Benjamin B. Kimia

Curriculum Vitae
January 2010

1. **Name, Position, Academic Department(s)**

   - **Benjamin B. Kimia**
   - Professor, Division of Engineering

2. **Education:**

   - Ph.D. Electrical Engineering
     - McGill University, 1991
     - Title: Toward a Computational Theory of Shape
     - Advisor: Prof. Steven Zucker
     - Dean's Honor List for Ph.D. Theses

   - M. Eng. Electrical Engineering
     - McGill University, 1986
     - Title: Deblurring Gaussian Blur
     - Advisor: Prof. Steven Zucker

   - B. Eng. Electrical Engineering
     - McGill University, 1983
     - Honors with Distinction, University Scholar

3. **Professional Appointments**

   - Professor of Engineering, Brown University, July 2004 - present
   - Associate Professor of Engineering, Brown University, July 1996 - June 2004
   - Associate Director, Laboratory for Engineering Man/Machine Systems, Brown University, 1997 - present
   - Assistant Professor of Engineering, Brown University, Sept 1990 - June 1996

4. **Completed Publications:**

   (a) **Chapters in Books:**

   [1] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. Entropy scale-space. pages 333–344, 1991.
   [2] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. Exploring the shape manifold: The role of conservation laws. In Ying-Lie O, Alexander Toet, David Foster, Henk J.A.M. Heijmans, and Peter Meer, editors, *Shape In Picture: Mathematical Description of Shape in Grey-level Images*, pages 601–620. Springer-Verlag, September 1992.
   [3] Steven W. Zucker, Allan Dobbins, Lee Iverson, Benjamin B. Kimia, and Allen R. Tannenbaum. From curve detection to shape description. In A. Basu and X. Li, editors, *Computer Vision: Systems, Theory, and Applications*, pages 25–39. World Scientific, 1993.
   [4] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. On optimal control methods in computer vision and image processing. In Bart M. ter Haar Romeny, editor, *Geometry-Driven Diffusion in Computer Vision*, pages 307–338. Kluwer, September 1994.
   [5] Huseyin Tek and Benjamin B. Kimia. Curve evolution, wave propagation, and mathematical morphology. In Henk J.A.M. Heijmans and Jos B.T.M. Roerdink, editors, *Mathematical Morphology and its Applications to Image and Signal Processing*, volume 12 of *Computational Imaging and Vision*, pages 115–126. Kluwer Academic, Amsterdam, The Netherlands, June 1998.
   [6] Benjamin B. Kimia, Ilana Frankel, and Ana-Maria Popescu. Euler spiral for shape completion. In Sudeep Sarkar and Kim L. Boyer, editors, *Recent Advances in Perceptual Organization for Artifical Vision Systems*, pages 289–309. Kluwer Academic Publishers, 1999.

[7] Elizabeth Bullit and Benjamin B. Kimia. Segmentation and registration requirements. In Kevin Cleary, editor, *Technical Requirements for Image Guided Spine Procedures Workshop Report*. Georgetown University Medical Center, April 1999.

[8] Benjamin B. Kimia. Content-based retrieval of images based on shape. In Vittorio Castelli and Larry Bergman, editors, *Image Databases, Search and Retrieval of Digital Imagery*, pages 345–372. Wiley Interscience, 2002.

[9] Peter J. Giblin and Benjamin B. Kimia. Local forms and transitions of the medial axis. In Kaleem Siddiqi and Stephen Pizer, editors, *Medial Representations: Mathematics, Algorithms and Applications*, pages 37–68. Kluwer Academic Publishers, 2008.

[10] Frederic F. Leymarie and Benjamin B. Kimia. From the infinitely large to the infinitely small: Applications of medial symmetry representations of shape. In Kaleem Siddiqi and Stephen Pizer, editors, *Medial Representations: Mathematics, Algorithms and Applications*, pages 327–351. Kluwer Academic Publishers, 2008.

[11] Benjamin B. Kimia. Shapes and shock graphs: From segmented shapes to shapes embedded in images. In Sven J. Dickinson, Ales Leonardis, Bernt Schiele, and Michael J. Tarr, editors, *Object Categorization: Computer and Human Vision Perspectives*, pages 430–450. Cambridge University Press, 2009.

(b) **Refereed Journal Articles:**

[1] Robert Hummel, Benjamin B. Kimia, and Steven W. Zucker. Deblurring Gaussian blur. *Computer Vision, Graphics, and Image Processing*, 38:66–80, 1987.

[2] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. On the evolution of curves via a function of curvature, I: The classical case. *JMAA*, 163(2):438–458, January 1992.

[3] Benjamin B. Kimia and Steven W. Zucker. Analytic inverse of discrete Gaussian blur. *Optical Engineering*, 32(1):166–176, January 1993.

[4] G. Sapiro, Benjamin B. Kimia, R. Kimmel, D. Shaked, and A.M. Bruckstein. Implementing continuous-scale morphology. *Pattern Recognition*, 26(9):1363–1372, 1993.

[5] Ronnie Kimmel, Kaleem Siddiqi, Benjamin B. Kimia, and Alfred M. Bruckstein. Shape from shading: Level set propagation and viscosity solutions. *IJCV*, 16(2), October 1995.

[6] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. Shapes, shocks, and deformations, I: The components of shape and the reaction-diffusion space. *IJCV*, 15(3):189–224, 1995.

[7] Kaleem Siddiqi and Benjamin B. Kimia. Parts of visual form: Computational aspects. *PAMI*, 17(3):239–251, March 1995.

[8] Kaleem Siddiqi, Kathryn J. Tresness, and Benjamin B. Kimia. Parts of visual form: Ecological and psychophysical aspects. *Perception*, 25:399–424, 1996.

[9] Benjamin B. Kimia and Kaleem Siddiqi. Geometric heat equation and nonlinear diffusion of shapes and images. *Computer Vision Graphics and Image Processing: Image Understanding*, 64(3):305–322, November 1996.

[10] Kaleem Siddiqi, Benjamin B. Kimia, and Chi-Wang Shu. Geometric shock-capturing ENO schemes for subpixel interpolation, computation and curve evolution. *Graphical Models and Image Processing*, 59(5):278–301, September 1997.

[11] Huseyin Tek and Benjamin B. Kimia. Volumetric segmentation of medical images by three-dimensional bubbles. *CVIU*, 64(2):246–258, February 1997.

[12] Daniel Sharvit, Jacky Chan, Hüseyin Tek, and Benjamin B. Kimia. Symmetry-based indexing of image databases. *Journal of Visual Communication and Image Representation*, 9(4):366–380, December 1998.

[13] Kaleem Siddiqi, Benjamin Kimia, Allen Tannenbaum, and Steven Zucker. Shocks, shapes, and wiggles. *Image and Vision Computing*, 17(5-6):365–373, 1999.

[14] Kaleem Siddiqi, Benjamin B. Kimia, Allen R. Tannenbaunm, and Steven W. Zucker. On the psychophysics of the shape triangle. *Vision Research*, 41(9):1153–1178, 2001.

[15] Huseyin Tek and Benjamin B. Kimia. Boundary smoothing via symmetry transforms. *JMIV*, 14(3):211–223, May 2001.

[16] Thomas Sebastian, Philip Klein, and Benjamin Kimia. On aligning curves. *PAMI*, 25(1):116–125, January 2003.

[17] Thomas Sebastian, Joseph Crisco, and Benjamin Kimia. Segmentation of carpal bones from ct images using skeletally coupled deformable models. *Medical Image Analysis*, 7(1):21–45, March 2003.

[18] Peter J. Giblin and Benjamin B. Kimia. On the intrinsic reconstruction of shape from its symmetries. *PAMI*, 25(7):895–911, July 2003.

[19] Michael Black and Benjamin Kimia. Computational vision at Brown. *IJCV*, pages 5–11, August 2003.

[20] Peter. J. Giblin and Benjamin. B. Kimia. On the local form and transitions of symmetry sets, medial axes, and shocks. *IJCV*, 54(Issue 1-3):143–157, August 2003.

[21] Huseyin Tek and Benjamin B. Kimia. Symmetry maps of free-form curve segments via wave propagation. *IJCV*, 54(Issue 1-3):35–81, August 2003.

[22] Benjamin B. Kimia, Ilana Frankel, and Ana-Maria Popescu. Euler spiral for shape completion. *IJCV*, 54:159–182, 2003.

[23] Benjamin B. Kimia. On the role of medial geometry in human vision. *Journal of Physiology-Paris*, 97(2–3):155–190, 2003.

[24] Peter J. Giblin and Benjamin B. Kimia. A formal classification of 3D medial axis points and their local geometry. *PAMI*, 26(2):238–251, February 2004.

[25] Christopher M. Cyr and Benjamin B. Kimia. A similarity-based aspect-graph approach to 3D object recognition. *IJCV*, 57(1):5–22, April 2004.

[26] Thomas Sebastian, Philip Klein, and Benjamin Kimia. Recognition of shapes by editing their shock graphs. *PAMI*, 26:551–571, May 2004.

[27] Thomas B. Sebastian and Benjamin B. Kimia. Curves vs skeletons in object recognition. *Signal Processing*, 85(2):247–263, February 2005.

[28] Frederic Fol Leymarie and Benjamin B. Kimia. The medial scaffold of 3D unorganized point clouds. *PAMI*, 29(2):313–330, 2007.

[29] Vishal Jain, Benjamin B. Kimia, and Joseph L. Mundy. Segregation of moving objects using elastic matching. *Computer Vision and Image Understanding*, 108:230–242, 2007.

[30] Peter J. Giblin, Benjamin B. Kimia, and Anthony J. Pollitt. Transitions of the 3D medial axis under a one-parameter family of deformations. *IEEE Trans. Pattern Anal. Mach. Intell.*, 31(5):900–918, 2009.

[31] M. E. Bowers, G. A. Tung, N. Trinh, E. Leventhal, J. J. Crisco, B. B. Kimia, and B. C. Fleming. Effects of ACL interference screws on articular cartilage volume and thickness measurements with 1.5T and 3T MRI. *Osteoarthritis and Cartilage*, pages 572–578, 2007.

[32] Ming-Ching Chang, Frederic Fol Leymarie, and Benjamin B. Kimia. Surface reconstruction from point clouds by transforming the medial scaffold. *Computer Vision and Image Understanding*, 113(11):1130 – 1146, 2009. **No. 5 in the Top 25 Hottest Articles in Computer Science on ScienceDirect during April - June 2009**, *http://top25.sciencedirect.com/subject/computer-science/7/archive/22/*.

[33] Nhon H. Trinh and Benjamin B. Kimia. Skeleton search: Category-specific object recognition and segmentation using a skeletal shape model. *International Journal of Computer Vision (IJCV)*, 2009, Under Review.

[34] Vishal Jain, Joseph L. Mundy, and Benjamin B. Kimia. Edge-based segmentation of moving objects in videos from a stationary camera or stabilized images. *IEEE Trans. Pattern Anal. Mach. Intell. (PAMI)*, Submitted, 2010.

(c) **Refereed Conference Papers:**

[1] Benjamin B. Kimia and Steven W. Zucker. Deblurring Gaussian blur. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, pages 416–421, June 1983.

[2] Benjamin B. Kimia and Steven W. Zucker. Symbolic inverse of discrete Gaussian blur. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, 1985.

[3] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. Toward a computational theory of shape: An overview. In Olivier D. Faugeras, editor, *ECCV*, volume 427 of *Lecture Notes in Computer Science*, pages 402–407. Springer, 1990.

[4] Kaleem Siddiqi and Benjamin B. Kimia. Parts of visual form: Computational aspects. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, pages 75–81, New York, New York, June 1993. IEEE Computer Society Press.

[5] Alan Arehart, Luc Vincent, and Benjamin B. Kimia. Mathematical morphology: The Hamilton-Jacobi connection. In *Proceedings of the Fourth International Conference on Computer Vision (Berlin, Germany, May 11–13, 1993)*, pages 215–219, Washington, DC, 1993. IEEE Computer Society Press.

[6] Benjamin B. Kimia and Kaleem Siddiqi. Geometric heat equation and nonlinear diffusion of shapes and images. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, pages 113–120, Seattle, Washington, June 1994. IEEE Computer Society Press.

[7] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. On the shape triangle. In Carlo Arcelli, editor, *Proceedings of the International Workshop on Visual Form*, pages 307–323, Capri, Italy, May 1994. World Scientific.

[8] Kaleem Siddiqi, Kathryn J. Tresness, and Benjamin B. Kimia. On the anatomy of visual form. In *Proceedings of the International Workshop on Visual Form*, pages 507–521, Capri, Italy, May 1994. World Scientific.

[9] Predrag Neskovic and Benjamin B. Kimia. Three-dimensional shape representation from curvature-dependent deformations. In *Proceedings of the IEEE International Conference on Image Processing*, pages 6–10, Austin, Texas, 1994. IEEE Computer Society Press.

[10] Huseyin Tek and Benjamin B. Kimia. Shock-based reaction-diffusion bubbles for image segmentation. In *Proceedings of the International Conference on Computer Vision, Virtual Reality and Robotics in Medicine*, Nice, France, April 1995. Springer-Verlag.

[11] Huseyin Tek and Benjamin B. Kimia. Image segmentation by reaction-diffusion bubbles. In *International Conference of Computer Vision*, pages 156–162, 1995.

[12] Huseyin Tek and Benjamin B. Kimia. Volumetric segmentation of medical images by three-dimensional bubbles. In *Proceedings of the IEEE Workshop on Physics-based Modelling in Computer Vision*, pages 9–16, Boston, Massachusetts, June 1995. IEEE Computer Society.

[13] Kaleem Siddiqi, Jayashree Subrahmonia, David Cooper, and Benjamin B. Kimia. Part-based Bayesian recognition using implicit polynomial invariants. In *Proceedings of the IEEE International Conference on Image Processing*, pages 360–364, Washington D.C., October 1995. IEEE Computer Society Press.

[14] Kaleem Siddiqi, Benjamin B. Kimia, and Chi-Wang Shu. Geometric shock-capturing ENO schemes for sub-pixel interpolation, computation and curve evolution. In *Proceedings of the IEEE International Symposium on Computer Vision*, Coral Gables, Florida, November 20–22 1995. IEEE.

[15] Kaleem Siddiqi and Benjamin B. Kimia. A shock grammar for recognition. In *Proc. CVPR*, pages 507–513, 1996.

[16] Kaleem Siddiqi, Benjamin Kimia, Allen Tannenbaum, and Steven Zucker. Shocks, shapes, and wiggles. In *Proceedings of the International Workshop on Visual Form*, Capri, Italy, May 1997. World Scientific.

[17] Huseyin Tek, Frederic Fol Leymarie, and Benjamin B. Kimia. Multiple generation shock detection and labeling using CEDT. In *Proceedings of the International Workshop on Visual Form*, pages 582–593, Capri, Italy, May 1997. World Scientific.

[18] Huseyin Tek, Perry Stoll, and Benjamin B. Kimia. Shocks from images: Propagation of orientation elements. In *Proceedings of the Conference on Computer Vision and Pattern Recognition*, pages 839–845, 1997.

[19] Mahesh Jayaraman, Benjamin Kimia, Huseyin Tek, Glenn Tung, and Jeffrey Rogg. Semi-automatic image segmentation of primary brain tumors based on deformable bubbles. In *Proceedings of the Radiological Society of North America*, November 1997.

[20] Thomas B. Sebastian, Huseyin Tek, Scott W. Wolfe, Joseph J. Crisco, and Benjamin K. Kimia. Segmentation of Carpal Bones from 3D CT images using Skeletally Coupled Deformable Models. In *International Conference on Medical Image Computing and Computer Assisted Interventions*, pages 1184–1194, Boston, MA, October 1998.

[21] Daniel Sharvit, Jacky Chan, and Benjamin B. Kimia. Symmetry-based indexing of image databases. In *Workshop on Content-Based Access of Image and Video Libraries, CVPR98*, pages 56–62, June 1998.

[22] Steven W. Zucker, Kaleem Siddiqi, Benjamin B. Kimia, and Allen Tannenbaum. Categorical features in shape perception. In *Annual Meeting, Association for Research in Vision and Opthalmology (ARVO'99)*, Fort Lauderdale, Florida, May 1999.

[23] Huseyin Tek and Benjamin B. Kimia. Symmetry map and symmetry transforms. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, pages 471–477, Fort Collins, Colorado, USA, June 23-25 1999. IEEE Computer Society Press.

[24] Peter J. Giblin and Benjamin B. Kimia. On the intrinsic reconstruction of shape from its symmetries. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, pages 79–84, Fort Collins, Colorado, USA, June 23-25 1999. IEEE Computer Society Press.

[25] Huseyin Tek and Benjamin B. Kimia. Symmetry maps of free-form curve segments via wave propagation. In *ICCV*, 1999.

[26] Peter J. Giblin and Benjamin B. Kimia. On the local form and transitions of symmetry sets, and medial axes, and shocks in 2D. In *Proceedings of the Fifth International Conference on Computer Vision*, pages 385–391, KerKyra, Greece, September 20-25 1999. IEEE Computer Society Press.

[27] Thomas B. Sebastian, Joseph J. Crisco, Philip N. Klein, and Benjamin B. Kimia. Constructing 2D curve atlases. In *Proceedings of Mathematical Methods in Biomedical Image Analysis*, pages 70–77, 2000.

[28] Christopher M. Cyr, Ahmed F. Kamal, Thomas B. Sebastian, and Benjamin B. Kimia. 2D-3D registration based on shape matching. In *Proceedings of Mathematical Methods in Biomedical Image Analysis*, pages 198–203, 2000.

[29] Frederic Fol Leymarie, David Cooper, Martha Joukowsky, Benjamin Kimia, David Laidlaw, David Mumford, and Eileen Vote. The SHAPE Lab: New technology and software for archaeologists. In *CAA 2000: Computing Archaeology for Understanding the Past*, Ljubljana, Slovenia, April 2000. A joint conference of Computer Applications and Quantitative Methods in Archaeology (28th annual conference) and the Union Internationale des Sciences Prehistoriques et Protohistoriques, Commission IV.

[30] Frederic Fol Leymarie and Benjamin B. Kimia. Discrete 3D wave propagation for computing morphological operations from surface patches and unorganized points. In J. Goutsias, L. Vincent, and D. Bloomberg, editors, *Math. Morphology and its Applications to Image and Signal Processing*, volume 18 of *Computational Imaging and Vision*, pages 351–360, Palo Alto, CA, USA, June 2000. Kluwer Academic. Proceedings of International Symposium on Mathematical Morphology (ISMM).

[31] Peter J. Giblin and Benjamin B. Kimia. On the local form of symmetry sets, and medial axes, and shocks in 3D. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, pages 566–573, Hilton Head Island, South Carolina, USA, June 13-15 2000. IEEE Computer Society Press.

[32] Philip Klein, Srikanta Tirthapura, Daniel Sharvit, and Benjamin Kimia. A tree-edit distance algorithm for comparing simple, closed shapes. In *Tenth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 696–704, San Francisco, California, January 9-11 2000.

[33] Philip Klein, Thomas Sebastian, and Benjamin Kimia. Shape matching using edit-distance: an implementation. In *Twelfth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 781–790, Washington, D.C., January 7-9 2001.

[34] Christopher M. Cyr and Benjamin B. Kimia. 3D object recognition using shape similarity-based aspect graph. In *Proceedings of the Eighth International Conference on Computer Vision*, pages 254–261, Vancouver, Canada, July 9-12 2001. IEEE Computer Society Press.

[35] Thomas B. Sebastian, Philip N. Klein, and Benjamin B. Kimia. Recognition of shapes by editing shock graphs. In *Proceedings of the Eighth International Conference on Computer Vision*, pages 755–762, Vancouver, Canada, July 9-12 2001. IEEE Computer Society Press.

[36] Thomas B. Sebastian, Philip N. Klein, and Benjamin B. Kimia. Alignment-based recognition of shape outlines. In Carlo Arcelli, Luigi Cordella, and Gabriella Sanniti di Baja, editors, *Proceedings of the International Workshop on Visual Form*, pages 606–618, Capri, Italy, May 2001. Springer.

[37] Frederic Fol Leymarie and Benjamin B. Kimia. The shock scaffold for representing 3D shapes. In Carlo Arcelli, Luigi Cordella, and Gabriella Sanniti di Baja, editors, *Proceedings of the International Workshop on Visual Form*, pages 216–228, Capri, Italy, May 2001. Springer.

[38] Thomas B. Sebastian and Benjamin B. Kimia. Curves vs skeletons in object recognition. In *Proceedings of the IEEE International Conference on Image Processing*, pages 22–25, Thessaloniki, Greece, October 2001. IEEE Computer Society Press.

[39] Frederic Fol Leymarie and Benjamin B. Kimia. Symmetry-based representation of 3D data. In *Proceedings of the IEEE International Conference on Image Processing*, pages 581–584, Thessaloniki, Greece, October 2001. IEEE Computer Society Press.

[40] Marc S. Johannes, Thomas B. Sebastian, Huseyin Tek, and Benjamin B. Kimia. Perceptual organization as object recognition divided by two. In *Workshop on Perceptual Organization in Computer Vision*, pages 41–46, 2001.

[41] Weixin Kong and Benjamin Kimia. On solving 2D and 3D puzzles under curve matching. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, pages 583–590, Kauai, Hawaii, USA, December 9-14 2001. IEEE Computer Society Press.

[42] A. Willis, S. Andrews, J. Baker, Y. Cao, D. Han, K. Kang, W. Kong, Frederic Fol Leymarie, X. Orriols, S. Velipasalar, E.L. Vote, D.B. Cooper, M.S. Joukowsky, B.B. Kimia, D.H. Laidlaw, and D. Mumford. Assembling virtual pots from 3D measurements of their fragments. In *VAST 2001: Virtual Reality, Archeology, and Cultural Heritage*, Glyfada, Nr Athens, Greece, November 28-30 2001.

[43] Peter J. Giblin and Benjamin B. Kimia. Transitions of the 3D medial axis under a one-parameter family of deformations. In *ECCV'02*, volume 2350 of *Lecture Notes in Computer Science*, pages 718–724. Springer, 2002.

[44] Thomas B. Sebastian, Philip N. Klein, and Benjamin B. Kimia. Shock-based indexing into large shape databases. In *ECCV'02*, volume 2350 of *Lecture Notes in Computer Science*, pages Part III:731 – 746. Springer, 2002.

[45] Thomas B. Sebastian and Benjamin B. Kimia. Metric-based shape retrieval in large databases. In *Proceedings of International Conference on Pattern Recognition*, volume 3, pages 30291–30296, Quebec City, Quebec, Canada, August 11-15 2002. Computer Society Press.

[46] David B. Cooper, Andrew Willis, Stuart Andrews, Jill Baker, Yan Cao, Dongjin Han, Kongbin Kang, Weixin Kong, Frederic Fol Leymarie, Xavier Orriols, Senem Velipasalar, Eileen L. Vote, Martha S. Joukowsky, Benjamin B. Kimia, David H. Laidlaw, and David Mumford. Bayesian pot-assembly from fragments as problems in perceptual-grouping and geometric-learning. In *Proceedings of International Conference on Pattern Recognition*, pages 30297–30302, Quebec City, Quebec, Canada, August 11-15 2002. Computer Society Press.

[47] Raghavan Dhandapani and Benjamin B. Kimia. Role of scale in partitioning shape. In *Proceedings of the IEEE International Conference on Image Processing*, volume II, pages 565–568, Rochester, New York, September 2002. IEEE Computer Society Press.

[48] Benjamin B. Kimia and Amir Tamrakar. The role of propagation and medial geometry in human vision. In *The Second Workshop on Biologically Motivated Computer Vision*, pages 219–229, Tubingen, Germany, November 2002. Springer Verlag.

[49] Frederic Fol Leymarie and Benjamin B. Kimia. Computation of the shock scaffold for unorganized point clouds in 3D. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, volume 1, pages 821–827, Madison, Wisconsin, June 16-22 2003. IEEE Computer Society Press.

[50] Jonah C. McBride and Benjamin B. Kimia. Archaeological fragment re-assembly using curve-matching. In *Proceedings of the IIEEE/CVPR Workshop on Applications of Computer Vision in Archaeology*, pages –, Madison, Wisconsin, June 2003. IEEE Computer Society Press.

[51] Anthony J. Pollitt, Peter J. Giblin, and Benjamin B. Kimia. Consistency conditions on medial axis. In *ECCV'04*, volume 2 of *Lecture Notes in Computer Science*, pages 530–541. Springer, 2004.

[52] Vishal Jain, Benjamin B. Kimia, and Joseph L. Mundy. Figure-ground segregation of object in video using curve-matching. In *ECCV'04*, volume 3021 of *Lecture Notes in Computer Science*. Springer, 2004.

[53] Amir Tamrakar and Benjamin B. Kimia. Medial visual fragments as an intermediate image representation for segmentation and perceptual grouping. In *Proceedings of CVPR Workshop on Perceptual Organization in Computer Vision*, page 47, 2004.

[54] Frederic Fol Leymarie, Peter J. Giblin, and Benjamin B. Kimia. Towards surface regularization via medial axis transitions. In *Proceedings of International Conference on Pattern Recognition*, volume 3, pages 123–126, Cambridge, England, August 2004. Computer Society Press.

[55] Ming-Ching Chang, Frederic F. Leymarie, and Benjamin B. Kimia. 3D shape registration using regularized medial scaffolds. In *Proceedings of the 3D Data Processing, Visualization, and Transmission (3DPVT)*, pages 987–994, Washington, DC, USA, September 2004. IEEE Computer Society.

[56] Ricardo Fabbri and Benjamin B. Kimia. High-order differential geometry of curves for multiview reconstruction and matching. In *Proceedings of the IEEE Conference on Energy Minimization Methods in Computer Vision and Pattern Recognition*, pages 645–660. Springer Verlag, November 2005.

[57] Ozge C. Ozcanli, Amir Tamrakar, Benjamin B. Kimia, and Joseph L. Mundy. Augmenting shape with appearance in vehicle category recognition. In *CVPR'06*, pages 935–942. IEEE Computer Society, 2006.

[58] Amir Tamrakar and Benjamin B. Kimia. Combinatorial grouping of edges using geometric consistency in a lagrangian framework. In *Proceedings of IEEE Workshop on Perceptual Organization in Computer Vision, POCV*, pages 189–197, 2006.

[59] Nhon H. Trinh, Jonathan Lester, Braden C. Fleming, Glenn Tung, , and Benjamin B. Kimia. Accurate measurement of cartilage morphology using a 3D laser scanner. In *Proceedings of Workshop on Computer Vision Approaches to Medical Image Analysis (CVAMIA 2006)*, pages 37–48. Springer Verlag, May 2006.

[60] Nhon H. Trinh and Benjamin B. Kimia. A symmetry-based generative model for shape. In *ICCV '07: Proceedings of the Eleventh IEEE International Conference on Computer Vision*, Rio de Janeiro, Brazil, October 2007. IEEE Computer Society.

[61] Amir Tamrakar and Benjamin B. Kimia. No grouping left behind: From edges to curve fragments. In *ICCV '07: Proceedings of the Eleventh IEEE International Conference on Computer Vision*, Rio de Janeiro, Brazil, October 2007. IEEE Computer Society.

[62] Vishal Jain, Benjamin B. Kimia, and Joseph L. Mundy. Background modeling based on subpixel edges. In *IEEE International Conference on Image Processing*, volume IV, pages 321–324, San Antonio, TX, USA, September 2007. IEEE.

[63] Vishal Jain and Benjamin B. Kimia. Enriched edge-map composite by perceptual fusion of video edge-maps. In *International Confernence on Computer Vision Workshtop on Dynamical Vision*, Rio de Janeiro, Brazil, October 2007.

[64] Ming-Ching Chang, Frederic F. Leymarie, and Benjamin B. Kimia. Surface reconstruction from point clouds by transforming the medial scaffold. In *Proceedings of the 3-D Digital Imaging and Modeling (3DIM)*, pages 13–20. IEEE Computer Society, August 2007.

[65] Ozge C. Ozcanli and Benjamin B. Kimia. Generic object recognition via shock patch fragments. In Nasir M. Rajpoot and Abhir Bhalerao, editors, *Proceedings of the British Machine Vision Conference*, pages 1030–1039, Coventry, USA, September 10-13 2007. Warwick Print.

[66] Megan E. Bowers, Braden C. Fleming, Evan Leventhal, Nhon H. Trinh, Glenn A. Tung, Joseph J. Crisco, and Benjamin B. Kimia. Effects of ACL interference screws on articular cartilage thickness measurements with 1.5T and 3T MRI. In *Proceedings of the American Society of Biomechanics 2007 Annual Conference*, Stanford University, CA, August 2007.

[67] Megan E. Bowers, Glenn A. Tung, Nhon H. Trinh, Joseph J. Crisco, Benjamin B. Kimia, and Braden C. Fleming. Quantitative MRI using livewire to measure tibiofemoral articular cartilage thickness. In *Proceedings of the 54th Annual Meeting of the Orthopaedic Research Society*, pages 1167–1173, San Francisco, CA, March 2008.

[68] Ming-Ching Chang and Benjamin B. Kimia. Regularizing 3D medial axis using medial scaffold transforms. In *CVPR'08*, pages 1–8. IEEE Computer Society, 2008.

[69] Nhon H. Trinh and Benjamin B. Kimia. Category-specific object recognition and segmentation using a skeletal shape model. In *BMVC'09: Proceedings of the British Machine Vision Conference*, September 7-10 2009.

[70] Ming-Ching Chang and Benjamin B. Kimia. Measuring 3D shape similarity by matching the medial scaffolds. In *Proceedings of the 3-D Digital Imaging and Modeling (3DIM)*, pages 1473–1480. IEEE Computer Society, 2009.

[71] Ricardo Fabbri and Benjamin B. Kimia. 3D curve sketch: Flexible curve-based stereo reconstruction and calibration. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, San Francisco, California, USA, Under Review, 2010. IEEE Computer Society Press.

(d) **Non-refereed Conference Papers and Technical Reports:**

[1] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. Reaction-diffusion equations and shape. In *Proceedings of the British Conference on Computer Vision*, Britain, 1990.

[2] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. Conservation minded evolution of shape. In *Proceedings of the fifth IEEE International Symposium on Intelligent Control*, pages 185–190, September 1990.

[3] Benjamin B. Kimia, Allen R. Tannenbaum, and Steven W. Zucker. Nonlinear shape approximation via the entropy scale space. In *Proceedings of the SPIE's Geometric Methods in Computer Vision II*, volume 2031, pages 218–233, San Diego, California, July 1993.

[4] Huseyin Tek and Benjamin B. Kimia. Automatic volumetric segmentation of three-dimensional medical images. In *Proceedings of the Computer Assisted Radiology, 9th International Symposium and Exhibition*, Berlin, Germany, June 21–24 1995. Society for Computer Applications in Radiology.

[5] Mahesh Jayaraman, Benjamin Kimia, Huseyin Tek, Glenn Tung, and Jeffrey Rogg. Semi-automatic image segmentation of primary brain tumors based on deformable bubbles. In *Brown Brain Research*, April 1997.

[6] Benjamin B. Kimia, Jacky Chan, Dale Bertrand, Seth Coe, Zachary Roadhouse, and Hüseyin Tek. A shock-based approach for indexing of image databases using shape. In *Proceedings of the SPIE's Multimedia Storage and Archiving Systems II*, volume 3229, pages 288–302, Dallas, Texas, November 1997.

[7] Srikanta Tirthapura, Daniel Sharvit, Philip Klein, and Benjamin B. Kimia. Indexing based on edit-distance matching of shape graphs. In *SPIE Inter. Symposium on Voice, Video, and Data Communications, Boston*, pages 25–36, November 1998.

[8] Wei Qian and Benjamin B. Kimia. On the perceptual notion of scale for halftone representations: Nonlinear diffusion. In *SPIE Proceedings of the Conference on Human Vision and and Electronic Imaging III*, volume 3299, pages 473–481, San Jose, California, January 1998.

[9] Michael J. Rodehorst and Benjamin B. Kimia. Subpixel polygonization of discrete implicit surfaces using ENO interpolation. Technical Report LEMS-194, LEMS, Brown University, Providence, RI, 02912, September 2001.

[10] Rania Wazir and Benjamin Kimia. Intrinsic shock computations for piecewise circular arcs. Technical Report 196, LEMS, Brown University, Providence, RI, 02912, March 2002.

[11] Frederic Fol Leymarie and Benjamin B. Kimia. Shock scaffolds for 3D shapes in medical applications. DIMACS Workshop on Medical Applications in Computational Geometry, April 2003.

[12] Frederic Fol Leymarie and Benjamin B. Kimia. Shock scaffold segregation and surface recovery. DIMACS Workshop on Surface Reconstruction, Apri 30 - May 2 2003.

[13] Ming-Ching Chang, Nhon H. Trinh, and Benjamin B. Kimia. Reliable fusion of knee bone laser scans to establish ground truth for cartilage thickness measurement. In *SPIE Medical Imaging (Image Processing, Proceedings of SPIE Volume 7623)*, February 2010, To Appear.

(e) **Patents**

- U.S. Patent Pending, "*Binned Micro Vessel Density Methods and Apparatus,*" Benjamin Kimia, Raul Bruaner, John Heymach, Jesse Funaro, **WO 2008/002648 A2**, Jan 2008.
- U.S. Patent Pending, '*'Methods and Apparatus for Identifying Subject matter in View Data,*" Joseph Mundy, Benjamin Kimia, Philip Klein, Kongbin Kang, Huseyin Aras, **20060182327**, August 2006.
- U.S. Patent Pending, '*'Methods And Apparatus for Model-Based Detection of Structure in View Data,*" Joseph Mundy, Benjamin Kimia, **7,492,934**, February 2007.
- U.S. Patent, '*'Color Management Systems and Methods with Improved Color Matching Techniques,*" **6,924,908**, August 2005.

5. **Service:**

(a) **Profession:**

i. **Editorial Activity**
- **Area Chair:** Eleventh IEEE International Conference on Computer Vision Rio de Janeiro, Brazil, October 14-21, 2007
- **Associate Editor:** Transactions on Pattern Analysis and Machine Intelligence (PAMI), rated as the highest impact computer science journal and IEEE publication by Journal Citation Report 2002, 2003-2007.
- **Area Chair:** IEEE Conference on Computer Vision and Pattern Recognition, Washington D.C, June 2004.
- Guest **Co-editor** for the International Journal on Computer Vision special issue on Vision Research at Brown, 2003.

ii. **Organization Activity**
- **General Co-Chair:** The Twenty Fifth IEEE Conference on Computer Vision and Pattern Recognition, Newport, RI, 2012.
- **Co-Organizer:** The Second IEEE Workshop on Applications of Computer Vision in Archaeology, San Francisco, CA June 2010.
- **Publications chair:** The Second International Symposium on 3D Data Processing, Visualization, and Transmission (3DPVT), Sept. 6-9, 2004, Thessaloniki, Greece.
- **Co-Organizer:** First IEEE Workshop on Applications of Computer Vision in Archaeology, Madison, Wisconsin, June 17, 2003
- **Co-Organizer:** IEEE Workshop on Mathematical Methods in Biomedical Image Analysis, Hilton Head Island, South Carolina, June 11-12, 2000.
- **Host and Organizer**, The Second International Nonlinear Diffusion meeting; held at Brown University, Providence, RI, June 15-16, 1995. The meeting was jointly sponsored by NSF-ESPRIT, and attended by American and Canadian (Brown, Caltech, HP, McGill, UNC Chapel Hill, etc.) as well as European researchers (Belgium, Czechoslovakia, Denmark, France, Germany, Netherlands, Portugal, Sweden, Switzerland).

iii. **Program Committee Membership**
- A. IEEE Conference on Computer Vision and Pattern Recognition, San Francisco, CA, June 2010.
- B. Twentieth International Conference on Pattern Recognition Istanbul Convention, Istanbul, Turkey, August 23-26, 2010.
- C. The Twelfth IEEE International Conference on Computer Vision, Kyoto, Japan, September 27-October 4, 2009.
- D. The Ninth Asian Conference on Computer Vision, Xi an, China, September 23-27, 2009.
- E. IEEE Conference on Computer Vision and Pattern Recognition, Miami, Florida, June 2009.
- F. The Fourth WORKSHOP ON DYNAMICAL VISION, Kyoto, Japan, September 28, 2009
- G. The Fifth International Symposium on Visual Computing, Las Vegas, Nevada,Nov 30 - Dec 2, 2009.
- H. Fourth International Symposium on Visual Computing, Las Vegas, Nevada, Dec 1-3, 2008
- I. IEEE Conference on Computer Vision and Pattern Recognition, Anchorage, Alaska, June 2008
- J. The Tenth European Conference on Computer Vision (ECCV), Marseille, France, Oct 2008.
- K. Nineteenth International Conference on Pattern Recognition (ICPR), Tampa, Florida, Dec 8-11, 2008
- L. The Sixth IEEE Workshop on Perceptual Organization in Computer Vision (POCV), Anchorage, Alaska, June 2008.
- M. IEEE Conference on Computer Vision and Pattern Recognition, Minneapolis, Minnesota, June 2007.
- N. Microscopy Image Analysis with Applications in Biology Copenhagen, Denmark, October 2006
- O. The Second International Workshop on Computer Vision Approaches to Medical Image Analysis (CVAMIA06), Graz, Australia, May 2006
- P. The IEEE Conference on Computer Vision and Pattern Recognition, New York, NY., June 2006.
- Q. The Seventh IEEE Workshop on Mathematical Methods in Biomedical Image Analysis (MMBIA), New York, NY., June 2006.
- R. The Fifth IEEE Workshop on Perceptual Organization in Computer Vision (POCV), New York, NY., June 2006.
- S. The Fourth IASTED International Conference on Biomedical Engineering, Innsbruck, Austria, Feb 15-17, 2006.
- T. The Ninth European Conference on Computer Vision (ECCV), Graz, Austria, May 7-13, 2006.

U. Eighteenth International Conference on Pattern Recognition (ICPR), Hong Kong, August 20-24, 2006

V. IEEE Tenth International Conference on Computer Vision (ICCV) Beijing, China, October 2005.

W. Energy Minimization Methods in Computer Vision and Pattern Recognition (EMMCVPR 2005), St. Augustine, FL, Nov. 9-11, 2005.

X. International Symposium on Brain, Vision, and Artificial Intelligence, Ischia, Italy, 2005.

Y. The Third IASTED International Conference on Biomedical Engineering, 2005.

Z. Computer Vision Approaches to Medical Image Analysis Workshop, (CVAMIA), Pargue, May 15, 2004.

. The Fourth IEEE Workshop on Perceptual Organization in Computer Vision (POCV), Washington D.C., June 2004.

. IEEE Workshop on "Articulated and Nonrigid Motion", in conjunction with CVPR04, Washington DC, June 2004 .

. The 8th European Conference on Computer Vision (ECCV), Prague, May 11-14, 2004.

. The Second IASTED International Conference on Biomedical Engineering, Innsbruck, Austria, February 16-18, 2004.

. The 17th International Conference on Pattern Recognition (ICPR), Cambridge, UK, August 23-26, 2004.

. The IEEE/RSJ International Conference on Intelligent Robots and Systems, Las Vegas, Nevada, October 2003.

. The Third International Conference on Scale-Space Theories in Computer Vision, Isle of Skye, Scotland, UK, June 2003.

. The 16th International Conference on Pattern Recognition (ICPR), Quebec City, Canada, August 11-15, 2002.

. IEEE Conference on Computer Vision and Pattern Recognition, Kauai, Hawaii, December 2001.

. IEEE Workshop on Scale-Space and Morphology in Computer Vision", Vancouver, Canada, July 7-8, 2001.

. IEEE Workshop on Level Set Methods in Computer Vision, Vancouver, Canada, July 13, 2001.

. The Fifth International Symposium on Mathematical Morphology, Palo Alto, CA, June 2000.

. The Second International Conference on Scale-Space Theories in Computer Vision, Corfu, Greece, September 1999.

. IEEE Workshop on Biomedical Image Analysis, Santa Barbara, CA, June 1998.

. IEEE Sixth International Conference on Computer Vision, Bombay, India, January 1998.

. The First International Conference on Scale Space Theory, Utrecht, Netherlands, July 1997.

. IEEE Conference on Computer Vision and Pattern Recognition, June 1997.

. The Third International Workshop on Visual Form, Capri, Italy, 1997.

. IEEE/SIAM Workshop on Mathematical Methods in Biomedical Image Analysis, June 21–22, 1996.

. IEEE Workshop on Physics-Based Modeling in Computer Vision,
at the International Conference on Computer Vision, MIT, Cambridge, MA, June 18-19, 1995.

. Vision Interface, Quebec City, Quebec, Canada, May 15-19 1995.

. The Second International Workshop on Visual Form, Capri, Italy, 1994.

iv. **Panel Membership**

- National Science Foundation, Funding Panel, 2009.
- National Science Foundation, Funding Panel, 2007.
- National Science Foundation, CISE Area Study Reviewer, 2005.
- National Science Foundation Funding Panel, 2004.
- Workshop on Perceptual Organization and Computer Vision, Panel on Segmentation, June 2004.
- National Science Foundation Funding Panel, ITR proposal evaluation, 2000.
- Planning Workshop on the Technical Requirements for Image-guided Spine Procedures, Ellicott City, MD, April 1999.
- National Science Foundation Funding Panel, NSF proposal evaluation, 1997.
- National Science Foundation Funding Panel, NSF proposal evaluation, 1993.
- Technology Transfer in Image-Guided Therapy I
  Sponsored by National Cancer Institute, National Aeronautics and Space Administration, and the Society of Cardiovascular and Interventional Radiology. The goal of this meeting was to identify, evaluate and direct future funding activities; San Francisco, CA, August 5, 1994.

- Technology Transfer in Image-Guided Therapy II
  Clinical Applications Workshop, Sponsored by National Cancer Institute, National Aeronautics and Space Administration, and the Society of Cardiovascular and Interventional Radiology. The goal of this meeting was to identify, evaluate and direct future funding activities; Washington, D.C., May 30 - June 1, 1995.

v. **Papers and Proposals Refereed**
- Associate Editor, Transactions on Pattern Analysis and Machine Intelligence, 2003-2007
- Ad hoc reviewer for CVPR99
- External Ph.D. thesis reader (Harvard U.), 1998.
- NSF Robotics and Machine Intelligence proposals
- NSF Mathematical Sciences Division grant proposals
- NSF Computer Systems Architecture proposal
- Journal papers: received more than a dozen papers in the last academic year for review, submitted for publication in: IJCV, CVGIP, IEEE PAMI, IEEE TIP, PR, MEP, Cognition, etc.