C. Joo and N. B. Shroff, "Performance of Random Access Scheduling Schemes in Multi-hop Wireless Networks," *IEEE INFOCOM*, May 2007. (Acceptance Ratio ~ 18%)
- C11.** C. Joo and N. B. Shroff, "Performance of Random Access Scheduling Schemes in Multi-hop Wireless Networks," *the 40th Asilomar Conference on Signals, Systems, and Computers*, Nov. 2006. (Invited)
- C10.** G. Sharma, C. Joo, and N. B. Shroff, "Distributed Scheduling Schemes for Throughput Guarantees in Wireless Networks," *the 44th Annual Allerton conference on Communications, Control, and Computing*, Sept. 2006. (Invited)
- C9.** C. Joo, S. Bahk, and H. Kim, "Detecting Spatial Congestion in Multihop Wireless Networks," *IEEE IWCMC*, July 2006.

- C8. C. Joo, S. Bahk, and H. Kim, "Synchronizing TCP with Block Acknowledgement over Multi-hop Wireless Networks," *ICOIN*, Jan. 2006.
- C7. C. Joo and S. Bahk, "Increasing TCP Capacity in Wireless Multihop Networks," *HIS*, July 2005.
- C6. Y. Dai, C. Joo, and S. Bahk, "Enhancing Routing Protocol with Memory in Mobil Ad Hoc Networks," *UbiCNS*, June 2005.
- C5. C. Joo, J. Hong, and S. Bahk, "Assuring drop probability for delay-insensitive traffic in a differentiated service network," *IEEE CCNC*, Jan. 2005.
- C4. J. Hong, C. Joo, and S. Bahk, "Active Queue Management Algorithm Considering Queue and Load States," *IEEE ICCCN*, Oct. 2004.
- C3. C. Joo and S. Bahk, "Weighted Fair Bandwidth Allocation and Active Queue Management for Adaptive Flows," *IEEE ICCS*, Sept. 2004.
- C2. C. Joo and S. Bahk, "Improving Performance of Active Queue Management at the Internet Gateway," *ICN*, March 2004.
- C1. C. Joo, S. Bahk, and S. S. Lumetta, "Hybrid Active Queue Management," *IEEE ISCC*, July 2003.

### Submitted Papers

- SJ2. G. Sharma, C. Joo, N. B. Shroff, and R. R. Mazumdar, "On the Complexity of Scheduling in Wireless Networks," submitted.
- SJ1. G. Sharma, C. Joo, N. B. Shroff, and R. R. Mazumdar, "Joint Congestion Control and Distributed Scheduling for Throughput Guarantees in Wireless Networks," submitted.
- SC1. C. Joo, J. Choi, and N. B. Shroff, "Delay Performance of Scheduling with Data Aggregation in Wireless Sensor Networks," submitted.