Ketan Mayer-Patel

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Education

Ph.D. University of California, Berkeley, 1999
Computer Science
Dissertation Title: *Parallel Software-only Video Effects Processing*

M.S. University of California, Berkeley, 1997
Computer Science
Thesis Title: *Design and Performance of the Berkeley Continuous Media Toolkit*

B.A. University of California, Berkeley, 1992
Computer Science and Economics

Professional Experience

Director of Undergraduate Studies, Department of Computer Science
University of North Carolina, Chapel Hill, NC (June 2020 – present)

Associate Professor
University of North Carolina, Chapel Hill, NC (August 2005 – present)

Assistant Professor
University of North Carolina, Chapel Hill, NC. (January 2000 – August 2005)

Visiting Researcher
Microsoft Bay Area Research Center (BARC), San Francisco, CA. (June 2003 – December 2003)

Graduate Student Researcher
University of California, Berkeley, CA. (June 1993 – November 1999)

Graduate Student Instructor
University of California, Berkeley, CA. (August 1997 – December 1997)

Programmer
University of California, Berkeley, CA. (June 1992 – June 1993)

Programmer
United States Department of Agriculture, Albany, CA. (May 1991 – June 1992)

Honors and Notables

- National Science Foundation CAREER Award, 2003
- Computer Science Student Association Teaching Award, 2003
- Associate editorships in top two leading journals in the field of multimedia computing.
- Exectuive committee membership for MMSys, NOSSDAV, and SIGMM.

Publications

Refereed Journals

Amazon v. Audio Pod
US Patent 8,738,740
Amazon EX-1096

S. Fang, K. Mayer-Patel and S. Nirjon, "Exploiting scene and body contexts in controlling continuous vision body cameras," *Ad Hoc Networks*, 2020, pp 102373. doi: 10.1016/j.adhoc.2020.102373

C. Shao, A. Zhong, J. Cribb, L. Osborne, E. O'Brien III, R. Superfine, K. Mayer-Patel and R. Taylor II, "Analysis-Preserving Video Microscopy Compression via Correlation and Mathematical Morphology," *Microscopy Research and Technique,* 2015 Dec; vol 78, no. 12, pp. 1055-61. doi: 10.1002/jemt.22584.

J. Greenberg, S. Trujillo, and K. Mayer-Patel, "YouTube: Applying FRBR and Exploring the Multiple Description Coding Compression Model," *Cataloging & Classification Quarterly,* vol. 50, issue 5-7, 2012 (20 pages).

K. Mayer-Patel and D. Gotz, "Scalable, Adaptive Streaming for Nonlinear Media," *IEEE Multimedia,* vol. 14, no. 3 (15 pages).

D. Ott and K. Mayer-Patel, "An open architecture for transport-level protocol coordination for distributed multimedia applications," *ACM Transactions on Multimedia Computing, Communications, and Applications*, vol. 3, no. 3 (22 pages).

D. Gotz and K. Mayer-Patel, "GAL: A middleware library for multidimensional adaptation," under review for *ACM Transactions on Multimedia Computing, Communications, and Applications* (21 pages).

Ketan Mayer-Patel, Brian C. Smith, and Lawrence A. Rowe. 2005. The berkeley software MPEG-1 video decoder. ACM Trans. Multimedia Comput. Commun. Appl. 1, 1 (February 2005), 110-125. DOI=http://dx.doi.org/10.1145/1047936.1047944 (26 pages).

K. Mayer-Patel and S.-U. Kum, "Real-time multi depth stream compression," *ACM Transactions on Multimedia Computing, Communications, and Applications,* vol. 1, no. 2 (26 pages).

D. Gotz and K. Mayer-Patel, "A Framework for Scalable Delivery of Digitized Spaces," *International Journal on Digital Libraries*, vol. 5, no. 3 (14 pages).

J. Considine, K. Mayer-Patel, and J. Byers, "A case for testbed embedding services," *Computer Communication Review*, vol. 34, no. 1, January 2004, pp. 137-142.

Refereed Conferences and Workshops

A.C. Freeman, K. Mayer-Patel, M. Singh, "Accelerated Event-Based Feature Detection and Compression for Surveillance Video Systems," to appear in *Proceedings of the 15th Conference on ACM Multimedia Systems (MMSys '24).*

A.C. Freeman, M. Singh, and K. Mayer-Patel, "An Asynchronous Intensity Representation for Framed and Event Video Sources," in *Proceedings of the 14th Conference on ACM Multimedia Systems (MMSys '23)*. Vancouver, Canada, June 7-10, 2023. pp. 74–85. https://doi.org/10.1145/3587819.3590969

D. Garcia, K. Jordan, C. Lewis, and K. Mayer-Patel, "Innovative Approaches to Managing Scale," *Proceedings of SIGCSE 2022: The 53rd ACM Technical Symposium on Computer Science Education*, Providence, RI, USA, March 3-5, 2022, vol. 2, pp. 1037-31038, doi: 10.1145/3478432.3499220

A.C. Freeman, C. Burgess, and K. Mayer-Patel. 2021. "Motion segmentation and tracking for integrating event cameras", *In Proceedings of the 12th ACM Multimedia Systems Conference (MMSys '21)*. Association for Computing Machinery, New York, NY, USA, 1–11. https://doi.org/10.1145/3458305.3463373

A. C. Freeman and K. Mayer-Patel, "Lossy Compression for Integrating Event Cameras," 2021 Data Compression Conference (DCC), 2021, pp. 53-62, doi: 10.1109/DCC50243.2021.00013.

Andrew C. Freeman and Ketan Mayer-Patel. 2020. "Integrating Event Camera Sensor Emulator". In Proceedings of the 28th ACM International Conference on Multimedia (MM '20). Association for Computing Machinery, New York, NY, USA, 4503–4505. DOI:https://doi-org.libproxy.lib.unc.edu/10.1145/3394171.3414394
(Best Demo Award)

K. Langen, D. Makaroff and K. Mayer-Patel, "Chroma Prediction for Low-Complexity Distributed Video Encoding," *2020 Fourth International Conference on Multimedia Computing, Networking and Applications (MCNA)*, 2020, pp. 16-24, doi: 10.1109/MCNA50957.2020.9264293.

Shiwei Fang, Ketan Mayer-Patel, and Shahriar Nirjon. 2019. ZenCam: Context-Driven Control of Autonomous Body Cameras. In the International Conference on Distributed Computing in Sensor Systems (DCOSS '19), 8 pg., Santorini Island, Greece, May 2019. (Best Paper Award)

Shiwei Fang, Ketan Mayer-Patel, and Shahriar Nirjon. 2017. Distributed Adaptive Model Predictive Control of a Cluster of Autonomous and Context-Sensitive Body Cameras. In Proceedings of the 2017 Workshop on Wearable Systems and Applications (WearSys '17). ACM, New York, NY, USA, 35-40. DOI: https://doi-org.libproxy.lib.unc.edu/10.1145/3089351.3089358

Aaron Smith, Montek Singh, and Ketan Mayer-Patel, "A System Model For Frameless Asynchronous High Dynamic Range Sensors." In Proceedings of the 27th Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV'17). ACM, New York, NY, USA, 85-90. DOI: https://doi.org/10.1145/3083165.3083178

M. Singh, P. Zhang, A. Vitkus, K. Mayer-Patel and L. Vicci, "A Frameless Imaging Sensor with Asynchronous Pixels: An Architectural Evaluation," 2017 23rd IEEE International Symposium on Asynchronous Circuits and Systems (ASYNC), San Diego, CA, 2017, pp. 110-117. doi: 10.1109/ASYNC.2017.19

Aaron J. Smith, Kristy Elizabeth Boyer, Jeffrey Forbes, Sarah Heckman, and Ketan Mayer-Patel. 2017. My Digital Hand: A Tool for Scaling Up One-to-One Peer Teaching in Support of Computer Science Learning. In Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education (SIGCSE '17). ACM, New York, NY, USA, 549-554. DOI: https://doi.org/10.1145/3017680.3017800

Mickey Vellukunnel, Philip Buffum, Kristy Elizabeth Boyer, Jeffrey Forbes, Sarah Heckman, and Ketan Mayer-Patel. 2017. Deconstructing the Discussion Forum: Student Questions and Computer Science Learning. In Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education (SIGCSE '17). ACM, New York, NY, USA, 603-608. DOI: https://doi.org/10.1145/3017680.3017745

Shiwei Fang, Ketan Mayer-Patel, and Shahriar Nirjon. 2017. Distributed Adaptive Model Predictive Control of a Cluster of Autonomous and Context-Sensitive Body Cameras. In Proceedings of the 2017 Workshop on Wearable Systems and Applications (WearSys '17). ACM, New York, NY, USA, 35-40. DOI: https://doi.org/10.1145/3089351.3089358

Charles D. Estes and Ketan Mayer-Patel. 2015. Video Killed The Data Store: Extending the n-Dimensional Display Interface for Full Screen Video. In *Proceedings of the 23rd ACM international conference on Multimedia* (MM '15). ACM, New York, NY, USA, 401-410. DOI: https://doi-org.libproxy.lib.unc.edu/10.1145/2733373.2806271

Charles D. Estes and Ketan Mayer-Patel. 2012. The n-dimensional display interface: a more elastic narrow waist for the display pipeline. In *Proceedings of the 3rd Multimedia Systems Conference* (MMSys '12). ACM, New York, NY, USA, 119-129. DOI=10.1145/2155555.2155577 http://doi.acm.org/10.1145/2155555.2155577

C.D. Estes and K. Mayer-Patel, "Moving Beyond the Framebuffer," *Proceedings of the 21st International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV 2011)*, Vancouver, Canada, June 2011, pp. 93-98.

K. Mayer-Patel and A. Jones, "StrandCast: Peer-to-peer content distribution for latency tolerant applications," 2010 Second International Conference on COMmunication Systems and NETworks (COMSNETS 2010), Bangalore, 2010, pp. 1-10. doi: 10.1109/COMSNETS.2010.5431998

J. Guebert, D. Makaroff, and K. Mayer-Patel, "Request Generation for a Peer-based PVR," *Proceedings of the 20th International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV '10)*, Amsterdam, The Netherlands, June 2010, pp. 99-104.

K. Mayer-Patel, “Systems challenges of media collectives: Supporting media collectives with adaptive MDC,” *Proceedings of the 15th International ACM Conference on Multimedia,* Augsberg, Germany, 2007, pp. 625-630.

S. Krishnan and K. Mayer-Patel, “A utility-driven framework for loss and encoding aware video adaptation,” *Proceedings of the 15th International ACM Conference on Multimedia,* Augsberg, Germany, 2007, pp. 1026-1035.

S. U. Kum and K. Mayer-Patel, "Reference Stream Selection for Multiple Depth Stream Encoding," 3D Data Processing, Visualization, and Transmission, Third International Symposium on, Chapel Hill, NC, 2006, pp. 623-630. doi: 10.1109/3DPVT.2006.117

G. Welch, D.H. Sonnenwald, K. Mayer-Patel, R. Yang, A. State, H. Towles, B. Cairns and H. Fuchs, "Remote 3D medical consultation," 2nd International Conference on Broadband Networks, 2005., Boston, MA, 2005, pp. 1026-1033 Vol. 2. doi: 10.1109/ICBN.2005.1589719

D. Gotz and K. Mayer-Patel, “A general framework for multidimensional adaptation,” *Proceedings of the 12th International ACM Conference on Multimedia,* New York, 2004, pp 612-619.

D. Ott and K. Mayer-Patel, “Coordinated multi-streaming for 3D tele-immersion,” *Proceedings of the 12th International ACM Conference on Multimedia*, New York, NY, 2004, pp. 596-603.

D. Ott and K. Mayer-Patel, “Aggregate congestion control for distributed multimedia applications,” *Proceedings of IEEE Infocom ‘04*, Hong Kong, 7-11 March 2004, vol. 1, pp. 13-23.

K. Mayer-Patel and W. Miaw, “Evaluating the effectiveness of automatic PVR management,” *Proceedings of the SPIE Conference on Storage and Retrieval Methods and Applications for Multimedia*, San Jose, CA, January 2004, vol. 5307, pp. 360-365.

S.-U. Kum, K. Mayer-Patel and H. Fuchs, “Real-time compression for dynamic 3D environments,” *Proceedings of the 11th International ACM Conference on Multimedia*, Berkeley, CA, 2003, pp. 185-194.

N. Kelshikar, X. Zabulis, J. Mulligan, K. Daniilidis, V. Sawant, S. Sinha, T. Sparks, S. Larsen, H. Towles, K. Mayer-Patel, H. Fuchs, J. Urbanic, K. Benninger, R. Reddy and G. Huntoon, “Real-time terascale implementation of tele-immersion,” *Proceedings of the International Conference on Computation Science*, Melbourne, Australia, 2003, Springer-Verlag Lecture Notes in Computer Science vol. 2660, pp. 33-42.

K. Mayer-Patel, L. Le and G. Carle, "An MPEG performance model and its application to adaptive forward error correction," *Proceedings of the 10th International ACM Conference on Multimedia*, Juan-les-Prins, France, 2002, pp. 1-10.

D. Gotz and K. Mayer-Patel, "IRW: an incremental representation for image-based walkthroughs," *Proceedings of the 10th International ACM Conference on Multimedia*, Juan-les-Prins, France, 2002, pp. 67-76.

D. Ott and K. Mayer-Patel, "A mechanism for TCP-friendly transport-level protocol coordination," *Proceedings of the USENIX Technical Conference*, Monterrey, CA, 2002 (14 pages).

A. Wilson, K. Mayer-Patel and D. Manocha, "Spatially-encoded far-field representations for interactive walkthroughs," *Proceedings of the 9th International ACM Conference on Multimedia*, Ottawa, Canada, 2001, pp. 348-357.

D. Ott and K. Mayer-Patel, "Transport-level protocol coordination in cluster-to-cluster applications," *Proceedings of the 8th International Workshop on Interactive Distributed Multimedia Systems (Lecture Notes in Computer Science)*, vol. 2158, Springer, 2001, pp. 10-22.

D. Yu, D. Wu, K. Mayer-Patel and L.A. Rowe, "dc: a live webcast control system," *Proceedings of the SPIE Conference on Multimedia Computing and Networking*, vol. 4312, San Jose, CA, 2001, pp. 111-122.

K. Mayer-Patel, "Incorporating application-level knowledge into the MPEG-2 coding model," *Proceedings of the Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Chapel Hill, CA, 2000, (6 pages).

K. Mayer-Patel and L.A. Rowe, "Exploiting spatial parallelism for software-only video effects processing," *Proceedings of the SPIE Conference on Multimedia Computing and Networking*, vol. 3654, San Jose, CA, 1999, pp. 252-263.

K. Mayer-Patel and L.A. Rowe, "A multicast control scheme for parallel software-only video effects processing," *Proceedings of the 7th International ACM Conference on Multimedia*, Orlando, FL, 1999, pp. 409-418.

K. Mayer-Patel and L.A. Rowe, "Exploiting temporal parallelism for software-only video effects processing," *Proceedings of the 6th International ACM Conference on Multimedia*, Bristol, England, 1998, pp. 161-169.

T.H. Wong, K. Mayer-Patel and L.A. Rowe, "A software-only video production switcher for the Internet MBone," *Proceedings of the SPIE conference on Multimedia Computing and Networking*, vol. 3310, San Jose, CA, 1998, pp. 28-41.

K. Mayer-Patel and L.A. Rowe, "Design and performance of the Berkeley Continuous Media Toolkit," *Proceedings of the SPIE conference on Multimedia Computing and Networking*, vol. 3020, San Jose, CA, 1997, pp. 194-206.

K. Mayer-Patel, D. Simpson, D. Wu, and L.A. Rowe, "Synchronized continuous media playback through the World Wide Web," *Proceedings of the 4th International ACM Conference on Multimedia,* Boston, MA, 1997, pp. 435-436.

L.A. Rowe, K. Patel, and B. Smith, "MPEG video in software: representation, transmission, and playback," *Proceedings of the SPIE conference on High-Speed Networking and Multimedia Computing*, vol. 2188, San Jose, CA, 1994, pp. 134-144.

K. Patel, B. Smith, and L.A. Rowe, "Performance of a software MPEG video decoder," *Proceedings of the 1st International ACM Conference on Multimedia,* Los Angeles, CA, 1993, pp. 75-82.

Book Chapters

K. Mayer-Patel, "MediaSynch Issues for Computer-Supported Cooperative Work," in *MediaSync Handbook on Multimedia Synchronization*, Montagud, M., Cesar, P., Boronat, F., Jansen, J. (Eds.), Springer International Publishing, 2018.

Software Artifacts

mpeg_play

The first publicly available MPEG-1 video decoder originally released in 1993. Over 1,000,000 copies of this program have been downloaded. It has been used as a code base for innumerable research and open source systems. Mayer-Patel was the architect of the original code that was later refactored and maintained by a number of other individuals.

The Berkeley Continuous Media Toolkit

The Berkeley CMT provided a framework within which to develop experimental multimedia tools and applications. Although primarily used by researchers at UC Berkeley, it was employed by a number of different research groups world-wide. Development of CMT ended in approximately 1998.

MPEG2Event

This recently released C# library allows researchers to rapidly develop MPEG-2 analysis tools that are interested in the details of bit-level coding elements. Although currently in use by only a small number of researchers, it is freely available at http://www.cs.unc.edu/~kmp/mpeg2event. Further development of the library is on-going.

Teaching

Data Structures
This course teaches how to organize the data used in computer programs so that manipulation of that data can be done efficiently on large problems and large data instances. This is the first required course in the major.

Foundations of Programming
Principles and practices of object-oriented programming. Advanced programming: object-oriented design, classes, interfaces, packages, inheritance, delegation, observers, MVC (model view controller), exceptions, assertions.

Modern Web Programming
Developing applications for the World Wide Web with a primary emphasis on client-side programming, Model-View-Controller architecture, AJAX, and RESTful Web services. I use the course as a context for teaching fundamentals of functional programming and distributed systems.

Files and Databases
Placement of data on secondary storage. File organization. Database history, practice, major models, system structure and design. Databases are an indispensable tool for managing information, and a course on the principles and practice of database systems is now an integral part of any computer science curricula. This course covers the fundamentals of modern database management systems, in particular relational database systems. In my offerings, I emphasize web application backend and data science applications.

Multimedia Computing and Networking
This course is an advanced graduate-level course that covers the fundamental concepts in multimedia computing and networking. Students are expected to complete an extensive final project, some of which have led to publications in refereed conferences and workshops.

Other Topics Taught:
Special Topics: Data Compression
Algorithms and Analysis
Introduction to Scientific Programming

Research Areas

Asynchronous Video Representations
Neuromorphic event cameras, designed to mimic the human vision system with asynchronous sensing, unlock a new realm of high-speed and high-dynamic-range applications. However, researchers often either revert to a framed representation of event data for applications or build bespoke applications for a particular camera's event data type. To usher in the next era of video systems, accommodate new event camera designs, and explore the benefits of asynchronous video in classical applications, there is a need for an asynchronous, source-agnostic video representation. This research introduces a novel, asynchronous intensity representation for both framed and non-framed data sources and explores techniques and mechanisms for compressing, streaming, and effectively negotiating rate-distortion tradeoffs that are under application-level control.

Recoverable Video Adaptation
Existing video adaptation techniques generally lead to irreversibly loss of video quality. In this project, we are exploring adaptation techniques that can be used to recover high (or at least higher) quality video from a set of independently constructed lower quality representations.

n-Dimensional Display Interface
The frame buffer has been the predominant abstraction display interfaces since the rise of raster displays. Despite the success of the framebuffer, it imposes serious restrictions that jeopardize its applicability in the face of new, emerging display challenges such as very large displays and mobile low-power displays. In this research, we are exploring a new narrow waist interface for display resources built around a parallel architecture suitable for scalability with respect to both size and power.

Streaming for Visualization
We are investigating a general framework for supporting remote interactive exploration of large-scale scientific data that allows for smoothly negotiated trade-offs between model streaming and view streaming and deeply integrated application-level knowledge with high-speed transport-level protocol mechanisms. The key mechanism in our approach is replicating the rendering process at both source and destination as part of parallel model/view streaming pipelines that are integrated into view prediction.

Streaming for Vision
Modern multimedia codecs for video compression built into low cost cameras are all highly optimized for the human consumer. In other words, lossy techniques introduce error that is least perceptible by people. If, however, these codecs need to be incorporated into a system that using machine vision, these design choices may not be appropriate. We are developing a framework for integrating state of the are multimedia encoding and streaming techniques with state of the art vision algorithms in order to more effectively realize large-scale vision-based video processing systems.

<u>Funding</u>

Analyst-Driven Rate Adaptation for Triaging Full Motion Video on the Edge
PI: K. Mayer-Patel and M. Singh
Agency: Department of Defense
Amount: $75,000
Duration: 1/2024-6/2024

Content-Adaptive Rate Control for Surveillance Video with Event Cameras
PI: K. Mayer-Patel and M. Singh
Agency: Department of Defense
Amount: $132,000
Duration: 1/2023-1/2024

Lightweight, Bio-Inspired Triage of Video from Motion Events
PI: K. Mayer-Patel and M. Singh
Agency: Department of Defense
Amount: $121,560
Duration: 1/2022-1/2023

Generalizing CS Rankings As Projections Between Publications and Institutions
PI: K. Mayer-Patel
Agency: ACM SIG Multimedia
Amount: $30,000
Duration: 5/2020 – 1/2021

CI-P: Shared Open-Source Tools in Support of Multimedia Systems Research
PI's: K. Mayer-Patel, W. Feng (Portland State)
Agency: NSF
Amount: $80,874 (UNC portion) / approx. $150,000 (total)
Duration: 6/2015 – 6/2017

Google 3x in 3 Years Capacity Grant
PI's: K. Mayer-Patel, J. Forbes (Duke), K.Boyer (NC State)
Agency: Google
Amount: $325,000 (UNC portion) / approx.. $1,500,000 (total)
Duration: 6/2015 – 6/2018

US-Singapore Workshop: Collaborative Research:
Understand the World by Analyzing Many Video Streams
PI's: K. Mayer-Patel, Y.Lu (Purdue)
Agency: NSF
Amount: $9,091.00 (UNC portion) / approx.. $50,000 (total)
Duration: 11/2014 – 11/2015

CAREER: Enabling Futuristic Distributed Applications with Integrative Multistream Networking
PI's: K. Mayer-Patel
Agency: National Science Foundation (ANI-0238260)
Amount: $404,387
Duration: 8/15/2003 – 8/14/2008

ITR: Protocol Coordination for Multi-Stream Applications
PI's: K. Mayer-Patel
Agency: National Science Foundation (ANI-0219780)
Amount: $368, 047
Duration: 10/1/2002 – 9/30/2005

RI: Tera-Pixels - Using High-Resolution Pervasive Displays to Transform Collaboration and Teaching

PI's: K. Jeffay, A. Lastra, F.D. Smith, K. Mayer-Patel and L. McMillan
Agency: National Science Foundation (EIA-0303590)
Amount: $590,986
Duration: 8/15/2003 – 8/14/2008

3D Telepresence for Medical Consultation: Extending Medical Expertise Throughout, Between, and Beyond Hospitals
PI's: H. Fuchs, B. Cairns, K. Mayer-Patel, D. Sonnenwald, G. Welch
Agency: National Library of Medicine
Amount: $2,549,980
Duration: 09/30/2003-09/29/2006

Video-Based Representation and Rendering of Large Real and Synthetic Environments
PI's: D. Manocha and K. Mayer-Patel
Agency: Office of Naval Research
Amount: $112,384
Duration: 01/01/2001-12/31/2003

Video Quality Metric Oracle
PI's: K. Mayer-Patel
Agency: North Carolina Networking Initiative Fellowship Program
Amount: $20,000
Duration: 08/15/2001 – 5/15/2002

SCOUT: An On-Line Network Path Measurement and Characterization Tool
PI's: K. Mayer-Patel
Agency: North Carolina Networking Initiative Fellowship Program
Amount: $20,000
Duration: 08/15/2000 – 5/15/2001

Professional Activities

Program Committees

- Multimedia Interactive Protocols and Systems Workshop (2004, 2005)
- IFIP Networking Conference (2005, 2010)
- Multimedia Information Systems Conference (2004)
- International World Wide Web Conference (2004)
- ACM Multimedia (2000, 2003, 2004, 2007 - 2021)
- Workshop on Network and Operating System Support for Digital Audio and Video (2000, 2002, 2003, 2006 – 2021)
- SPIE Conference on Multimedia Computing and Networking (2001 - 2003)
- IEEE International Conference on Distributed Computing Systems (2003)
- Interactive Distributed Multimedia Systems Workshop (2003, 2002)
- Global Internet Symposium (2002, 2001)
- ACM Multimedia Systems, MMSys (2012, 2013-2021)
- Packet Video (2013, 2015)
- NetGames (2013, 2015)

Organizing Committees

- Co-Chair, AsyncVideo ’23 Workshop
- Chair, standing executive committee for NOSSDAV (2008-present)
- Chair, standing executive committee for MMSys (2013-present)
- Technical Program Co-Chair, ACM Multimedia (2015)
- General Chair, ACM Multimedia Systems (2011)
- Technical Program Chair, ACM Multimedia Systems (2010)
- Technical Program Co-Chair, Multimedia Modeling (2009)
- General Co-Chair, Workshop on Network and Operating Systems Support for Digital Audio and Video (2005)
- Multimedia Grand Challenge Chair, ACM Multimedia (2017)
- Open Source Software Competition Chair, ACM Multimedia (2004, 2005)
- Tutorial Program Chair, ACM Multimedia (2003)
- Doctoral Symposium Chair, ACM Multimedia (2000, 2001)

Other Prior Professional Service

- Associate Editor, ACM Transactions on Multimedia Computer, Communications, and Applications (TOMCCAP)
- Associate Editor, IEEE Multimedia.
- Guest Editor, Special issue of HINDAWI Journal on Video and Image Processing featuring best papers from MMM 2009.
- Guest Editor, Special Issue of Multimedia Systems Journal featuring expanded papers from the SPIE Conference on Multimedia Computing and Networking, 2003.
- In 2004, participated in a by invitation-only meeting of leaders within ACM SIGMultimedia. A report of the meeting outlining important directions for multimedia research will appear in Transactions on Multimedia Computing, Communications, and Applications.
- Invited to an international meeting of leading multimedia researchers being organized for Spring 2005 in Dagstuhl, Germany to discuss the future of multimedia research.
- Invited to NSF workshop on Multimedia Research 10-year Roadmap Workshop, 2017.

<u>Ph.D. Students</u>

Advised

- Andrew Freeman, current.
- Aaron Smith, *Receiver-Driven Video Adaptation,* 2022.
- David Estes, *n-Dimensional Display Interface: A Replacement for the Venerable Framebuffer*, 2020.
- David Ott, *Coordination mechanisms for distributed multistream applications*, November 2006.
- David Gotz, *Supporting adaptive scalable access to multiresolutional multidimensional data,* May 2005.
- Sang-Uok Kum, *Encoding and transmission of 3D depth streams*, November 2007.

University Service

University Committees

- Tar Heel Bus Tour Advisory Committee (Fall 2001).
- Conflict of Interest Committee (Fall 2015 – present).

Department Committees

- Undergraduate Curriculum Committee (Spring 2010 – present)
- Graduate Admissions Committee (Spring 2001 – present).
- Examination Committee, (Fall 2004 – Fall 2011).
- Buildings and Grounds Committee, (Spring 2000 – Spring 2005).

Other Service

- Project UPLIFT participant (recruitment of minority high school students) (Summer 2001, Summer 2002, Summer 2004).
- Co-coach of the UNC ACM Programming Competition team (Fall 2000 – present).
- Faculty advisor for Sigma Alpha Phi fraternity.
- Participated in the UNC Summer Reading Program (Summer 2004).
- Ran for faculty senate (Fall 2002).