

## PROMOTION RECOMMENDATION

University of Michigan  
College of Engineering

Mingyan Liu, assistant professor of electrical engineering and computer science, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

### Academic Degrees

B.S. 1995 Nanjing University of Aeronautics and Astronautics, China, Electrical Engineering,  
M.S. 1997 University of Maryland, College Park, Systems Engineering  
Ph. D. 2000 University of Maryland, College Park, Electrical Engineering

### Professional record

2000-present Assistant Professor of Electrical Engineering and Computer Science, University of Michigan  
1997-2000 Research Engineer, Center for Satellite and Hybrid Communication Network, University of Maryland, College Park  
1998 Visiting Researcher, Telcordia Technologies Inc.  
1995-1997 Graduate Research Assistant, University of Maryland, College Park

### Summary of Evaluation:

**Teaching:** Professor Liu has become an excellent classroom instructor as well as an excellent research advisor. She has taught a broad spectrum of courses at both the undergraduate and graduate level. Her teaching ratings have been consistently improving to a most recent 4.68 rating (out of 5). She has improved her rating in each class she has taught and has even done well in a course for which it is notoriously difficult to get high ratings. She received high praise from the students in her classes for giving clear lectures, being very thorough, available and helpful in office hours. Finally Professor Liu has an excellent track record supervising graduate students. Her students state that she makes sure they are learning and are challenging themselves. A colleague mentions that he has been impressed by her ability to motivate students to achieve their potential. In summary, Professor Liu is an excellent classroom teacher and research advisor.

**Research:** Since joining the University of Michigan in 2000, Professor Liu has established a first rate research program in networks, and in particular, wireless networks, a technological field that is becoming increasingly important. Professor Liu has made significant contributions including: (1) The development of mobility models for *ad hoc* networks. This work received significant attention in the research community and inspired other researchers to carefully study the statistical properties of mobility models. (2) The analytic determination of optimal dynamic bandwidth allocation strategies in satellite systems. This work is a fundamental contribution to restless bandits, a generic class of resource allocation problems arising in communication systems, statistics, operations research, economics, manufacturing systems, transportation systems, etc. Furthermore, this work was used by Hughes Networks Systems to validate their existing satellite system design. (3) The determination of optimal search and optimal query strategies for problems arising in *ad hoc* networks. This work is a fundamental contribution to *ad hoc* networks. (4) The study of the transport capacity of a large-scale data gathering sensor network. This work is a solid contribution to the organization and performance characterization of data-gathering sensor networks. (5) The development of a decentralized resource allocation mechanism for multirate multicast

service provisioning. This mechanism presents a generic and complete methodology for optimal rate control in multicast using pricing techniques.

Because of her research accomplishments, Professor Liu gained national visibility. This is evidenced by the number of invited talks she has given throughout the country, the invitation to be an editor in a premier journal on Mobile computing and Communications, and the invitation to numerous panel review and conference organizing committees.

Recent and Significant Publications:

- J. Yoon, M. Liu and B. Noble, "A General Framework to Construct Stationary Mobility Models for the Simulation of Mobile Networks," accepted for publication, *IEEE Transactions on Mobile Computing*, 2005.
- E. J. Duarte-Melo, M. Liu and A. Misra, "An Efficient and Robust Computational Framework for Studying Lifetime and Information Capacity in Sensor Networks," accepted for publication, *ACM Journal on Mobile Networks and Applications (MONET) Special Issue on Energy Constraints and Lifetime Performance in Wireless Sensor Networks*, 2004.
- C. Hsin and M. Liu, "A Two-Phase Self-Monitoring Mechanism for Wireless Sensor Networks," accepted for publication, *Elsevier Journal of Computer Communications (JCC) Special Issue on Sensor Networks*, 2004.
- M. Liu and J. S. Baras, "Fixed Point Approximation for Multirate Multihop Loss Networks with State-Dependent Routing," *IEEE/ACM Transactions on Networking*, vol. 12, no. 2, pp. 361-374, April 2004.
- N. Ehsan and M. Liu, "Modeling TCP Performance with Proxies," *Elsevier Journal of Computer Communications (JCC) Special Issue on Protocol Engineering for Wireless Networks*, vol. 27, issue 10, pp. 961-975, June 2004.
- N. Ehsan and M. Liu, "Dynamic bandwidth allocation for low power devices with random connectivity," to appear in *IEEE Conference on Decision and Control (CDC)*, December 2005, Seville, Spain. Invited paper.
- N. Ehsan and M. Liu, "Minimizing power consumption in sensor networks with quality of service requirement", *Proc. Annual Allerton Conference on Communication, Control and Computing (Allerton)*, September 2005. Invited paper.
- N. Chang and M. Liu, "Optimal controlled flooding search in large wireless networks," in *Proc. The 3rd International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt)*, pp. 229-237, March 2005, Trentino, Italy.
- N. Ehsan and M. Liu, "Properties of optimal power and admission control for a single user queue in a time varying wireless channel," in *Proc. Annual Allerton Conference on Communication, Control and Computing (Allerton)*, September 2004, Allerton, IL.
- N. Ehsan and M. Liu, "Properties of optimal resource sharing in a delay channel," in *Proc. IEEE Conference on Decision and Control (CDC)*, vol. 3, pp. 3277-3282, December 2004, Paradise Island, Bahamas. Invited paper.

Service: Professor Liu has an outstanding service record for a faculty member at this stage of development. She has served and is currently serving on several departmental committees including the EE: Systems Graduate Admissions Committee, the EECS Web Committee, The ECE Faculty Search Committee, and the Committee on Research Emphasis and Faculty Hiring. She is a member of the College of Engineering International Program Committee. She has also volunteered for survey and interview studies conducted by the ADVANCE program at the University of Michigan. Professor Liu has been very active in her professional society. She has served in organizing and technical program committees of numerous conferences or workshops on networks. She is currently serving as an area editor for ACM-SIGMOBILE (a new ACM journal on Mobile Communication) and has served as a guest

editor for EURASIP Journal on Wireless Communication and Networking, Special Issue on Sensor Networks. She has been a reviewer for NSF. All indications are that she will continue to exceptionally fulfill her service obligations.

External Reviewers:

Reviewer (A): "Many researchers in networking rely on simulations, and her emphasis on mathematically rigorous analysis of meaningful fundamental problems sets her apart from the majority of her peers."

Reviewer (B): "Her contributions are noteworthy and diverse. She is keeping abreast of the rapidly evolving field of networking and has gained distinction and recognition ... ."

Reviewer (C): "These contributions are important and display the high level of depth and breadth expected from an associate professor at a top university."

Reviewer (D): "Mingyan's work is characterized by technical rigour and is theoretically well founded. This is important in areas where much work is, unfortunately, ad hoc. Mingyan, does communicate the implications of her work well too, since her work is well cited in the literature."

Reviewer (E): "...Dr. Liu's record to date is an excellent one indeed, and in my opinion, strongly suggestive of her many future accomplishments and possible contributions to your department and institution."

Reviewer (F): "Dr. Liu's work is excellent on several counts: the problems are well-chosen (i.e. important and interesting), her contributions are original, the mathematics is skillful and clean, her papers are thoroughly written and a pleasure to read."

Reviewer (G): "...Prof. Liu has established a strong research record in wireless networking. She brings to her work an expertise in analytical modeling of wireless protocols, which is lacking in the wireless networking community."

Reviewer (H): "I am very impressed by the quality of these six papers. The analysis is invariably interesting and difficult; the prior literature (sometimes extensive) is thoroughly mastered; the choice of problems shows a taste for elegance and topicality."

Summary of Recommendation: Professor Liu is an excellent classroom instructor and an excellent research advisor. Since coming to the University of Michigan Professor Liu has established a first-rate research effort in communication networks, in particular, wireless networks. Because of her research accomplishments she has achieved national visibility. Her contributions to service are outstanding and far exceed the level of dedication and leadership expected of an Assistant Professor. It is with the support of the College of Engineering Executive Committee that I recommend her for promotion to associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.



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Ronald Gibala  
Interim Dean, College of Engineering

May 2006