MATTHEW A. KUPINSKI, Ph.D.

CONTACT INFORMATION:

Matthew A. Kupinski
Professor
College of Optical Sciences,
Department of Medical Imaging
Program in Applied Mathematics
University of Arizona
1630 East University Boulevard
Tucson, Arizona 85721 USA
Work Phone: (520) 621-2967   Fax: (520) 621-3389
Email: mkupinski@optics.arizona.edu

CITIZENSHIP: USA

EDUCATION:

2000-2002	Postdoc	Department of Radiology University of Arizona Tucson, Arizona Worked under Dr. Harrison H. Barrett on image-quality research.
1995-2000	Ph.D.	Medical Physics University of Chicago Chicago, Illinois Ph.D. Thesis, "Computerized Pattern Classification in Medical Imaging," Advisor: Maryellen L. Giger, Ph.D. Devised methods of detecting cancerous lesions in digital mammograms using signal-detection theory.
1991-1995	B.S.	Physics with Honors Trinity University San Antonio, Texas Participated in two research projects: 1) forced Rayleigh scattering used in the study of diffusion coefficients and 2) the computerized detection of cancerous lesions in mammograms in collaboration with the University of Chicago.

EMPLOYMENT:

2014-current	Professor College of Optical Sciences, Department of Medical Imaging, Program in Applied Mathematics University of Arizona Tucson, Arizona
2008-2014	Associate Professor College of Optical Sciences and Department of Medical Imaging University of Arizona Tucson, Arizona
2002-2008	Assistant Professor College of Optical Sciences and Department of Radiology University of Arizona Tucson, Arizona
2000-2002	Postdoctoral Research Associate Department of Radiology University of Arizona Tucson, Arizona
1995-2000	Research Assistant Department of Radiology University of Chicago Chicago, Illinois
1997-1998	Teaching Assistant Department of Radiology University of Chicago Chicago, Illinois Teaching assistant for a graduate-level mathematics course.
1990-1993	Engineering Assistant Honeywell, Defense Avionics Systems Division Albuquerque, NM Worked in developing software to simulate C-130 cargo aircraft for the purposes of testing autopilot systems.

HONORS AND AWARDS:

2012   Outstanding Mentor Award presented by the Graduate and Professional Student Council
Nominated by my students. Recognizes mentors who:
• Create opportunities for the graduate/professional students, faculty, and staff with whom they work to achieve excellence;
• Demonstrate outstanding efforts of mentorship and develop mentees' research and professional skills;

• Mentor a wide diversity of students;
• Assist students to present and publish their work, to find financial aid, and to provide career guidance;
• Offer psychological support, encouragement, and essential strategies for life in the scholarly community;
• Demonstrate continued interest in the individual's professional advancement.

2010   Best student paper award given to my Ph.D. student Abhinav K. Jha at the SPIE Medical Imaging Conference in San Diego, CA.

2007   Mark Tetalman Young-Investigator Award
Presented every other year by the Society of Nuclear Medicine to a single recipient. The award recognizes outstanding achievement among young investigators in molecular imaging and nuclear medicine. I was given this award for being "an established leader in the methodology of objective or task-based assessment of image quality and specific applications of these techniques in nuclear medicine." – Journal of Nuclear Medicine **48**(7), pp. 19N.

2005/06   Top Abstract Prize.
The Academy of Molecular Imaging Annual Meeting. Presented to one of my students for our paper, "Design and evaluation of a novel, high-resolution small-animal SPECT system", J. Y. Hesterman, M. A. Kupinski, et. al.

SERVICE/OUTREACH
PROFESSIONAL MEMBERSHIPS

2002-current   Member of the Optical Society of America (OSA)

2007-current   Member of the Society of Nuclear Medicine (SNM)

2008-current   Member of the SPIE

SERVICE (NATIONAL/INTERNATIONAL)

2013-2016	SPIE Conference Chair. *Image Perception, Observer Performance, and Technology Assessment Conference* This conference focuses on a broad understanding of medical image perception, observer-performance measurement, and the application of these methods to evaluation of medical technology. Yearly conference is part of SPIE Medical Imaging and typically has over 200 attendees.
2013-current	Member of the American Association of Physicists in Medicine (AAPM) Task Group 234 on Tools for Evaluation of New 3D/4D Breast Imaging Systems This TG will explore current and potential roles of virtual tools for preclinical evaluation of the performance and capabilities of new 3D/4D breast imaging systems, with a focus on software anthropomorphic phantoms, as well as other simulated test objects.
2013-current	Associate Editor, SPIE Journal of Medical Imaging (Publication will begin in 2014)
2012-2015	OSA Publications Council Member
2010-2011	NIH Study Section. Biomedical Imaging Technology Reviewed R01 Grants for the NIH
2011	Chair of OSA R. Wood Prize Committee Established by OSA in 1975, this award recognizes an outstanding discovery, scientific or technical achievement, or invention in the field of optics.
2010	On the committee for the OSA R. W. Wood Prize.
2004, 2006, 2008, 2010, 2012, 2016	Organized and Co-Chaired the "Biennial Workshop on Small-Animal SPECT Imaging" This conference brings together ~80 researchers from around the world to discuss the field of small-animal SPECT imaging. I was responsible for organizing the conference, soliciting and reviewing abstract submissions, and organizing short courses.
2007	Editor for a special issue of JOSA A on Image Quality.
2007-2012	Program Committee for the SPIE conference on Image Perception, Observer Performance, and Technology Assessment.

SERVICE (LOCAL)

2014-current	Conflict of interest committee member
2012-2013	Senior Design Project Co-Mentor Worked with 5 engineering undergraduate students to design and implement an adaptive aperture for clinical SPECT imaging.
2013	Mentored Marien Ochoa, an undergraduate REU student from Honduras. Her project involved measuring the positron-range effects in PET imaging.
2009, 2011	Mentored Matthew Haverty, a high-school science teacher at Amphitheater High School. Mr. Haverty was participating in an NSF-funded RET program. His project involved designing and building a low-cost nephelometer for optically measuring air quality.
2011	Participated in the Optics Fun Day which brought K-12 students into the college and taught optics for all grades.
2007	Organized and ran a Matlab Users Group at Optical Sciences. The purpose of this group was to discuss with students and faculty programming issues related to Matlab. Specifically, we had presentations relating to the simulation of optical systems, the use of Matlab to solve differential equations, and converting Matlab programs to the C programming language.

COLLEGE COMMITTEES

2015-2016	Faculty Academic Steering Committee member
2015-2016	Admissions Committee
2013-2014	Chair of the Colloquium Committee
2006-2016	TRIF Imaging Committee This committee is responsible for determining areas of interest and interested departments for new faculty hires as well as using Proposition 301 funds to promote educational initiatives.
2012-2013	Chair of the Prelim Committee
2005-2007, 2011-2012	Prelim Committee Member
2009-2011, 2006-2007	Executive Committee Responsible for annual faculty reviews, reviewing promotion packages for research-track and adjunct faculty, and advising the Dean on matters relating to the operation of the College.
2010	Chair of the Image Science Faculty Search Committee
2010-2011	Chair of the Graduate Admission Committee for the College of Optical Sciences
2008-2009	Chair of the Optical Sciences Curriculum Committee

BOOKS:

1. Small-Animal SPECT Imaging, Springer Publishing, **M. A. Kupinski**, H. H. Barrett, editors. 2005.
2. **M. A. Kupinski**, & Nishikawa, R. M. (2017). Image Perception, Observer Performance, and Technology Assessment. In Proc. of SPIE Vol (Vol. 10136, pp. 1013601-1).
3. C. K. Abbey, **M. A. Kupinski**, (2016). Image Perception, Observer Performance, and Technology Assessment. In Proc. of SPIE Vol (Vol. 9787, pp. 978701-1).
4. Mello-Thoms, C. R., **M. A. Kupinski**, (2015). Image Perception, Observer Performance, and Technology Assessment. In Proc. of SPIE Vol (Vol. 9416, pp. 941601-1).
5. Mello-Thoms, C. R., **M. A. Kupinski**, (2014). Image Perception, Observer Performance, and Technology Assessment. In Proc. of SPIE Vol (Vol. 9037, pp. 903701-1).

BOOK CHAPTERS:

1. **M. A. Kupinski,** Implementation of Observer Models, in The Handbook of Medical Image Perception and Techniques (second edition), Cambridge University Press, 2018.
2. **M. A. Kupinski**, Evaluation and Image Quality in Radiation-based Medical Imaging, in Handbook of Particle Detection and Imaging, pp. 1083-1093, Springer, 2012.
3. **M. A. Kupinski,** Implementation of Observer Models, in The Handbook of Medical Image Perception and Techniques, Cambridge University Press, 2009.
4. **M. A. Kupinski**, E. Clarkson, Objective Assessment of Image Quality, in Small-Animal SPECT Imaging, 2005, Springer Publishing.
5. **M. A. Kupinski**, Gamma-ray Imaging, in McGraw-Hill Yearbook of Science and Technology, 2003.
6. M. L. Giger, Z. Huo, **M. A. Kupinski**, C. J. Vyborny, Computer-Aided Diagnosis in Mammography, in SPIE Handbook of Medical Imaging, Vol 2, 2000.

PATENTS:

1. Patent No. 6,138,045, **M. A. Kupinski**, M. L. Giger, Method and System for the Segmentation and Classification of Lesions, Oct. 24, 2000.
2. Kuo, P. H., Najafi, B., **M. A. Kupinski**, (2017). U.S. Patent Application No. 15/308,310.
3. Huang, J., Rolland, J. P., Clarkson, E., **M. A. Kupinski**. (2017). U.S. Patent Application No. 15/461,893.

ORIGINAL, PEER-REVIEWED ARTICLES:

1. M. A. Rahman, Y. Zhu, E. Clarkson, **M. A. Kupinski**, E. C. Frey, and A. K. Jha. "Fisher information analysis of list-mode SPECT emission data for joint estimation of activity and attenuation distribution." Inverse Problems 36, no. 8 (2020): 084002.
2. Y. Ding, H. H. Barrett, **M. A. Kupinski**, Y. Vinogradskiy, M. Miften, and B. L. Jones. "Objective assessment of the effects of tumor motion in radiation therapy." Medical physics 46, no. 7 (2019): 3311-3323.

3. A. Lin, **M. A. Kupinski**, T. E. Peterson, S. Shokouhi, L. C. Johnson, "Task-based design of a synthetic-collimator SPECT system used for small animal imaging,". Medical physics 45.7, pp. 2952-2963, 2018.

4. N. Ghanbari, E. Clarkson, **M. A. Kupinski**, X. Li, "Optimization of an adaptive SPECT system with the scanning linear estimator," IEEE transactions on radiation and plasma medical sciences, **1**(5), 435-443, 2017.

5. A. K. Jha, Y. Zhu, E. Clarkson, **M. A. Kupinski**, E. C. Frey, "Fisher information analysis of list-mode SPECT emission data for joint estimation of activity and attenuation distributions," arXiv preprint arXiv:1807.01767, 2018.

6. L. Yu, B. Chen, J. M. Kofler, C. P. Favazza, S. Leng, **M. A. Kupinski**, C. H. McCollough, "Correlation between a 2D channelized Hotelling observer and human observers in a low-contrast detection task with multislice reading in CT," Medical physics, **44**(8), 3990-3999, 2017.

7. C. J. MacGahan, **M. A. Kupinski**, E. M. Brubaker, N. R. Hilton, P. A. Marleau, "Linear Models to Perform Treaty Verification Tasks for Enhanced Information Security," Nuclear Instruments and Methods in Physics Research A **844**, pp. 147-157, 2017.

8. H. W. Tseng, J. Fan, **M. A. Kupinski**, "Design of a practical model-observer-based image quality assessment method for x-ray computed tomography imaging systems," Journal of Medical Imaging, **3**(3), 2016.

9. C. J. MacGahan, **M. A. Kupinski**, N. R. Hilton, E. M. Brubaker, W. C. Johnson, "Development of an Ideal Observer that Incorporates Nuisance Parameters and Processes List-Mode Data," JOSA A **33**(4), pp 689-697, 2016.

10. R. M. Stephen, A. K. Jha, D. Roe, T. Trouard, **M. A. Kupinski**, et al., "Diffusion MRI with Semi-Automated Segmentation Can Serve as a Restricted Predictive Biomarker of the Therapeutic Response of Liver Metastasis," Magnetic Resonance Imaging (2015) (in press).

11. H. H. Barrett, K. J. Myers, C. Hoeschen, **M. A. Kupinski**, M. P. Little, "Task-bases measures of image quality and their relation to radiation dose and patient risk," Physics in Medicine and Biology, invited review paper, **60**(2), 2015.

12. A. K. Jha, H. H. Barrett, E. C. Frey, L. Caucci, E. Clarkson, **M. A. Kupinski**, "SVD and analytic reconstruction methods for photon-processing imaging systems," Physics in Medicine and Biology **60**(18), 2015.

13. H. Jiang, Q. Yuan, B. Zhang, K. Xu, P. Tankam, E. Clarkson, **M. A. Kupinski**, J. Rolland, "Measurement of a multi-layered tear film phantom using optical coherence tomography and statistical decision theory." Biomedical Optics Express 5.12 (2014): 4374-4386.

14. W. Welge, A. T. DeMarco, J. M. Watson, P. S. Rice, J. K. Barton, **M. A. Kupinski**, "Diagnostic potential of multimodal imaging of ovarian tissue using optical coherence tomography and second-harmonic generation microscopy," Journal of Medical Imaging **1**(2), 025501, 2014.

15. H.-W. Tseng, J. Fan, **M. A. Kupinski**, P. Sainath, J. Hseih, "Assessing image quality and dose reduction of a new computed tomography iterative reconstruction algorithm using model observers," Medical Physics **41**(7), 0171910, 2014.

16. H. H. Barrett, **M. A. Kupinski**, S. Müeller, H. J. Halpern, J. C. Morris III, R. Dwyer, "Objective assessment of image quality VI: Imaging in Radiation Therapy," Physics in Medicine and Biology **58**, 8179-8213, 2013.

17. Abhinav K. Jha, E. Clarkson, **M. A. Kupinski**, "An ideal-observer framework to investigate signal detectability in diffuse optical imaging," Biomedical Optics Express **4**(10), 2107-2123, 2013.

18. J. Huang, K. Lee, E. Clarkson, **M. A. Kupinski**, K. Maki, D. Ross, J. Rolland, "Phantom study of tear film dynamics with optical coherence tomography and maximum-likelihood estimation," Optics Letters 38(10), 1721-1723, 2013.

19. D. Kang, **M. A. Kupinski**, "Figure of merit for task-based assessment of frequency-domain diffusive imaging," Optics Letters 38(2), 235-236, 2013.

20. Abhinav K. Jha, Herman T. van Dam, **Matthew A. Kupinski** and Eric Clarkson, "Simulating Silicon Photomultiplier response to scintillation light," IEEE Transaction on Nuclear Science 60(1), 336-351, 2013.

21. Chih-Jie Lee, **M. A. Kupinski**, L. Volokh, "Assessment of cardiac single-photon emission computed tomography performance using a scanning linear observer," Medical Physics 40(1), 2013.

22. Abhinav K. Jha, **Matthew A. Kupinski**, Takahiro Masumura, Eric Clarkson, Alexey A. Maslov, Harrison H. Barrett, "Simulating photon-transport in uniform media using the radiative transport equation: A study using the Neumann-series approach," JOSA A 29(8), 1741-1757, 2012.

23. Abhinav K. Jha, **Matthew A. Kupinski**, Harrison H. Barrett, Eric Clarkson, John H. Hartman, "Three-dimensional Neumann-series for modeling light transport in nonuniform media," JOSA A 29(9), 1885-1899, 2012.

24. Abhinav K. Jha, **Matthew A. Kupinski**, Jeffrey J. Rodriguez, Renu M. Stephen and Alison T. Stopeck, "Task-based evaluation of segmentation algorithms for diffusion-weighted MRI without using a gold-standard," Physics in Medicine and Biology 57(13), 4425-4446, 2012.

25. D. Kang, **M. A. Kupinski**, "Effect of noise on modulation amplitude and phase in frequency-domain diffusive imaging," Journal of Biomedical Optics 17(1), 016010, 2012.

26. D. Kang, **M. A. Kupinsi**, "Noise characteristics of heterodyne/homodyne frequency-domain measurements," Journal of Biomedical Optics 17(1), 015002, 2012.

27. D. Kang, **M. A. Kupinski**, "Signal detectability in diffusive media using phased arrays in conjunction with detector arrays," Optics Express 19(13), 12261-12274, 2011.

28. E. Clarkson, R. Palit, **M. A. Kupinski**, "SVD for imaging systems with discrete rotational symmetry," Optics Express 18(24), 25306-25320, 2010.

29. J. Hesterman, L. Caucci, **M. A. Kupinski,** "Maximum-likelihood estimation with a contracting-grid search algorithm," IEEE Transactions on Nuclear Science 57(3), 1077-1084, 2010.

30. E. Clarkson, **M. A. Kupinski**, "Global compartmental pharmacokinetic models for spatiotemporal SPECT and PET imaging," SIAM Journal on Imaging Sciences 2(1), 204-225, 2009.

31. H. H. Barrett, L. Furenlid, M. Freed, J. Y. Hesterman, **M. A. Kupinski**, E. Clarkson, M. K. Whitaker, "Adaptive SPECT," IEEE Transactions on Medical Imaging, 27(6), 775-788, 2008.

32. M. Freed, **M. A. Kupinski,** L. Furenlid, H. H. Barrett, "A Prototype Instrument for Single Pinhole Small-Animal Adaptive SPECT Imaging", Medical Physics 35, 2008.

33. E. Clarkson, **M. A. Kupinski**, H. H. Barrett, "A Task-Based Approach to Adaptive and Multimodality Imaging," Proceedings of the IEEE, Invited Paper, 46(3), 2008.

34. S. Park, H. H. Barrett, E. Clarkson, **M. A. Kupinski**, K. J. Myers, " Channelized-ideal observer using Laguerre-Gauss channels in detection tasks involving non-Gaussian distributed lumpy backgrounds and a Gaussian signal," JOSA A 24, B136-B150, 2007.

35. J. Y. Hesterman, **M. A. Kupinski**, E. Clarkson, et al., "Hardware assessment using the multi-module, multi-resolution system (M3R) – A signal-detection study," Medical Physics 34, 3034-3044, 2007.

36. N. Hagen, **M. A. Kupinski**, E. L. Dereniak, "Gaussian profile estimation in one dimension," Applied Optics 46, 5374-5383, 2007.

37. J. Y. Hesterman, **M. A. Kupinski**, L. R. Furenlid, et al., "The multi-module, multi-resolution system M3R: A novel small-animal SPECT system," Medical Physics 34, 987-993, 2007.

38. A. K. Sahu, A. Joshi, **M. A. Kupinski**, E. M. Sevick-Muraca, "Assessment of a fluorescence-enhanced optical imaging system using the Hotelling observer," Optics Express 14, 7642-7660, 2006.

39. **M. A. Kupinski**, E. Clarkson, H. H. Barrett, "A probabilistic model for the MRMC method, part 2: Validation and applications," Academic Radiology 13, 1422-1430, 2006.

40. E. Clarkson, **M. A. Kupinski**, H. H. Barrett, "A probabilistic model for the MRMC method, part 1: Theoretical development," Academic Radiology 13, 1410-1421, 2006.

41. **M. A. Kupinski**, John W. Hoppin, Joshua Krasnow, Seth Dahlberg, Jeffrey A. Leppo, Michael A. King, Eric Clarkson, and Harrison H. Barrett, "Comparing Cardiac Ejection Fraction Estimation Algorithms Without a Gold Standard," Academic Radiology 13, 329-337, 2006.

42. S. Park, E. Clarkson, **M. A. Kupinski**, et al., "Efficiency of the human observer detecting random signals in random backgrounds," Journal of the Optical Society of America A 22, 3-16, 2005.

43. D. C. Edwards, C. E. Metz, **M. A. Kupinski**, "Ideal observers and optimal ROC hypersurfaces in N-class classification," IEEE Transactions on Medical Imaging 23, 891-895, 2004.

44. **M. A. Kupinski**, J. W. Hoppin, E. Clarkson, H. H. Barrett, "Ideal Observer Computation Using Markov-Chain Monte Carlo," Journal of the Optical Society of America A 20, 430-438, 2003.

45. **M. A. Kupinski**, E. Clarkson, J. Hoppin, H. H. Barrett, "Experimental Determination of Object Statistics," Journal of the Optical Society of America A 20, 421-429, 2003.

46. **M. A. Kupinski**, "Computing in Optics," Computing in Science and Engineering 5, 13-14, 2003.

47. S. Park, **M. A. Kupinski**, E. Clarkson, et al., "Ideal-observer performance under signal and background uncertainty," Lecture Notes in Computer Science 2732, 342-353, 2003.

48. D. C. Edwards, **M. A. Kupinski**, R. M. Nishikawa, C. E. Metz, "Maximum Likelihood Fitting of FROC Curves Under an Initial-Detection-and-Candidate-Analysis Model," Medical Physics 29, 2861-2870, 2002.

49. E. Clarkson, **M. A. Kupinski**, H. H. Barrett, "Transformation of Characteristic Functionals Through Imaging Systems," Optics Express 10, 536-539, 2002.

50. J. Hoppin, **M. A. Kupinski**, G. Kastis, E. Clarkson, H. H. Barrett, "Objective Comparison of Quantitative Imaging Modalities Without the Use of a Gold Standard," IEEE Transactions on Medical Imaging 21, 441-449, 2002.

51. **M. A. Kupinski**, J. Hoppin, E. Clarkson, H. H. Barrett, "Estimation in Medical Imaging Without a Gold Standard," Academic Radiology 9, 290-297, 2002.

52. K. Drukker, M. L. Giger, K. Horsch, **M. A. Kupinski**, et al., "Computerized detection of masses in breast ultrasound," Medical Physics 29, 1438-1446, 2002.

53. Z. L. Liu, G. A. Kastis, G. D. Stevenson, H. H. Barrett, L. R. Furenlid, **M. A. Kupinski**, "Quantitative analysis of acute myocardial infarct in rat hearts with ischemia," Journal of Nuclear Medecine 43, 933-939, 2002.

54. J. Hoppin, **M. A. Kupinski**, G. Kastis, E. Clarkson, H. H. Barrett, "Objective Comparison of Quantitative Imaging Modalities Without the Use of a Gold Standard," Lecture Notes in Computer Science, 2001.

55. **M. A. Kupinski**, D. C. Edwards, M. L. Giger, and C. E. Metz, "Ideal Observer Approximation Using Bayesian Classification Neural Networks," IEEE Transactions on Medical Imaging 20, 886-899, 2001.

56. **M. A. Kupinski** and M. A. Anastasio, "Multiobjective Genetic Optimization of Diagnostic Classifiers with Implications for Generating Receiver Operating Characteristic Curves," IEEE Transactions on Medical Imaging 18, 675-685, 1999.

57. **M. A. Kupinski** and M. L. Giger, "Feature Selection with Limited Datasets," Medical Physics 26, 2176-2182, 1999.

58. M. A. Anastasio, **M. A. Kupinski**, and R. M. Nishikawa, "Optimization and FROC Analysis of Rule-Based Detection Schemes Using a Multiobjective Approach," IEEE Transactions on Medical Imaging 17, 1089-1093, 1998.

59. M. A. Anastasio, **M. A. Kupinski**, and X. Pan, "Noise Properties in Diffraction Tomography: Comparison of Conventional Reconstruction Algorithms with a New Algorithm," IEEE Transactions on Nuclear Science 45, 2216-2223, 1998.

60. **M. A. Kupinski** and M. L. Giger, "Automated Seeded Lesion Segmentation on Digital Mammograms" IEEE Transactions on Medical Imaging 17, 510-517, 1998.

CONFERENCE PROCEEDINGS PAPERS:

1. **M. A. Kupinski**, Z. Garrett, and J. Fan. "Observer-driven texture analysis in CT imaging." In *Medical Imaging 2020: Image Perception, Observer Performance, and Technology Assessment*, vol. 11316, p. 1131610. International Society for Optics and Photonics, 2020.

2. Doty, Kimberly J., Xin Li, R. Garrett Richards, Michael A. King, Phillip H. Kuo, **Matthew A. Kupinski**, and Lars R. Furenlid. "Modular camera design study for human brain SPECT system." In 2020 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), pp. 1-3. IEEE, 2020.

3. **Kupinski, Matthew A**., and Jiahua Fan. "Observer models utilizing compressed textures." In Medical Imaging 2021: Image Perception, Observer Performance, and Technology Assessment, vol. 11599, p. 115990I. International Society for Optics and Photonics, 2021.

4. Cronin, Kelsea P., **Matthew A. Kupinski**, James M. Woolfenden, Goro Yabu, Tenyo Kawamura, Shin'ichiro Takeda, Tadayuki Takahashi, and Lars R. Furenlid. "Design of a Multi-Technology Pre-Clinical SPECT System." In 2020 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), pp. 1-3. IEEE.

5. Auer, Benjamin, Kesava S. Kalluri, Aly H. Abayazeed, Jan De Beenhouwer, Navid Zeraatkar, Clifford Lindsay, Neil C. Momsen, **M. A. Kupinski** et al. "Aperture size selection for improved brain tumor detection and quantification in multi-pinhole 123I-CLINDE SPECT imaging." In 2020 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), pp. 1-2. IEEE.

6. C Yujia, Y. Lou, **M. A. Kupinski**, and M. A. Anastasio. "Task-Based Data-Acquisition Optimization for Sparse Image Reconstruction Systems." In SPIE Medical Imaging, pp. 101360Z-101360Z. International Society for Optics and Photonics, 2017.

7. H. W. Tseng, J. Fan, **M. A. Kupinski**, et al., "Quantitative image quality evaluation for cardiac CT reconstructions." In SPIE Medical Imaging, pp. 978716-978716. International Society for Optics and Photonics, 2016.

8. C. Chaix, S. Kovalsky, **M. A. Kupinski**, H. H. Barrett, L. Furenlid. "Fabrication of the pinhole aperture for AdaptiSPECT." SPIE Optical Engineering: Applications. International Society for Optics and Photonics, 2014.

9. J. Fan, H. Tseng, **M. A. Kupinski**, "Study of the radiation dose reduction capability of a CT reconstruction algorithm: LCD performance assessment using mathematical model observers," SPIE Medical Imaging, 2013.

10. A. K. Jha, E. Clarkson, **M. A. Kupinski**, "Joint reconstruction of activity and attenuation map using LM SPECT emission data," SPIE Medical Imaging, 2013.

11. J. Huang, K. Lee, E. Clarkson, **M. A. Kupinski,** J. Rolland, "Task-based assessment and optimization of spectral-domain optical coherence tomography for tear film imaging," Frontiers in Optics, Rochester, NY, 2012.

12. A. K. Jha, **M. A. Kupinski**, "Monte Carlo simulation of Silicon photomultiplier output in response to scintillation induced light," IEEE Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, 2011.

13. A. K. Jha, **M. A. Kupinski**, "Evaluating segmentation algorithms for diffusion-weighted MR images: A task-based approach," SPIE Medical Imaging Conference, 2010.

14. H. H. Barrett, D. Wilson, **M. A. Kupinski**, K. Aguwa, et al., "Therapy operating characteristic (TOC) curves and their application to the evaluation of segmentation algorithms," SPIE Medical Imaging Conference, 2010.

15. A. K. Jha, **M. A. Kupinski**, et. al, "ADC estimation of lesions in diffusion-weighted MR images: A maximum-likelihood approach," 2010 IEEE Southwest Symposium on Image Analysis and Interpretation.

16. A. K. Jha, **M. A. Kupinski,** "ADC Estimation in Multi-scan DWMRI," OSA 2010.

17. S. Young, **M. A. Kupinski**, "Estimating signal detectability in a model diffuse optical imaging system," OSA Conference on Biomedical Optics, 2010.

18. A. K. Jha, **M. A. Kupinski**, "Solutions to the radiative transport equation for non-uniform media," OSA Conference on Biomedical Optics, 2010.
19. H. H. Barrett, D. W. Wilson, **M. A. Kupinski**, "Therapy operating characteristic (TOC) curves and their application to the evaluation of segmentation algorithms," SPIE Medical Imaging Conference 2010.
20. R. Palit, **M. A. Kupinski**, "Singular value decomposition of pinhole SPECT systems," SPIE Medical Imaging, 2009.
21. A. Breme, **M. A. Kupinski,** E. Clarkson, "Adaptive Hotelling discriminant functions," SPIE Medical Imaging Conference, 2007.
22. M. Freed, **M. A. Kupinski**, L. R. Furenlid, "A prototype instrument for adaptive SPECT imaging," SPIE Medical Imaging Conference, 2007.
23. J. Y. Hesterman, **M. A. Kupinski**, E. Clarkson, "Evaluation of hardware in a small-animal SPECT system using reconstructed images," SPIE Medical Imaging Conference, 2007.
24. **M. A. Kupinski**, E. Clarkson, J. Y. Hesterman, "Bias in Hotelling observer performance computed from finite data," SPIE Medical Imaging Conference, 2007.
25. S. Park, E. Clarkson, H. H. Barrett, **M. A. Kupinski**, K. J. Myers, "Performance of a channelized-ideal observer using Laguerre-Gauss channels for detecting a Gaussian signal at a known location in different lumpy backgrounds," SPIE Medical Imaging Conference, 2006.
26. S. Park, E. Clarkson, **M. A. Kupinski**, H. H. Barrett, "Efficiency of human and model observer for signal-detection tasks in non-Gaussian distributed lumpy backgrounds," SPIE Medical Imaging Conference, 2005.
27. **M. A. Kupinski**, E. Clarkson, "Extending the channelized Hotelling observer to account for signal uncertainty and estimation tasks," SPIE Medical Imaging Conference, 2005.
28. J. Y. Hestermann, **M. A. Kupinski**, D. W. Wilson, L. Furenlid, "Experimental, task-based optimization of a four-camera, variable-pinhole small-animal SPECT system," SPIE Medical Imaging Conference, 2005.
29. H. H. Barrett, **M. A. Kupinski**, E. Clarkson, "Probabilistic foundations of the MRMC method," SPIE Medical Imaging Conference, 2005.
30. K. Gross, **M. A. Kupinski**, "A fast model of a multiple pinhole SPECT imaging system," SPIE Medical Imaging Conference, 2005.
31. **M. A. Kupinski**, E. Clarkson, K. Gross, J. W. Hoppin, "Optimizing imaging hardware for estimation tasks," SPIE Medical Imaging Conference, 2003.
32. K. Gross, **M. A. Kupinski**, T. Peterson, E. Clarkson, "Optimizing a multiple-pinhole SPECT system using the ideal observer," SPIE Medical Imaging Conference, 2003.
33. J. W. Hoppin, **M. A. Kupinski**, et. al. "Evaluating estimation techniques in medical imaging without a gold standard: Experimental validation," SPIE Medical Imaging Conference, 2003.
34. E. Clarkson, **M. A. Kupinski**, "Assessing the accuracy of estimates of the likelihood ratio," SPIE Medical Imaging Conference, 2003.
35. D. Edwards, J. Papaioannou, Y. Jiang, **M. A. Kupinski**, R. Nishikawa, "Eliminating false-positive microcalcification clusters in a mammography CAD scheme using a Bayesian neural network," SPIE Medical Imaging Conference, 2001.

36. **M. A. Kupinski** and M. L. Giger, "A Comparison of Bayesian ANN and Multiobjective Classifier Training Using Limited Datasets," Computer-Assisted Radiology and Surgery Conference, San Francisco, California, 2000.

37. D. C. Edwards, **M. A. Kupinski**, R. M. Nishikawa, and C. E. Metz, "Estimation of Linear Observer Templates in the Presence of Multi-Peaked Gaussian Noise Through 2AFC Experiments," SPIE Medical Imaging Conference, San Diego, California, 2000.

38. **M. A. Kupinski** and M. L. Giger, "Multiobjective Genetic Optimization of Diagnostic Classifiers Used in the Computerized Detection of Mass Lesions in Mammography," SPIE Medical Imaging Conference, San Diego, California, 2000.

39. M. A. Anastasio, **M. A. Kupinski**, and X. Pan, "New Classes of Reconstruction Methods in Reflection Mode Diffraction Tomography," Proceedings of the 1998 Ultrasonics Symposium, 1998.

40. M. A. Anastasio, **M. A. Kupinski**, R. M. Nishikawa, and M. L. Giger, "A Multiobjective Approach to Optimizing Computer-Aided Diagnosis Schemes," Proceedings of the 1998 IEEE Nuclear Science Symposium and Medical Imaging Conference, Toronto, Canada, 1998.

41. M. A. Anastasio, **M. A. Kupinski**, and X. Pan, "Noise Properties of Reconstructed Images in Ultrasound Diffraction Tomography," Proceedings of the 1997 IEEE Nuclear Science Symposium and Medical Imaging Conference, Albuquerque, New Mexico, 1997.

42. **M. A. Kupinski** and M. L. Giger, "Investigation of Regularized Neural Networks for the Computerized Detection of Mass Lesions in Digital Mammograms," IEEE Engineering in Medicine and Biology Society Conference, Chicago, Illinois, 1997.

43. **M. A. Kupinski** and M. L. Giger, "Feature Selection and Classifiers for the Computerized Detection of Mass Lesions in Digital Mammography," IEEE International Congress on Neural Networks, Houston, Texas, 1997.

44. **M. A. Kupinski**, M. L. Giger, and K. Doi, "Optimization of Neural Network Inputs with Genetic Algorithms," Digital Mammography 96: Proceedings of the 3rd International Workshop on Digital Mammography, Chicago, Illinois 1996.

45. **M. A. Kupinski**, M. L. Giger, P. Lu, and Z. Huo, "Computerized Detection of Mammographic Lesions: Performance of Artificial Neural Network with Enhanced Feature Extraction," SPIE Medical Imaging Conference, San Diego, California, 1995.

INVITED PRESENTATIONS:

1. **M. A. Kupinski**, "The Role of Dose in Task-Based Assessment of Image Quality — Diagnostic Imaging and Radiation Therapy," AAPM Special Session, July, 2021.

2. **M. A. Kupinski**, "Keynote Talk: Imaging Science in System and Algorithm Design", OSA COSI, 2020.

3. **M. A. Kupinski**, "Imaging Science in Medical Applications," ASU Colloquium, 2019.

4. **M. A. Kupinski**, "Photon Processing in Reconstruction," FDA Colloquium, 2019.

5. **M. A. Kupinski**, "Imaging Science in Homeland Security Applications," Gordon Research Conference on Image Science, 2014.

6. **M. A. Kupinski**, "Image Science and Adaptive Imaging," Biomedical Engineering Department, Washing University in St. Louis, April 2013.

7. **M. A. Kupinski**, "ROC Analysis," IEEE Nuclear Science Symposium and Medical Imaging Conference, 2012.
8. **M. A. Kupinski**, The National Academies Keck Futures Initiative, 2010. Title: "Task-based Assessment of Image Quality"
9. **M. A. Kupinski,** Frontiers of Biomedical Imaging Science, Nashville, TN. June, 2009. Title: "Image Quality Assessment"
10. **M. A. Kupinski**, "Task-Based Assessment of Image Quality," Rochester Institute of Technology Image Science Group, Rochester, New York, December 2006.
11. **M. A. Kupinski**, "Image Quality Assessment in Medical Imaging," Baylor College of Medicine, Molecular Imaging Group, Houston, Texas, January 2006.
12. **M. A. Kupinski**, "Image Quality Assessment," Radiology Research Seminar Series, Tucson, Arizona, 2006.
13. **M. A. Kupinski**, "Task-based Assessment of Image Quality," Illinois Institute of Technology, Bioengineering Department, Chicago, Illinois, March 2005.
14. **M. A. Kupinski**, "Image Quality in Optical Tomography," IEEE ISBI meeting, Washington DC, 2005.
15. **M. A. Kupinski**, "Medical Image Quality Assessment," Photonics and Imaging Workshop, Tucson, Arizona, 2004.
16. **M. A. Kupinski**, "Hardware optimization and comparison using task-based measures of image quality," University of Chicago, Program in Medical Physics, Chicago, Illinois, 2002.

RECENT GRANTS AND CONTRACTS :

1. NIH/NIBIB (L. Furenlid, PI, **M. A. Kupinski**, co-investigator), "AdaptiSPECT-C: A next-generation, adaptive brain-imaging SPECT system for drug discovery and clinical imaging," 5 years, $2,185,279. September 2016 - August 2020.
Development of a novel clinical brain imager and initial clinical testing of the instrument.
2. R01 EB000803-27 (Caucci, PI, **M. A. Kupinski,** co-I) 04/01/1990-03/31/2021 2.40 person months NIH/NIBIB $415,670
Emission Computed Tomography and Parallel Computing
This grant deals with Emission Computed Tomography (ECT), defined broadly as three-dimensional (3D) imaging of molecules or cells that have been labeled so that they emit light, high-energy photons or charged particles without significant alteration of their biological function. The labeling can use radionuclides or light-emitting molecules, so the emissions can be nuclear decay products, including electrons, positrons and high-energy photons, or visible or near-infrared phot1.8+ons. The main application of ECT, and the focus of this grant, is molecular imaging in clinical medicine and biomedical research.

3. DE-AC52-06NA25946 (**Kupinski, M.A**., PI)   01/06/2020-01/05/20210.50 person months
   National Security Technologies, LLC $85,582
   Hierarchical Bayesian approaches to image deblurring with application to high-energy x-ray imagin. The goal of this project are to develop adaptive denoising techniques that can be applied to high-energy x-ray projection images.

4. HHM402-18-C-0039 (Furenlid and Kupinski, Co-PIs) 05/21/2018-05/20/2020
   3.00 person months.   DOD $530,096
   3-Dimensional Modeling and Simulation
   This grant deals with X-ray Computed Tomography (X-ray CT), and involves the development of accurate simulation tools for propagating x-ray photon trajectories from sources, through materials and objects, and into detectors, as a means for assessing the feasibility of novel instrumentation designs.

5. NIH/NIBIB (**M. A. Kupinski**, PI), "6th Small-Animal Imaging Workshop," 1 year, $10,000. Funded student and/or minority support to attend a workshop in Tucson, AZ.

6. GE Medical (**M. A. Kupinski**, PI), "Model Observer Design for Quantitative CT Imaging-Quality Assessment," $115,818, 7/1/14-6/30/15, 3 calendar months effort
   Corporate
   Development of tools and methods for assessing image quality in CT imaging. Use these methods to verify dose reduction capabilities of new hardware and software. Aid in the 510K FDA approval process.

7. NIH/NIBIB (H. H. Barrett PI, **M. A. Kupinski**, Project Leader) "Center for Gamma-Ray Imaging," 5 years, $5,835,915, October 2014 - September 2019
   Federal
   The objectives of the Center for Gamma-Ray Imaging are to develop advanced gamma-ray detectors and Imaging systems, to push the limits of spatial and temporal resolution in SPECT and PET, and to make state-of-the-art technology available to our collaborators and to the biomedical research community.

8. Sandia National Laboratories (**M. A. Kupinski**, PI) "Optimal Treaty Verification", ~$800,000, 6/1/12-5/30/15, 3.6 calendar months effort
   Federal
   This project will implement advanced signal-detection theory methods to help design imaging systems for verifying nuclear disarmament compliance. Comparison of new designs to current neutron and gamma-ray systems will be evaluated.

9. NIH/NIBIB U01EB017185, (C. McCollough, PI. **M. A. Kupinski**, PI on Arizona subcontract), "Critical resources to evaluate CT scan techniques and dose reduction approaches," 9/1/2013-8/31/2017, $232,000 (UA portion), 0.6 calendar months.
   Federal
   Computed tomography (CT) provides important medical benefits, but for patient safety it is essential that CT providers use the lowest dose of radiation consistent with achieving the needed diagnostic performance. New algorithmic approaches to image reconstruction will be critical to reducing the dose without compromising image quality; however, the development of novel approaches to image reconstruction is hampered because many image scientists do

not have access to CT projection data from patient exams. We propose to develop data sets, metrics, and software tools that will help investigators create and compare new approaches to dose reduction and will guide clinical users in selecting optimized scanning parameters and reconstruction methods.

10. NIH/NIBIB R01EB013677 (**M. A. Kupinski**, PI on UA subcontract, T. Peterson, Vanderbilt University PI), "Synthetic-collimator SPECT with semiconductor detectors," $272,000 (UA Portion), 7/01/11-6/30/15, 1.2 calendar months effort
Federal
The goal of this work is to develop a novel two-layer SPECT imaging system using the synthetic-collimator imaging approach to provide a combination of spatial resolution and sensitivity tailored to the demands of mouse-brain imaging.

11. NIH/NIBIB P41EB002035 (H. H. Barrett, PI. **M. A. Kupinski,** Project Leader), "Center for Gamma-Ray Imaging," 7/1/09-6/30/14, ~$5,000,000, 3 calendar months effort
Federal
The objectives of the Center for Gamma-Ray Imaging are to develop advanced gamma-ray detectors and Imaging systems, to push the limits of spatial and temporal resolution in SPECT and PET, and to make state-of-the-art technology available to our collaborators and to the biomedical research community.

12. GE Medical (**M. A. Kupinski**, PI), "Model Observer Design for Quantitative CT Imaging-Quality Assessment," $115,818, 7/10/12-6/31/13, 3 calendar months effort
Corporate
Development of tools and methods for assessing image quality in CT imaging. Use these methods to verify dose reduction capabilities of new hardware and software. Aid in the 510K FDA approval process.

13. NIH/NIBIB R01EB015481 (L. Peng, PI, **M. A. Kupinski**, co-investigator), "High-Resolution Multi-Color FLIM-FRET Imaging of Whole Organism," 8/1/12-7/31/16, $1,011,100, 0.6 calendar months effort
Federal
The objective of this research is develop a multi-color FLIM-FRET imaging system. As co-investigator, I will be responsible to aiding in image-reconstruction methods.

14. NIH/NCI R01CA161534 (A. Stopeck, PI, **M. A. Kupinski**, co-investigator), "NSAID Effects on Clinical and Imaging Breast Biomarkers," 1/1/12-12/31/17, $2,142,710, 1.2 calendar months effort
Federal
The objective of this research is to develop biomarkers for breast-cancer risk. As a co-investigator, my role will be to aid in the statistical assessment of the fat-water and ADC MRI images.

15. NIH/NIBIB RC1EB010974 (**M. A. Kupinski**, PI), "Quantitative Assessment of the Benefits and Risks of Clinical PET/CT and SPECT/CT," 9/30/09-8/31/12, $544,611, 3.6 calendar months effort
Federal
The objectives of this proposal are to develop methods and tools to quantitatively assess the

benefits and risks of multimodality PET/CT and SPECT/CT imaging. We will use task-based measures of image quality to assess the benefits and effective dose to assess the risks.

16. Sandia National Labs, (**M. A. Kupinski**, PI), "Optimal Threat Detection," 6/1/2010-9/30/2010, $39,912
Federal
Internal Sandia funding to study the feasibility of using nuclear-medicine methods to perform the task of threat detection and localization.

17. Canon Corporation, (**M. A. Kupinski**, PI), "Medical Imaging," 5/1/08-8/31/10, $618,545, 5.7 months/year
Corporate
The objectives of this proposal are to establish a new simulation scheme and method for solving forward and inverse problems of diffuse optical imaging and to create a new technical concept of a breast-imaging system which enables high spatial resolution of optical parameters.

18. NIH/NCI R01 CA119046 (A. Stopeck, PI. **M. A. Kupinski**, co-investigator), "Diffusion MRI for Predicting Response to Therapy in Breast Cancer Metastases," 7/1/05-6/30/10, $2,248,098, 0.83 months/year.
Federal
Develop methods for predicting a patient's response to chemotherapy using apparent diffusion coefficients computed from MRI data.

19. Authenti-Corp, (**M. A. Kupinski**, PI), "Biometric Iris Recognition Covariate Analysis Research," 4/1/09-12/31/09, $30,000
Corporate
The objectives of this proposal are to determine how the performance of iris-recognition software packages perform under different conditions such as light level, gaze parameters, and other factors that might negatively effect the results.

20. General Electric Corporation (GE), (**M. A. Kupinski**, PI) "Design of a cardiac SPECT imager," 2/1/07-2/1/10, $340,000.
Corporate
The objective of this research is to aid in the design of a clinical imager for GE Corporation. We are applying our knowledge of task-based assessment methods to help both make design decisions and to aid in the reconstruction and processing of the image data returned by the system.