Bruce A. Draper
draper@cs.colostate.edu

Professional Experience

2011 – date. *Professor, Department of Computer Science, Colorado State University*

2011 – 2014. *Graduate Program Director, Department of Computer Science, Colorado State University*

2001 – 2011. *Associate Professor, Department of Computer Science, Colorado State University*

2006 (Jan through July) *Visiting Scholar, Department of Psychology, Harvard University*

1996 – 2001. *Assistant Professor, Department of Computer Science, Colorado State University*

1993 – 1996. *Senior Post-doctoral Research Scientist, Department of Computer Science, University of Massachusetts (Amherst)*

Education

Ph.D., Computer Science, University of Massachusetts (Amherst), 1993.
M.S., Computer Science, University of Massachusetts (Amherst), 1987.
B.S., Computer Science, Yale University, 1984.

Journal Articles Currently Under Review

- *P. Narayana, B. Draper and R. Beveridge. "Interacting Hidden Markov Models for Video Understanding", International Journal of Pattern Recognition and Artificial Intelligence.*

- *R. Arn, P. Narayana, T. Emerson, B. Draper, M. Kirby and C. Peterson. "Motion Segmentation via Generalized Curvatures", IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI).*

Journal Articles

1. *M.Wigness, B. Draper and R. Beveridge. "Efficient Label Collection for Image Datasets via Hierarchical Clustering", International Journal of Computer Vision, to appear.*

2. *H. Zhang, R. Beveridge, B. Draper and J. Phillips. "On the Effectiveness of Soft Biometrics for Increasing Face Verification Rates," Computer Vision and Image Understanding, 137:50-62 (August 2015). Reprinted in: Celebrating the Breadth of Biometrics Research 2015, Kevin Bowyer (ed).*

3. *B. Draper, M. Kirby, J. Marks, T. Marrinan, and C. Peterson. "A flag representation for finite collections of subspaces of mixed dimension", Linear Algebra and its Applications, 451:15-32, June 15, 2014.*

4. *G. Givens, R. Beveridge, J. Phillips, B. Draper, Y.M. Lui, and D. Bolme. "Introduction to face recognition and evaluation of algorithm performance", Computational Statistics and Data Analysis, 67:236-247, Nov. 2013.*

5. *G. Givens, R. Beveridge, Y.M. Lui, D. Bolme, B. Draper and J. Phillips. "Biometric Face Recognition: from classical statistics to future challenges", Wiley Interdisciplinary Reviews: Computational Statistics (WIREs), 5(4):288-308, July/August 2013.*

6. *S. O'Hara and B. Draper, "Using a Product Manifold Distance for Unsupervised Action Recognition", Image and Vision Computing 30(3):206-216, 2012 http://dx.doi.org/10.1016/j.imavis.2011.11.001*

7. *J. Phillips, R. Beveridge, B. Draper, G. Givens, A. O'Toole, D. Bolme, J. Dunlop, Y.M. Lui, H. Sahibzada, S. Weimer. "The Good, the Bad, and the Ugly Face Challenge Problem," Image and Vision Computing, 30(3):177-185, March 2012.*

8. J. Beveridge, B. Draper, J-M Chang, M. Kirby, H. Kley, C. Peterson. "Principal Angles Separate Subject Illumination Spaces in YDB and CMU-PIE", IEEE Transactions on Pattern Analysis and Machine Intelligence, to appear 2009.

9. K. Saitwal, A. Maciejewski, B. Roberts and B. Draper. "Using the Low Resolution Properties of Correlated Images to Improve the Computational Efficiency of Eigenspace Decomposition," IEEE Transactions on Image Processing, 15(8):2376-87, 2006.

10. B. Draper and A. Lionelle. "Evaluation of Selective Attention under Similarity Transformations," Vision and Image Understanding, 100:152-171, 2005.

11. B. Draper, D. Elliott, J. Hayes and K. Baek. "EM in High Dimensional Spaces", IEEE Transactions on Systems, Man and Cybernetics, 35(3):571-577, 2005.

12. D. Bolme, R. Beveridge, M. Teixeira and B. Draper. "The CSU Face Identification Evaluation System: Its Purpose, Features and Structure," Machine Vision and Applications, 16(2):128-138, 2005 .

13. B. Draper, K. Baek and J. Boody. "Implementing the Expert Object Recognition Pathway," Machine Vision and Applications, 16(1):27-32, 2004.

14. B. Draper, K. Baek, M.S. Bartlett and R. Beveridge. "Recognizing Faces with PCA and ICA", Computer Vision and Image Understanding, 91:115-137, 2003.

15. B. Draper, R. Beveridge, W. Böhm, C. Ross and M. Chawathe. "Accelerated Image Processing on FPGA's", IEEE Transactions on Image Processing, 12(12):1543-1551, 2003.

16. W. Najjar, W. Böhm, B. Draper, J. Hammes, R. Rinker, R. Beveridge, M. Chawathe, and C. Ross. "From Algorithms to Hardware – A High-Level Language Abstraction for Reconfigurable Computing," IEEE Computer, 36(8):63-69, 2003.

17. S. Buluswar and B. Draper. "Estimating Apparent Color in Outdoor Images", Computer Vision and Image Understanding, 85(2):71-99, 2002.

18. W. Böhm, J. Hammes, B. Draper, M. Chawathe, C. Ross, R. Rinker, and W. Najjar. "Mapping a Single Assignment Programming Language to Reconfigurable Systems," Supercomputing, 21:117-130, 2002.

19. B. Draper and R. Beveridge. "Teaching Image Computation: From Computer Graphics to Computer Vision," International Journal on Pattern Recognition and Artificial Intelligence, 15(5):823-831, 2001.

20. B. Draper, J. Bins, K. Baek. "ADORE: Adaptive Object Recognition", Videre, 1(4):86-99, 2000.

21. M. Marengoni, B. Draper, A. Hanson, and R. Sitaraman. ``Placing Observers to Cover a Polyhedral Terrain in Polynomial Time", Vision and Image Computing, 18(10):773-780, 2000.

22. S.D. Buluswar and B.A. Draper. "Color Machine Vision for Autonomous Vehicles", International Journal for Engineering Applications of Artificial Intelligence, 11:245-256, 1998.

23. B. Draper, A. Hanson and E. Riseman. "Knowledge-Directed Vision: Control, Learning and Integration," Proceedings of the IEEE, 84(11):1625-1637, 1996.

24. B. Draper, C. Brodley and P. Utgoff. "Goal-directed Classification Using Linear Machine Decision Trees," IEEE Trans. on Pattern Analysis and Machine Intelligence, 16(9):888-89, 1994.

25. B. Draper and R. Beveridge. "Response to `Performance Characterization in Computer Vision,'" Image Understanding, 60(3):262-263.

26. B. Draper, A. Hanson and E. Riseman. "Learning Blackboard-based Scheduling Algorithms for Computer Vision," International Journal of Pattern Recognition and Artificial Intelligence, 7(2):309-328, 1993.

27. B. Draper, R. Collins, J. Brolio, A. Hanson and E. Riseman. "The Schema System," International Journal of Computer Vision, 2:209-250, 1989. Reprinted in Computer Vision:

Advances and Applications, R. Kasturi and R. Jain (eds.), IEEE Computer Society Press, Los Alamitos, CA., 1991, pp. 433-471.

28. *J. Brolio, B. Draper, R. Beveridge and A. Hanson. "ISR: A Database for Symbolic Processing in Computer Vision," IEEE Computer, 22(12):22-30, 1989.*

Journal Articles (Popular)

29. *W. Böhm, R. Beveridge, B. Draper, C. Ross, M. Chawathe. "SA-C: Single Assignment C for FPGA Programming", Dr. Dobb's Journal, May, 2003, p. 60-64.*

Book Chapters

30. *T. Marrinan, R. Beveridge, B. Draper, M. Kirby and C. Peterson. "Flag Manifolds for the Characterization of Geometric Structure in Large Data Sets," in Numerical Mathematics and Advanced Applications: ENUMATH 2013, Springer-Verlag, available Dec. 2014.*

31. *R. Beveridge, B. Draper, G. Givens and W. Fisher. "Introduction to the Statistical Evaluation of Face Recognition Algorithms," in Face Processing, Advanced Modeling and Methods, W. Zhao and R. Chellappa (eds), Elsevier, 2005.*

32. *W. Yambor, B. Draper and R. Beveridge. "Analyzing PCA-based Face Recognition Algorithms: Eigenvector Selection and Distance Measures," in Empirical Evaluation Methods in Computer Vision, H. Christensen and J. Phillips (eds.), World Scientific Press, Singapore, 2002.*

33. *R. Beveridge, B. Draper, M. Stevens, A. Hanson and K. Siejko. "A Coregistration Approach to Multisensor Target Recognition with Extensions to Exploit Digital Elevation Map Data," in Reconnaissance, Surveillance, and Target Acquisition for the Unmanned Ground Vehicle, Oscar Firschein (ed.). Morgan Kaufmann, 1997, pp. 231-265.*

34. *B. Draper. "Learning Control Strategies for Object Recognition," in Symbolic Visual Learning, K. Ikeuchi and M. Veloso (eds.), Oxford University Press, New York, 1997, pp. 49-76.*

35. *B. Draper, A. Hanson and E. Riseman. "Integrating Visual Procedures for Mobile Perception," in Experimental Environments for Computer Vision and Image Processing, H.I. Christenson and J.L. Crowley (eds.), World Scientific Press, 1994. pp. 183-193.*

36. *B. Draper, R. Collins, J. Brolio, A. Hanson and E. Riseman. "Issues in the Development of a Blackboard-based Schema System for Image Understanding," in Blackboard Systems, R. Englemore and T. Morgan (eds.), Addison-Wesley, London, 1988. pp. 189-218.*

Conference and Workshop Articles[1]

37. *N. Krishnaswamy, P. Narayana, I. Wang, K. Rim, R. Bangar, D. Patil, G. Mulay, R. Beveridge, B. Draper and J. Pustejovsky. "Communicating and Acting: Understanding Gesture in Simulation Semantics", 12th International Conference on Computational Semantics, Montpellier, France, Sept. 19-22, 2017.*

38. *I. Wang, M. Ben-Fraj, P. Narayana, D. Patil, G. Mulay, R. Bangar, B. Draper, R. Beveridge and J. Ruiz. "EGGNOG: A continuous multi-modal data set of naturally occurring gestures with ground truth data", IEEE Conference on Automatic Face and Gesture Recognition (F&G), Washington DC, May 31-June2, 2017.*

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[1] Only peer-reviewed conferences and workshops are listed here. For a list of non-peer reviewed papers, see http://www.cs.colostate.edu/~draper/publications_workshops.html

39. I. Wang, P. Narayana, D. Patil, G. Mulay, R. Bangar, B. Draper, R. Beveridge and J. Ruiz. "Exploring the Use of Gesture in Collaborative Tasks", ACM CHI Extended Abstracts, Denver, CO, May 6-100, 2017.

40. M. Wigness, J. Rogers III, L. Navarro-Serment, A. Suppe, and B. Draper. Reducing Adaptation Latency for Multi-Concept Visual Perception in Outdoor Environments, International Conference on Intelligent Robots and Systems (IROS), Daejon, Korea, Oct. 9-14, 2016.

41. T. Marrinan, R. Beveridge, B. Draper, M. Kirby and C. Peterson. "Flag-based detection of weak gas signatures in long-wave infrared hyperspectral image sequences" SPIE9840, Algorithms and Technologues for Multispectral, Hyperspectral, and Ultraspectral Imagery XXII, Baltimore, MD, April 17, 2016.

42. M. Wigness, B. Draper and R. Beveridge. "Efficient Label Collection for Unlabeled Image Datasets," IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Boston, MA, June 8-10, 2015.

43. H. Zhang, R. Beveridge, Q. Mo, B. Draper and J. Phillips. "Randomized Intraclass-Distance Minimizing Binary Codes for Face Recognition," International Joint Conference on Biometrics (IJCB), Sept. 29 - Oct. 2, Clearwater, FL, 2014.

44. T. Marrinan, R. Beveridge, B. Draper, M. Kirby and C. Peterson. "Finding the Subspace Mean or Median to Fit Your Need", IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Columbus, OH, June 24-27, 2014.

45. M. Wigness, B. Draper and R. Beveridge. "Selectively Guiding Visual Concept Discovery", IEEE Winter Conference on Applications of Computer Vision (WACV), Steamboat Springs, CO, March 24-26, 2014.

46. R. Dutta, B. Draper and R. Beveridge. "Video Alignment to a Common Reference", IEEE Winter Conference on Applications of Computer Vision (WACV), Steamboat Springs, CO, March 24-26, 2014.

47. R. Beveridge, J. Phillips, D. Bolme, B. Draper, G. Givens, Y.M. Lui, N. Teli, H. Zhang, T. Scruggs, K. Bowyer, P. Flynn and S. Cheng. "The Challenge of Face Recognition from Digital Point-and-Shoot Cameras", Conference on Biometric Theory, Applications and Systems (BTAS), Washington D.C., Sept. 29 -Oct. 2, 2013.

48. J. Phillips, R. Beveridge, D. Bolme, B. Draper, G. Givens, Y.M. Lui, S. Cheng, N. Teli and H. Zhang. "On the Existence of Face Quality Measures", Conference on Biometric Theory, Applications and Systems (BTAS), Washington D.C., Sept. 29 -Oct. 2, 2013.

49. S. O'Hara and B. Draper, "Are You Using the Right Approximate Nearest Neighbor Algorithm?", IEEE Winter Conference on Applications of Computer Vision, Clearwater Beach, FL, Jan. 17-18, 2013.

50. Q. Mo and B. Draper, "Semi-Nonnegative Matrix Factorization for Motion Segmentation with Missing Data", European Conference on Computer Vision, Florence, Oct. 7-13, 2012.

51. S. O'Hara and B. Draper, "Scalable Action Recognition with a Subspace Forest", IEEE Conference on Computer Vision and Pattern Recognition, Providence, R.I., June 18-20, 2012.

52. Y.M. Lui, D. Bolme, J. Phillips, R. Beveridge and B. Draper. "Preliminary Studies on The Good, The Bad and The Ugly Face Recognition Challenge Problem", Computer Vision and Pattern Recognition Workshops, Providence, RI June 2012.

53. M.N. Teli, R. Beveridge, J. Phillips, G. Givens, B. Draper and D. Bolme. "Biometric Zoos: Theory and Experimental Evidence", International Joint Conference on Biometrics, Washington, D.C., Oct. 2011.

54. D. Bolme, R. Beveridge, B. Draper, J. Phillips and Y.M. Lui. "Automatically Searching for Optimal Parameter Settings Using a Genetic Algorithm", International Conference on Vision Systems, Sophia Antipolis, France, Sept. 2011, pp. 213-222.

55. S. O'Hara and B. Draper, "Unsupervised Learning of Micro-action Exemplars using a Product Manifold", IEEE International Conference on Advanced Video and Signal-based Surveillance, Klagenfurt, Austria, Aug 30-Sept. 2, 2011.

56. S. O'Hara, Y.M. Lui and B. Draper, "Unsupervised Learning of Human Expressions, Gestures, and Actions," IEEE Conference on Face and Gesture Recognition, Santa Barbara, CA, March 2011.
57. R. Beveridge, J. Phillips, G. Givens, B. Draper, M. Nayeem and D. Bolme, "When High-Quality Face Images Match Poorly," IEEE Conference on Face and Gesture Recognition, Santa Barbara, CA, March 2011.
58. J. Philips, R. Beveridge, B. Draper, G. Givens, A. O'Toole, D. Bolme, Y.M. Lui, J. Dunlop and S. Weimer, "An Introduction to the Good, the Bad, and the Ugly Face Recognition Challenge Problem," IEEE Conference on Face and Gesture Recognition, Santa Barbara, CA, March 2011.
59. D. Bolme, R. Beveridge, B. Draper, and Y.M. Lui. "Visual Object Tracking using Adaptive Correlation Filters", IEEE Conference on Computer Vision and Pattern Recognition, San Francisco, CA, June, 2010.
60. R. Beveridge, D. Bolme, B. Draper, G. Givens, Y.-M. Lui, and J. Phillips. "Quantifying How Lighting and Focus Affect Face Recognition Performance", Computer Vision and Pattern Recognition Workshops, San Francisco, June 2010.
61. D. Bolme, Y.M. Lui , B. Draper, R. Beveridge, "Simple Real-Time Human Detection using a Single Correlation Filter", 12th IEEE International Workshop on Performance Evaluation of Tracking and Surveillance, Salt Lake City, Utah, Dec. 2009.
62. D. Bolme, R. Beveridge and B. Draper. "FaceL: Facile Face Labeling", International Conference on Vision Systems, Liege, Belgium, Oct. 2009, p.21- 32.
63. T. Comer and B. Draper. "Interest Point Stability Prediction", International Conference on Vision Systems, Liege, Belgium, Oct. 2009, p. 315-324
64. Y.M. Lui, D. Bolme, B. Draper, R. Beveridge, G. Givens and J. Phillips. "A Meta-Analysis of Face Recognition Coavariates", IEEE Workshop on Biometrics Theory, Application, and Systems, Washington D.C., Sept. 30-Oct. 2, 2009.
65. D. Bolme, B. Draper and R. Beveridge. Average of Synthetic Exact Filters, IEEE Conference on Computer Vision and Pattern Recognition, Miami Beach, FL, June 20-25, 2009.
66. D. Moore, J. Stevens, S. Lundberg and B. Draper. "Top-down Image Segmentation Using Congealing and Graph-cut", IEEE International Conference on Pattern Recognition, Tampa, FL, Dec. 8-11, 2008.
67. Y.-M. Liu, R. Beveridge, B. Draper and M. Kirby. "Image-set matching using a geodesic distance and cohort normalization", IEEE International Conference on Face and Gesture Recognition, Amsterdam, Sept. 17-19, 2008
68. R. Beveridge, G. Givens, J. Phillips, B. Draper and Y.-M. Liu. "Focus on Quality: Predicting FRVT 2006 Performance," IEEE International Conference on Face and Gesture Recognition, Amsterdam, Sept. 17-19, 2008.
69. Bruce A. Draper. "A Biomimetic Architecture", International Conference on Vision Systems, Bielefeld, Germany, March 21-24, 2007.
70. J-M Chang, M. Kirby, H. Kley, H. Kley, C. Peterson, B. Draper, and R. Beveridge. "Recognition of digital images of the human face at ultra low resolution via illumination spaces" in 8th Asian Conference on Computer Vision. 2007. Tokyo: IEEE CS Press.
71. L.J Troup, M.A. Pitts, B.A. Draper and E.K. Catellier. "High Band Pass Filters of Face Images and their Effect on the N170 Event Related Potential" in Vision Sciences Society. 2007. Sarasota, FL: Journal of Vision 6(6).
72. J-M Chang, M. Kirby, H. Kley, C. Peterson, R. Beveridge and B. Draper. "Examples of Set-to-set Image Classification," Seventh International Conference on Mathematics in Signal Processing, The Royal Agricultural College, Cirencester, England. Dec. 2006, pp. 102-105. (Abstract reviewed)
73. J-M Chang, R. Beveridge, B. Draper, M. Kirby, H. Kley and C. Peterson. "Illumination Face Spaces Are Idiosyncratic," in Proceedings of the 2006 International Conference on Image

Processing, Computer Vision, & Pattern Recognition, Las Vegas, Nevada, USA, June 26-29, 2006, Volume 2, pp. 390-396

74. *G. Givens, R. Beveridge, B. Draper and D. Bolme. "Using a Generalized Linear Mixed Model to Study the Configuration Space of a PCA+LDA Human Face Recognition Algorithm," Third International Workshop on Articulated Motion and Deformable Objects, Palma de Mallorca, Spain, Sept. 22-24, 2004. p. 1-11.*

75. *G. Givens, R. Beveridge, B. Draper, P.Grother and J. Phillips. "How Features of the Human Face Affect Recognition: A Statistical Comparison of Three Face Recognition Algorithms," IEEE Conference on Computer Vision and Pattern Recognition, Washington, D.C., June 27-July2, 2004. p. 381-388 (Vol. 2).*

76. *B. Draper, C. Kaito and J. Bins. "Iterative Relief", Workshop on Learning in Computer Vision and Pattern Recognition, Madison, WI, June 22, 2003.*

77. *B. Draper, K. Baek and J. Boody. "Implementing the Expert Object Recognition Pathway," International Conference on Vision Systems, Graz, Austria, April 1-3, 2003. p. 1-11.*

78. *D. Bolme, R. Beveridge, M. Teixeira and B. Draper. "The CSU Face Identification Evaluation System: Its Purpose, Features and Structure," International Conference on Vision Systems, Graz, Austria, April 1-3, 2003. p. 304-313.*

79. *B. Draper and A. Lionelle. "Evaluation of Selective Attention under Similarity Transforms," Workshop on Attention and Performance in Computer Vision, Graz, Austria, April 3, 2003. p. 31-38.*

80. *D. Bolme and B. Draper. "Interpreting LOC Cell Responses," IEEE International Workshop on Biologically Motivated Computer Vision, Tübingen, Germany, Nov. 22-24, 2002, pp. 294-300.*

81. *B. Draper, R. Beveridge, W. Böhm, C. Ross and M. Chawathe. "Implementing Image Applications on FPGAs," International Conference on Pattern Recognition, Quebec City, Aug. 11-15, 2002.*

82. *K. Baek and B. Draper. "Factor Analysis for Background Suppression," International Conference on Pattern Recognition, Quebec City, Aug. 11-15, 2002.*

83. *B. Draper, K. Baek and J. Boody. "A Biologically Plausible Approach to Cat and Dog Discrimination," Joint AIPR International Workshops on Structural, Syntactic and Statistical Pattern Recognition, Windsor, Ont. Aug. 6-9, 2002. p.779-788.*

84. *W. Böhm, R. Beveridge, B. Draper, C. Ross, M. Chawathe and W. Najjar. "Compiling ATR Probing Codes for Execution on FPGA Hardware," IEEE Symposium on Field Programmable Custom Computing Machines, Napa Valley, CA, April 21-24, 2002.*

85. *J. Bins and B. Draper. "Evaluating Feature Relevance: Reducing Bias is Relief," Joint Conference on Information Sciences, Durham, NC, March 8-14, 2002. pp 757-760.*

86. *K. Baek, B. Draper, R. Beveridge, K. She. "PCA vs ICA: A comparison on the FERET data set," Joint Conference on Information Sciences, Durham, NC, March 8-14, 2002. pp. 824-837.*

87. *R. Beveridge, K. She, B. Draper, G. Givens. "A Nonparametric Statistical Comparison of Principal Component and Linear Discriminant Subspaces for Face Recognition," IEEE Conference on Computer Vision and Pattern Recognition, Kauai, HI, Dec. 11-13, 2001. Pp. I:535-542.*

88. *J. Hammes, W. Böhm, C. Ross, M. Chawathe, B. Draper, W. Najjar. "High Performance Image Processing on FPGAs", Los Alamos Computer Science Institute Symposium, Sante Fe, NM, Oct. 15-18, 2001. Proceedings on CD.J. Bins and B. Draper. "Feature Selection from Huge Feature Sets", International Conference on Computer Vision, Vancouver, July 9-12, 2001. Vol 2, p. 159-165.*

89. *B. Draper, U. Ahlrichs and D. Paulus. "Adapting Object Recognition Across Domains: A Demonstration," International Conference on Vision Systems, Vancouver, July 7-8, 2001. p. 256-267.*

90. B. Draper, W. Bohm, J. Hammes, W. Najjar, R. Beveridge, C. Ross, M. Chawathe, M. Desai, J. Bins. "Compiling SA-C Programs to FPGAs: Performance Results," International Conference on Vision Systems, Vancouver, July 7-8, 2001. p. 220-235.

91. W. Bohm, B. Draper, W. Najjar, J. Hammes, R. Rinker, M. Chawathe and C. Ross. "One-step Compilation of Image Processing Applications to FPGAs," IEEE Symposium on Field-programmable Custom Computing Machines, Rohnert Park, CA, April 30 - May 2, 2001.

92. J. Hammes, W. Bohm, C. Ross, M. Chawathe, B. Draper, R. Rinker, and W. Najjar. "Loop Fusion and Temporal Common Subexpression Elimination in Window-based Loops," IPDPS 8th Reconfigurable Architectures Workshop, San Francisco, CA, April 27, 2001.

93. M. Stevens, B. Draper & R. Beveridge. "Pose from Color," International Conference on Pattern Recognition, Barcelona, Sept. 3-8, 2000. pp. 236-244.

94. R. Rinker, J. Hammes, W. Najjar, W. Bohm & B. Draper. "Compiling Image Processing Applications to Reconfigurable Hardware," IEEE International Conference on Application-specific Systems, Architectures, and Processors, Boston, July 10-12, 2000. pp. 56-65.

95. W. Yambor, B. Draper & R. Beveridge. "Analysis of PCA-based Face Recognition Algorithms: Eigenvector Selection and Distance Measures," Second Workshop on Empirical Evaluation Methods in Computer Vision, Dublin, July 1, 2000.

96. B. Draper, W. Najjar, W. Böhm, J. Hammes, R. Rinker, C. Ross, M. Chawathe, & J. Bins. "Compiling and Optimizing Image Processing Algorithms for FPGA's," IEEE Workshop on Computer Architectures for Machine Perception (CAMP), Padova, Italy, Sept. 11-13, 2000.

97. J. Hammes, R. Rinker, W. Bohm, W. Najjar and B. Draper. "A High Level, Algorithmic Programming Language and Compiler for Reconfigurable Systems," Second International Workshop on Engineering of Reconfigurable Hardware/Software Objects (ENREGLE 2000), June 26- 29, 2000, Las Vegas.

98. C. Anderson, B. Draper and D. Peterson. "Behavioral Cloning of Student Pilots with Modular Neural Networks,", International Conference on Machine Learning, Stanford, CA., June 29-July 2, 2000. p. 25-32

99. L. Forbes & B. Draper. "Inconsistencies in Edge Detector Evaluation," IEEE Conference on Computer Vision and Pattern Recognition, Hilton Head, S.C., June 13-15, 2000. Vol 2, p. 398-404.

100. B. Draper & K. Baek. "Unsupervised Learning of Biologically Plausible Object Recognition Strategies," IEEE International Workshop on Biologically Motivated Computer Vision, Seoul, May 15-17, 2000. p. 238-247

101. J. Hammes, B. Rinker, W. Bohm, W. Najjar, B. Draper, R. Beveridge. "Cameron: High Level Language Compilation for Reconfigurable Systems," Conference on Parallel Architectures and Compilation Techniques, Newport Beach, CA, Oct. 12-16, 1999.

102. B. Draper, J. Bins and K. Baek. "ADORE: Adaptive Object Recognition", International Conference on Vision Systems, Las Palmas de Gran Canaria, Spain, Jan 13-15, 1999, pp. 522-537

103. J. Hammes, B. Draper and W. Böhm. "Sassy: A Language and Optimizing Compiler for Image Processing on Reconfigurable Computing Systems", International Conference on Vision Systems, Las Palmas de Gran Canaria, Spain, Jan 13-15, 1999, pp. 83-97.

104. B. Draper and K. Baek. "Bagging in Computer Vision", IEEE Conference on Computer Vision and Pattern Recognition, Santa Barbara CA, June 23-25, 1998, pp. 144-149.

105. S. Buluswar and B. Draper. "Color Recognition in Outdoor Images", International Conference on Computer Vision, Bombay, Jan. 4-7, 1998, pp. 171-177.

106. S. Buluswar and B. Draper. "Learning Object Color: ATR in Color Images," 8th British Machine Vision Conference, Essex, U.K., Sept. 8-11, 1997.

107. M. Das, E. Riseman, and B. Draper. "FOCUS: Searching for Multi-colored Objects in a Diverse Database", IEEE Conference on Computer Vision and Pattern Recognition, San Juan, P.R., June 17-19, 1997, pp. 756-761.

108. M. Marengoni, B. Draper, A. Hanson, and R. Sitaraman. "Placing Observers to Cover a Polyhedral Terrain in Polynomial Time", IEEE Workshop on Applications of Computer Vision, Sarasota, FL, Dec. 2-4, 1996.

109. B. Draper. "Object Recognition as a Markov Decision Process," International Conference on Pattern Recognition, Vienna, Austria, Aug. 25-29, 1996, Vol. IV, pp. 95-99.

110. G. Kutlu, B. Draper, E. Moss and E. Riseman. "Support Tools for Visual Information Management," Fifth Annual Symposium on Document Analysis and Information Retrieval, Las Vegas, NV, April 15-17, 1996.

111. S. Ravela, B. Draper, J. Lim and R. Weiss. "Adaptive Tracking and Model Registration across Distinct Aspects," International Conference on Intelligent Robots and Systems, Pittsburgh, PA, Aug. 1995 Vol 1, pp. 174-180.

112. B. Draper, G. Kutlu, E. Riseman and A. Hanson. "ISR3: Communication and Data Storage for an Unmanned Ground Vehicle," International Conference on Pattern Recognition, Jerusalem, Oct. 1994. Vol I, pp. 836-838.

113. B. Rochwerger, C. Fennema, B. Draper, A. Hanson and E. Riseman. "An Architecture for Reactive Behavior," International Conference on Pattern Recognition, Jerusalem, Oct. 1994. Vol IV, pp. 304-309.

114. B. Rochwerger, C. Fennema, B. Draper, A. Hanson and E. Riseman. "Executing Reactive Behavior for Autonomous Navigation," IEEE Conference on Computer Vision and Pattern Recognition, Seattle, WA, June 1994, pp. 838-841.

115. B. Draper and A. Hanson. "An Example of Learning in Knowledge-directed Vision", Scandinavian Conference on Image Analysis, Aalborg, DK., August 1991. pp. 189-201. Reprinted in Theory and Applications of Image Analysis, P. Johansen and S. Olsen (eds.), World Scientific Publishing Co., Singapore, 1992. pp. 237-252.

116. B. Draper and E. Riseman. "Learning 3D Recognition Strategies," Third International Conference on Computer Vision, Osaka, Japan, Dec. 1990. pp. 320-324.

117. B. Draper, J. Brolio, R. Collins, A. Hanson and E. Riseman. "Image Interpretation by Distributed Cooperative Processes," IEEE Conference on Computer Vision and Pattern Recognition, Ann Arbor, MI, June 1988, pp. 129-135.

Academic (External) Service

Chair, International Association for Pattern Recognition (IAPR) Technical Committee on Computer Vision and Image Understanding (TC4), Fall 2002 - 2004.

Steering Committee Member, International Conference on Vision Systems, 2007-2017..

Member, International Association for Pattern Recognition (IAPR) Technical Committee on Education (TC8), Fall 2002-2007

Associate Editor, IEEE Transactions on Systems, Man & Cybernetics (Electronic Edition), 1999-2000.

Honary Co-chair, International Conference on Vision Systems, Shenzhen, China, July 2017.

Senior Member, Program Committee, AAAI National Conference on Artificial Intelligence, San Francisco, CA,, Feb 2017.

Member, Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, Honolulu, HI. July 2017

Member, Program Committee, European Conference on Computer Vision, Amsterdam, Oct. 2016.

Member, Program Committee, International Conference on Biometrics, Halmsted, Sweden, June 2016.

Member, Program Committee, Asian Conference on Computer Vision, Taipei, Taiwon, Nov. 2016.

Member, Program Committee, International Conference on Pattern Recognition, Cancun, Mexico, Dec. 2016.

Member, Program Committee, British Machine Vision Conference, York, Engand, Sept. 2016.

Area Chair, IEEE Winter Conference on Applications of Computer Vision, Waikoloa Beach, HI, 2015

Member, Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, Las Vegas, June 2016

Senior Member, Program Committee, AAAI National Conference on Artificial Intelligence, Phoenix, AZ, Jan 2015.

Member, Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, Boston, June 2015.

Member, Program Committee, AAAI National Conference on Artificial Intelligence, Austin, TX, Jan 2015.

Member, Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, Columbus, OH, June 2014

Member, Program Committee, AAAI National Conference on Artificial Intelligence, Quebec City, July 2014.

Member, Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, Portland, OR, June 2013

Member, Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, Providence, RI, June 2012

Member, Program Committee, 7th International Conference on Vision Systems, Liege, Belgium, October 2009.

Member, Program Committee, 6th Interational Conference on Vision Systems, Santorini, Greece, May 12-15, 2008.

Member, Program Committee, 5th International Conference on Vision Systems, Bielefeld, Germany, March 21-24, 2007.

Program Committee Chair, 4th International Conference on Vision Systems, New York, NY, Jan 5-7, 2006.

General Co-chair, 3rd International Workshop on Articulated Motion and Deformable Objects, Palma de Mallorca, Spain, Sept. 22-24, 2004.

Program Co-chair, IEEE Workshop on Learning in Computer Vision and Pattern Recognition, Madison, WI, June 22nd, 2003 (in conjunction with CVPR 2003).

Member, Program Committee, International Conference on Vision Systems, Graz, Austria, April 1-3, 2003.

Member, Program Committee, XI International Conference on Computing, Mexico City, Nov. 25-29, 2002.

Member, Program Committee, Workshop on Vision, Modeling, and Visualization, Erlangen, Germany, Nov. 20-22, 2002.

Member, Program Committee, International Conference on Pattern Recognition, Quebec City, Aug. 11-15, 2002.

Area Chair, International Conference on Machine Learning, Sydney, July 8-12, 2002.

Member, Program Committee, Workshop on Vision, Modeling, and Visualization, Stuttgart, Nov. 2001.

Member, Program Committee, International Conference on Vision Systems, Vancouver, July 7-8, 2001.

Area Chair, International Conference on Machine Learning, Williamstown, MA, June 28-July 1, 2001.

General co-chair, IEEE Conference on Computer Vision and Pattern Recognition, Ft. Collins, CO., June 23-25 1999.

Area Chair, International Conference on Machine Learning, Stanford, CA., June 29-July 2, 2000.

Program Committee, International Conference on Pattern Recognition, Barcelona, Sept. 3-8, 2000

Program committee, Machine Learning in Computer Vision Workshop, held in conjunction with the Machine Learning Conference in Bled, Slovenia, June 30, 1999.

Program committee, International Conference on Vision Systems, Las Palmas de Gran Canaria, Spain, January 13-15, 1999.

Program committee, International Conference on Pattern Recognition, Vienna, August 25-30, 1996.

Organizing committee, Workshop on Machine Learning and Computer Vision, AAAI Fall Symposium Series, Raleigh, NC, October 1993.

Reviewer for Videre, Machine Vision and Applications, IEEE Transactions on Pattern Analysis and Machine Intelligence, and Image Understanding.

Ph.D. Students (completed)

Maggie Wigness. 2015. Hierarchical Cluster Guided Labeling: Efficient Label Collection for Visual Classification. Current position: post-doctoral scientist, Army Research Lab, Adelphi, MD.

Hessah Alsaaran, 2015. Unsupervised Video Segmentation Using Temporal Coherence of Motion. Current position: faculty, King Saud University, Riyadh, KSA.

Steve O'Hara, 2013. Scalable Learning of Actions from Unlabeled Videos. Current position: Senior Scientist, HERE inc..

Kyungim Baek, 2002. An Algorithmic Implementation of Expert Object Recognition in the Ventral Visual Pathway. Current position: Assistant Professor, Department of Computer Science, University of Hawaii.

Shashi Buluswar, 2001 (Univ. of Massachusetts). Color-based Models for Outdoor Machine Vision. Current position: Lecturer, Haas School of Business (Univ. of California, Berkeley).

José Bins, Filho, 2000. Feature Selection from Huge Feature Sets in the Context of Computer Vision. Current position: Prof., Universudade Federal do Pampa (Unipampa), Bage, Rio Grande do Sul, Brazil.

I co-direct the computer vision lab with Ross Beveridge, and as such have formally or informally co-advised the following Ph.D. students who worked in the lab: Mark Stevens (1998), Lance Forbes (2000), Jason Denton (2002), Charles Ross (2006), Yui Man Lui (2010), David Bolme (2011), Mohammad Nayeem Teli (2013).

Funded Projects

2015-2020	*(PI) Communication through Gestures, Expression and Shared Perception, DARPA, $2,128,922.*
2010-2016	*(PI) Visual Intelligence through Latent Geometry and Selective Guidance, DARPA (extended through 2016 by ARL), $955,000*
2012-2014	*(co-PI) Advanced Statistical Biometric Analysis, including Video and Soft Biometrics, TSWG, $510,873*
2011-2012	*(co-PI) Face Recognition Evaluation and Baseline Algorithm Development, IARPA, $249,088*
2010-2012	*(co-PI) Advanced Statistical Analysis of Biometric Challenges and Evaluations, TSWG, $451,663*
2008-2009	*(co-PI) Enhanced Biometrics Fusion: Multiple Biometrics Grand Challenge, TSWG through U.S. Army, $433,587*
2007	*(co-PI) Transfer EBGM to #VR Security, Inc. 3VR Security Inc., $56,104*
2006-2007	*(PI) Computer Simulation Model of a Biological Vision System, Harvard University (subcontract from DARPA), $21,913.*
2005-2007	*(co-PI) Understanding Image-feature and Decision-procedure Choice for Human Face Detection, National Science Foundation (NSF), $160,000.*
2004-2007	*(co-PI) Computing Projections of High-dimensional Data using Algebro-geometric Tools, National Science Foundation (NSF), $594,423.*
2004-2007	*(co-PI) Covariate Analysis of Face Recognition Algorithms, with R. Beveridge, TSWG through U.S. Army, $333,070.*
2003-2005	*A Three-dimensional in-vivo system for visualizing gene expression, with June Medford (PI) and Ross Beveridge, National Science Foundation (NSF), $99,000.*
2001-2003	*(PI) Modeling the Ventral Visual Pathway: A Biomimetic Approach to Object Recognition, National Image and Mapping Agency (NIMA), $224,545.*
2000-2003	*(co-PI) Statistical Inference Methods for Understanding Human Identification Systems, with R. Beveridge, Defense Advanced Research Projects Agency (DARPA), $442,482*
2001-2002	*(co-PI) Adaptive Intelligent Methods for Distributed Learning and Data Mining, with D. Whitley, TRW, $147,414*
1998-2001	*(co-PI) Optimized Compilation of Visual Programs for Image Processing on Adaptive Computing Systems, with W. Najjar, W. Bohm and R. Beveridge, Defense Advanced Research Projects Agency (DARPA), $1,466,700*
1997-1998	*(PI) Populating Geospatial Databases via Markov Decision Processes, Defense Advanced Research Projects Agency (DARPA), $171,875*
1997-1998	*(co-PI) Modeling Student Pilots for Intelligent Training, with C. Anderson, Colorado Advanced Software Institute (CASI), $34,048.*