Leana Golubchik

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PERSONAL INFORMATION

Research Interests: Computer systems modeling and performance evaluation, QoS-oriented design of large-scale storage systems, and scalable data transfers over wide-area networks

Education

- Ph.D. in Computer Science
  University of California, Los Angeles, June 1995
  Thesis title: Resource Management in Large Multimedia Information Systems
  Advisor: Richard R. Muntz
- Master of Science in Computer Science
  University of California, Los Angeles, December 1992
- Bachelor of Science (*summa cum laude*) in Computer Science and Engineering
  University of California, Los Angeles, June 1989

Employment

8/97 to present	Assistant Professor of Computer Science Institute for Advanced Computer Studies (50% appointment) University of Maryland, College Park, MD
7/95 to 7/97	Assistant Professor of Computer Science Columbia University, New York, NY
7/94 to 9/94 7/93 to 9/93	Summer Research Intern Lawrence Livermore National Laboratory, Livermore, CA
6/91 to 9/91	Summer Research Intern T.J. Watson Research Center, IBM, Yorktown Heights, NY
9/88 to 6/91	Member of the Tangram Research Group Computer Science Department, UCLA, Los Angeles, CA
6/89 to 11/90	Performance Analyst Teradata Corporation, El Segundo, CA
6/88 - 8/88	Summer Research Assistant Washington University, St. Louis, MO

RESEARCH ACTIVITY

A. Articles in Refereed Journals

A1. L. Golubchik, J.C.S. Lui, and R.R. Muntz. "Adaptive Piggybacking: A Novel Technique for Data Sharing in Video-On-Demand Storage Servers." *ACM Multimedia Systems*, Volume 4, Number 3, 1996, pp. 140-155.

A2. L. Golubchik, J.C.S. Lui, and M. Papadopouli. "A Survey of Approaches to Fault Tolerant Design of VOD Servers: Techniques, Analysis, and Comparison." In a special issue of *Parallel Computing* on Parallel Data Servers and Applications, Volume 24, Number 1, January 1998, pp. 123-155.

A3. S.W. Lau, J.C.S. Lui, and L. Golubchik. "Merging Video Streams in a Multimedia Storage Server: Complexity and Heuristics." *ACM Multimedia Systems*, Volume 6, Number 1, pp. 29-42, 1998.

A4. J.C.S. Lui and L. Golubchik. "Stochastic Complement Analysis of Multi-Server Threshold Queues with Hysteresis." *Performance Evaluation*, Volume 35, Numbers 1-2, March 1999, pp. 19-48.

A5. E. de Souza e Silva, H.R. Gail, L. Golubchik, and J.C.S. Lui. "Analytical Models for Mixed Workload Multimedia Storage Servers." *Performance Evaluation*, Volume 36-37, October 1999, pp. 185-211. Presented at the *Performance'99 Conference*.

A6. K.K.W. Law, J.C.S. Lui, and L. Golubchik. "Efficient Support for Interactive Services in Multi-resolution VOD Systems." *VLDB Journal*, Volume 8, Number 2, 1999, pp. 133-153.

A7. L. Golubchik, V.S. Subrahmanian, S. Marcus, and J. Biskup. "Sync Classes: A Framework for Optimal Scheduling of Requests in Multimedia Storage Servers." *IEEE Transactions on Knowledge and Data Engineering*, Volume 12, Number 1, 2000, pp. 60-77.

A8. P.W.K. Lie, J.C.S. Lui, and L. Golubchik. "Threshold-Based Dynamic Replication in Large-Scale Video-on-Demand Systems." *Multimedia Tools and Applications*, Volume 11, Number 1, May 2000, pp. 35-62.

A9. L. Golubchik, R.R. Muntz, C.F. Chou, and S. Berson. "Design of Fault Tolerant Large-Scale VOD Servers: with Emphasis on High-Performance and Low-Cost." To appear in *IEEE Transaction on Parallel and Distributed Systems*.

A10. M.Y.Y. Leung, J.C.S. Lui, and L. Golubchik. "Use of Analytical Performance Models for System Sizing and Resource Allocation in Interactive Video-on-Demand Systems Employing Data Sharing Techniques." To appear in *IEEE Transactions on Knowledge and Data Engineering*.

A11. L. Golubchik and J.C.S. Lui. "Threshold-based Systems: Theory and Application to Dynamic Resource Management in Video-on-Demand Servers." Submitted for publication.

A12. L. Golubchik, J.C.S. Lui, E. de Souza e Silva, and H.R. Gail. "Evaluation of Performance Tradeoffs in Scheduling Techniques for Mixed Workload Multimedia Servers." Submitted for publication.

B. Articles in Other Journals

B1. L. Golubchik and R.R. Muntz. "Fault Tolerance Issues in Data Declustering for Parallel Database Systems." *IEEE Bulletin of the Technical Committee on Data Engineering*, Volume 17, Number 3, September, 1994, pp. 14-28. Invited paper.

B2. L. Golubchik, J.C.S. Lui, and R.R. Muntz. "I/O Stream Sharing for Continuous Media Systems." *IEEE Bulletin of the Technical Committee on Data Engineering*, Volume 18, Number 4, December 1995, pp. 17-26. Invited paper.

B3. L. Golubchik. "On Issues and Tradeoffs in Design of Fault Tolerant VOD Servers." In *ACM SIGMETRICS Performance Evaluation Review*, Volume 25, Number 2, September 1997, pp. 21-28. Invited paper.

B4. M. Papadopouli and L. Golubchik. "Support of VBR Video Streams Under Disk Bandwidth Limitations." In *ACM SIGMETRICS Performance Evaluation Review*, Volume 25, Number 3, December 1997, pp. 13-20. Invited paper.

C. Articles in Books

C1. M. Papadopouli and L. Golubchik. "A Scalable Video-on-Demand Server for a Dynamic Heterogeneous Environment." In *Advances in Multimedia Information Systems*, S. Jajodia, M. T. Ozsu, A. Dogac (Eds.), Lecture Notes in Computer Science 1508, Springer Verlag, September 1998, pp. 4-17. Presented at the 4th International Workshop on Multimedia Information Systems.

C2. L. Golubchik and R.R. Muntz. "Parallel Database Systems and Multimedia Object Servers." In *Volume 5 Handbook on Parallel and Distributed Processing*, Eds. J. Blazewicz, K. Ecker, B. Plateau and D. Trystram, Springer Verlag, 2000, pp. 364-409 (Chapter 8). Invited chapter.

D. Articles in Refereed Conferences

D1. L. Golubchik, G.D. Rozenblat, W.C. Cheng, and R.R. Muntz. "The Tangram Modeling Environment." In Proceedings of the *Fifth International Conference on Modeling Techniques and Tools for Computer Performance Evaluation*, Turin, Italy, February 1991, pp. 421-435.

D2. L. Golubchik, J.C.S. Lui, and R.R. Muntz. "Chained Declustering: Load Balancing and Robustness to Skew and Failures." In Proceedings of the *Second International Workshop on Research Issues in Data Engineering: Transaction and Query Processing (RIDE)*, Tempe, Arizona, February 1992, pp. 88-95.

D3. L. Golubchik, and A. Thomasian. "Token Allocation in Distributed Systems." In Proceedings of the *12th International Conference on Distributed Computing Systems (ICDCS)*, Yokohama, Japan, June 1992, pp. 64-71.

D4. L. Golubchik, J.C.S. Lui, and R.R. Muntz. "Reducing I/O Demand in Video-On-Demand Storage Servers." In Proceedings of the *ACM SIGMETRICS/Performance Conference*, Ottawa, Canada, May 1995, pp. 25-36.

D5. S. Berson, L. Golubchik, and R.R. Muntz. "Fault Tolerant Design of Multimedia Servers." In Proceedings of the *ACM SIGMOD Conference*, San Jose, CA, June 1995, pp. 364-375.

D6. L. Golubchik, R.R. Muntz, and R.W. Watson. "Analysis of Striping Techniques in Robotic Storage Libraries." In Proceedings of the *14th IEEE Symposium on Mass Storage Systems*, Monterey, CA, September, 1995, pp. 225-238.

D7. L. Golubchik and R.R. Muntz. "Fault Tolerance Issues in Multidisk Video-on-Demand Storage Servers." In Proceedings of the *SPIE (International Society for Optical Engineering) Conference on High-Density Data Recording and Retrieval Technology*, Volume 2604, October, 1995, pp. 70-87.

D8. L. Golubchik and S. Marcus. "On Multilevel Multimedia Storage Systems." In Proceedings of the *2nd International Workshop on Multimedia Information Systems*, September 1996, pp. 12-16.

D9. M.Y.Y. Leung, J.C.S. Lui, and L. Golubchik. "Buffer and I/O Resource Pre-allocation for Implementing Batching and Buffering Techniques for Video-on-Demand Systems." In Proceedings of the *International Conference on Data Engineering (ICDE)*, Birmingham, UK, April 1997, pp. 344-353.

D10. L. Golubchik and J.C.S. Lui. "Bounding of Performance Measures for a Threshold-based Queueing System with Hysteresis." In Proceedings of the *ACM SIGMETRICS Conference*, Seattle, Washington, June 1997, pp. 147-157.

D11. S. Marcus, V.S. Subrahmanian, and L. Golubchik. "Sync Classes: A Framework for Optimal Scheduling of Requests in Multimedia Storage Servers." In Proceedings of the *3rd International Workshop on Multimedia Information Systems*, September 1997, pp. 92-100. A full version of this paper was selected for a journal special issue [A7].

D12. P.W.K. Lie, J.C.S. Lui, and L. Golubchik. "Threshold-Based Dynamic Replication in Large-Scale Video-on-Demand Systems." In Proceedings of the *Eighth International Workshop on Research Issues in Data Engineering: Continuous-Media Databases and Applications (RIDE'98)* February 23-24, 1998, pp. 52-59. A full version of this paper was selected for a journal special issue [A8].

D13. L. Golubchik and R.K. Rajendran. "A Study on the Use of Tertiary Storage in Multimedia Systems." In Proceedings of the *Joint IEEE Symposium on Mass Storage and Goddard Conference on Mass Storage Systems and Technologies*, March 23-26, 1998, pp. 229-247.

D14. D.I. Kang, R. Gerber, L. Golubchik, J.K. Hollingsworth, and M. Saksena. "A Software Synthesis Tool for Distributed Embedded System Design." In the *ACM SIGPLAN Workshop on Languages, Compilers, and Tools for Embedded Systems (LCTES)*, May 1999. Appears in the *ACM SIGPLAN Notices*, Volume 34, Number 7, pp. 87-95.

D15. C.F. Chou, L. Golubchik, and J.C.S. Lui. "A Performance Study of Dynamic Replication Techniques in Continuous Media Servers." In Proceedings of the *ACM SIGMETRICS Conference*, May 1999, pp. 202-203. Poster paper.

D16. L. Golubchik, J.C.S. Lui, E. de Souza e Silva, and H.R. Gail. "Evaluation of Performance Tradeoffs in Scheduling Techniques for Mixed Workload Multimedia Servers." In Proceedings of the *IEEE International Conference on Multimedia Computing and Systems*, June 1999, pp. 292-296. Poster paper.

D17. D.I. Kang, R. Gerber, L. Golubchik, and J.K. Hollingsworth. "Techniques for Automating Distributed Real-Time Applications Design." In Proceedings of the *High Performance Distributed Computing Conference*, August 1999, pp. 156-163.

D18. L. Golubchik, S. Khanna, S. Khuller, R. Thurimella, and A. Zhu. "Approximation Algorithms for Data Placement on Parallel Disks." In Proceedings of the *ACM-SIAM Symposium on Discrete Algorithms (SODA)*, San Francisco, CA, January 2000, pp. 223-232.

D19. C.F. Chou, L. Golubchik, and J.C.S. Lui. "Striping Doesn't Scale: How to Achieve Scalability for Continuous Media Servers with Replication." In Proceedings of the *International Conference on Distributed Computing Systems (ICDCS)*, Taipai, Taiwan, April 2000, pp. 64-71.

D20. L. Golubchik and J.C.S. Lui. "A Fast and Accurate Iterative Solution of a Multi-class Threshold-based Queueing System with Hysteresis." In Proceedings of the *ACM SIGMETRICS Conference*, Santa Clara, CA, June 2000, pp. 196-206.

D21. S. Bhattacharjee, W.C. Cheng, C.F. Chou, L. Golubchik, and S. Khuller. "Bistro: a Platform for Building Scalable Wide-Area Upload Applications." In the *Workshop on Performance and Architecture of Web Servers (PAWS), held in conjunction with SIGMETRICS 2000*, Santa Clara, CA, June 2000. To appear as part of the PAWS 2000 Workshop in an issue of the *ACM SIGMETRICS Performance Evaluation Review.*

D22. L. Golubchik and J.C.S. Lui. "Open Problems for Threshold-based System." In the *2nd Workshop on Mathematical (performance) Modeling and Analysis (MAMA), held in conjunction with SIGMETRICS 2000*, Santa Clara, CA, June 2000. To appear as part of the MAMA 2000 Workshop in the *ACM SIGMETRICS Performance Evaluation Review.*

D23. C.F. Chou, L. Golubchik, and J.C.S. Lui. "A Performance Study of Dynamic Replication Techniques in Continuous Media Servers." To appear in Proceedings of the *International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems (IEEE MASCOTS)*, San Francisco, CA, August 2000.

D24. W.C. Cheng, C.F. Chou, L. Golubchik, and S. Khuller. "A Secure and Scalable Wide-Area Upload Service Architecture." Submitted for publication.

D25. W.C. Cheng, C.F. Chou, L. Golubchik, and S. Khuller. "A Performance Study of Bistro, a Scalable Wide-Area Upload Architecture." Submitted for publication.

E. Inventions and Patents

E1. "Bistro: a System for Building Scalable Wide-Area Upload Applications." *Invention Disclosure*, March 2000. With W.C. Cheng, S. Khuller, S. Bhattacharjee, and C.F. Chou.

F. Unrefereed Reports

F1. S. Berson, A. Dashti, M. Escobar-Molano, S. Ghandeharizadeh, L. Golubchik, R.R. Muntz, C. Shahabi. "Design of a Scalable Multimedia Storage Manager." Technical Report No. CSD-940042, UCLA, December 1994.

F2. R. Bunt, D. Eager, L. Golubchik, G. Kotsis, S. Majumdar, R.R. Muntz, E. Rosti, G. Serazzi, E. Smirni. Report of the Computer Resource Management Group, International Workshop on Performance Evaluation - Origins and Directions, Schloss Dagstuhl, Wadern, Germany G. Haring (Wien), Ch. Lindemann (GMD-FIRST Berlin), M. Reiser (Zurich), organizers, 1997.

F3. D.I. Kang, R. Gerber, and L. Golubchik. "Automated Techniques for Designing Embedded Signal Processors on Distributed Platforms." Technical Report No. CS-TR3944 October 1998.

G. Invited Talks

G1. "Tangram Modeling Environment." *Digital Equipment Co.*, Malboro, MA, June 1991.

G2. "Disk Arrays." *Dipartimento di Informatica, Universitá di Torino*, Torino, Italy, September 1993.

G3. "Improving Performance of Robotic Storage Libraries." *Lawrence Livermore National Laboratory*, Livermore, CA, February 1994.

G4. "Fault Tolerant Design of Multimedia Storage Servers." *IBM Almaden Research Center*, Almaden, CA, September 1994.

G5. "On Efficient Use of Resources in On-Demand Multimedia Storage Servers."

- *Universidade Federal do Rio de Janeiro*, Rio de Janeiro, Brazil, May 1996.
- *MITL, Panasonic Technologies, Inc.*, Princeton, New Jersey, July 1996.

G6. "A Threshold-Based Approach to Dynamic Resource Management in Large Systems." *System Performance Evaluation - Origins and Directions, International Workshop, Schloss Dagstuhl, Wadern, Germany*, September 1997.

G7. "Mixed Workload Scheduling in Multimedia Storage Servers."

- *Computer Science Colloquium Series, Dartmouth College*, Hanover, New Hampshire, April 1998.
- *Computer Science Colloquium Series, College of William and Mary*, Williamsburg, Virginia, May 1999.

G8. "Sync Classes: A Framework for Optimal Scheduling of Requests in Multimedia Storage Servers." Presented at the *INFORMS'98 Conference (Institute for Operations Research and the Management Sciences)*, as part of the Performance Models of Computer/Communication Systems track, June 1998. Short abstract (with S. Marcus and V.S. Subrahmanian) appeared in the proceedings, p. 27.

G9. "Striping Doesn't Scale: How to Achieve Scalability for Continuous Media Servers with Replication." Presented at the *DIMACS Workshop on Multimedia Streaming on the Internet*, June 2000.

G10. "Bistro: a Platform for Building Scalable Wide-Area *Upload* Applications."

- *Information Sciences Institute, University of Southern California*, Los Angeles, CA, May 2000.
- *Computer Science Colloquium Series, University of California at Irvine*, Irvine, CA, June 2000.
- *California Institute of Technology*, Los Angeles, CA, June 2000.
- *Hewlett-Packard Laboratories*, Palo Alto, CA, June 2000.
- *University of California at Los Angeles*, Los Angeles, CA, June 2000.

- *University of California at Riverside*, Riverside, CA, June 2000.
- *Lawrence Berkeley Laboratory*, Berkeley, CA, August 2000.
- *University of Texas at Austin*, Austin, TX, October 2000.

G11. "Threshold-based Queueing Systems with Hysteresis." *CSHCN Advanced Network Colloquium, University of Maryland*, College Park, MD, October 2000.

G12. "Application Level Adaptation and Control for Retrieval and Delivery of Continuous Media over the Internet." *NSF PI meeting*, Irvine, CA, to be given in November 2000.

H. Technical Presentations and Expert Panels

H1. "Resource Management in Large Multimedia Systems." *Mitsubishi Research Association, visiting Columbia University*, New York, NY, November 1995 & November 1996.

H2. "Multimedia Systems Lab, Overview." *IBM Site Visit Presentations, UMIACS, University of Maryland*, College Park, MD, December 1997.

H3. Member of Experts Panel on "Continuous Media Management – Where We Stand Today and Where We will be Over the Next Decade." *International Workshop on Research Issues in Data Engineering: Continuous-Media Databases and Applications (RIDE)*, February 1998.

H4. Member of Experts Panel on "Visual Information Retrieval." *International Workshop on Multimedia Information Systems*, September 1998.

H5. Member of Experts Panel on "Exotic Applications." *Supercomputing Conferences (SC)*, November 1998.

H6. Member of Experts Panel on "Multimedia Streaming and Network Interaction." *DIMACS Workshop on Multimedia Streaming on the Internet*, June 2000.

I. Tutorials and Seminars

I1. "System Architectures for Large-Scale Multimedia Information Servers." *Brazilian Symposium on Networks and Distributed Systems (SBRC)*, Fortaleza, Brazil, May 1996.

I2. "Multimedia Storage Servers." *1997 ACM SIGMETRICS Conference*, Seattle, WA, June 1997. With H. Vin and P. Shenoy (University of Texas, Austin).

I3. "Continuous Media Storage Servers."

- *1998 ACM SIGMETRICS/PERFORMANCE Conference*, Madison, WI, June 1998. With J.C.S. Lui (CUHK) and R.R. Muntz (UCLA).
- *1999 ACM SIGMETRICS Conference*, Atlanta, GA, May 1999. With J.C.S. Lui (CUHK).

I4. "Continuous Media Servers." *Universitá del Piemonte Seminar Series*, June 1999. 1 day seminar.

I5. "Multimedia Storage Systems." *Universitá di Torino Seminar Series*, July 1999. 3 day seminar.

I6. "Multimedia Information Systems." *Federal University of Rio de Janeiro*, December 1999. Half day seminar.

J. Visiting Scholar

J1. *Department of Computer Science, Federal University of Rio de Janeiro*, Brazil, December 1999.

J2. *Dipartimento di Scienze e Tecnologie Avanzate, Universitá del Piemonte*, Alessandria, Italy and *Dipartimento di Informatica, Universitá di Torino*, Torino, Italy, June-July, 1999.

J3. *Department of Computer Science & Enginnering, The Chinese University of Hong Kong*, Hong Kong, January 1997 and January 1998.

Contracts and Grants

- Principal Investigator. "A Study on the Use of Tertiary Storage Devices in Multimedia Information Systems." *AT&T Foundation Special Purpose Grants in Science and Engineering Program*, 1995-1996, $24,000.
- Principal Investigator. "Towards a New Generation of Multimedia Storage Systems." *National Science Foundation, Faculty Early Career Development (CAREER) Grant*, 1996-2001, $200,000.
- Senior Personnel (with Y. Yemini (PI) and SMARTS Corp.). "Embedded Training Technologies." *Advanced Research Projects Agency*, 1996-1997, $309,153 (Columbia University).
- Co-principal Investigator (with A. Aho (PI) and 11 other Co-PIs). "Scalable Multimedia Information Processing." *National Science Foundation CISE Research Infrastructure Grant*, 1996-2000, $\approx \$2.5M$ (Columbia University).
- Co-principal Investigator (with J.C.S. Lui (PI) and E. de Souza e Silva (Co-PI)). "Operating System and Network Support for Distributed Multimedia Services." *Hong Kong Mainline Research Grant*, 1996-1999, $\approx \$14,000$ (Chinese University of Hong Kong).
- Principal Investigator (Faculty Mentor). "Efficient Resource Management in Large Multimedia Information Systems." *NSF-sponsored Computing Research Association (CRA) Undergraduate Research Program Grant*, Summer 1996, travel and stipend support awarded to 2 undergraduate summer research assistants.
- Co-principal Investigator (with Y. Yemini (PI) and H. Schulzrinne, S. Stolfo (Co-PIs)). "MarketNet: a Survivable, Market-Based Architecture for Large-Scale Information Systems." *Advanced Research Projects Agency*, $1997 - 2000$, $\approx \$2M$ (Columbia University).
- Principal Investigator (Faculty Mentor). "Multilevel Multimedia Storage Systems." *NSF-sponsored Computing Research Association (CRA) Undergraduate Research Program Grant*, Summer 1998, travel and stipend support awarded to 1 undergraduate summer research assistant.
- Principal Investigator. "Adaptive Large-scale Multimedia Storage Systems." *University of Maryland, GRB Semester Award*, Fall 1998.
- Co-principal Investigator (with J.C.S. Lui (PI) and H.R. Gail (Co-PI)). "Design, Analysis and Implementation of Mixed Workload Schedulers with Application to the Multimedia Digital Library System." *Research Grant Council in Hong Kong*, 1999-2000, $\approx \$60,000$ (Chinese University of Hong Kong).
- Principal Investigator. "Performance Aspects of Multimedia Presentation Servers." *University of Maryland, International Travel Award for joint research with Universitá del Piemonte and Universitá di Torino*, Summer 1999.

- Co-Principal Investigator (with J.C.S. Lui (PI) and A. U. Shankar, G. Franceschinis (Co-PIs)). "Providing Differentiated Services for the Internet: Design, Analysis and Implementation." *Hong Kong Mainline Research Grant*, 2000-2001, $\approx \$20,000$ (Chinese University of Hong Kong).
- Senior Personnel (with P. Keleher (PI) and 9 other Co-PIs and senior personnel). "System Support for Enterprise Application Servers." *National Science Foundation CISE Research Infrastructure Grant*, 2000-2003, $861,244.
- Co-principal Investigator. "Application Level Adaptation and Control for Retrieval and Delivery of Continuous Media over the Internet." *National Science Foundation, Collaborative Research Program with CNPq/Brazil*, 2000-2003, $360,000 of which $241,569 is UMD's under L. Golubchik. (With R.R. Muntz (PI, UCLA) and D. Towsley, J. Kurose (Co-PIs, University of Massachusetts)).
- Co-principal Investigator (with H. Samet (PI) and S. Khuller (Co-PI)). "Scalable Data Collection Infrastructure for Digital Government Applications." Submitted to the *National Science Foundation, Digital Government program.* Requested: 2001-2004, $616,172.
- Principal Investigator. "Scalable Data Collection for Internet-based Digital Government Applications." Submitted to *Compaq* as an equipment grant proposal. Requested: 2001-2003, 20 PCs.
- Principal Investigator (with W. Arbaugh (Co-PI)). "Scalable and Secure Data Gathering." White paper evaluated and full proposal invited, submitted to *Air Force Office of Scientific Research.* Requested: 2001-2004 (plus 2004-2006 optional), $875,000 (plus $740,000 optional).
- Co-principal Investigator. (with R.R. Muntz (PI, UCLA) and W.C. Cheng (Co-PI)). "Bolshoi – A Modeling Spreadsheet (Improving Usability of Complex Analytical Modeling Tools)." Submitted to the *National Science Foundation, ITR program.* Requested: 2001-2004, $\approx \$500,000$.
- Co-principal Investigator. (with S. Khuller, (PI)). "Algorithms for Data Storage and Movement." Submitted to the *National Science Foundation, ITR program.* Requested: 2001-2004, $\approx \$500,000$.

Fellowships, Awards, and Honors

- Litton Engineering Scholarship, 1987-1989.
- Society of Women Engineers Scholarship, 1987 - 1989.
- Member of Tau Beta Pi, elected 1988.
- GTE Graduate Fellowship, 1990-1991.
- National Science Foundation Graduate Fellowship, 1991-1994.
- IBM Graduate Fellowship, 1994-1995.
- NSF Faculty Early Career Development (CAREER) Award, 1996-2001.
- Member of IFIP WG 7.3, elected 2000.

Reviewing and Editing Activities

Co-guest Editor

- Special Issue of *Parallel Computing Journal* on Parallel Data Servers and Applications, Volume 24, Number 1, January 1998. (With R.R. Muntz.)

- Special Issue of *International Journal of Intelligent Systems* on Multimedia Systems, Volume 13, Number 12, December 1998. (With J.C.S. Lui.)
- Special Issue of *IEEE Transactions on Knowledge and Data Engineering*, based on selected papers from the International Workshop on Multimedia Information Systems (MIS'99). To appear in 2001. (With S. Tripathi and V. Tsotras.)

Reviewing Activities: Journals and Conferences

- ACM Transactions on Database Systems
- IEEE Transactions on Knowledge and Data Engineering
- IEEE Transactions on Computers
- IEEE Transactions on Parallel and Distributed Systems
- IEEE/ACM Transactions on Networking
- Performance Evaluation Journal
- IEEE Transactions on Software Engineering
- ACM Transactions on Software Engineering and Methodology
- IEEE Networks
- IBM Journal of Research and Development
- International Conference on Very Large Databases (VLDB)
- ACM SIGMOD Conference
- ACM SIGMETRICS Conference
- IEEE INFOCOM Conference
- IEEE MASCOTS
- TOOLS Conference
- ICS Conference
- IFIP WG7.3 Conference on Modeling and Performance Evaluation of Computer Systems and Networks
- International Telecommunications Symposium (ITS)
- International Conference on the Numerical Solutions of Markov Chains Conference
- International Workshop on Petri Nets and Performance Models (PNPM)

Reviewing Activities: Grant Proposals

- National Science Foundation, external reviewing and several proposal review panels, 1996-1999.
- Army Research Office, 1996.
- Hong Kong Research Grants Council, 1996.

External Examiner

- MS Thesis, The Chinese University of Hong Kong, Hong Kong, August 2000. *Admission Control Algorithms for Providing Quality-of-Service Guarantee for Individual Connection in Video-on-Demand Systems*, Wang Xiaoquing. Advisor: J.C.S. Lui.
- MS Thesis, The Chinese University of Hong Kong, Hong Kong, to defend December 2000. *Performance Evaluation of Parallel/Distributed Simulation*, Lam Wing Kai. Advisor: J.C.S. Lui.
- MS Thesis, The Chinese University of Hong Kong, Hong Kong, July 1999. *Design and Implementation of Distributed Interactive Virtual Environment*, Chan Ming Fei. Advisor: J.C.S. Lui.
- MS Thesis, The Chinese University of Hong Kong, Hong Kong, July 1999. *Routing Algorithms and Channel Reservation Strategies for a Low Earth Orbit Satellite System*, Tam Tsz Shing. Advisor: J.C.S. Lui.
- MS Thesis, The Chinese University of Hong Kong, Hong Kong, July 1999. *Issues in a Very Large Scale Distributed Virtual Environment*, So King Yan Oldfield. Advisor: J.C.S. Lui.
- MS Thesis, The Chinese University of Hong Kong, Hong Kong, July 1997. *On Design of a Scalable Video Data Placement Strategy for Supporting a Load Balancing Video-on-Demand Storage Server*, Kwok-Wai Law. Advisor: J.C.S. Lui.
- MS Thesis, The Chinese University of Hong Kong, Hong Kong, July 1997. *Parallel Replication in Distributed Video-on-Demand Systems*, Wai-Kwok Lie. Advisor: J.C.S. Lui.

TEACHING ACTIVITY

Courses Taught

Semester	Course	# students	Description
Summer 1993		15	Data Structures and Algorithms (Johns Hopkins University Center for Talented Youth)
Summer 1994		12	Data Structures and Algorithms (Johns Hopkins University Center for Talented Youth)
Summer 1995		15	Data Structures and Algorithms (Johns Hopkins University Center for Talented Youth)
Fall 1995	E6998-42	8	Architecture Support for Large Information Systems (Columbia University, *new course development*)
Spring 1996	W3824	56	Computer Organization (Columbia University)
Fall 1996	W4995	50	Multimedia Information Systems (Columbia University, *new course development*)
Spring 1997	W3824	69	Computer Organization (Columbia University)
Fall 1997	CMSC818G	15	Large Multimedia Information Systems (*new course development*)
Spring 1998	CMSC417	26	Computer Networks
Spring 1999	CMSC417	44	Computer Networks
Fall 1999	CMSC420	45	Data Structures
Spring 2000	CMSC417	44	Computer Networks
Fall 2000	CMSC420	56	Data Structures

Independent Studies

Alka Sham (Columbia University, Fault tolerant design of VOD Servers, 1996-1997)
Taruni U. Seth (Columbia University, Design and development of VOD servers, 1996-1997)

Courses or Curriculum Development

CMSC 818G - Large Multimedia Information Systems (1997) (Taught a similar course, **W6998-42** - Architecture Support for Large Information Systems, at Columbia University, 1995)

Created a new course to provide first and second year graduate students with an introduction to large-scale multimedia information systems. This course explores current research directions and design issues in advanced system architectures for storage servers. Specifically it concentrate on multimedia information systems, and explores similar issues in parallel database systems and scientific computing systems. The objective of this course is to bring students up to date on research directions in large multimedia information systems and to provide the requisite background for original research in this area. Specific topics covered in the course include (but are not limited to): current (a) storage device technology and technology trends, (b) interconnect technologies and technology trends, (c) compression technologies and technology trends, and their impact on application areas such as multimedia storage systems; multimedia storage servers; database systems for multicomputer architectures; I/O intensive scientific computing applications. Students are required to read the equivalent of approximately 20 conference/journal research papers. Grades are based on a final examination, class participation, and a term report which includes a class presentation and a term paper. Most reports are expected to be critical summaries and reviews of a small collection of papers in an area relevant to the course. However, reports describing original research are also possible. This course can be used by Ph.D. and M.S. students as part of their comprehensive exams curriculum in the systems area.

W4995 - Columbia University, Multimedia Information Systems (1996)

Created a new course to provide junior and senior level undergraduate students with a broad introduction to multimedia information systems. This course covers the following topics: media, applications, and their requirements; storage technologies; interconnect technologies; compression technologies for various media; multimedia storage servers; operating systems issues; large distributed storage systems; multimedia networks. Course material is taken from textbooks as well as on-line notes provided by the instructor. The work in the course includes several homeworks, a large programming project (chosen from a list of topics related to the course) with a written report, and a final examination.

W3824 - Columbia University, Computer Organization (1996, 1997)

Expended course coverage to include detailed coverage of I/O devices and corresponding interconnect architectures.

CMSC 417 - Computer Networks (1999, 2000)

Introduced a set of new projects (with Prof. Bhattacharjee) to emphasize current directions in communication networks.

Expended course coverage to include detailed coverage of an introduction to probabilities.

Advising: Ph.D. Committees

- German Goldszmidt (Columbia University, CS, defended December 1995).
- Bruce Zenel (Columbia University, CS, proposed March 1996, defended July 1997).
- Akira Kawaguchi (Columbia University, CS, proposed April 1996).
- Damianos Chatziantoniou (Columbia University, CS, proposed April 1996).
- Wei Zhao (CS, proposed October 1997, defended 1999).
- Philip Korn (CS, defended May 1998).
- Demet Aksoy (CS, proposed May 1998, defended January 2000).
- Eenjun Hwang (CS, defended June 1998).
- Ladan Gharai (CS, defended July 1998).
- Cynthia Rais (CS, defended August 1998).
- Yuan-Shin Hwang (CS, defended October 1998).
- Yoram J. Sussmann (CS, defended February 1999).
- Ioannis Kotidis (CS, proposed March 1999, defended May 2000).
- Tolga Urhan (CS, proposed April 1999, to defend Fall 2000).
- Alexander Dehktyar (CS, proposed May 1999, defended July 2000).
- George Apostolopoulos (CS, defended 1999).
- Simon Hawkin (CS, proposed 1999).
- Dong-In Kang (CS, defended July 1999).
- Kuang-Yeh Wang (CS, defended December 1999).
- Mike Beynon (CS, proposed February 2000).
- Apinun Tunpan (CS, proposed May 2000).
- Catalin T. Popescu (CS, defended July 2000).
- Fatma Ozcan (CS, proposed August 2000).
- Ibrahim Korpeoglu (CS, defended September 2000).

Advising: Research

Undergraduate

- Hannah K. Lee, Columbia University, Summer 1996, under the NSF-sponsored Computing Research Association (CRA) undergraduate research program.
- Lanphuong Pham, visiting Columbia University from Wilkes University, Summer 1996, under the NSF-sponsored Computing Research Association (CRA) undergraduate research program.
- Georgina Russell, visiting University of Maryland from Berkeley, Summer 1998, under the NSF-sponsored Computing Research Association (CRA) undergraduate research program.

Masters

- Raj Kumar (Columbia University), 1997-1998.

Doctoral

- Maria Papadopouli (Columbia University, co-advising with H. Schulzrinne), 1996-present.
- Joseph Dunnick, 1997-present.
- Cheng-Fu Chou, 1998-present.
- Dong-In Kang (co-advised with R. Gerber and J. Hollingsworth during R. Gerber's sabbatical, 1998-1999).
- I-Hsin Chung, 2000-present.

SERVICE TO UNIVERSITY AND COMMUNITY

University

- Academic advisor for CS undergraduates, School of General Studies, Columbia University, 1995-1997.
- Member, CS Department PhD Committee, Columbia University, 1995-1997
- Member, CS Department Facilities Committee, Columbia University, 1995-1997.
- Member, CS Department TA Awards Committee, Columbia University, 1997.
- Member, CS Department Web Pages Committee, Columbia University, 1995-1996.
- Member, Lab Committee, 1997-1998.
- Member, Graduate Students Admissions Committee, 1997-2000.
- Judge/Problem Contributor, High School Programming Contest, 1998.
- Problems Contributor, High School Programming Contest, 1999.
- Member, Awards Committee, 1998-2000.
- Chair, Systems Field Committee, 1998-1999.
- Member, Executive Council, 1999-2000.
- Co-chair, Department Colloquium Series, 1999-2000.
- Member, Department of Computer Science Chair Search Committee, 1999-2000.
- Dean's representative for PhD Defense Examinations:
  - Seungyup Paek (Columbia University, Electrical Engineering, proposed November 1995, Advisor: S.F. Chang)
  - M. Farooq Anjum (Electrical Engineering, defended April 1999, Advisor: L. Tassiulas)
  - Daniel Friedman (Electrical Engineering, to defend November 2000, Advisor: A. Ephremides)
- Member, Teaching Committee, 1999-2001.
- Member, UMIACS APT Committee, 1999-2000.
- Co-author, Computer Science Department Enhancement Proposal on Foundations of Systems and Software Group, 1999.

- Co-author, Strategic Plan for UMIACS, 2000.
- Organizer, Faculty Presentations at the Graduate Students Orientation, 2000.

Community

- Board of Directors, TeleGIF, A Nonprofit Corporation, 1998-2000.

SERVICE TO PROFESSION

Board of Directors

- ACM SIGMETRICS, elected July 1999.

Program Committee Co-Chair

- International Workshop on Multimedia Information Systems, 1999.
- Joint ACM SIGMETRICS/Performance Conference, 2001.

Tutorial Chair

- ACM SIGMETRICS Conference, 2000.

Member of Program Committee

- International Conference on Parallel and Distributed Information Systems (PDIS), 1996.
- International Workshop on Multimedia Information Systems, 1996, 1997, 1998.
- ACM SIGMETRICS Conference, 1997, 1998, 1999, 2000.
- International Conference on Data Engineering (ICDE), 1997.
- International Conference on Distributed Computing Systems (ICDCS), 1997.
- Workshop on I/O in Parallel and Distributed Systems (IOPADS), 1997.
- ACM SIGMOD Conference, 1999.
- Conference on Extending Database Technology (EDBT), 2000.
- Workshop on Mathematical (performance) Modeling and Analysis (MAMA), 2000.

Session Chair

- International Workshop on Multimedia Information Systems, 1995, 1996, 1997, 1998.
- ACM SIGMETRICS Conference, 1998, 2000.
- IEEE MASCOTS, 1999.