Michael Kazhdan

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PERSONAL INFORMATION

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RESEARCH INTERESTS

- *Image and Geometry Processing.* I am interested in developing efficient solvers supporting the solution of PDEs over both planar and non-planar domains.
- *Surface Reconstruction*. I am interested in developing data-structures and algorithms for efficiently reconstructing high-resolution surfaces from large point clouds.
- *Shape Analysis.* I am interested in developing new techniques for analyzing the geometry of 3D shapes, providing a means for performing shape retrieval from databases of 3D models.

EDUCATION

- *Ph.D. in Computer Science*. Computer Science Dept., Princeton University, June 2004.
  Advisor: Professor Thomas Funkhouser
  Dissertation: Shape Representations and Algorithms for 3D Model Retrieval
- *M.A. in Computer Science*. Computer Science Dept., Princeton University, May 2001.
- *B.A. in Mathematics*. Mathematics Dept., Harvard University, June 1997.

ACADEMIC APPOINTMENTS

- **March 2020 - Present.** *Full Professor*. Computer Science Dept. Johns Hopkins University.
- **October 2011 – March 2020.** *Associate Professor*. Computer Science Dept. Johns Hopkins University.
- **Spring 2013.** *Visiting Researcher*, Microsoft Research.
- **Spring 2013.** *Visiting Researcher*, Technion University.
- **August 2004 - October 2011.** *Assistant Professor.* Computer Science Dept. Johns Hopkins University.
- **Summer 2009.** *Visiting Researcher*, Microsoft Research.
- **Summer 2008.** *Visiting Researcher*, Microsoft Research.

- **Summer 2007.** *Visiting Researcher*, Technion University.

PUBLICATIONS

Journals

J-1. T. Mitchel, V. Kim, and M. Kazhdan "**Field Convolutions for Surface CNNs**", *International Conference on Computer Vision* (2021).

J-2. T. Mitchel, S. Rusinkiewicz, G. Chirikjian, and M. Kazhdan "**ECHO: Extended Convolution Histogram of Orientations for Local Surface Description**", *Computer Graphics Forum* (2021).

J-3. M. Kazhdan, M. Chuang, S. Rusinkiewicz, and H. Hoppe, "**Poisson Surface Reconstruction with Boundary Constraints**", *Computer Graphics Forum (SGP)* (2020).

J-4. A. Bunge, P. Herholz, M. Kazhdan, and M. Botsch, "**Polygon Laplacian Made Simple"**. *Eurographics* (2020).

J-5. S. Lee and M. Kazhdan, "**Dense Point-to-Point Correspondences Between Genus-Zero Shapes"**. *Computer Graphics Forum (SGP)* (2019) pp. 730-743.

J-6. S. Zheng, S. Lauritzen, E. Perlman, C. Robinson, M. Nichols, D. Milkie, O. Torrens, J. Price, C. Fisher, N. Sharifi, S. Calle-Schuler, L. Kmecova, I. Ali, B. Karsh, E. Trautman, J. Bogovic, P. Hanslovsky, G. Jefferis, M. Kazhdan, K. Khairy, S. Saalfeld, R. Fetter, and D. Bock, "**A Complete Electron Microscopy Volume of the Brain of Adult *Drosophila melanogaster*"**. *Cell* (2018) pp. 730-743.

J-7. A. Baden, K. Crane, and M. Kazhdan, "**Möbius Registration"**. *Computer Graphics Forum (SGP)* (2018) pp. 211-220.

J-8. F. Prada, M. Kazhdan, M. Chuang, and H. Hoppe "**Gradient-Domain Processing within a Texture Atlas**". *Transactions on Graphics (SIGGRAPH)* (2018) pp. 154:1-154:14.

J-9. M. Kazhdan and H. Hoppe "**An Adaptive Multigrid Solver for Applications in Computer Graphics**". *Computer Graphics Forum* (2018) pp.138-150.

J-10. F. Prada, M. Kazhdan, M. Chuang, A. Collet, and H. Hoppe "**Spatiotemporal Atlas Parameterization for Evolving Meshes**". *Transactions on Graphics (SIGGRAPH)* (2017) pp. 58:1-58:12.

J-11. N. Schertler, M. Tarini, W. Jakob, M. Kazhdan, S. Gumhold, and D. Panozzo "**Field-Aligned Online Surface Reconstruction**". *Transactions on Graphics (SIGGRAPH)* (2017) pp. 77:1-77:13.

J-12. F. Prada, M. Kazhdan, M. Chuang, A. Collet, and H. Hoppe "**Motion Graphs for Unstructured Textured Meshes**". *Transactions on Graphics (SIGGRAPH)* (2016) pp. 108:1-108:14.

J-13. M. Chuang, S. Rusinkiewicz, and M. Kazhdan "**Gradient Domain Processing of Meshes**". *Journal of Computer Graphics Techniques* (2016) pp. 44-55.

J-14. A. Pilleboue, G. Singh, D. Coeurjolly, M. Kazhdan, and V. Ostromoukhov "**Variance Analysis for Monte Carlo Integration**". *Transactions on Graphics (SIGGRAPH)* (2015) pp. 124:1-124:14.

J-15. F. Prada and M. Kazhdan, "**Unconditionally Stable Shock Filters for Image and Geometry Processing"**. *Computer Graphics Forum (SGP)* (2015) pp. 201-210.

J-16. M. Kazhdan, "**Fast and Exact (Poisson) Solvers on Symmetric Geometries"**. *Computer Graphics Forum (SGP)* (2015) pp. 153-165.

J-17. M. Kazhdan, H. Hoppe "**Screened Poisson Surface Reconstruction**". *Transactions on Graphics (ToG)*. *Volume 32*. (2013) pp. 29:1-29:13.

J-18. M. Kazhdan, J. Solomon, M. Ben-Chen "**Can Mean-Curvature Flow be Modified to be Non-singular?**". *Computer Graphics Forum (SGP)*. *Volume 31*. (2012) pp. 1745-1754.

J-19. B. Lucas, M. Kazhdan, R. Taylor "**Spring Level Sets: A Deformable Model Representation to Provide Interoperability Between Meshes and Level Sets**". *Transactions on Visualizations and Computer Graphics*. (2012) pp. 852-865.

J-20. S. Petit, B. Wu, M. Kazhdan, A. Dekker, P. Simari, R. Kumar, R. Taylor, J. Herman, T. McNutt "**Increased Organ Sparing Using Shape-Based Treatment Plan Optimization for Intensity Modulated Radiation Therapy of Pancreatic Adenocarcinoma**". *Radiotherapy and Oncology*. *Volume 102*. (2011) pp. 38-44.

J-21. M. Chuang, M. Kazhdan "**Interactive and Anisotropic Geometry Processing Using the Screened Poisson Equation**". *Transactions on Graphics (SIGGRAPH). Volume 30*. (2011) pp. 57:1-57:10.

J-22. M. Chuang, M. Kazhdan "**Fast Mean-Curvature Flow via Finite-Elements Tracking**". *Computer Graphics Forum. Volume 30.* (2011) pp. 1750-1760.

J-23. M. Kazhdan, H. Hoppe "**Metric-Aware Processing of Spherical Imagery**". *Transactions on Graphics (SIGGRAPH Asia)*. *Volume 29*. (2010) pp. 149:1-149:10.

J-24. J. Lawrence, S. Arietta, M. Kazhdan, D. Lepage, C. O'Hagan. **"A User-assisted Approach to Visualizing Multidimensional Images"**. *IEEE Transactions on Visualization and Computer Graphics*. *Volume 17*. (2010) pp. 1487-1498.

J-25. B. Wu, F. Ricchetti, G. Sanguineti, M. Kazhdan, P. Simari, R. Jacques, R. Taylor, T. McNutt. **"A Data-driven Approach to Generating Achievable DVH Objectives in IMRT Treatment Planning"**. *International Journal of Radiation Oncology Biology Physics*. (2010) pp. 1241-1247.

J-26. M. Kazhdan, D. Surendran, H. Hoppe. **"Distributed Gradient-domain Processing of Planar and Spherical images"**. *Transactions on Graphics. Volume 29.* (2010) pp. 14:1-14:11.

J-27. D. Ghosh, N. Amenta, M. Kazhdan. **"Closed-form Blending of Local Symmetries"**. *Computer Graphics Forum (Symposium on Geometry Processing). Volume 29*. (2010) pp. 1681-1688.

J-28. B. Wu, F. Ricchetti, G. Sanguineti, M. Kazhdan, P. Simari, M. Chuang, R. Taylor, R. Jacques, T. McNutt. **"Patient Geometry-driven Information Retrieval for IMRT Treatment Planning"**. *Journal of Medical Physics. Volume 36*. (2009) pp. 5497-5505.

J-29. M. Chuang, L. Luo, B. Brown, S. Rusinkiewicz, M. Kazhdan. **"Estimating the Laplace-Beltrami operator by Restricting 3D Functions"**. *Computer Graphics Forum (Symposium on Geometry Processing)*. *Volume 28*. (2009) pp. 1475-1484.

J-30. M. Kazhdan, H. Hoppe. **"Streaming Multigrid for Gradient-domain Operations on Large Images"**. *Transactions on Graphics (SIGGRAPH)*. *Volume 27*. (2008) pp. 21:1-21:10.

J-31. M. Kazhdan. **"An Approximate and Efficient Method for Optimal Rotation Alignment of 3D Models"**. *Transactions on Pattern Analysis and Machine Intelligence*. *Volume 27*. (2007) pp. 21:1-21:10.

J-32. M. Kazhdan, T. Funkhouser, S. Rusinkiewicz. **"Shape Matching and Anisotropy"**. *Transactions on Graphics (SIGGRAPH)*. (2004) pp. 623-629.

J-33. T. Funkhouser, M. Kazhdan, P. Shilane, P. Min, W. Kiefer, A. Tal, S. Rusinkiewicz, D. Dobkin. **"Modeling by Example"**. *Transactions on Graphics (SIGGRAPH)* pp. 652-663.

J-34. M. Kazhdan, B. Chazelle, D. Dobkin, T. Funkhouser, S. Rusinkiewicz. **"A Reflective Symmetry Descriptor for 3D Models"**. *Algorithmica*. *Volume 38*. (2003) pp. 201-225.

J-35. T. Funkhouser, P Min, M. Kazhdan, J. Chen, A. Halderman, D. Dobkin, D. Jacobs. **"A Search Engine for 3D Models"**. *Transactions on Graphics*. *Volume 22*. (2003) pp. 83-105

Peer-Reviewed Conferences

C-1. S. Furhmann, M. Kazhdan, M. Goesele, "**Accurate Isosurface Interpolation with Hermite Data**". In the proceedings of *3D Vision* (2015) pp. 256-263. [Acceptance Rate: 46%]

C-2. R. Burns, K. Lillaney, D. Berger, L. Grosenick, K. Deisseroth, C. Reid, W. Roncal, P. Manavalan, D. Bock, N. Kasthuri, M. Kazhdan, S. Smith, D. Kleissas, E. Perlman, K. Chung, N. Weiler, J. Lichtman, A. Szalay, J. Vogelstein, J. Vogelstein "**The Open Connectome Project Data Cluster: Scalable Analysis and Vision for High-throughput Neuroscience**". In the proceedings of *Scientific and Statistical Database Management* (2013) pp. 27:1-27:11. [Acceptance Rate: 39%]

C-3. B. Lucas, M. Kazhdan, R. Taylor "**Multi-Object Spring Level Sets**". In the proceedings of *Medical Imaging Computing and Computer Assisted Interventions (MICCAI)*. (2012) pp. 495-503. [Acceptance Rate: 32%]

C-4. B. Lucas, M. Kazhdan, R. Taylor "**Multi-Object Geodesic Active Contours (MOGAC)**". Proceedings of *Medical Imaging Computing and Computer Assisted Interventions (MICCAI)*. (2012) pp. 404-412. [Acceptance Rate: 32%]

C-5. H. Tokgozoglu, E. Meisner, M Kazhdan, G. Hager. "**Color-based Hybrid Reconstruction for Endoscopy**". In Proceedings of *Computer Vision and Pattern Recognition Workshops (CVPRW).* (2012) pp. 8-15.

C-6. B. Lucas, M. Kazhdan, R. Taylor. **"SpringLS: A Deformable Model Representation to Provide Interoperability Between Meshes and Level Sets"**. Proceedings of *Medical Imaging Computing and Computer Assisted Intervention (MICCAI)*. (2011) pp. 442-450. [Acceptance Rate: 30%]

C-7. P. Simari, B. Wu, R. Jacques, A. King, T. McNutt, R. Taylor, M. Kazhdan. **"A Statistical Approach for Achievable Dose Querying in IMRT Planning"**. Proceedings of *Medical Imaging Computing and Computer Assisted Intervention (MICCAI)*. (2010) pp. 521-528. [Acceptance Rate: 32%]

C-8. E. Perlman, R. Burns, M. Kazhdan, R. Murphy, W. Ball, N. Amenta. **"Organization of Data in Non-convex Spatial Domains"**. Proceedings of *Scientific and Statistical Database Management Conference (SSDBM)*. (2010) pp. 342-359. [Acceptance Rate: 32%]

C-9. M. Bolitho, M. Kazhdan, R. Burns, H. Hoppe. **"Parallel Poisson Surface Reconstruction"**. Proceedings of *International Symposium on Visual Computing (ISVC)*. (2009) pp. 678-689. [Acceptance Rate: 30%]

C-10. M. Kazhdan, N. Amenta, S. Gu, D. Wiley, B. Hamann. **"Symmetry Restoration by Stretching"**. Proceedings of *Canadian Conference on Computational Geometry*. (2009) pp. 37-40. [Acceptance Rate: 69%]

C-11. M. Kazhdan, P. Simari, T. McNutt, B. Wu, R. Jacques, M. Chuang, R. Taylor. **"A Shape Relationship Descriptor for Radiation Therapy Planning"**. Proceedings of *Medical Imaging Computing and Computer Assisted Intervention (MICCAI)*. (2009) pp. 100-108. [Acceptance Rate: 32%]

C-12. M. Kazhdan, A. Klein, K. Dalal, H. Hoppe. **"Unconstrained Isosurface Extraction on Arbitrary Octrees"**. Proceedings of *Symposium on Geometry Processing*. (2007) pp. 125-133. [Acceptance Rate: 28%]

C-13. M. Bolitho, M. Kazhdan, R. Burns, H. Hoppe. **"Multilevel Streaming for Out-of-core Surface Reconstruction"**. Proceedings of *Symposium on Geometry Processing*. (2007) pp. 69-78. [Acceptance Rate: 28%]

C-14. M. Kazhdan, M. Bolitho, H. Hoppe. **"Poisson Surface Reconstruction"**. Proceedings of *Symposium on Geometry Processing*. (2006) pp. 61-70. [Acceptance Rate: 26%]

C-15. M. Kazhdan. **"Reconstruction of Solid Models from Oriented Point Sets"**. Proceedings of *Symposium on Geometry Processing*. (2005) pp. 73-82. [Acceptance Rate 25%]

C-16. M. Kazhdan, T. Funkhouser, S. Rusinkiewicz. **"Symmetry Descriptors and 3D Shape Matching"**. Proceedings of *Symposium on Geometry Processing*. (2004) pp. 115-123. [Acceptance Rate: 29%]

C-17. P. Shilane, P. Min, M. Kazhdan, T. Funkhouser. **"The Princeton Shape Benchmark"**. Proceedings of *Shape Modeling International*. (2004) pp. 167-178. [Acceptance Rate: 37%]

C-18. P. Min, M. Kazhdan, T. Funkhouser. **"A Comparison of Text and Shape Matching for Retrieval of Online 3D Models"**. Proceedings of *European Conference on Digital Libraries*. (2004) pp. 209-220. [Acceptance Rate: 32%]

C-19. M. Kazhdan, T. Funkhouser, S. Rusinkiewicz. **"Rotation Invariant Spherical Harmonic Representation of 3D Shape Descriptors"**. Proceedings of *Symposium on Geometry Processing*. (2003) pp. 156-164. [Acceptance Rate: 35%]

C-20. P. Min, A. Halderman, M. Kazhdan, T. Funkhouser. **"Early Experiences with a 3D Model Search Engine"**. Proceedings of *Web3D Symposium*. (2003) pp. 7-18. [Acceptance Rate: Not Available]

C-21. M. Kazhdan, B. Chazelle, D. Dobkin, A. Finkelstein, T. Funkhouser. **"A Reflective Symmetry Descriptor"**. Proceedings of *European Conference on Computer Vision*. (2002) pp.642-656. [Acceptance Rate: 38%]

C-22. A. Klein, W. Li, M. Kazhdan, W. Correa, A. Finkelstein, T. Funkhouser. **"Non-photorealistic Virtual Environments"**. Proceedings of *SIGGRAPH*. (2000) pp. 527-534. [Acceptance Rate: 19%]

Extended Abstracts, ArXiv Publications, and Demonstration Papers

A-1. T. Mitchel, B. Brown, D. Koller, T. Weyrich, S. Rusinkiewicz, and M. Kazhdan, "**Efficient Spatially Adaptive Convolution and Correlation**". *ArXiv.* (2020)

A-2. B. Lasala, J. Kemeny, J. Levine, T. Swetnam, M. Kazhdan, N. Steele, and C. McKinney. "**Creating a High Resolution Model of the Timpanogos Cave System Using a Terabyte Scale LIDAR Dataset**". *Geological Society of America*. (2019)

A-3. K. Schild, D. Sutherland, F. Straneo, D. Duncan, M. Kazhdan, and P. Gadomski. "**Can We Observe Depth-Variable Iceberg Melt Rates?**". *American Geophysical Union*. (2019)

A-4. R. Burns, E. Perlman, A. Baden, W. Roncal, B. Falks, V. Chandrashekhar, F. Collman, S. Seshamani, J. Patsolic, K. Lilaney, M. Kazhdan, R. Hider, D. Pryor, J. Matelsky, T. Gion, P. Manavalan, B Wester, M. Chevillet, E. Trautman, K. Khairy, E. Bridgeford, D. Kleissas, D. Tward, A. Crow, M. Wright, M. Miller, S. Smith, J. Vogelstein, K. Deisseroth, and J. Vogelstein. "**A Community-Developed Open-Source Computational Ecosystem for Big Neuro Data**". *ArXiv.* (2018)

A-5. Z. Zheng, S. Lauritzen, E. Perlman, C. Robinson, M. Nichols, D. Milkie, O. Torrens, J. Price, C. Fisher, N. Sharifi, S. Calle-Schuler, L. Kmecova, I. Ali, B. Karsh, E. Trautman, J. Bogovic, P. Hanslovsky, G. Jefferis, M. Kazhdan, K. Khairy, S. Saalfeld, R. Fetter, D. Bock. **"A Complete Electron Microscopy Volume of the Brain Of Adult Drosophila melanogaster"**. *bioRxiv*. (2017)

A-6. A. Sinha and M. Kazhdan. "**Geodesics Using Waves**". *ArXiv.* (2016)

A-7. M. Kazhdan, K. Lillaney, W. Roncal, D. Bock, J. Vogelstein, R. Burns. "**Gradient-Domain Fusion for Color Correction in Large EM Image Stacks**". *ArXiv.* (2015)

A-8. M. Kazhdan, G. Singh, A. Pilleboue, D. Coeurjolly, V. Ostromoukhov. "**Variance Analysis for Monte Carlo Integration: A Representation-Theoretic Perspective**". *ArXiv.* (2015)

A-9. M. Chuang, M. Kazhdan. "**A Connectivity-Aware Multi-level Finite-Element System for Solving Laplace-Beltrami Equations**". *ArXiv.* (2015)

A-10. A. Sinha, W. Roncal, N. Kasthuri, J. Lichtman, R. Burns, M. Kazhdan. "**Automatic Annotation of Axoplasmic Reticula in Pursuit of Connectomes using High-Resolution Neural EM Data**". *ArXiv.* (2014)

A-11. M. Kazhdan, R. Burns, B. Kasthuri, J. Lichtman, J. Vogelstein, J. Vogelstein. "**Gradient-domain Processing for large EM Image Stacks**". *ArXiv.* (2013)

A-12. M. Kazhdan, J. Solomon, M. Ben-Chen. "**Can Mean-Curvature Flow Be Made Non-Singular?**" *ArXiv* (2012)

A-13. Y. Ahmad, R. Burns, M. Kazhdan, C. Meneveau, A. Szalay, A. Terzis. "**Scientific Data Management at the Johns Hopkins Institute for Data Intensive Engineering and Science**". *ACM SIGMOD Record*. (2011)

A-14. E. Perlman, R. Burns, M. Kazhdan. "**Organizing and Indexing Non-convex Regions**". *In proceedings of International Conference on Very Large Databases (VLDB).* (2008)

A-15. B. Wu, M. Kazhdan, F. Ricchetti, P. Simari, R. Jaques, G. Sanguineti, M. Chuang, R. Taylor, T. McNutt. **"Using a Database of Patient Geometric and Dosimetric Information for Quantitative IMRT Plan Quality Control"**. *Journal of Medical Physics. Volume 36*. (2009)

A-16. B. Wu, F. Ricchetti, G. Sanguineti, M. Kazhdan, P. Simari, R. Jaqcues, M. Chuang, R. Taylor, T. McNutt. **"A Data-driven Approach to Generating Achievable Dose Volume Histograms (DVH) Objectives in Intensity Modulated Radiation Therapy (IMRT) Treatment Planning"**. *Proceedings of the 51st ASTRO Annual Meeting*. (2009)

A-17. M. Kazhdan, T. Funkhouser. **"Harmonic 3D Shape Matching"**. *In proceedings of SIGGRAPH* (2002)

Invited Presentations

1. **"Moebius Registration"**, Johns Hopkins University (AMS), September 2019.
2. **"Moebius Registration"**, Weizmann Institute, July 2019.
3. **"Registering Genus-Zero Surfaces"**, IPAM Workshop, April 2019.
4. **"Signal Processing – from Images to Surfaces"**, Carnegie Mellon University, February 2018.
5. **"Can Mean-Curvature Flow be Modified to be Non-Singular?"**, Princeton University, November 2017.
6. **"Signal Processing – from Images to Surfaces"**, Distinguished Lecture *The 6th Annual Henry Taub TCE Conference | 3D Visual Computing: Graphics, Geometry & Imaging*, 2016.
7. "**Fast and Exact (Poisson) Solvers on Surfaces of Revolution**", Mathematisches Forschungsinstitut Oberwolfach, 2015. (Organizers: Alexander Bobenko, Richard Kenyon, and Peter Schroder)
8. "**The Poisson System: From Images to Geometry**", Keynote *Shape Modeling International*, 2014.
9. "**Searching for Structure in Geometry Processing**", Keynote *Symposium on Geometry Processing*, 2014.
10. "**The Poisson Equation in Image Stitching, Geometry Processing, and Surface Reconstruction**", Technion-Israel Institute of Technology. March, 2013. (Host: Mirela Ben-Chen)
11. **"Reconstructing Solid Models from Oriented Points Sets",** Stanford University. October, 2010. (Host: Leo Guibas)
12. **"Gradient Domain Processing of Large Images",** Adobe. April, 2009.
13. **"Reconstructing Solid Models from Oriented Points Sets: FFT vs. Poisson",** Texas A&M University. October, 2008. (Host: Scott Schaefer)
14. **"Reconstruction of Solid Models from Oriented Point Sets",** SIAM Geometric Design and Computing Conference. November, 2007.
15. **"Reconstruction of Solid Models from Oriented Point Sets",** University of Virginia. October, 2007. (Host: Jason Lawrence)
16. **"Unconstrained Isosurface Extraction on Arbitrary Octrees"**, Technion University. June 2007. (Host: Craig Gotsman)
17. **"Reconstruction of Solid Models from Oriented Point Sets",** University of Texas. April, 2007. (Host: Chandrajit Bajaj)
18. **"Reconstruction of Solid Models from Oriented Point Sets",** Drexel University. May, 2006. (Host: David Brin)
19. **"Reconstruction of Solid Models from Oriented Point Sets",** University of Maryland. November, 2005. (Host: Amitabh Varshney)
20. **"3D Scan Matching and Registration",** International Conference on Computer Vision**.** October, 2005.
21. **"Modeling by Example",** Imagina. February, 2005.

22. **"Shape Matching and Model Alignment",** Tel-Aviv University, September 2003. (Host: Dani Cohen-Or)
23. **"Shape Matching and Model Alignment",** IBM. November, 2003.
24. **"A Reflective Symmetry Descriptor",** McGill University. June, 2002. (Host: Kaleem Siddiqi)
25. **"A Reflective Symmetry Descriptor",** Workshop on Shape-Based Retrieval and Analysis of 3D Models. October, 2001.

SOFTWARE ARTIFACTS AND PATENTS

- **PoissonRecon.** PoissonRecon is an octree-based, streaming, out-of-core, implementation of the Poisson Surface Reconstruction algorithm, supporting the processing of large datasets that exhibit noise and non-uniform sampling. The software has been included in several packages, including **CGAL** , **MeshLAB**, and the **VTK Journal**, and has been used by **NASA** in reconstruction of the Martian landscape data acquired by the Curiosity rover.

  Available from: http://www.cs.jhu.edu/~misha/Code/PoissonRecon

- **DenseP2PCorrespondence.** DenseP2PCorrespondence is a package for registering genus-zero surfaces. Using a combination of conformal spherical parametrization, authalic evolution, fast spherical correlation, and optical flow on the sphere, the system provides a way for efficiently and automatically computing correspondences between genus-zero surfaces. Applications include registration, matching, texture and segmentation transfer.

  Available from: http://www.cs.jhu.edu/~misha/Code/DenseP2PCorrespondences

- **TextureSignalProcessing**. TextureSignalProcessing is a general-purpose package that supports efficient signal processing by performing computation in texture space, where the regularity of the texture grid enables a hierarchical solver that leverages memory coherence. Applications include: texture filtering, texture stitching, line integral convolution, computation of approximate geodesics, and simulation of reaction-diffusion PDEs.

  Available from: http://www.cs.jhu.edu/~misha/Code/TextureSignalProcessing/

- **ShapeGradientDomain**. ShapeGradientDomain is a general-purpose package that enables the extension of classical gradient-domain processing techniques to be extended to the processing of signals on images, supporting both isotropic and anisotropic processing.

  Available from: http://www.cs.jhu.edu/~misha/Code/ShapeGradientDomain/

- **SurfaceOpticalFlow.** SurfaceOpticalFlow extends the classical image-based optical flow computation to support processing of textures/signals on meshes.

  Available from: http://www.cs.jhu.edu/~misha/Code/SurfaceOpticalFlow

- **GradientDomainFusion**. GradientDomainFusion performs color-correction of 3D EM data, supporting the processing of huge (teravoxel) datasets, thereby facilitating down-stream processing such as segmentation.
  This code is currently is used for processing the EM data for the **Connectome Project** and is being integrated into the 3D image processing pipeline at **Janelia Farms.**

  Available from: http://www.cs.jhu.edu/~misha/Code/GradientDomainFusion/

- **IsoSurfaceExtraction.** IsoSurfaceExtraction provides an extended implementation of the classical Marching-Cubes algorithm, supporting a full-case table for resolving ambiguities, polygon / minimal-area-triangulation output, and Hermite data interpolation.

  Available from: http://www.cs.jhu.edu/~misha/Code/IsoSurfaceExtraction

- **AdvectionSharpening.** AdvectionSharpening revisits the Shock Filters proposed by Osher and Rudin (1995) and shows how the PDE can be interpreted as the advection of the input signal.

  Available from: http://www.cs.jhu.edu/~misha/Code/AdvectionSharpening

- **SORPoisson.** SORPoisson uses fast signal processing to support the efficient solution of linear systems like diffusion, advection, and the wave-equation on geometries with symmetries.

  Available from: http://www.cs.jhu.edu/~misha/Code/SORPoisson

- **ConformalizedMCF.** ConformalizedMCF is an implementation of a modified mean-curvature flow that appears to evolve genus-zero surface to conformal mappings onto the unit sphere. This software supports computing conformal spherical orbifold embeddings of sphere- and disk-like surfaces by introducing symmetry constraints within the linear system.

  Available from: http://www.cs.jhu.edu/~misha/Code/ConformalizedMCF

- **ElementFlow.** ElementFlow efficiently evolves meshes using mean-curvature flow.

  Available from: http://www.cs.jhu.edu/~misha/Code/ElementFlow

- **MetricSphere.** MetricSphere is a metric-aware, streaming multigrid solver for efficiently processing equirectangular spherical images.

  Available from: http://www.cs.jhu.edu/~misha/Code/MetricSphere

  DMG. DMG is a distributed and streaming system for performing gradient-domain processing of images.

  Available from: http://www.cs.jhu.edu/~misha/Code/DMG/

- **TextureStitcher.** TextureStitcher is a hierarchical, finite-elements solver over meshes that supports solving the gradient-domain system in texture stitching.

  Available from: http://www.cs.cs.jhu.edu/~misha/Code/TextureStitcher

- **SMG.** SMG is a tool for solving the large linear systems arising from gradient-domain image processing in a streaming fashion.

  Available from: http://www.cs.jhu.edu/~misha/Code/SMG

- **IsoOctree.** IsoOctree extracts a watertight surface from an octree representation of an implicit function.

  Available from: http://www.cs.jhu.edu/~misha/Code/IsoOctree

- **Reconstruct3D.** Reconstruct3D reconstructs watertight surfaces from an input of oriented points using the FFT.

  Available from: http://www.cs.jhu.edu/~misha/Code/Reconstruct3D

- **ShapeSymmetry.** ShapeSymmetry efficiently computes the symmetries of a model with respect to every axis passing through the model's center of mass.

  Available from: http://www.cs.jhu.edu/~misha/Code/ShapeSymmetry

- **ShapeDescriptor.** ShapeDescriptor is a new mathematical tool, based on spherical harmonics, for obtaining rotation invariant representations of 3D shapes.

  Available from: http://www.cs.jhu.edu/~misha/Code/ShapeDescriptor

- **Anisotropy.** Anisotropy is an iterative method for transforming anisotropic models into isotropic ones.

  Available from: http://www.cs.jhu.edu/~misha/Code/Anisotropy

- **System and Method for Shape Based Retrieval of Prior Patients for Automation and Quality Control of Radiation Therapy Treatment Plans**. Patent Application #12/820,852. Filed June 22, 2010.
  Licensed to Varian Medical Systems on 9/22/2014 for $350,000.

CONTRACTS AND GRANTS

1. National Science Foundation: *III:CGV: Small: Designing an Adaptive Method for Solving Large Linear Systems of Equations in Two- and Three-Dimensional space*. PI M. Kazhdan, IIS-1422325, $499,999. Funding Period: 09/2014 – 09/2017.
2. NIH *CRCNS: Collaborative Research: Data Sharing: The EM Open Connectome Project*. Co-PI with PI R. Burns, $583,683. Funding Period: 09/2012 – 09/2015.
3. National Science Fouccation *CAREER: Reconstructing 3D Models from Today's Scanning Devices.* PI M. Kazhdan, CCF-0746039, $400,001. Funding Period: 08/2008-07/2012.
4. Paul Maritz Fund *JHU Maritz: E-Science Meets Radiation Oncology: A Proposal for Information-Based Closed Loop Interventional Medicine.* Co-PI with PI R. Taylor, $246,089. Funding Period: 04/2007-12/2008.
5. National Science Foundation: *MRI: The Development of Data-Scope – A Multi-Petabyte Generic Data Analysis Environment for Science*. Senior personnel with PI A. Szalay, OCI-1040114, $2,087,760. Funding Period: 01/2011 – 12/2012.

AWARDS AND RECOGNITION

- Test of Time Award, Symposium on Geometry Processing, 2020.
- Microsoft Research Outstanding Collaborator Award, 2016.
- Research on large image processing show-cased at Microsoft's Faculty Summit, 2010. Software Award, Symposium on Geometry Processing, 2009.
- Second Best Paper Award, Symposium on Geometry Processing, 2009.
- Finalist, Microsoft Young Researcher Fellowship, 2009.
- Recipient of NSF Career Award, 2008.

GRADUATE STUDIES AWARDS

Best Paper Award, Web3D, 2003

UNDERGRADUATE STUDIES AWARDS

Magna Cum Laude from the Mathematics Department, Harvard University, 1997

SERVICE

Professional Service

- Papers Chair
  - **2012**
    - Geometric Modeling and Processing (Co-chair)
  - **2009**
    - Symposium on Geometry Processing (Co-chair)
- Associate Editor
  - **2013-2018**
    - Transactions on Graphics
  - **2016-2017**
    - Computer Aided Geometric Design
  - **2010-2017**
    - Graphical Models
- Program Committee Member
  - **2020**
    - Eurographics
    - Symposium on Geometry Processing
  - **2019**
    - Computer Vision and Pattern Recognition
    - Geometric Modeling and Processing
  - **2018**
    - Symposium on Geometry Processing
    - European Conference on Computer Vision
    - Eurographics Star Reports
  - **2017**
    - Computer Vision and Pattern Recognition
    - Shape Modelling International
  - **2016**
    - SIGGRAPH
    - Symposium on Geometry Processing
    - Shape Modelling International
  - **2015**
    - Symposium on Geometry Processing

- SIGGRAPH Asia
- GMP

- **2014**
  - GMP
  - SIGGRAPH
  - SIGGRAPH Asia
- **2013**
  - Eurographics
  - CAD/Graphics
  - SIGGRAPH
- **2012**
  - 3DIMPVT
  - MeshMed
  - Symposium on Geometry Processing
  - Shape Modeling International
  - NORDIA (Non-Rigid Shape Analysis and Deformable Image Alignment)
- **2011**
  - Conference on Geometric and Physical Modeling
  - MeshMed
  - Symposium on Geometry Processing
  - Shape Modeling International
  - NORDIA (Non-Rigid Shape Analysis and Deformable Image Alignment)
- **2010**
  - Sympoisum on Geometry Processing
  - SIGGRAPH (Special Interest Group on GRAPHics and interactive techniques)
  - Geometry Modeling and Processing
  - NORDIA (Non-Rigid Shape Analysis and Deformable Image Alignment)
- **2009:**
  - ISVC (International Symposium on Visual Computing)
  - NORDIA (Non-Rigid Shape Analysis and Deformable Image Alignment)
  - SIGGRAPH (Special Interest Group on GRAPHics and interactive techniques)
- **2008**
  - Symposium on Geometry Processing
- **2007**
  - EUROGRAPHICS (European Association for Computer Graphics)
  - Symposium on Geometry Processing

- Other
  - **2013-2019**
    - Symposium on Geometry Processing – Software Award Committee Chair
  - **2020**
    - Symposium on Geometry Processing – Best Paper Award Committee Chair
- Reviewer
  - SIGGRAPH,
  - SIGGRAPH Asia
  - EUROGRAPHICS
  - Symposium on Geometry Processing

- Geometry Modeling and Processing
- Non-Rigid Shape Analysis and Deformable Image Alignment
- International Symposium on Visual Computing
- Transactions on Visualizations and Computer Graphics
- Transactions on Graphics
- Transactions on Pattern Analysis and Machine Intelligence
- International Journal of Computer Vision
- Computers & Graphics
- IEEE Visualization
- Graphics Interface
- Shape Modeling International
- Graphical Models
- SIAM Journal on Imaging Sciences
- IEEE Computer Graphics and Applications
- IEEE Transactions on Multimedia
- Pacific Graphics
- Journal of Mathematical Imaging and Vision
- Computer Aided Design
- Journal on Applied Signal Processing.
- Computer Vision and Image Understanding

TEACHING EXPERIENCE

- **Fall 2021**: 601.857: *"Selected Topics in Computer Graphics".* [Number of students: 5]
- **Fall 2021**: 601/457/657 *"Computer Graphics".* [Number of students: 40]
- **Spring 2021**: 601.810: *"Diversity and Inclusion in Computer Science and Engineering".* [Number of students: 6] **(New Course)**
- **Spring 2021**: 601.857: *"Selected Topics in Computer Graphics".* [Number of students: 7]
- **Spring 2021**: 601.220: *"Intermediate Programming".* [Number of students: 42]
- **Fall 2020**: 601.857: *"Selected Topics in Computer Graphics".* [Number of students: 3]
- **Fall 2020**: 601. 457/657: *"Computer Graphics".* [Number of students: 26]
- **Spring 2020**: 601.857: *"Selected Topics in Computer Graphics".* [Number of students: 5]
- **Spring 2020**: 601. 459/659: *"Computational Geometry".* [Number of students: 21]
- **Fall 2019**: 601.857: *"Selected Topics in Computer Graphics".* [Number of students: 3]
- **Fall 2019**: 600. 457/657: *"Computer Graphics".* [Number of students: 47]
- **Spring 2019**: 601.857: *"Selected Topics in Computer Graphics".* [Number of students: 6]
- **Spring 2019**: 601.760 *"FFT in Graphics & Vision"*. [Number of students: 15]
- **Fall 2018**: 600. 457: *"Computer Graphics".* [Number of students: 47]
- **Spring 2018**: 600.120: "Intermediate Programming". [Number of students: 34]
- **Fall 2017**: 600. 457: *"Computer Graphics".* [Number of students: 42]
- **Spring 2017**: 600.120: "Intermediate Programming". [Number of students: 34] **(New Course)**
- **Fall 2016**: 600. 457: *"Computer Graphics".* [Number of students: 41]
- **Spring 2016**: 600.459: "Computational Geometry". [Number of students: 13] **(New Course)**
- **Fall 2015**: 600.357/457: *"Computer Graphics".* [Number of students: 33]
- **Spring 2015:** 600.660 "*FFTs in Graphics and Vision*". [Number of students: 10]
- **Fall 2014**: 600.357/457 "*Computer Graphics*". [Number of students: 30]
- **Spring 2014**: 600.659: *"Introduction to Computational Geometry".* [Number of students: 4] **(New Course)**

- **Fall 2013**: 600.660: *"Survey of Methods in Computer Graphics".* [Number of students: 5] **(New Course)**
- **Fall 2013**: 600.357/457: *"Computer Graphics".* [Number of students: 35]
- **Fall 2013**: 600.757: *"Selected Topics in Computer Graphics".* [Number of students: 3]
- **Fall 2012**: 600.660: *"FFTs in Graphics & Vision".* [Number of students: 7]
- **Fall 2012**: 600.757: *"Selected Topics in Computer Graphics".* [Number of students: 5]
- **Spring 2010**. 600.357/457: "*Computer Graphics*". [Number of students: 15]
- **Spring 2011**: 600.757: *"Selected Topics in Computer Graphics".* [Number of students: 2]
- **Fall 2011**: 600.657: *"Advanced Topics for Computer Graphics: Rendering".* [Number of students: 4] **(New Course)**
- **Fall 2011**: 600.757: *"Selected Topics in Computer Graphics".* [Number of students: 2]
- **Spring 2011**. 600.357/457: "*Computer Graphics*". [Number of students: 23]
- **Spring 2011**: 600.757: *"Selected Topics in Computer Graphics".* [Number of students: 3]
- **Fall 2010**. 600.657: "*Advanced Topics for Computer Graphics: Mesh Processing*". [Number of students: 4] **(New Course)**
- **Fall 2010**: 600.757: *"Selected Topics in Computer Graphics".* [Number of students: 2]
- **Spring 2010**. 600.357/457: "*Computer Graphics*". [Number of students: 28]
- **Fall 2009**. 600.657: *"Advanced Topics for Computer Graphics: Discrete Differential Geometry"*. [Number of students: 5] **(New course)**
- **Spring 2009**. 600.357/457: "*Computer Graphics".* [Number of students: 25]
- **Spring 2009.** 600.757: "*Selected Topics in Computer Graphics".* [Number of students: 3]
- **Fall 2008.** 600.660: *"FFTs in Graphics & Vision".* [Number of students: 8]
- **Fall 2008.** 600.757: *"Selected Topics in Computer Graphics"*. [Number of students: 2]
- **Spring 2008.** 600.357/457: "*Computer Graphics".* [Number of students: 25]
- **Spring 2008.** 600.758: *"Graduate Seminar in Computational Geometry".* [Number of students: 4] **(New course)**
- **Spring 2008.** 600.757: *"Selected Topics in Computer Graphics".* [Number of students: 2]
- **Fall 2007.** 600.657: *"Advanced Topics in Computer Graphics: The Poisson Equation".* [Number of students: 12] **(New course)**
- **Fall 2007.** 600.757: *"Selected Topics in Computer Graphics".* [Number of students: 4]
- **Spring 2007.** 600.357/457: *"Computer Graphics".* [Number of students: 18]
- **Spring 2007.** 600.757: "*Selected Topics in Computer Graphics".* [Number of students: 1]
- **Fall 2006.** 600.660: *"FFTs in Graphics and Vision".* [Number of students: 7] **(New course)**
- **Fall 2006.** 600.757: "*Selected Topics in Computer Graphics".* [Number of students: 2]
- **Spring 2006.** 600.357/457: "*Computer Graphics".* [Number of students: 28]
- **Spring 2006.** 600.757: *"Selected Topics in Computer Graphics"*. [Number of students: 2]
- **Fall 2005.** 600.659: *"3D Model Reconstruction".* [Number of students: 7] **(New course)**
- **Fall 2005.** 600.757: "*Selected Topics in Computer Graphics".* [Number of students: 4]
- **Spring 2005.** 600.357/457: "*Computer Graphics".* [Number of students: 33] **(New Course)**
- **Fall 2004.** 600.658: *"Seminar in Shape Analysis and Retrieval".* [Number of students: 11] **(New course)**

CO-TEACHING EXPERIENCE

- **Spring 2017**: 600.756: "Introduction to Geometry Processing". [Number of students: 3] **(New Course)**
- **Fall 2010.** 600.205: *"M&Ms: Freshman Experience"*. [Number of students: 27] (Offered 3 lectures)
- **Spring 2009**. 600.255: "*Introduction to Video Game Design".* [Number of students: 38] (Offered 6 lectures)
- **Fall 2006.** 600.205: *"M&Ms: Freshman Experience"*. [Number of students: 22] (Offered 2 lectures)

- **Fall 2005.** 600.205: *"M&Ms: Freshman Experience"*. [Number of students: 14] (Offered 2 lectures)

Department Service

- Graduate Board Oral Exams
  - 2019
    - Sing Chun Lee (CS)
    - Tommy Mitchel (Mechanical Engineering)
    - Tianyu Ding (AMS)
  - 2017
    - Rob Grupp (CS), Preetham Chalasani (CS)
  - 2016
    - Stephen Hamilton (CS)
  - 2015
    - Xi Zhao (CE), Sue Kulason (BME), Will Gray (CS), Nathan Cho (CS), Purnima Rajan (CS), Hari Menon (CS), Chi Li (CS)
  - 2011
    - Ming Chuang (CS), Blake Lucas (CS)
  - 2010
    - Andre Harrison (ECE), Nolan Li (CS), Jae Hyun Ahn (CS), Xiaoxo Kang (BME)
  - 2009
    - Zachary Pezzementi (CS), Rizwan Chaudry (CS), Raphael Snitzman (CS), Robert Jacques(BME), Omar Ahamad (CS)
  - 2008
    - Matthew Bolitho (CS), Eric Perlman (CS)
  - 2007
    - Daniel Abretske (CS)
- PhD thesis reader
  - Apurva Nakade, 2019. Thesis title: *"Manifold Calculus and Complex Integration".*
  - Shengwen Wang, 2018. Thesis title: *"Some properties of closed hypersurfaces of small entropy and the topology of hypersurfaces through singularities of mean curvature flow"*.
  - Vitaly Lorman, 2016. Thesis title: *"Real Johnson-Wilson Theories and Computations"*.
  - Ming Chuang, 2014. Thesis title: "*Grid-based Finite Elements System for Solving Laplace-Beltrami Equations on 2-Manifolds*".
  - Blake Lucas, 2012. Thesis title: "*Unifying triangle Mesh, Level Set, and Label Mask Representations in Image Analysis*".
  - Eric Perlman, 2012. Thesis title: "*Indexing and Processing Spatial Range Functions in Data-Intensive Scientific Databases*".
  - Oliver van Kaick, 2011. Thesis title: "*Matching Dissimilar Shapes*".
  - Zachary Pezzementi, 2011. Thesis title: "*Object Recognition Using Tactile Array Sensors*".
  - Yuan Chen, 2008. Thesis title: "*Techniques for 3D Scalar and Vector Field Visualization with Error Evaluation"*.

- Budrijanto Purnomo, 2008. Thesis title: *"Mesh Processing Techniques on Graphics Hardware*".
- Ofri Sadowsky, 2008. "*Image Registration and Hybrid Volume Reconstruction of Bone Anatomy Using a Statistical Shape Atlas*".
- Krzystof Niski, 2007. Thesis title: "*View-Dependent Level of Detail for the Parallel Rendering of Complex Models"*.

- Department Committees

  - Diversity and Inclusion Committee (Chair): 2020-Present
  - Masters Admissions committee: 2020-Present
  - Diversity Committee: 2017-2020
  - Masters Admissions Committee (Chair): 2015-2019
  - Graduate Admissions Committee (Chair): 2014-2015
  - Graduate Admissions Committee: 2009-2015
  - Diversity Committee: 2013-2015
  - WSE Graduate Committee: 2011-2013
  - Faculty Hiring Committee: 2005-2007, 2008-2012
  - Curriculum Committee: 2007-2013
- University Committees

  - Graduate Committee: 2010-2012 and 2014-2016

  - Siebel Scholar Selection Committee: 2013-2015

ADVISING

Current

1. Sing Chun Lee, PhD Student (5th year)
2. Crane Chen, PhD Student (3rd year)
3. Tommy Mitchel, PhD Student (4th year)

Past

- Postdoctoral Scholars

  - Patricio Simari, June 2008 – June 2010.

- PhDs

  - Fabian Prada. October 2018. PhD thesis title: "Signal Processing on Textured Meshes".
  - Ming Chuang. June 2014. PhD thesis title: "*Grid-based Finite Elements System for Solving Laplace-Beltrami Equations on 2-Manifolds*".
  - Blake Lucas (co-advised with R. Taylor), June 2012. PhD thesis title: "*Unifying Deformable Model Representations through New Geometric Data Structures*".

  - Matthew Bolitho. June 2010. PhD thesis title: "*The Reconstruction of Large Three-Dimensional Meshes"*.

- Masters

- Alex Baden, (co-advised with R. Burns), 2017.
- Mengtie Hu, 2015.
- Alex King, Supervised MSE project, 2010.
- Pao-Hahn Shih. Supervised MSE project, 2008.
- Bhaskar Kishore. Supervised MSE project, 2008.

❑ Undergraduates

1. James Doverspike
2. Junkei Hong
3. Spencer Ong. Supervised PURMA Fellowship, Fall 2010
4. Spencer Ong. Supervised Pristorito Fellowship, Summer 2010
5. Laura Briskin. Supervised Pristorito Fellowship, Summer 2006

❑ High School

1. Jack Phoebus, Summer 2013