Christopher F. Barnes

Associate Professor
School of Electrical and Computer Engineering
Georgia Institute of Technology
January 2011

I. Earned Degrees

Ph.D.	1989	Brigham Young University Electrical Engineering: Digital Signal Processing
M.S.	1987	Brigham Young University Electrical Engineering: Communication Theory
B.S.	1985	Brigham Young University Electrical Engineering: Electronics

II. Employment

Associate Professor	Georgia Institute of Technology	2002 – Present
Adjunct Principle Research Engineer	Georgia Tech Research Institute	2007 – Present
Director (interim) of Administration & Finance	Georgia Tech Savannah Campus	2009 (7 months)
Adjunct Professor	Georgia Institute of Technology	1990 – 1996
Founder & President	iMaxus Inc. (Micromine, Inc.)	1998 – Present
Principal Research Engineer	Georgia Tech Research Institute	1999 – 2002
Senior Research Engineer	Georgia Tech Research Institute	1994 – 1999
Research Engineer II	Georgia Tech Research Institute	1989 – 1994
Product Design Engineer	Texas Instruments	1987
Research Assistant	Brigham Young University	1987 – 1989
Instructor	Brigham Young University	1987 – 1989

III. Teaching

A. Individual Student Guidance

1. Post Docs

1. Yeongseon Lee, 2009-2010, video and image driven data mining software engineering.

2. Ph.D. Students

1. Cihan Bayindir, 2010, co-advising with Dr. David Frost, not yet passed preliminary exam: spring 2010.
2. Teresa Sanders, 2009-2010, passed PhD preliminary exam, “Bioinformatics of dynamic cellular imagery, expected proposal exam: spring 2011.

3. Salman Muhammad Aslam, 2007-present, passed PhD preliminary exam – Spring 2006, “Video driven data mining,” expected graduation data: fall 2010.

4. Abdul Khan, 2003–2004, passed PhD preliminary exam - fall 2002, on academic leave for mandatory recall to Pakistan military service.

5. Jehanzeb Burki, 2004–present, passed PhD preliminary exam - fall 2003, “Circular synthetic aperture radar,” degree granted: fall 2007.

6. Rafi Mohammed, 2004–2008, passed PhD preliminary exam - spring 2005.

7. Syed Irteza Ali Khan, 2006–present, passed PhD preliminary exam - fall 2006, “Geospatial object based image analysis,” expected proposal exam: fall 2009.

8. Jesong Yoo (Civil & Environmental Engineering student), 2003–present, “Estimation of breaking wave celerity from nearshore video imagery and its adjustment across the breaker points for a nonlinear depth inversion,” provided funding and co-advised with Prof. Hermann Fritz, Fall 2007.

9. Mahdi Yahya Zaidan, 1992-1995, graduated 1995, “Tree structured trellis codes,” co-advised with Prof. Stephen B. Wicker.

10. Faouzi Kossentini, 1992-1995, graduated 1995, “Variable rate residual vector quantization,” co-advised with Prof. Mark J. T. Smith.

3. M.S. Students

1. Jehanzeb Burki, 2004– 2005, first ECE Master student (non-thesis) graduated from Georgia Tech Savannah.

4. Undergraduate Students

2. Arnold Moore, “FLIR video data compression,” co-op undergraduate student, Clark Atlanta University, 1993.

3. Theresa Schlitt, “Mammogram pattern recognition,” co-op undergraduate student, Georgia Tech, 1995.

4. Precilla Vannashege, “Mammogram data mining,” Georgia Tech Savannah undergraduate student, 2004.

B. Other Teaching Activities

1. New Course Development

- GTS 2001: GTS-AASU Engineering Alliance Sophomore Seminar – first offering spring 2010. This course is last in a seminar series for students entering GT curriculum in the next fall semester, and who have completed their Engineering Alliance studies at AASU in the spring semester.

- *ECE 8873: Radar Imaging:* New graduate level course – approved spring 2007; first offering fall 2007. This course is an in depth study of Fourier-based inversion algorithms for synthetic aperture radar. Included in the new course material for Radar Imaging is a

novel SAR software package developed by Prof. Barnes that generates phase map presentations based on generalized Fresnel zone plates. This software enables visualization of complicated signal phase modulations and enhances the Georgia Tech learning experience for Radar Imaging students.

- *ECE Synthetic Aperture Imaging:* New special topics course – summer 2003, spring 2005 and spring 2006.

2. Continuing Education

- *Synthetic Aperture Radar Image Formation Processing* (offered twice annually, 2004-2009): Prof. Barnes continues to teach these Continuing Education courses twice annually (35 hours of lecture) on synthetic aperture radar image formation processing. Taught on site in Bangalore, India – 2009.

- *Fundamentals of Synthetic Aperture Radar* (2003-2004): Prof. Barnes developed and taught Continuing Education lectures (3 hours of lecture) on the topics of SAR applications and SAR image interpretation for the short course offered and managed by Dr. Mark A. Richards.

- *Synthetic Aperture Radar and Sonar* (1997-2002): Prof. Barnes co-developed a Continuing Education course with Dr. Mark A. Richards (Barnes' portion of the lectures: 12 hours) on synthetic aperture imaging applied to both radar and sonar systems.

- *Principles of Modern Radar* (1994-2002): Prof. Barnes taught introductory Continuing Education course (4 hours of lecture) on Synthetic Aperture Radar in the Principles of Modern Radar short course.

- *Radar Signal Processing* (1996-2002): Prof. Barnes taught mid-level Continuing Education course (8 hours of lecture) on Synthetic Aperture Radar in the Radar Signal Processing course.

3. New Teaching Methods Development

- Developed "two-dimensional radar signal phase-map" visualization tool and supporting software application (programmed in C++ for Windows) to teach synthetic aperture imaging techniques, this software is used extensively in the new graduate Radar Imaging course, and related Professional Continuing Education courses.

IV. Scholarly Accomplishments

B. Refereed Publications

1. Refereed Journal Publications

1. Barnes, C. F. and Frost, R. L., "Residual vector quantizers with jointly optimized codebooks," *Advances in Electronics and Electron Physics,* volume 84, pages 1-59, Academic Press, 1992.

2. Barnes, C. F. and Frost, R. L., "Vector quantizers with direct sum codebooks," *IEEE Transactions on Information Theory,* volume 39, number 2, pages 565-580, March 1993.

3. Barnes, C. F., “Tree structured signal space codes,” *DIMACS Series in Discrete Mathematics and Theoretical Computer Science*, volume 14, pages 33-53, American Mathematical Society, 1993.

4. Kossentini, F., Smith, M.J.T. and Barnes, C.F., “Finite-state residual vector quantization,” *Journal of Visual Communications and Image Representation,* volume 5, number 1, pages 75-78, January 1994.

5. Kossentini, F., Smith, M.J.T. and Barnes, C.F., “Image coding using entropy-constrained residual vector quantization,” *IEEE Transactions on Image Processing,* volume 4, number 10, pages 1349-1357, October 1995.

6. Kossentini, F., Smith, M.J.T. and Barnes, C.F., “Necessary conditions for the optimality of variable rate residual vector quantization,” *IEEE Transactions on Information Theory,* volume 41, number 6, part 2, pages 1903-1914, November 1995.

7. Barnes, C.F., Rizvi, S.A. and Nasrabadi, N.M., “Advances in residual vector quantization: a review,” invited paper, *IEEE Transactions on Image Processing,* volume 5, number 2, pages 226-262, February 1996.

8. Zaidan, M.Y., Barnes, C.F. and Wicker, S.B., “Use of sigma-trees as constellations in trellis-coded modulation,” *IEEE Transactions on Information Theory,* volume 43, number 6, pages 2005-2012, November 1997.

9. Barnes, C.F. and Burki, J., “Late-season rural land-cover estimation with polarmetric-SAR intensity pixel blocks and sigma-tree structured near neighbor classifiers,” *IEEE Transactions on Geoscience and Remote Sensing,* volume 44, number 9, pages 2384-2392, September 2006.

10. Mohammed, R. and Barnes, C. F., “Vector quantization in SPIHT image codec,” *Lecture Notes in Computer Science: Advances in Image and Video Technology,* volume 4319, pages 742-750, Springer, 2006.

11. Barnes, C.F., Fritz, H., and Yoo, J., “Hurricane disaster assessments with image driven data mining in high resolution satellite imagery,” *IEEE Transactions on Geoscience and Remote Sensing: Special Issue on Remote Sensing for Major Disaster Prevention, Monitoring and Assessment,* part 1 of 2, volume 45, number 6, pages 1631-1640, June 2007.

12. Barnes, C.F., “Image driven data mining for image content segmentation, classification and attribution,” *IEEE Transactions on Geoscience and Remote Sensing,* volume 45, number 9, pages 2964-2978, September 2007.

13. Burki, J. and Barnes, C.F, “Slant plane CSAR processing using Householder transform,” *IEEE Transactions on Image Processing,* volume 17, number 10, pages 1900-1907, October 2008.

14. Yoo, J., Fritz, H. M., Haas, K. A., Work, P. A. and Barnes, C. F., “Estimation of breaking wave celerity from oblique near shore video,” *The Journal of Waterway, Port, Coastal and Ocean Engineering,* (submitted 26 August 2009).

15. Yoo, J., Fritz, H. M., Haas, K. A., Work, P. A. and Barnes, C. F., "Depth inversion in the surf zone with inclusion of wave nonlinearity using video-derived celerity," *ASCE's Journal of Waterway, Port, Coastal and Ocean Engineering,* March/April 2011.

16. Barnes, C.F., "Volumetric-synthetic aperture radar," *IEEE Transactions on Geosciences and Remote Sensing,* submitted February 2010 – under revision.

2. Refereed Conference Publications

1. Budge, S.E., Barnes, C.F., Talbot, L.M., Chabries, D.M. and Christiansen, R.W., "Image coding for data compression using a human visual model," *SPIE/SPSE Symposium on Electronic Imaging: Advanced Devices and Systems,* volume 1077, pages 164-177, Los Angeles, CA, January 1989.

2. Barnes, C.F. and Frost, R.L., "Necessary conditions for the optimality of residual vector quantizers," *IEEE International Symposium on Information Theory,* page 34, San Diego, CA, January 14-19, 1990.

3. Barnes, C.F., "Two-dimensional signal constellations for nonlinear coset codes based on multistage codes," *Proceedings of the Conference on Information Sciences and Systems,* pages 129-138, Johns Hopkins University, Baltimore, MA, March 20-22, 1991.

4. Kossentini, F., Smith, M.J.T. and Barnes, C.F., "Residual VQ with state prediction: a new method for image coding," *SPIE/SPSE Symposium on Electronic Imaging: Science and Technology,* volume 1452, pages 383-394, San Jose, CA, February 24 – March 1, 1991.

5. Frost, R.L., Barnes, C.F. and Xu, F., "On the design and performance of residual quantizers," *Proceedings of the Data Compression Conference,* pages 129-138, Snowbird, UT, April 8-10, 1991.

6. Kossentini, F., Smith, M.J.T. and Barnes, C.F., "A perspective view of finite state binary residual VQ," *Proceedings of the International Symposium on Circuits and Systems,* volume 1, pages 300-303, Singapore, June 11-14, 1991.

7. Kossentini, F., Smith, M.J.T. and Barnes, C.F., "Large block RVQ with multipath searching," *IEEE International Symposium on Circuits and Systems,* volume 5, pages 2276-2279, San Diego, CA, January 20-21, 1992.

8. Barnes, C.F., "Direct sum signal constellations for coded modulation," *Proceedings of the Conference on Information Sciences and Systems,* pages 300-306, Princeton University, NJ, March 18-20, 1992.

9. Kossentini, F., Smith, M.J.T. and Barnes, C.F., "Image coding with variable rate RVQ," *Proceedings of the International Conference on Acoustics, Speech, and Signal Processing,* volume III, pages 369-372, San Francisco, CA, March 23-26, 1992.

10. Barnes, C.F. and Holder, E.J., "Classified variable rate residual vector quantization applied to image subband coding," *Proceedings of the Data Compression Conference,* pages 272-281, Snowbird, UT, March 30 – April 3, 1993.

11. Kossentini, F., Smith, M.J.T. and Barnes, C.F., “Entropy-constrained residual vector quantization,” *Proceedings of the International Conference on Acoustics, Speech, and Signal Processing,* volume V, pages 598-601, Minneapolis, MN, April 27-30, 1993.

12. Nathanson, F., Cassady, W., Barnes, C., Tuley, M., Williamson, F. and Moore, L., “Airborne clutter measurements,” *Proceedings of the National Radar Conference,* pages 60-65, Boston, MA, April 20-22, 1993.

13. Barnes, C.F. and Sjoberg, E.S, “A comparative study of JPEG and residual VQ compression of radar imagery,” *Proceedings of the National Telesystems Conference: Commercial Applications with Dual-Use Technology,* pages 203-207, Atlanta, GA, June 16-17, 1993.

14. Sjoberg, E.S. and Barnes, C.F., “Precision approach radar (PAR) remote operation feasibility study,” *Proceedings of the National Telesystems Conference: Commercial Applications with Dual-Use Technology,* pages 197-201, Atlanta, GA, June 16-17, 1993.

15. Barnes, C.F and Holder, E.J., “Successive approximation vector quantization with generalized decoding for wavelet transform image coding,” invited paper to *Proceedings of the Twenty-Seventh Annual Asilomar Conference on Signals, Systems, and Computers,* volume 1, pages 533-537, Pacific Grove, CA, November 1-3, 1993.

16. Barnes, C.F., “A new multiple path search technique for residual vector quantizers,” *Proceedings of the Data Compression Conference,* pages 42-51, Snowbird, UT, March 29-31, 1994.

17. Barnes, C.F., “Vector quantization target identification,” invited paper to *Proceedings of the 4th Annual 1994 IEEE Dual-Use Technologies & Application Conference: Emerging Technologies-Transitioning Challenge to Commercial Applications,* Utica/Rome, NY, May 23-26, 1994.

18. Barnes, C.F., Goldstein, J.S., Ingram, M.A. and Holder, E.J., “Stochastic successive approximation quantization of image subbands,” *NJIT Symposium: Applications of Subbands and Wavelets,* Newark, NJ, March 18, 1994.

19. Adeyemi, H.O. and Barnes, C.F., “Initial investigations into joint source/channel video coding for nonstationary channels with adaptable residual vector quantization,” *Proceedings of the Twenty-Eighth Annual Asilomar Conference on Signals, Systems, and Computers,* pages 482-486, Pacific Grove, CA, November 1-3,1994.

20. Barnes, C.F., “Adaptive successive approximation quantization of image waveforms with efficient codebook updates,” *Proceedings of the IEEE International Conference on Image Processing,* volume III, pages 876-880, Austin, TX, November 13-16, 1994.

21. Barnes, C.F., “Embedded wavelet zero-tree coding with direct sum quantizer structures,” *Proceedings of the Data Compression Conference,* pages 252-261, Snowbird, UT, March 28-30, 1995.

22. Zaidan, M.Y., Barnes, C.F. and Wicker, S.B., “Applications of TCM with sigma-tree constellations over the AWGN channel,” in *Abstracts of the IEEE International*

Symposium on Information Theory, page 185, Whistler, British Columbia, Canada, September 17-22, 1995.

23. Biega, M.J., Goldstein, J.S., Wall, J.A. and Barnes, C.F., "Adaptive subband decompositions of imagery," *Proceedings of the IEEE Dual-Use Technologies & Application Conference,* Utica/Rome, NY, May 12, 1995.

24. Barnes, C.F., "Seamine detection with a nearest neighbor classifier based on residual vector quantization," *Proceedings of the SPIE International Symposium on Aerospace/Defense Sensing and Controls: Detection and Remediation Technologies for Mines and Mine-Like Targets I,* volume 2765, pages 167-178, Orlando, FL, April 8-12, 1996.

25. Partizian, A.A., Barnes, C.F., Maier, R.A., Piper, S.O., Smith, M.H. and Kastle, T.A., "Airborne SAR electronic protection algorithms using adaptive image processing to counter coherent, ground-based jamming," *42nd Annual TriService Radar Symposium Record (classified),* Monterey, CA, June 24-27, 1996.

26. Barnes, C.F., "Object detection with a nearest neighbor classifier based on residual vector quantization," *Terrorism and Counterterrorism Methods and Technologies: SPIE Symposium on Enabling Technologies for Law Enforcement and Security,* Boston, MA, November 19-21, 1996.

27. Barnes, C.F., "Fast search nearest neighbor classification based on structured templates," *Proceedings of the SPIE International Symposium on Aerospace/Defense Sensing and Controls: Detection and Remediation Technologies for Mines and Mine-Like Targets II,* volume 3079, pages 60-70, Orlando, FL, April 21-24, 1997.

28. Barnes, C.F., Keel, B.M., Richards, M.A., Sangston, K.J. and Moorefield, F.D., "A simple post range compression SAR electronic protection technique," *43rd Annual Tri-Service Radar Symposium Record (classified),* Boulder, CO, June 24-27, 1997.

29. Barnes, C. F., "Acoustic backscatter classification for mine detection using multiple fused aspects and novel database classification rules," *Proceedings of the SPIE International Symposium on Aerospace/Defense Sensing and Controls: Detection and Remediation Technologies for Mines and Mine-Like Targets III,* volume 3392, pages 357-369, Orlando, FL, April 1998.

30. Barnes, C.F., Hallenborg, P., Snehal, P. and Fisher, D., "Detection of mine and mine-like objects in forward looking sonar data with direct sum successive approximation templates," *Proceedings of the SPIE International Symposium on Aerospace/Defense Sensing and Controls: Detection and Remediation Technologies for Mines and Mine-Like Targets IV,* volume 3710, pages 670-674, Orlando, FL, April 5-9,1999.

31. Barnes, C.F., "Mammogram image data mining for diagnosis support: mammogram case studies," *BISTIC Symposium, National Institutes of Health*, page 29, Washington, DC, November 2003.

32. Barnes, C.F., "Successive approximation source coding and image enabled data mining," *Data Compression Conference,* page 525, Snowbird, UT, March 23, 2004.

33. Yoo, J., Barnes, C., Fritz, H., Haas, K. and Work, P., "Wave property estimation using linear feature extraction from near shore wave images," *5th International Symposium on Ocean Wave Measurement and Analysis*, Madrid, Spain, July 2-7, 2005.

34. Fritz, H., Yoo, J., Haas, K., Work, P. and Barnes, C., "Particle image velocimetry applied to near-shore video wave images," *5th International Symposium on Ocean Wave Measurement and Analysis*, Madrid, Spain, July 3-7, 2005.

35. Burki, J. and Barnes, C. F., "Interpolation-free algorithm for SAR 2D aperture synthesis," *SPIE Conference on SAR Algorithms, SPIE Symposium on Defense and Security Symposium*, volume 6237, Orlando, FL, April 17-19, 2006.

36. Burki, J. and Barnes, C. F., "Beam raster scanning 2D flyover SAR," *The Fourth IEEE Workshop on Sensor Array and Multi-channel Processing*, pages 339-343, Waltham, MA, July 12-14, 2006.

37. Yoo, J., Fritz, H., Haas, K. and Work, P., and Barnes, C., "Wave celerity estimation and depth inversion using linear feature extraction from near shore images," *ASCE Proceedings of the 30th International Conference on Coastal Engineering*, San Diego, CA, September 2006.

38. Mohammed, R. and Barnes, C. F., "Vector quantization in SPIHT image codec," *IEEE Pacific-Rim Symposium on Image and Video Technology*, pages 742-750, Taiwan, December 11-13, 2006.

39. Burki, J. and Barnes, C. F., "SAR 2D AS algorithm for modeling human vision," *IS&T/SPIE 19th Annual Symposium: Electronic Imaging*, volume 6492, San Jose, CA, January 28 – February 1, 2007.

40. Burki, J. and Barnes, C. F., "SAR with two-dimensional aperture synthesis," *IEEE Radar Conference*, Waltham, MA, pages 1418-1422, April 17-21, 2007.

41. Burki, J. and Barnes, C. F., "Refocusing of defocused images using SAR^2 algorithm," *SPIE Symposium on Optical Engineering and Applications: Advanced Signal Processing Algorithms, Architectures, and Implementations XVII*, San Diego, CA, August 26-30, 2007.

42. Burki, J. and Barnes, C. F., "Fast CSAR algorithm," *Algorithms for Synthetic Aperture Radar Imagery XV, SPIE Symposium on Defense and Security Symposium*, Orlando, FL, March 16-20, 2007.

43. Aslam, S., Bobick, A., Barnes, C. F. and O. Sezer, "Better computer vision under video compression, an example using mean shift tracking," *IEEE International Conference on Image Processing 2009,* Cairo, Egypt, November 7-11, 2009.

44. Aslam, S., Bobick, A. and Barnes, C. F., "Compensation methods using signal processing and quantization for better mean shift tracking on compressed video," *International Conference on Image Processing, Computer Vision, and Pattern Recognition,* Jul 13-16, 2009.

45. Aslam, S., Bobick, A. and Barnes, C. F., “Robust surveillance on compressed video: uniform performance from high to low bitrates,” *IEEE Conference on Advanced Video and Signal Based Surveillance,* October 2009.

46. Khan, I. A. and Barnes, C. F., “Object-specific feature extraction via Markov random fields derived from 0th order sigma-tree segmentations,” ASPRS 2010, April 26-30, San Diego, California.

47. Aslam, S., Bobick, A. and Barnes, C. F., “Robust real-time contour tracking on low quality aerial infra red imagery,” *IGARSS* 2010.

48. Khan, I. A. and Barnes, C. F., “Markov random field-structured direct sum residual vector quantization for classification,” IEEE 5th International Conference of Future Technologies, Pusan, South Korea.

49. Aslam, S., Barnes, C. F. and Bobick, A., “Video action recognition using residual vector quantization and hidden Markov models,” *accepted IPCV* 2010.

50. Aslam, S., Barnes, C. F. and Bobick, A., “Multi-target video tracking using residual vector quantization,” *accepted IPCV* 2010.

51. Aslam, S., Bobick, A. and Barnes, C. F., “Modeling the quantization staircase function,” *Data Compression Conference,* page 520, Snowbird, Utah, March, 2010.

52. Khan, I. A. and Barnes, C. F., “Using residual vector quantization for image content classification,” ICASSP 2011, April 24, Prague, Czech Republic.

C. Other Publications

1. “Learning from experience: new pattern recognition and detection technique may help radiologists analyze digital mammograms,” Georgia Tech Research News (press release), 11 June 1997. http://gtresearchnews.gatech.edu/newsrelease/MAMMOG.html

2. “Detecting a pattern of irregularities,” London Financial Times (newspaper), 26 June 1997.

3. “Software improves mammogram analysis,” *U.S. Medicine* (magazine), July 1997.

4. “Pattern recognition technique may help radiologists analyze mammograms,” *The Computer Journal* (trade journal), September 1997.

5. “System aids mammography,” *The Medical Herald* (trade journal), September 1997.

6. “Pattern recognition system aids medical imaging,” *Computer Graphics World* (magazine), pages 15 & 18, September 1997.

7. “Many applications for new pattern recognition formula,” *Optics & Photonics* (trade journal), pages 10 & 14, October 1997.

8. “Spotting defects in people and parts,” *Quality in Manufacturing* (trade journal), October 1997.

9. "Una nueva technica de deteccion ayudaria a los radiologos a analizar mamogramas digitales," *Mecanica Popular* (magazine), October 1997.

10. "Pattern recognition technique may help analyze mammograms," *Medical Equipment Designer* (trade journal), November 1997.

11. "Pattern recognition technique may help analyze mammograms," *DesignFax* (trade journal), November 1997.

12. "Computer database aids pattern recognition," *Diagnostic Imaging* (trade journal), pages 74-75, September 1997.

13. "Data mining of digital mammograms will aid in war against cancer," Georgia Institute of Technology Press Release, Atlanta, 29 November 2000. http://www.gatech.edu/news-room/archive/news_releases/digimammogram.html

14. Barnes, C.F., "A picture is worth a thousands words – even more if computers have vision and voice – New tools for marine environment monitoring," *Skidaway Scenes,* July 2003.

15. "Tech faculty join fight against cancer," The Whistle, Georgia Institute of Technology, 20 February 2004. http://www.whistle.gatech.edu/archives/04/mar/01/gcc.shtml

16. Barnes, C.F., "Mining breast cancer imaging data," *Research Horizons: New Strategies for Battling Cancer* (magazine)*, page 15, Spring/Summer 2004.* http://gtresearchnews.gatech.edu/reshor/rh-ss04/c-mining.html

17. Barnes, C.F., "Remote sensing of coastal processes," *College of Engineering Annual Report,* Georgia Institute of Technology, Fall 2004.

18. "Can high-resolution imagery resolve the Ararat mystery?" *Geospatial Solutions, Earth Imaging and Remote Sensing*, 1 October 2008. visit http://eirs.geospatial-solutions.com/gsseirs/Earth+Imaging+Newsletter/Can-High-Resolution-Imagery-Resolve-the-Ararat-Mys/ArticleStandard/Article/detail/562829?contextCategoryId=42569

D. Presentations

3. Conference Presentations without Proceedings

1. Barnes, C.F., Partizian, A.A. and Piper, S.O., "EP techniques for DRFM jammers using adaptive threshold," *Electronic Counter Measures / Electronic Protection Workshop,* Atlanta, GA, November 14, 1995.

2. Richards, M.A., Barnes, C.F., Showman, G.A., Moorefield, F.D. and Sangston, J.K., "Improved SAR image formation algorithms for simulation and evaluation of SAR electronic protection techniques," *10th Annual Electronic Protection Technical Interchange Meeting,* GTRI, Atlanta, GA, October 29-30, 1997.

3. Barnes, C.F., "A new type of structured templates for nearest-neighbor pattern matching: applications in compression and classification," *Workshop on Data Compression Techniques for Missile Guidance Data Links,* Redstone Arsenal, AL, December 2-3, 1998.

4. Smith, G., Catrone, J. and Barnes, C. “Theater high altitude air defense homogeneous signal and data processing on COTS scalable parallel processors,” *HPEC’99 Third Annual Workshop on High-Performance Embedded Computing,* Lincoln Laboratory, Boston, MA, September 22-23, 1999.

5. Smith, G., Manoogian, D., Kingan, R., Lubanko, D. and Barnes, C., “Commonality and use of COTS for signal and data processing for multiple radar systems,” *AIAA 2000, Multinational BMD Conference and Exhibition,* Boston, MA, November, 2000.

6. Cooper, J., Oravits, R. and Barnes, C. “Fault tolerant signal and data processing in missile defense radars,” *HPEC’01 Fifth Annual Workshop on High-Performance Embedded Computing,* Lincoln Laboratory, Boston, MA, September 2001.

7. Barnes, C.F., “SOLDIER empowered image data mining for target recognition and attribution,” *AIAA Conference,* Monterrey, CA, November 5-7, 2002.

8. Barnes, C.F., “Autonomous attribution of mammograms for breast cancer diagnosis through Image Data Mining,” *Suddath Cancer Symposium,* Atlanta, GA, March 28, 2003.

9. Barnes, C.F., “S4E data mining,” presented at *NIMA Pathfinder 2002 Conference,* Washington, DC, May 8, 2001.

10. Barnes, C.F., “SOLDIER image enabled data mining for remote sensing processing workflows,” *NGA Academic Researchers Program Symposium*, Washington, DC, September 2003.

11. Barnes, C.F., Automated data extraction with SOLDIER image mining, *NIMA Academic Research Program Symposium*, Washington, DC, October 2003.

12. Barnes, C.F., “Genomic and image enabled data mining in integrative databases: New tools for computational biology,” *Suddath Cancer Symposium,* Atlanta, GA, March 19, 2004.

13. Barnes, C. F., “Mammogram enabled data mining for diagnosis decision support and for the clinical research enterprise,” *GCC Cancer Research Conference*, Braselton, GA, May 6-7, 2004.

14. Barnes, C.F. “SOLDIER image data mining and applications,” *ASPRS Annual Conference*, Denver, CO, May 23-28, 2004.

15. Barnes, C.F., Work, P., Hass, K. and Fritz, H., “Shore video enabled data mining for bathymetric assessments,” *NGA Academic Researchers Program Symposium*, National Academy of Sciences, Keck Center, Washington, DC, September 15-17, 2004.

16. Burki, J. and Barnes, C. F., “SAR image exploitation via image enabled data mining,” *GSPx Conference of SAR Imaging*,” San Jose, CA, October 24-27, 2005.

17. Barnes, C. F., “A tutorial on SAR image interpretation,” *GSPx Conference of SAR Imaging*, San Jose, CA, October 24-27, 2005.

18. Barnes, C. F., “Understanding Omega-K SAR processing with use of phase maps,” *GSPx Conference of SAR Imaging*, San Jose, CA, October 24-27, 2005.

19. Barnes, C. F., “Processing polar format SAR data with Omega-K algorithms,” *GSPx Conference of SAR Imaging*, San Jose, CA, October 24-27, 2005.

20. Barnes, C.F., Work, P., Hass, K. and Fritz, H., “Image applications framework for automatic feature extraction,” *NGA Academic Researchers Program Symposium*, National Academy of Sciences, Keck Center, Washington, DC, September 2005.

21. Barnes, C.F., Work, P., Hass, K. and Fritz, H., “Image driven data mining of high resolution satellite imagery of hurricane and tsunami disaster zones,” *NGA Academic Researchers Program Symposium*, National Academy of Sciences, Keck Center, Washington, DC, September 2006.

22. Barnes, C.F, Fritz, H. and Yoo, J., “Image driven data mining in tsunami and hurricane high resolution satellite imagery,” *ASPRS 2007 Annual Conference*, Tampa, FL, May 7-11, 2007.

23. Aslam, S. and Barnes, C. F., “Video tracking with RVQ, Georgia Tech Broadband Institute Poster Show, Atlanta, GA, April 21, 2009.

4. Seminar Presentations

1. Barnes, C.F., “Origami codes,” Georgia Institute of Technology, Electrical Engineering Department, Digital Signal Processing Group, April 1990.

2. Barnes, C.F., “Tree structured signal space codes,” Georgia Tech Research Institute, Senior Technology Guidance Council, January 1992.

3. Barnes, C.F., “Statistical image processing for imagery and communications,” *Advanced Computational and Information Science Directorate Colloquium*, Army Research Laboratory, Ft. Monmouth, NJ, July 1994.

4. Barnes, C.F., “SAR and ISAR surveillance algorithms based on a merger of iterative image formation processing and sequential detection and classification techniques,” Office of Naval Research, Arlington, VA, December 2-4, 1997.

5. Barnes, C.F., “Recent advances in automatic target recognition and data compression,” National Security Agency, Fort Meade, ML, September 25, 1997.

6. Barnes, C.F., “DSSA classification of forward-looking sonar data,” NSWC Coastal Systems Station, Panama City, FL, October 27, 1998.

7. Barnes, C.F., “Image data mining: medical, remote sensing and security applications,” IEEE Sectional Meeting, Savannah, GA, April 2003.

8. Barnes, C.F., “Image data mining: medical, remote sensing and security applications,” GTREP Advisory Board Meeting, Savannah, GA, May 2003.

9. Barnes, C. F., “Skin texture analysis via image enabled data mining,” Johnston & Johnston Inc., Research and Development Center, New Brunswick, NJ, May 10, 2004.

10. Barnes, C. F., “Mammogram enabled data mining for clinical decision support,” Anderson Cancer Institute, Savannah, GA, September 22, 2004.

11. Barnes, C. F., “GT-Savannah and Anderson Cancer Initiatives,” Georgia Senate Economic Development Committee, Savannah, GA, September 19, 2004.

12. Barnes, C. F., “Medical image enabled data mining,” Anderson Cancer Institute and Hoskin Oncology Research Center, Memorial Hospital, Savannah, GA, November 22, 2006.

13. Barnes, C. F., Image driven data mining and advances in synthetic aperture radar signal processing, Center for Signal and Image Processing (CSIP), Georgia Tech, Atlanta, GA, 29 January, 2010.

5. Broadcast News and Asynchronous Multimedia

1. Barnes, C.F., “Computer aided diagnosis for breast cancer,” Broadcast interview conducted by WAGA TV (Channel 5), Atlanta, GA, October 19, 1994.

2. Barnes, C.F., “Stochastic successive approximation quantization of image subbands,” Rensselaer Video Proceedings on Applications of Subbands and Wavelets, December 1994.

3. Barnes, C.F., “Computer aided detection of breast cancer,” Georgia Tech Research Institute Overview Video Segment, July 1996.

E. Other Scholarly Accomplishments

1. Patents

1. U.S. Patent Number 5,250,949: “System and method for data compression using multiple codewords and transmitted indices,” filed: 14 August 1989, issued: 5 October 1993.

2. Invention Disclosures (disclosed to Georgia Tech Research Corporation)

1. Generalized multistage data compression system, 1991.
2. Improved design method for residual vector quantizers, 1992.
3. Subband image coding with fractal exploitation, 1993.
4. Signal point generator for high-dimensional coset codes, 1994.
5. Image data mining services over portable communication devices, 2003.
6. Synthetic aperture radar with 2D aperture synthesis, 2006.
7. Non-phone book, pyramid similar image search and browsing, 2009.
8. Volumetric synthetic aperture radar image formation processing, 2010.

3. Intellectual Property Licenses (disclosed to Georgia Tech: licensed to iMaxus)

1. Template generation system, exclusive licensed issued 2002.
2. Cellular telephone data mining, exclusive licensed pending 2004.

4. Software Development Accomplishments

1. *Boeing Mine Classification Software.* (1995) Prof. Barnes engineered a large software package (10,000+ source code lines) licensed by Boeing North America, Inc. for use in

internal research and development programs for classification of side-looking and forward-looking sonar data for sea mine detection and classification (C/Unix).

2. *NASA Real-Time Windshear Detection Software*. (1996) Prof. Barnes helped to develop radar signal processing software operating on a real-time multi-processor system under the OS9 operating system for detecting windshear from radar sensors onboard commercial aircraft. This software was delivered to NASA and subsequently tested by NASA in field tests that compared and evaluated various techniques for windshear avoidance (C/OS9).
3. *Kodak AirSAR Classification Software*. (1998) Prof. Barnes engineered a software package for Eastman Kodak for investigative work in SAR image exploitation (C/Unix).
4. *SARSim Software*. (2004) Prof. Barnes developed synthetic aperture radar simulation software capable of SAR signal simulation, motion error simulation, mo-comp simulation, Omega-K image formation and polar format image formation (C++/Windows).
5. *Image Driven Data Mining*. (2002-2006) Prof. Barnes engineered a full suite of software tools for image driven data mining (C++/Windows).

5. Foreign Language Skills

1. Prof. Barnes is able to speak, read, and write the Japanese language.

V. Service

A. Professional Contributions

- Publications Chair, IEEE Conference on Image Processing, Atlanta, GA, 2006.
- Department of Energy (DOE) program reviewer of Sandia National Labs – Radar activities, 2005.
- SBIR proposal reviewer for the National Nuclear Security Agency*, 2006 – present.*
- Advisory Board Member, Department of Electrical and Computer Engineering, Brigham Young University, Provo, UT, 2007 – Present
- Reviewer for *IEEE Transactions on Image Processing, 1992 – present.*
- Reviewer for *IEEE Transactions on Signal Processing, 1994 – present.*
- Reviewer for *IEEE Transactions on Communications, 1995 – present.*
- Reviewer for *IEEE Transactions on Signal Processing Letters, 1994 – present.*
- Reviewer for *IEEE Transactions on Information Theory, 4 papers, 1993 – present*
- Reviewer for *IEEE Transactions on Circuits and Systems for Video Technology, 1992.*
- Reviewer for *IEEE Transactions on Aerospace and Electronic Systems, 1999 – 2006.*
- Reviewer for *Journal of Visual Communication and Image Representation, 1994.*
- Reviewer for *IEEE Transactions on Geoscience and Remote Sensing, 1999 – present.*
- Reviewer for *Mechatronics, 1996.*
- Reviewer for *Journal of Space Research, 2006.*
- Reviewer for *Institute of Physics Journal, Inverse Problems, 2007.*
- Reviewer for *Journal of Optics A: Pure and Applied Optics,* 2007.

B. Campus Contributions

- COE Dean's Faculty Advisory Committee Member, 2002-2006
- ECE Graduate Committee Member, 2005-2007

- GTRI Promotion Peer Review Committee Member, 2002
- GT-Savannah Faculty Hiring Committee Member, 2002-2007
- GT-Savannah IT Director Hiring Committee Member, 2004
- GT-Savannah IT Support Hiring Committee Member, 2004
- GT-Savannah HR Director Hiring Committee Member, 2004
- Georgia Tech High Definition Task Force, Committee Member, 1992.

C. Other Contributions

- Comdisco Systems, Inc., Radar signal processing consulting, Foster City, CA, 1990-1991.
- Hughes, Inc., Data compression consulting, Los Angeles, CA, 1992.
- Teledyne Brown Engineering, Inc., Video compression consulting, Huntsville, AL, 1993.
- Itek, Inc., Data compression consulting, Boston, MA, 1993.
- Hayes Modems, Inc., Coded modulation consulting, Atlanta, GA, 1993.
- Technical Japanese-to-English translator for Scripta Technica, Inc., August 1992 – May 1995.
- Technical Japanese-to-English translator for John Wiley & Sons Publishers, June 1995 – December 1997.
- ESP, Inc., Data compression consulting, Atlanta, GA, 1996.
- Johnson & Johnson., Face image data mining consulting, New Brunswick, NJ, 2004.
- EMS, Inc., Synthetic aperture radar consulting, Atlanta, GA, 2006.
- Serving as group leader for Savannah cBETA's Bioinformatics business development pod, 2007 to present.
- NNSA, 2007.

VII. Honors and Awards

- Georgia Tech's George Riley Outstanding Professional Education Award, 2009.
- Interdisciplinary Research Initiative Award, Georgia Tech Savannah, 2006.
- Certificate of Appreciation, Ground-Based Midcourse Defense Joint Program Office, Ballistic Missile Defense Organization, Department of Defense, 2002.
- Who's Who in Science and Engineering, 1998.
- IEEE Donald G. Fink Award, Nominated 1997.
- NASA Group Achievement Award, 1993.
- Outstanding Young Men of America, Nominated 1983.
- Phi Kappa Phi, 1989.
- Sigma Xi, 1988.
- Eta Kappa Nu, Zeta Eta Chapter President, 1986-1987.
- Eta Kappa Nu, 1986.
- Phi Eta Sigma, 1983.