

Curriculum Vitae

Notarization. I have read the following and certify that this *curriculum vitae* is a current and accurate statement of my professional record.

Signature:



Date: July 17, 2026

I. Personal Information

I.A. UID 103378440, Duraiswami, Ramani

*Department of Computer Science & UMIACS;
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I.B. Academic Appointments at UMD

- Department of Computer Science and UMIACS, University of Maryland, Professor, 07/01/2014 – present
- Department of Computer Science, University of Maryland, Associate Chair and Director of Graduate Studies, 08/28/2018 – present
- Department of Computer Science and UMIACS, University of Maryland, Associate Professor, 07/01/2007 – 06/30/2014
- Department of Computer Science and UMIACS, University of Maryland, Assistant Professor, 07/01/2004 – 06/30/2007
- Institute for Advanced Computer Studies, University of Maryland, Associate Research Scientist, 07/01/2003–06/30/2004
- Institute for Advanced Computer Studies, University of Maryland, Assistant Research Scientist, 01/05/1998– 06/30/2003

I.C. Administrative Appointments at UMD

- Affiliate Associate Professor (2007–2014), then Affiliate Professor (2014–2024), Department of Electrical and Computer Engineering, University of Maryland, College Park, MD, 11/06/2007 - 09/25/2024

- Faculty Member, Program in Applied Mathematics and Scientific Computation, University of Maryland, College Park, MD. 07/01/2004 - Present
- Director, Perceptual Interfaces and Reality Laboratory, UMIACS, University of Maryland, College Park, MD. 01/01/2002 - present.
- Member, Center for Machine Learning, UMD, University of Maryland, College Park, MD. 01/01/2020 - present.
- Member, Computer Vision Laboratory, UMIACS, University of Maryland, College Park, MD. 01/05/1998 - present.
- Member, The Norbert Wiener Center for Harmonic Analysis and Applications, Department of Mathematics, University of Maryland, College Park, MD. 07/01/2007 - present.
- Member, Burgers Program for Fluid Mechanics, University of Maryland, College Park, MD.
- Member, Robotics Center, University of Maryland, College Park, MD

I.D. Other Employment

- VisiSonics Corporation, College Park, MD, Founder and President, 2011 – 2023.
- Dynaflow Inc., Fulton, MD, Principal Research Scientist; also Head of the Applied Mathematics Division, 01/01/1997 - 12/31/1997
- Dynaflow Inc., Fulton, MD, Senior Research Scientist 01/01/1994– 12/31/1996
- Dynaflow Inc., Fulton, MD, Research Scientist 06/01/1990 – 12/31/1993
- The Johns Hopkins University, Baltimore, MD Research and Teaching Assistant 08/22/1985– 05/30/1990

I.E. Educational Background

Include dates, degrees, and institutions

- Ph.D., Mechanical Engineering (minor: Applied Mathematics), The Johns Hopkins University, January 1991. Dissertation: “I. Sound Propagation in Fog; II. Orthogonal Mapping in Two Dimensions.”
- B.S., Mechanical Engineering, Indian Institute of Technology, Bombay, India, July 1985

II. Research, Scholarly and Creative Activities

In the following, an * indicates a co-author who was a student or a postdoc advised, co-advised, or supervised by Dr. Duraiswami when the work was done. A † indicates a scientist who is supported by Dr. Duraiswami. Electronic copies of almost all papers are available [online](#). Dr. Duraiswami's [Google scholar page](#) provides a citation analysis, and indicates his h-index is 68 with over 17,700 citations of his work.

References

A. Books

— A.1. Books Authored —

- [B1] Nail A. Gumerov[†] and Ramani Duraiswami. *Fast Multipole Methods for the Helmholtz Equation in Three Dimensions*. The Elsevier Electromagnetism Series. Elsevier Science, Amsterdam, 2005. ISBN: 0080443710.

— A.2. Books Edited —

- [B2] Lauri Savioja, Akio Ando, Ramani Duraiswami, Emanuel A. P. Habets, and Sascha Spors. Introduction to the issue on spatial audio. *IEEE Journal of Selected Topics in Signal Processing*, 9:767–769, 2015.
- [B3] Derek Brock, Ramani Duraiswami, and Alexander I. Rudnický, editors. *Papers from the AAAI Fall Symposium*, number ISBN 978-1-57735-299-0. AAAI Press, Menlo Park, CA, 2006.
- [B4] David Doermann and Ramani Duraiswami, editors. *Proceedings of the Third International Conference on Mobile and Ubiquitous Multimedia (MUM2004), College Park, Maryland, U.S.A. October 27 - 29, 2004*, volume 273 of *ACM International Conference Proceeding Series*. Association of Computer Machinery, 2004. ISBN:1-58113-981-0.

— B.1 Book Chapters —

- [B5] Nail A. Gumerov[†] and Ramani Duraiswami. *Excursions in Harmonic Analysis, Volume 3*, chapter Recursive computation of spherical harmonic rotation coefficients of large degree, pages 105–142. Birkhauser, 2015.
- [B6] N A Gumerov and R Duraiswami. Recursive computation of spherical harmonic rotation coefficients of large degree. In Radu Balan and Matthew Begué and John J. Benedetto and Wojciech Czaja and Kasso A. Okoudjou, editor, *Excursions in Harmonic Analysis*. Springer, 2015.

- [B7] Ramani Duraiswami, Dmitry N. Zotkin[†], Nail A. Gumerov[†], and Adam E. O'Donovan*. *Principles and Applications of Spatial Hearing*, chapter Capturing and Recreating Auditory Virtual Reality, pages 337–356. World Scientific, 2011.
- [B8] Dmitry N. Zotkin* and Ramani Duraiswami. *Handbook on Signal Processing Systems*, chapter Signal processing for audio HCI, pages 243–265. Springer, 2010.
- [B9] Vikas C. Raykar* and Ramani Duraiswami. The improved fast Gauss transform with applications to machine learning. In L. Bottou, O. Chapelle, D. Decoste, and J. Weston, editors, *Large Scale Kernel Machines*, pages 175–202. MIT Press, 2007.
- [B10] Dmitry Zotkin*, Vikas Raykar*, Ramani Duraiswami, and Larry S. Davis. Multimodal tracking for smart videoconferencing and video surveillance. In Zhigang Zhu and Thomas S. Huang, editors, *Multimodal Surveillance*, pages 1–2. Artech House Publisher, 2007.

C. Articles in Refereed Journals

— Published/accepted Articles in Refereed Journals —

- [J1] Meenakshi Krishnan and Ramani Duraiswami. ViscoReg: Neural signed distance functions via viscosity solutions. *Trans. Mach. Learn. Res.*, 2026, 2026.
- [J2] Shoken Kaneko and Ramani Duraiswami. Layer potential quadrature on manifold boundary elements with constant densities for laplace and helmholtz kernels in r3. *Engineering Analysis with Boundary Elements*, 181:106545, 2025.
- [J3] GL Chahine, KM Kalumuck, and R Duraiswami. Coupling of a fluids BEM code with a structural FEM code for fluid-structure interaction simulation. *WIT Transactions on Modelling and Simulation*, 2, 2025.
- [J4] Shoken Kaneko, Nail A Gumerov, and Ramani Duraiswami. Recursive analytical quadrature for the close evaluation of Laplace and Helmholtz layer potentials over flat boundary elements in R3. *Eng. Anal. Bound. Elem.*, 159:259–271, February 2024.
- [J5] Nail A. Gumerov, Shoken Kaneko, and Ramani Duraiswami. Analytical galerkin boundary integrals of laplace kernel layer potentials in r3. *SIAM J. Sci. Comput.*, 46(2):974, 2024.
- [J6] Samuel F Potter, Maria K Cameron, and Ramani Duraiswami. Numerical geometric acoustics: An eikonal-based approach for modeling sound propagation in 3D environments. *J. Comput. Phys.*, 486:112111, August 2023.
- [J7] Nail A Gumerov, Shoken Kaneko, and Ramani Duraiswami. Recursive computation of the multipole expansions of layer potential integrals over simplices for efficient fast multipole accelerated boundary elements. *J. Comput. Phys.*, 486:112118, August 2023.

- [J8] Nail A. Gumerov and Ramani Duraiswami. Fast multipole accelerated boundary element methods for room acoustics. *J. Acoust. Soc. Am.*, 150(3):1707–1720, September 2021.
- [J9] Shoken Kaneko and Ramani Duraiswami. Multiple scattering ambisonics: Three-dimensional sound field estimation using interacting spheres. *JASA Express Lett.*, 1(8):084801, August 2021.
- [J10] Nail A Gumerov and Ramani Duraiswami. Laplace green’s functions for infinite ground planes with local roughness. *Journal of Computational Physics*, 447:110673, 2021.
- [J11] Nail A Gumerov and Ramani Duraiswami. Efficient fast multipole accelerated boundary elements via recursive computation of multipole expansions of integrals. *arXiv preprint arXiv:2107.10942*, 2021.
- [J12] Nail A Gumerov and Ramani Duraiswami. Analytical computation of boundary integrals for the helmholtz equation in three dimensions. *arXiv preprint arXiv:2103.17196*, 2021.
- [J13] Shoken Kaneko and Ramani Duraiswami. Spheroidal ambisonics: Spatial audio in spheroidal bases. *JASA Express Letters*, 1(8):084803, 2021.
- [J14] Nail A Gumerov, Ross N Adelman, and Ramani Duraiswami. Boundary element solution of electromagnetic fields for non-perfect conductors at low frequencies and thin skin depths. *IEEE Transactions on Magnetism*, 56(11):1–12, November 2020.
- [J15] Nail A Gumerov, Ross N Adelman, and Ramani Duraiswami. Boundary element solution of electromagnetic fields for non-perfect conductors at low frequencies and thin skin depths. *IEEE Transactions on Magnetism*, 56(11):1–12, 2020.
- [J16] Ross Adelman* Nail A Gumerov[†] and Ramani Duraiswami. FMM/GPU-accelerated boundary element method for computational magnetism and electrostatics. *IEEE Transactions on Magnetism*, 53(12):1–11, 2017.
- [J17] Ross Adelman*, Nail A. Gumerov[†], and Ramani Duraiswami. Accurate computation of galerkin double surface integrals in the 3-d boundary element method. *IEEE Transactions on Antennas and Propagation*, 64:2389–2400, 2016.
- [J18] L. Savioja, A. Ando, R. Duraiswami, E.A.P. Habets, and S Spors. Introduction to the issue on spatial audio. , *IEEE Journal of Selected Topics in Signal Processing*, 9(5):767–769, 2015.
- [J19] Ross Adelman*, Nail A. Gumerov[†], and Ramani Duraiswami. Semi-analytical computation of acoustic scattering by spheroids and disks. *Journal of the Acoustical Society of America*, 136:405–410, 2014.
- [J20] Jounghoon Beh*, David Han, Ramani Duraiswami, and Hanseok Ko. Hidden markov model on a unit hypersphere space for hands gesture trajectory recognition. *Pattern Recognition Letters*, 36:405–410, 2014.

- [J21] Konstantin Berlin*, Nail A. Gumerov[†], David Fushman, and Ramani Duraiswami. Hierarchical $O(N)$ computation of small-angle scattering profiles and their associated derivatives. *Journal of Applied Crystallography*, pages 755–761, 2014.
- [J22] Nail A. Gumerov[†] and Ramani Duraiswami. A method to compute periodic sums. *Journal of Computational Physics*, 272:307–326, 2014.
- [J23] Yuancheng Luo, Dmitry N. Zotkin, and Ramani Duraiswami. Gaussian process models for HRTF based sound-source localization and active-learning. *IEEE J. Sel. Top. Signal Process.*, 2014. Journal venue confirmed from manuscript header; exact volume/issue/pages not found in available records – please verify.
- [J24] Qi Hu*, Nail A. Gumerov[†], and Ramani Duraiswami. GPU accelerated fast multipole methods for dynamic N-body simulation. *Computers and Fluids*, 88:857–865, 2013.
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- [J30] Yuancheng Luo* and Ramani Duraiswami. Efficient parallel non-negative least-squares. *SIAM Journal on Scientific Computing*, 33:2848–2863, 2011.
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- [J32] Vikas Raykar*, Ramani Duraiswami, and Linda Zhao. Fast computation of kernel estimators. *Journal of Computational and Graphical Statistics*, 19:205–220, 2010.

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- [J37] Nail A. Gumerov and Ramani Duraiswami. Fast multipole methods on graphical processors. *Journal of Computational Physics*, 227:8290–8313, 2008. Also published as Fantalgo LLC, Technical Report 2007-2.
- [J38] Vikas C. Raykar*, Ramani Duraiswami, and Balaji Krishnapuram. A fast algorithm for learning a ranking function from large scale data sets. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 30:1158–1170, 2008.
- [J39] Fad Seydou, Ramani Duraiswami, and Tappio Seppanen. Numerical solution of electromagnetic scattering by multiple cylinders. *Applied Computational Electromagnetics Journal*, 23:1–8, 2008.
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- [J41] Nail A. Gumerov[†] and Ramani Duraiswami. Fast radial basis function interpolation via preconditioned Krylov iteration. *SIAM Journal on Scientific Computing*, 29:1876–1899, 2007.
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- [J45] Dmitry N. Zotkin*, Ramani Duraiswami, Nail A. Gumerov[†], and Elena Grassi*. Rapid measurement of head related transfer functions. *The Journal of the Acoustical Society of America*, 120(4):2202–2215, Oct 2006.
- [J46] Nail A. Gumerov[†] and Ramani Duraiswami. Fast multipole method for the biharmonic equation in three dimensions. *Journal of Computational Physics*, 215(1):363–383, Jun 2006.
- [J47] Nail A. Gumerov[†], Ali Zandifar*, Ramani Duraiswami, and Larry S. Davis. 3-D structure recovery and unwarping of surfaces applicable to planes. *International Journal of Computer Vision*, 66(3):261–281, Mar 2006.
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- [J51] Dmitry N. Zotkin*, Tai-Shi Chi, Shihab A. Shamma, and Ramani Duraiswami. Neuromimetic sound representation for percept detection and manipulation. *EURASIP Journal on Applied Signal Processing*, 2005(9):1350–1364, Jun 2005.
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- [J53] Nail A. Gumerov[†] and Ramani Duraiswami. Computation of scattering from clusters of spheres using the fast multipole method. *The Journal of the Acoustical Society of America*, 117(4):1744–1761, 2005.
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- [J55] Philip David*, Daniel F. Dementhon, Ramani Duraiswami, and Hanan Samet. SoftPOSIT: Simultaneous pose and correspondence determination. *International Journal of Computer Vision*, 59(3):259–284, Sep 2004.

- [J56] Dmitry N. Zotkin* and Ramani Duraiswami. Accelerated speech source localization via a hierarchical search of steered response power. *IEEE Transactions on Speech and Audio Processing*, 12(5):499– 508, Sep 2004.
- [J57] Dmitry N. Zotkin*, Ramani Duraiswami, and Larry S. Davis. Rendering localized spatial audio in a virtual auditory space. *IEEE Transactions on Multimedia*, 6(4):553– 564, Aug 2004.
- [J58] Fadoulourahmane Seydou, Ramani Duraiswami, Nail A. Gumerov, and Tappio Seppanen. Tm electromagnetic scattering from 2D multilayered dielectric bodies -. *Applied Computational Electromagnetics Society Journal*, 19(2):100–107, Jul 2004.
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- [J64] Nail A. Gumerov[†] and Ramani Duraiswami. Computation of scattering from N spheres using multipole reexpansion. *The Journal of the Acoustical Society of America*, 112(6):2688–2701, 2002.
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- [J69] Kenneth M. Kalumuck, Ramani Duraiswami, and Georges L. Chahine. Bubble dynamics fluid-structure interaction simulation by coupling. *Journal of Fluids and Structures*, 9(8):861–883, Nov 1995.
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- [J72] Ramani Duraiswami and Andrea Prosperetti. Orthogonal mapping in 2 dimensions. *Journal of Computational Physics*, 98(2):254–268, Feb 1992.

D. Refereed Conference Proceedings

- [C1] Sonal Kumar, Simon Sedláček, Vaibhavi Lokegaonkar, Fernando López, Wenyi Yu, Nishit Anand, Hyeonggon Ryu, Lichang Chen, Maxim Plicka, Miroslav Hlaváček, William Fineas Ellingwood, Sathvik Udupa, Siyuan Hou, Allison Ferner, Sara Barahona, Cecilia Bolaños, Satish Rahi, Laura Herrera-Alarcón, Satvik Dixit, Rupali S. Patil, Soham Deshmukh, Lasha Koroshinadze, Yao Liu, Leibny Paola García-Perera, Eleni Zanou, Themis Stafylakis, Joon Son Chung, David Harwath, Chao Zhang, Dinesh Manocha, Alicia Lozano-Diez, Santosh Kesiraju, Sreyan Ghosh, and Ramani Duraiswami. MMAU-Pro: A challenging and comprehensive benchmark for holistic evaluation of audio general intelligence. In Sven Koenig, Chad Jenkins, and Matthew E. Taylor, editors, *Fortieth AAAI Conference on Artificial Intelligence, Thirty-Eighth Conference on Innovative Applications of Artificial Intelligence, Sixteenth Symposium on Educational Advances in Artificial Intelligence, AAAI 2026, Singapore, January 20-27, 2026*, pages 22688–22697. AAAI Press, 2026.
- [C2] Nishit Anand, Ashish Seth, Sreyan Ghosh, Dinesh Manocha, and Ramani Duraiswami. FIGMA: towards fine-grained music retrieval. In Maria Liakata, Viviane P. Moreira, Jiajun Zhang, and David Jurgens, editors, *Proceedings of the 64th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers), ACL 2026, San Diego, California, United States, July 2-7, 2026*, pages 47559–47572. Association for Computational Linguistics, 2026.
- [C3] Sonal Kumar, Sreyan Ghosh, Yueqian Lin, S. Sakshi, Ashish Seth, Yiran Chen, Ramani Duraiswami, and Dinesh Manocha. PolyAudio: Advancing multi-audio reasoning in large audio language models with interleaved multi-audio contexts. In Maria Liakata, Viviane P. Moreira,

Jiajun Zhang, and David Jurgens, editors, *Findings of the Association for Computational Linguistics, ACL 2026, San Diego, California, United States, July 2-7, 2026*, pages 42335–42353. Association for Computational Linguistics, 2026.

- [C4] Sanjaya Herath, Armin Gerami, Kevin Wagner, Ramani Duraiswami, and Christopher A. Metzler. A scalable MVDR beamforming algorithm that is linear in the number of antennas. In *59th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, USA, October 26-29, 2025*, pages 1074–1079. IEEE, 2025.
- [C5] Ashish Seth, Utkarsh Tyagi, Ramaneswaran Selvakumar, Nishit Anand, Sonal Kumar, Sreyan Ghosh, Ramani Duraiswami, Chirag Agarwal, and Dinesh Manocha. EGOILLUSION: benchmarking hallucinations in egocentric video understanding. In Christos Christodoulopoulos, Tanmoy Chakraborty, Carolyn Rose, and Violet Peng, editors, *Proceedings of the 2025 Conference on Empirical Methods in Natural Language Processing, EMNLP 2025, Suzhou, China, November 4-9, 2025*, pages 28461–28480. Association for Computational Linguistics, 2025.
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- [C7] Armin Gerami, Bowen Zhi, Dmitry N. Zotkin, and Ramani Duraiswami. Efficient spatial audio rendering via differentiable FIR to IIR estimation. In *2025 IEEE International Conference on Acoustics, Speech and Signal Processing, ICASSP 2025, Hyderabad, India, April 6-11, 2025*, pages 1–5. IEEE, 2025.
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- [C11] Sonal Kumar, Sreyan Ghosh, Utkarsh Tyagi, Anton Jeran Ratnarajah, Chandra Kiran Reddy Evuru, Ramani Duraiswami, and Dinesh Manocha. ProSE: Diffusion priors for speech enhancement. In Luis Chiruzzo, Alan Ritter, and Lu Wang, editors, *Proceedings of the 2025*

Conference of the Nations of the Americas Chapter of the Association for Computational Linguistics: Human Language Technologies, NAACL 2025 - Volume 1: Long Papers, Albuquerque, New Mexico, USA, April 29 - May 4, 2025, pages 12470–12483. Association for Computational Linguistics, 2025.

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- [T37] Ross G. Cutler, Ramani Duraiswami, Heng J. Qian, and Larry S. Davis. Design and implementation of the university of maryland keck laboratory for the analysis of visual movement. Technical Report CS-TR-4329 and UMIACS-TR-2002-11, University of Maryland Department of Computer Science and Institute for Advanced Computer Studies, Feb 2002.
- [T38] R Duraiswami. Camera calibration. *Electronic. University of Maryland-Institute for*, 2000.

— **F.4 Dynaflow Inc. Reports** —

- [T39] Ramani Duraiswami, Antoine Chahine, and Georges L. Chahine. Development of a desktop ship simulator using systems identification techniques. Technical Report 95016-1, Dynaflow, Inc., 1997.
- [T40] Gregory Zilman, Ramani Duraiswami, and Georges L. Chahine. Optimal ship design and simulator development using systems identification techniques. Technical Report 94006-1, Dynaflow, Inc., 1994.
- [T41] Ramani Duraiswami. A pseudospectral mapping technique for the accurate solution of viscous flows in complex geometries. Technical report, Dynaflow, Inc., 1993.

H. Inventions, Patents, Patent Applications, and Invention Disclosures

- [P1] Armin Gerami, Monte Hoover, Pranav S. Dulepet, and Ramani Duraiswami. Systems and methods for fast computation of attention for the speedup of transformers, February 2024. UMD Provisional Patent Application No. 63/552,309, filed Feb. 12, 2024.
- [P2] Armin Gerami, Bowen Zhi, Dmitry N. Zotkin, and Ramani Duraiswami. Differentiable FIR-to-IIR filter estimation with applications, October 2023. UMD invention disclosure, Ref. No. 2024-041, filed Oct. 19, 2023.
- [P3] Ramani Duraiswami, Bowen Zhi, and Dmitry Zotkin. Systems and methods for head related transfer function personalization, July 13 2023. US Patent App. 18/021,164.
- [P4] Bowen Zhi, Alisha Sharma, Dmitry N. Zotkin, and Ramani Duraiswami. Differentiable room acoustics optimization and design, May 2023. UMD invention disclosure, Ref. No. 2024-011, filed May 2023.
- [P5] Ramani Duraiswami, Shoken Eckhart Kaneko, Nail A Gumerov, and Nirupam Roy. Audio control system, November 24 2022. US Patent App. 17/736,641.
- [P6] Dmitry N Zotkin, Nail A Gumerov, and Ramani Duraiswami. Audio signal processor and generator, September 23 2021. US Patent App. 16/332,680.

- [P7] Nail A Gumerov, Bowen Zhi, and Ramani Duraiswami. Systems and methods for analyzing multichannel wave inputs, November 12 2020. US Patent App. 16/759,237.
- [P8] Yuancheng Luo, Ramani Duraiswami, and Dmitry N Zotkin. Sparse decomposition of head related impulse responses with applications to spatial audio rendering, March 19 2019. US Patent 10,237,676.
- [P9] Yuancheng Luo, Ramani Duraiswami, and Dmitry N Zotkin. Sparse decomposition of head related impulse responses with applications to spatial audio rendering, July 3 2018. US Patent 10,015,616.
- [P10] Yuancheng Luo, Ramani Duraiswami, and Dmitry N Zotkin. Statistical modelling, interpolation, measurement and anthropometry based prediction of head-related transfer functions, June 13 2017. US Patent 9,681,250.
- [P11] Ramani Duraiswami, Adam O'Donovan*, and Nail A Gumerov[†]. Audio camera using microphone arrays for real time capture of audio images and method for jointly processing the audio images with video images. USPTO, 2017.
- [P12] Yuancheng Luo*, Ramani Duraiswami, and Dmitry N Zotkin[†]. Statistical modelling, interpolation, measurement and anthropometry based prediction of head-related transfer functions. USPTO, 2017.
- [P13] R Duraiswami, A O'Donovan, and D Zotkin. Microphone array and method for operating the same. US Patent, 2016.
- [P14] Yuancheng Luo*, Ramani Duraiswami, and Dmitry N. Zotkin[†]. Sparse decomposition of head related impulse responses with applications to spatial audio rendering. US Patent application 20150358755, 2015.
- [P15] Yuancheng Luo*, Ramani Duraiswami, and Dmitry N. Zotkin[†]. Statistical modeling, interpolation, measurement and anthropometry based prediction of head related transfer functions. Invention Disclosure, 2013.
- [P16] Ramani Duraiswami, Adam O'Donovan, and Dmitry N. Zotkin. Microphone array configuration and method for operating the same. US Patent application 20130121505, 2013.
- [P17] Ramani Duraiswami, Adam E. O'Donovan, and Nail A. Gumerov. Audio camera using microphone arrays for real time capture of audio images and method for jointly processing the audio images with video images. Continuation. US Patent Application 20120288114, 2012.
- [P18] Ramani Duraiswami, Adam. O'Donovan*, and Nail A. Gumerov[†]. Audio camera using microphone arrays for real time capture of audio images and method for jointly processing the audio images with video images. US Patent 8229134, 2012.

- [P19] Adam E. O'Donovan, Ramani Duraiswami, and Dmitry N. Zotkin. Method and system for dereverberation of signals propagating in reverberative environments. US Patent 8,988,970, 2011.
- [P20] Adam E. O'Donovan, Ramani Duraiswami, and Dmitry N. Zotkin. Method and system for dereverberation of signals propagating in reverberative environments. US Patent Application 20110222372, 2011.
- [P21] Ramani Duraiswami, Adam E. O'Donovan, and Nail A. Gumerov. Audio camera using microphone arrays for real time capture of audio images and method for jointly processing the audio images with video images. US Patent Application 20090028347, 2010.
- [P22] Ramani Duraiswami and Nail A. Gumerov[†]. Representation, interpolation and measurement of head related transfer functions. US Patent 7720229, 2010.
- [P23] Nail A. Gumerov[†] and Ramani Duraiswami. A method for unwarping paper. UMD Invention Disclosure, 2003.

II.J. Sponsored Research

II.J.1. Grants & Contracts

Projects at the University of Maryland Participated as a principal investigator, Co-PI or member of the proposal team in projects which resulted in over \$30M of research expenditure. Collaborated with numerous researchers at UMD and elsewhere.

1. 09/25-08/26 I-Corps: Translation Potential of Spatial Context for Next-Generation Wearable Technologies, \$50K NSF
2. 05/23-04/24 SAAB: Machine learning based audio visual sensing for underwater robotics \$ 250K
3. 01/23-12/28 MURI: Learning to Mine a Soundscape, ONR (\$ 7.5M, JHU prime, UMD share \$ 2.5 M, my share \$ 1.25M)
4. ARL 9/20 - 09/24. Electric and Magnetic Field Simulation and Processing in Support of E/H Field Safety, Sensor Development, and Applications. \$1.8M Army Research Lab.
5. 01/21-07/22 Facebook, Estimation of the Numerical Errors of the Boundary Element Methods, \$300K/.
6. Applied Research LIS Summer 2020, 2021. Internship program, \$70K
7. Summer 2020, Course redesign for Introduction to Machine Learning, Provost's Office, UMD \$ 30K
8. 09/20 - 03/21 USG Corporation Gift to PIRL Lab. \$60K

9. 01/19 - 10/19 Advanced Capabilities for Sensor Networks \$80K ARL
10. 07/18- 03/21 Wearable Sound Sensing and Feedback Techniques for Persons who are Deaf or Hard of Hearing. \$200K NSF
11. 07/16-01/18: DURIP: Heterogeneous GPU Cluster to Support Deep Learning Research in Computational Vision, Audition and Neuroscience, ONR.
12. 04/16-03/17: I-Corps: On Demand Simulations in the Cloud of the Equations of Mathematical Physics, NSF.
13. 03/16-04/17 BBI Seed Grant, VP Research, UMD. \$100K. My share \$40K.
14. 10/14 - 12/18: FMM Accelerated Simulation Tools in Support of Electric Field Research at ARL, \$820K. Army Research Lab.
15. 09/12-09/17: Standing on the Fourth Pillar: Data Enabled Understanding of Flapping Flight, \$731K. NSF (PI B. Balachandran, my share \$301K.)
16. 09/15-10/17: SquadX:, \$310K. DARPA. (PI Larry Davis).
17. 10/11-09/13: III: Small:Learning the Relationship between the Anatomy and Spatial Hearing, \$165K. NSF
18. 07/12-12/12: Creating Immersive 3D Audio, \$50K, NSF.
19. 01/12-02/15: SET Subcontract on VMR, \$631K, (PI Larry Davis).
20. 02/12-02/15: E-VERIFY: Open Architecture Image-Based W4 Extraction on GPU and Cloud Systems, Leidos National Security Sector (DARPA prime).
21. 07/10-07/11: TechStart Application: Evaluating the IP and Viability of a University Spinout: VisiSonics Corporation, Maryland Technology Development Corporation.
22. 03/10-03/14: Vortex-Particle Dynamics, Interaction and Control for Brownout Mitigation, \$4.5M. AFOSR MURI. (PI J. Gordon Leishman, my share approximately \$600,000)
23. 01/11-12/11: Towards Improved Structure Determination via Fast SAXS/SANS, UMIACS New Research Frontiers Seed Funding, \$50K
24. 11/09-10/12: Hand Signal Interface Between Human Operators and Unmanned Ground Vehicles, \$282K. ONR. (Co-PI; Hanseok Ko, PI), used to support post-doc Jounghoon Beh.
25. 12/09–12/11: Auditory Cortical Approaches for Robust Speaker Identification, \$ 1,941,535. I-ARPA. (Co-PI, Shihab Shamma PI, my share approximately \$450,000).
26. 02/09–01/10: Portable interactive audio scene analysis system, \$ 90,000 Maryland MIPS and Lakenheath Electronic Design (PI).

27. 05/08–04/13: Remote Multi-Modal Biometrics for Maritime Domain (ONR, MURI), \$7.5M. (Co-PI, Rama Chellappa, PI), my share approximately: \$520K.
28. 09/09–08/10: Algorithms, Scientific Computing, and Numerical Studies in Classical and Quantum General Relativity (NSF), \$100K. (Co-PI, Manuel Tiglio, PI), my share approximately \$33K.
29. 01/07–05/10: Creating Auditory Virtual Environments, \$2,100,000 DARPA. (Co-PI, Larry Davis PI), my share \$610,000.
30. 02/08 - 12/15: Center for the Study of Plasma Microturbulence, (Co-PI, Bill Dorland, PI), \$767K, my share \$150K.
31. 09/07 - 09/08: Chesapeake Bay Forecasting System, Internal Maryland of effort (\$1M) via the President's office, Raghu Murtugudde, PI (my share \$80K)
32. 02/08 - 01/09: Flexible and High Performance Biometric Systems, PI, Maryland Industrial Partnerships and Signal Processing, Inc., \$90K.
33. 09/02–09/08: ITR/AITS: Customizable Auditory User Interfaces for the Visually Impaired and the Sighted, \$1,800,000, NSF award 0205271. (PI)
34. 05/05-05/08: MRI: High Performance and Visualization Cluster for Research in Coupled Computational Steering and Visualization for Large Scale Applications. NSF Major Research Instrumentation \$1.6M). (Co-PI, PI: Amitabh Varshney)
35. 01/06 – 12/06: Commercialization of UMD Fast Multipole Method Software (PI), \$50,000. Maryland Technology Development Corporation.
36. 01/06 – 11/06: Evaluation of Sound Source Localization Algorithms (PI), \$55,000. Microsoft.
37. 03/06-12/07: Development of Virtual Environments for Visually Impaired Users (PI), \$130,000, VA Atlanta.
38. 05/06-05/08 : Gifts and License Income from Offspring media, as income from intellectual property derived from [P22] \$30,000/year.
39. 09/02–09/05: ITR/SF&IT: Fast Multipole Translation Algorithms for Solution of the 3D Helmholtz Equation, \$450,000, NSF award 0219681. (Co-PI)
40. 09/00–09/05: ITR: Personalized Spatial Audio via Scientific Computing and Computer Vision, \$2,999,995 NSF award 0086075. (Co-PI)
41. 04/00–04/04 Textual Information Access for the Visually Impaired, \$700,000, NSF award 9987944. (Co-PI):

42. 04/02–04/03: Customizable Auditory Displays, \$175,000, ONR/DARPA Award N000140210571. (PI)

Projects at Fantalgo, LLC

1. 01/07-07/07: Fast Multipole Methods on Graphics Processors, \$100,000. NASA (Co-PI, PI: Nail Gumerov)
2. 04/09-10/09: Simulating particle dynamics on Graphics Processors, \$30,000. JHU-APL. (Co-PI, PI: Nail Gumerov)
3. 06/10-01/11: Electro-Optic Simulation of Rigid Particles, \$65,512. JHU-APL. (Co-PI, PI: Nail Gumerov)
4. 07/12-06/13: Electro-Optic Simulation of Rigid Particles, \$80,000. JHU-APL. (Co-PI, PI: Nail Gumerov)

Projects at Dynaflow, Inc.

1. 10/97-5/98 Development of a high-fidelity surf-zone model for USMC simulators, \$70,000, ONR (PI)
2. 8/96-8/98: Dual Reciprocity Boundary Element Based Algorithms for Efficient 2D and 3D Electrical Impedance Tomography, \$300,000, NSF. (PI)
3. 10/95-10/97: Optimal Ship Design and Simulator Development using Systems Identification Techniques, \$300,000, NSF. (PI)
4. 2/95 - 8/95: Dual Reciprocity Boundary Element Based Algorithms for Efficient 2D and 3D Electrical Impedance Tomography, \$75,000. (PI)
5. 4/94 - 10/94: Optimal Ship Design and Simulator Development using Systems Identification Techniques, \$75,000, NSF. (PI)
6. 1/94 - 1/96: Bubble Nuclei Measurement via an Inverse Acoustic Scattering Technique, \$250,000, NSF. (PI)
7. 1/93 - 7/93: A Pseudospectral Mapping Technique for the Accurate Solution of Viscous Flows in Complex Geometries, \$50,000, NASA. (PI)
8. 2/92 - 9/92: Bubble Nuclei Measurement via an Inverse Acoustic Scattering Technique, \$50,000, NSF. (PI)

Projects at VisiSonics Corp.

1. 1/13 - 7/13: Phase I: Three Dimensional Headphone Audio for Music, Gaming, Entertainment and Telepresence \$190,000, NSF. (Co-PI)

2. 01/14 - 06/18: Phase II: Three Dimensional Headphone Audio for Music, Gaming, Entertainment and Telepresence \$1,422,000, NSF (Co-PI)

II.K Invited Talks on Research

- Invited Colloquium Talk, Indian Institute of Technology, Bombay, Mumbai, India, “Differentiable Modeling for Machine Learning,” April 2025.
- Plenary Talk at JSALT 2025, Brno Institute of Technology, Brno, Czech Republic, “Differentiable Modeling for Machine Learning,” July 2025.
- Kickoff Colloquium, JSALT 2025, Brno Institute of Technology, Brno, Czech Republic, “Towards Auditory General Intelligence,” June 2025.
- Invited Colloquium, Scientific Machine Learning: Theory and Algorithms, Brin Mathematics Research Center, University of Maryland, “Making Scientific Computing Models Differentiable for Deep Learning,” February 2024.
- Invited Presentation, MURI Annual Meeting, ONR, Johns Hopkins University, Baltimore, MD, “Learning to Mine a Soundscape: Physics and Learning,” November 2023.
- Department Seminar, Computer Science, University of Maryland, “Acoustical Scene Analysis and Fast Solution of Wave Propagation Problems,” November 2022.
- Invited Presentation, MURI Kickoff, AES, Carnegie Mellon University, Pittsburgh, PA, “Ocean Soundscapes,” September 2022.
- Colloquium, Army Research Laboratory, Adelphi, MD, “Efficient Solution of the Maxwell Equations,” June 2022.
- Presentation to SAAB visitors, “Underwater soundscapes and physical acoustics,” April 2022.
- Keynote at AES AVAR 2020
- Invited talk at AES AVAR 2019
- Research Seminar at the Laboratory of Physical Sciences, Adelphi, MD 2019
- Keynote at AES Headphone, The Presidio, San Francisco, CA, “Audio Engines, head-tracking and personalization enable new headphone experiences,” August 2019.
- Invited talk at AES AVAR 2018
- Presentation Army Research Lab, Adelphi, MD “Fast Multipole Methods for Electromagnetic Field Simulation,” 2017.

- Presentation Army Research Lab, Adelphi, MD “Fast Multipole Methods for Electric Field Simulation,” 2016.
- Invited talk at Microsoft Faculty Summit 2016, Redmond, WA, “Personalized Spatial Audio for Virtual and Augmented Reality,” 2016.
- Presentation Army Research Lab, Adelphi, MD “Fast Multipole Methods on Heterogeneous Architectures,” 2015.
- Presentation at the UMD/NVIDIA GPU Summit, College Park, MD “Fast Heterogeneous Computing,” 2014.
- Presentation at UNC, Chapel Hill, NC. “Computing, Recreating, Capturing, and Visualizing Spatial Sound,” 2014.
- Presentation at 3M Research, St. Paul, MN. “Computing, Recreating, Capturing, and Visualizing Spatial Sound,” 2014.
- Four lectures on Modern Scientific Computation for the Simulation of Particles, at the Summer School held at the Summer Workshop on “Dynamics of Dispersed Systems” June 22-28, 2014, Ufa, Russia, Organized by the Russian Academy of Sciences.
- Presentation at Apple, Cupertino, CA. “Recereating, Capturing, and Visualizing Spatial Sound,” 2014.
- Presentation at Google, Mountain View, CA. “Recereating, Capturing, and Visualizing Spatial Sound,” 2014.
- Presentation Army Research Lab, Adelphi, MD “Fast Multipole Methods for Computational Electric Field Monitoring,” 2014.
- Presentation at PopTech, Camden, ME. “3D Spatial Audio,” 2012.
- Presentation at MIT Media Lab, “Computational Cameras for Sound,” 2012.
- Colloquium talk at Queens University, London, “Capture and reproduction of 3D Audio,” Audio.
- Invited keynote on “Fast Multipole Methods and other Hierarchical Algorithms,” at SHAX-C, KAUST, 2012.
- Colloquium talk at Aalto University, Helsinki, Finland, 2012
- Colloquium at NASA Langley Research Center, April 2011.
- Colloquium on “Audio-Visual Scene Analysis and Recreation,” Army Research Lab., Adelphi, Maryland. November 2010

- Invited Lecture on “Spatial Audio Research at the Perceptual Interfaces and Reality Lab,” Vienna, Austria, Sep 2010.
- Tutorial Keynote “Capture and Reproduction of Sound Scenes”, at DAFx 2010, Graz, Austria, Sep 2010.
- Keynote “Spherical Sound Scene Analysis”, at the Second International Symposium on Ambisonics and Spherical Acoustics (“Ambisonics 2010”), Paris, France, May 2010.
- Invited Talk on “Computational Estimation of Scattering Coefficients,” meeting of the Acoustical Society of America, Baltimore, 2010.
- Invited Talk on “Spatial Audio,” IWPASH 2009 (International Workshop on the Principles and Applications of Spatial Hearing), Sendai Japan, November 2009.
- Colloquium on “Spatial Audio Research,” Korea University, Seoul, South Korea, November, 2009.
- Colloquium on “Spatial Audio Research,” Samsung Research, Samsung Science City, Suwon, South Korea, November, 2009.
- Colloquium on “Computational Acoustics,” Korea Advanced Institute of Science and Technology, Daejeon, South Korea, November, 2009.
- Talk entitled “Audio Cameras for Audio-Visual Scene Analysis” at Microsoft Research, Seattle, Washington, June 2009
- Invited Talk on “Imaging room acoustics with the audio camera”, Acoustical Society of America, Portland, OR, May 2009.
- Colloquium on Spatial Audio, IEEE Signal Processing Society, Washington DC chapter, College Park, MD, May 2009.
- Talks at DARPA ISAT meetings on “Recreating Auditory Reality”, February 2008, July 2008, November 2008.
- Invited Colloquium at the National Aeronautical and Space Agency, Goddard, “Fast Multipole Methods on Graphics Processors,” November 2007.
- Invited Colloquium at the Naval Research Laboratory, Washington DC, “Fast Multipole Methods for High Frequency Acoustics, January 2007.
- Invited talk at the Acoustical Society of America meeting in Honolulu, Hawaii, November 2006 on “Capture of spatial sound for head-tracked playback.”
- Invited talk at the Acoustical Society of America meeting in Honolulu, Hawaii, November 2006 on “Measurement of room acoustics”

- Keynote on “Similarities and differences in the perception of space via vision and audio,” the 2006 IEEE International Workshop on Multimedia Signal Processing (MMSP06)
- University of Toronto, “Fast algorithms for statistics and machine learning using the improved fast Gauss transform,” March 2006
- University of Maryland, “Fast algorithms for statistics and machine learning using the improved fast Gauss transform,” Norbert Wiener Center, February 2006
- University of California, Santa Barbara, “Fast algorithms for statistics and machine learning using the improved fast Gauss transform,” Department of Electrical and Computer Engineering; February 2006
- University of California, Santa Barbara, “Capturing and Rendering Three Dimensional Auditory Scenes,” IGERT Seminar; February 2006
- Microsoft Research, “Capturing and Rendering Three Dimensional Auditory Scenes,” August 2005
- University of Maryland, “Boundary Integral Methods without Singular Integration,” Mathematics, May 2005
- Carnegie Mellon University, “Capturing and Rendering Perceptually Valid Three Dimensional Audio,” Electrical Engineering, September 2004
- Naval Research Laboratory, “Capturing and Rendering Perceptually Valid Three Dimensional Audio,” Artificial Intelligence Seminar, November, 2004
- Army Research Lab, Aberdeen, MD, “An Introduction to Fast Multipole Methods,” 2005
- Department of Computer Science, University of Maryland, “Creating Perceptually Valid Spatial Audio,” College Park, April 1, 2004
- Purdue University, Colloquium on Interdisciplinary Cognitive and Perceptual Technologies, “Engineering Perceptually Valid Spatial Audio Systems,” March 8, 2004
- IIT Bombay, “Audio research in Computer Science,” April 2003
- Georgia Tech., Computer Science, Sep. 2002
- Microsoft Research, July 2002
- IBM Almaden Research Center, “Creating Perceptually Valid Three Dimensional Audio,” July 2002
- Stanford University, “Creating Rendering Perceptually Valid Three Dimensional Audio,” CCRMA, July 2002

- Boston University, “Creating and Rendering Perceptually Valid Three Dimensional Audio,” April 2002
- Massachusetts Institute of Technology, April 2002
- Invited talk at the Third international workshop on Microphone Array Systems, “Microphone Array Research at the University of Maryland,” October 6, 2000, Harvard University, Cambridge, MA
- Invited colloquium on “Inverse Problems,” Department of Mathematics, Louisiana State University, Baton Rouge, March 3, 1998
- Invited talk at the special session on “Bubble measurement in the oceans,” Joint meeting of the Acoustic Societies of America and Japan, Honolulu, HI, Dec 2–6, 1996

II.M. Centers for Research, Scholarship, and Creative Activities

II.M.1. Centers Established

Perceptual Interfaces and Reality Laboratory. (Founding Director)

II.M.2. Other Laboratories

Co-established NVIDIA CUDA Center of Excellence at UMD, 2007-2016.

Established Laboratories at VisiSonics Corp.

III. Teaching, Mentoring and Advising.

III.A. Courses Taught

Semester	Course	Name	Enrollment
Spring 2026	CMSC 848U	Modern Computational Speech and Audition	31
Fall 2025	AMSC 460	Computational Methods	35
Fall 2024	CMSC 828N	Computational Audition	22
Fall 2023	CMSC 878B	Fast Multipole Methods: Fundamentals and Applications	8
Spring 2022	CMSC 800	How to Conduct Great Research	104
Fall 2021	CMSC 422	Introduction to Machine Learning	122
Spring 2021	CMSC 828R	Deep Learning for Audio-to-Audio Processing	16
Fall 2020	CMSC 422	Introduction to Machine Learning	90
Spring 2020	CMSC 800	How to Conduct Great Research	69
Fall 2019	CMSC 422	Introduction to Machine Learning	93
Fall 2019	CMSC 798E	Graduate Seminar in Computer Science	30
Spring 2019	CMSC 798F	How to Conduct Great Research (Grad. Seminar)	59
Spring 2017	CMSC 422	Introduction to Machine Learning	40
Fall 2016	AMSC 460	Computational Methods	29
Spring 2016	AMSC 662	Comp. Org. for Sci. Comput.	29
Spring 2016	GEMS 497	Team Thesis Defense	10
Fall 2015	CMSC 878	Fast Multipole Methods: Fundamentals and Applications	7
Fall 2015	GEMS 496	Project Writing Seminar	12
Spring 2015	AMSC 460	Computational Methods	42
Spring 2015	GEMS 397	Gemstone Team Project Seminar	14
Fall 2014	AMSC 660	Scientific Computing-1	32
Fall 2014	GEMS 396	Gemstone Team Project Seminar	14
Spring 2014	AMSC 460	Computational Methods	38
Spring 2014	GEMS 297	Gemstone Team Project Seminar	14
Fall 2013	AMSC 660	Scientific Computing-1	29
Fall 2013	GEMS 296	Gemstone Team Project Seminar	7
Spring 2013	AMSC 460	Computational Methods	39
Fall 2012	CMSC 498	CS Ventures	19
Spring 2012	AMSC 460	Computational Methods	37
Fall 2011	CMSC 858M	Fast Multipole Methods	10
Spring 2010	AMSC 460/ CMSC 460	Computational Meth.	39
Fall 2009	AMSC 662/ CMSC 662	Comp. Org. for Sci. Comput.	26
Spring 2009	CMSC 828E	Sci. Comput. on Graph. Proc.	13

III.B. Teaching Innovations

1. CMSC 828D - Computer Vision, Fall 2000: Developed a new graduate computer vision course that employed an innovative approach that emphasized fundamentals and mathematical foun-

ditions. Course was co-developed with Larry Davis and Daniel DeMenthon. The course notes (online at <http://www.umiacs.umd.edu/users/ramani/cmsc828.html>) have been used by several faculty at other universities and have been cited in the literature, including in the paper that developed ESPN's first down marker.

2. CMSC 878R/AMSC698R. - Fast Multipole Methods: Fundamentals & Applications, Fall 2002-2004. (with N.A. Gumerov). The first course anywhere on an important new algorithm that has tremendous potential. Several graduate students and faculty at other universities have informed me that they have used the course notes at <http://www.umiacs.umd.edu/users/ramani/cmsc878R> as a tool to learn the algorithm. Forms basis for chapters of a research monograph [B1] that has been published, and a graduate textbook that is under contract with Birkhauser. The course has since been included in to the new Masters program in Industrial Mathematics being developed by the Norbert Weiner Center for Harmonic Analysis, and was cross-listed there in Fall 2006 and Spring 2008, and Fall 2011. Eight peer-reviewed papers have come out of student projects in the course.
3. CMSC 828D - Algorithms and Systems for Capture and Playback of Spatial Audio. (2006) - This again is a unique course emphasizing the capture and rendering of spatial audio from a computer science viewpoint. I combined elements of signal processing, applied mathematics, psychophysics, physical acoustics, human computer interaction, assistive devices, and audio technology to develop the course. There was no textbook, and I developed the lectures using a broad array of resources. I plan to develop an undergraduate course based on the same materials once the department teaching schedule permits.
4. CMSC 828E - Scientific Computing on Graphics Processors. (2009) - This is a new course that combines elements of parallel programming, research experience on performing scientific computing on graphics processors, and hands on instruction to provide students with a background in this emerging area. There was no textbook, and I developed the lectures using a broad array of resources. Was useful in shaping the graduate research of the cohort of students who took the course.
5. CMSC662/AMSC 662 - Computer Science for Scientific Computing (2009) - Revived this course, which was a core course in the Applied Math and Scientific Computing. The course introduces computer architecture, parallel computing, and basic algorithms to non CS majors.
6. CMSC498 - Computer Science Ventures (2012) - assisted Larry Davis with others in an exploratory effort to develop a course that teaches entrepreneurship to computer science undergraduates.

III.C. Advising

III.C.1. Undergraduate

- Pranav Dulepet, 2022-2024.
- Justin Shen, 2016-2017. Mr. Shen is a computer science major. He is developing new algorithms for point-cloud based mesh processing.
- Bowen Zhi, 2015-2016. Mr. Zhi is a computer science major. He is working with me on developing new systems for audio capture and scene understanding.
- Matthew Demers, 2015-2016. Mr. Demers is a computer science major. He is working with me on developing new methods for presenting audio in cinematic VR.
- Charles W. Parker, 2015- 2016. Mr. Parker is a dual computer-science/math major. He worked on fast methods for solving partial differential equations. He is at Brown pursuing a Ph.D.
- Yuancheng Luo, 2008-2009: Mr. Luo was a dual-degree student in mathematics and computer science. He has worked on a number of different projects related to graphics processors and scientific computing. His work has lead to two publications ([C64, C60]), two open-source software projects, and the possibility of more papers based on ongoing work. He is now finished grad school at UMD, and is a scientist in a start-up.
- Jane Hwang, 2002-2003: Ms. Hwang was an electrical engineering student who did an honors project with post-doctoral scientist Dmitry Zotkin and myself. Her work lead to a publication [C116]. She has since gone on to graduate school.
- Advisor to a team of 7 undergraduates, “Team MUSIC,” who are exploring the area of sound identification over the period 08/2013-05/2016.

III.C.2. Master’s

- James Robertson, 2024. M.S. Electrical and Computer Engineering (Chair). Leads a simulation division at US Submarine Command, Groton, CT. (joined US Navy).
- Sonal Kumar, 2024. M.S. Computer Science. Work on Multimodal Large Language Models. (admitted to the UMD Ph.D. program in Computer Science).
- Matthew Wong, “SharedSpace: Videoconferencing with Spatial Audio.”MS Computer Science. (joined Amazon). 2022
- Ophir Gal, 2022. “YouMixIt: Your Music Deserves Spatial Treatmeant.”MS Computer Science. (joined Applied Physics Laboratory).

- Ross Adelman, 2014. “Fast Multipole Method Acceleration of the Indirect Boundary Element Method.”MS Computer Science. (became a Ph.D. student in Computer Science).
- Kerry Cheng, 2014. MS in Computer Science. “Scattered Data Interpolation.”(at Google).
- Adam O’Donovan, 2013. “Computational Cameras for Sound.”MS Computer Science. (became a Ph.D. student in Computer Science).
- Balaji Vasan Srinivasan, 2008. “Gaussian Process Regression for Model Estimation.”MS Electrical Engineering. (became a Ph.D. student in Computer Science).
- Yang Wang, MS Applied Mathematics, 2005. “Animation of the Fast Multipole Algorithm for Display and Optimization,” Graduate Advisor. (went to the University of Michigan Law school with a full fellowship; and now a lawyer with Simpson Thacher in Beijing).
- Vikas Raykar,¹ 2004, “Position Calibration of Acoustic Sensors and Actuators on Distributed General Purpose Computing Platforms, MS Electrical Engineering.
- Kexue Liu, MS.,¹ Applied Mathematics and Computer Science, 2003. Ph.D. 2004 (Now an analyst on Wall Street).
- Ankur Mohan, M.S.,¹ Electrical Engineering, 2002. (now at Applied Media Analysis, College Park, MD) “Robust Vision Based Tracking for Virtual Auditory Spaces.” (principal advisor)
- Hazem El-Alfy, M.S., Computer Science, 2007. (became a CS Ph.D. student with Larry Davis)
- Shravya Reddy Konda, MS, CS, 2009 (now at Microsoft).
- Liping Liu, MS, CS, 2009 (now at Schlumberger Research).

III.C.3. Doctoral

- Vasanth Philomin, Ph.D., Computer Science, 2000. “Quasi Random Sampling for Condensation.” (co-advisor, primary advisor Larry S. Davis) (now Senior Director, at Philips Lighting)
- Dmitry Zotkin, Ph.D., Computer Science, 2002. “Audio input and display devices for audio-visual user interfaces and virtual reality.” (now a research scientist at UMIACS, University of Maryland, College Park)
- Ahmed Elgammal Ph.D., Computer Science, 2002. “Fast Gauss Transform for Kernel Density Estimation in Vision.” (Co-advisor, primary advisor Larry S. Davis) (now a tenured associate professor at Rutgers University)
- Zhihui Tang, Ph.D., Applied Mathematics, 2003. “Fast transforms based on matrices with structure with applications to the Fast Multipole Method.” (now a Senior Quantitative Analyst and manager at QSG)

- Ali Zandifar, Ph.D., Electrical Engineering 2004. “Textual Information Access for the Visually Impaired.” (cofounder of Gauss Surgical, a medical imaging startup)
- Changjiang Yang, Ph.D., Computer Science, 2005. “Fast multipole methods for density estimation and interpolation, with applications to image processing and vision.” (Primary advisor, co-advisor Larry S. Davis) (now a scientist at SAIC)
- Zhiyun Li, 2005. Ph.D., Computer Science, “Acquisition and Rendering of Virtual Audio.” (Founding Member, Sr. Manager and Sr. R&D Lead at Samsung Seattle lab)
- Vikas Raykar, 2007. Ph.D., Computer Science, “Scalable algorithms for machine learning”. (now at IBM Research)
- Balaji Vasan Srinivasan, 2011. Ph.D., Computer Science, “Scalable learning for geostatistics and speaker recognition.” (now at Adobe Labs)
- Qi Hu, 2013. Ph.D., Computer Science, “Scientific Computing on Heterogeneous Architectures. (now at Facebook) ”
- Yuancheng Luo, 2014. Ph.D., Computer Science, “Fast Numerical and Machine Learning Algorithms for Spatial Audio Reproduction. (now at VisiSonics) ”
- Ross Adelman, 2016. Ph.D., Computer Science, “Fast and Accurate Boundary Element Methods in Three Dimensions ”(now at Amazon)
- Samuel Potter, 2021. Ph.D Computer Science (jointly advised with Maria Cameron, Math) “Numerical Geometric Acoustics ”(now at Courant Institute of Mathematical Sciences)

Current Students (advisees)

- Lasha Koroshinadze, Ph.D., CS, started 2025.
- Pranav Pulijala, Ph.D., CS (Chair), started 2024.
- Sakshi, Ph.D., CS (Chair), started 2024.
- Sonal Kumar, Ph.D., CS (Chair). Work on Multimodal Large Language Models. Started 2024.
- Ryan Synk, Ph.D., CS. Fast algorithms for solving partial differential equations. Started 2024.
- Anirudh Poruri, Undergraduate, CS, started 2024.
- Sreyan Ghosh, Ph.D., CS (co-advised). Investigations of Speech and Neural Activity via Deep Learning. Started 2023.
- Pranav Dulepet, Undergraduate, CS, started 2023.
- Sathya Gnanakumar, Undergraduate, CS, started 2023.

- Meenakshi Krishnan, Ph.D., AMSC. Integral Equation Methods. Started 2022.
- John Harrison Baur, M.S., ECE. Electric Field Simulation. Started 2022.
- Siminfar Samakoush Galougah, Ph.D., ECE. Models of Dolphin Hearing. Started 2022.
- Monte Hoover, M.S., CS. Neural mesh generation for boundary element methods. Started 2021.
- Alisha Sharma, Ph.D., CS. Simulation and deep learning. Started 2020.
- Matthew Ziemann, Ph.D., CS. Using deep learning and simulation together to assess wireless wave propagation. Started 2020.
- Bowen Zhi, Ph.D., CS. Algorithms for computational human audition. Started 2016.

III.C.4. Postdoctoral

- Elena Grassi, 2003-2005 (at Walter Reed Army Medical Center)
- Dmitry N. Zotkin, 2003-2005 (at University of Maryland)
- Jounghoon Beh, 2011-2014
- Konstantin Berlin, 2011-2013 (at Department of Chemistry, University of Maryland)

Senior Scientists

- Dr. Nail A. Gumerov, Assistant/Associate/Senior Research Scientist, UMIACS, 2000 - present.
- Dr. Dmitry N. Zotkin, Assistant/Associate Research Scientist, UMIACS, 2005-present.

IV. Service and Outreach

IV.A. Editorships, Editorial Boards, and Reviewing Activities

- Special Issue Editor, *Frontiers in Signal Processing*, 2021 – 2022
- Program Committees of ICASSP and WASPAA; Member of IEEE Signal Processing Committee Technical Committee on Electroacoustics
- IEEE Signal Processing Society local Chapter Secretary
- Organization of various conferences

IV.B. University and Department Service

- Member, UMIACS Appointment, Promotion and Tenure (APT) Committee, 2023 – present
- Member, Department Council, Department of Computer Science, 09/2023 – 08/2025
- Member, Provost's Planning Committee on Innovation, 05/2021 – 12/2021
- Member, Department Council, Department of Computer Science, 2021 – 08/2022
- Chair, Search Committee for IMDM Faculty Search, Department of Computer Science, 01/2022 – 07/2022
- Research Day Organizer, Department of Computer Science, through 08/2022 and through 08/2023
- Member, Appointments and Promotion Committee, ARLIS, 11/2021
- Member, UMIACS Steering Committee, 2018 – 2019
- Member, Center for Machine Learning, UMD, 2020 – present (see also I.C)
- Organizer, CMSC/UMIACS/AMSC Research Day, 2018 – 2021

IV.C. External Service and Consulting

IV.C.4. Entrepreneurial Activities

- CEVA, Inc., Rockville, MD, Consultant (spatial audio research), 05/2023 – 05/2024
- VisiSonics Corporation, College Park, MD, Scientific Advisor, 2023 – present
- Fantalgo, LLC, Elkridge, MD, Partner, 2006 – 2021
- VisiSonics Corporation, College Park, MD, Founder and President, 2011 – 2023
- Lab126 (Amazon), Cupertino, CA, Consultant, 2013 – 2014
- 3M Corporation, Consultant (expert talk), through 2015
- Microsoft Corporation, Redmond, WA, Consultant, 06/2009
- Institute for Defense Analyses, Alexandria, VA, Consultant, 2007-2008
- SkyComp, Columbia, MD, Consultant, 2006-2007
- Applied Media Analysis, College Park, MD, Consultant, 2002-2006
- ACD Simulators, Columbia, MD, Partner, 1998-1999

V. Awards, Honors and Recognition

- USM Board of Regents Award for most creative faculty member, 2016
- Startup Prize, UM Ventures, 2013 (for VisiSonics Corporation)
- University of Maryland, Invention of the Year, 2008
- University of Maryland, Invention of the Year Finalist, 2003
- University of Maryland, Invention of the Year Finalist, 2006
- University of Maryland, “Research Leader” (also called in some years as “Top 100 Rainmaker”), 2002-present
- American Society of Mechanical Engineers’ Robert Knapp award for the best paper in analytical and laboratory research in 1992-1993. (with G.L. Chahine)
- Honorable-mention prize for the best student paper at Society of Industrial and Applied Mathematics annual general meeting, San Diego, California, (1989)
- Johns Hopkins University Tuition Fellowship and graduate assistantship (1985-1990)
- Travel scholarship from Mathematical Sciences Institute, Cornell University, to attend workshop on theoretical aspects of multi-phase flows (1988)
- National Merit Scholarship awarded by the Indian Government (1979)