CURRICULUM VITAE
MATHEWS JACOB

RESEARCH EXPERIENCE & EDUCATION

2015- Present: Associate Professor   *Dept of ECE, Univ. of Iowa*
  Research: Theoretical tools and algorithms for inverse problems in MRI.
  • Super-resolution recovery of multidimensional image data
  • Novel algorithms for discover and exploit structure in data
  • Free breathing and ungated cardiac imaging
  • Metabolic & structural MRI: (MR spectroscopic imaging, CEST, T1rho, diffusion weighted imaging)
  • Live cell super-resolution microscopy

2011- 2015 : Assistant Professor   *Dept of ECE, Univ. of Iowa*
  Research: Theoretical tools and algorithms for inverse problems in MRI.
  • Sparse reconstruction algorithms for MR spectroscopic imaging, with application to cancer therapy
  • Adaptive/Blind linear model, algorithms, and applications to cardiac perfusion MRI
  • Higher degree total variation schemes & novel optimization algorithms
  • Fast non-iterative algorithms for non-Cartesian MRI

2007- 2011: Assistant Professor   *Dept of BME, Univ. of Rochester*
  Research: Theoretical tools and algorithms for inverse problems in MRI.
  • Sparse reconstruction algorithms for MR spectroscopic imaging, with application to cancer therapy
  • Adaptive/Blind linear model, algorithms, and applications to cardiac perfusion MRI
  • Higher degree total variation schemes & novel optimization algorithms
  • Efficient approximation for non-uniform fast Fourier transform for non-Cartesian MRI
  • Fast non-iterative algorithms for non-Cartesian MRI
  • Application of fat-water decomposition & MRSI to obesity imaging

2003- 2006:   Beckman Post-Doctoral Fellow   *Univ. of Illinois at Urbana Champaign*
  Research: Model based algorithms for inverse problems.
  • Constrained reconstruction algorithm for MR spectroscopic imaging
  • Level-set reconstruction algorithm for near infrared spectroscopic imaging
  • Algebraic algorithm for the decomposition of fat and water in MRI

1999- 2003: PhD in Biomedical Imaging   *Biomedical Imaging Group, Swiss Federal Institute of Technology*
  Advisor: Prof. Michael Unser
  Thesis: Development of model based algorithms for image segmentation and 3-D shape reconstruction.
  • Design of steerable filters for feature detection
  • Novel active contour models for biomedical image segmentation
  • Projection steerable snake model for 3-D reconstruction of DNA filaments from cryo-EM data
  • Quantification of approximation error in curve representations
  • Exact methods for the computation of area moments of Bspline curves

1997- 1999: MS in Signal Processing   Dept. of Electrical Engineering, *Indian Institute of Science, Bangalore*
  Advisor: Prof. GV Anand
  Thesis: Adaptive wavelet transforms for image compression.
  • Generalization of multiresolution analysis and design of novel wavelets
  • Design of fractal-wavelet coders for image compression

1992- 1996: BTech in Electrical & Communication Engineering   *National Institute of Technology, Calicut*

EMPLOYEMENT

2015-Present : Associate Professor, Department of Electrical and Computer Engg, University of Iowa
2011-2015 : Assistant Professor, Department of Electrical and Computer Engg, University of Iowa
2007-2011 : Assistant Professor, Department of Biomedical Engineering, University of Rochester
2003-2006 : Beckman Post-Doctoral Fellow, Beckman Institute, University of Illinois at Urbana Champaign
1999-2003 : Research Assistant, Swiss Federal Institute of Technology, Switzerland
1996-1997 : Hardware Design Engineer, Wipro Infotech R&D, Bangalore, India

ACADEMIC & PROFESSIONAL HONORS

2015 : Best paper award, IEEE International Symposium on Biomedical Imaging
2014 : Best paper in the BioImaging & Signal Processing at ICASSP 2014
2011 : American Cancer Society New Investigator Award
2009 : CAREER Award, National Science Foundation
2009-Present : Associate Editor, IEEE Transactions on Medical Imaging
2008 : Junior Lecturer, IEEE EMBS International Summer School on Biomedical Imaging
2003-2006 : Beckman Fellowship, University of Illinois at Urbana Champaign
1996 : 30th rank in national GATE exams (~40,000 students)
1996 : Second rank in BTech outgoing exams from Calicut University (~240 students)

TEACHING

2016: Instructor: Computers in Engineering
2015: Instructor: Pattern Recognition, Advanced Image Processing, Computers in Engineering
2014: Instructor: MR Imaging Systems, Linear Systems 1, Computers in Engineering
2013: Instructor: Pattern Recognition, Computers in Engineering
2012: Instructor: Computers in Engineering
2011: Instructor: Digital Signal Processing
2010: Biomedical Computation
2009: Biomedical Computation

PROFESSIONAL SERVICE

International

- Associate Editor, IEEE Transactions on Medical Imaging, 2009-present
- Member, IEEE TC on Bioimaging and Signal Processing
- Member, IEEE Special Interest Group on Computational Imaging
- Technical Program Committee, ISBI 2016, Prague
- Technical Program Committee, ICSSP 2011, Calicut, India
- Organizer, Special Session on MR imaging at Wavelets and Sparsity, 2015, 2013
- 2010-present Track Chair, IEEE International Conf. Image Processing (ICIP)
- Track Chair, IEEE International Conference on Image Processing (ICIP) 2010, Hongkong
- Associate Editor, Invited Sessions, IEEE EMBS, 2010, Minneapolis
- Panel Member, Neuroscience and Opthalmic Imaging Technologies, National Institute of Health
- Proposal reviewer, National competence center for Biomedical Imaging, Switzerland, 2010
- Proposal reviewer, Image and Signal Processing panel, NSF-CCF, 2010
- Proposal reviewer, Fondecyt (National Fund for Science & Technology, Chile), 2009
- Proposal reviewer, Sensing and Biomedical Engineering panel, NSF-CBET, 2009
- Proposal reviewer, MRI-R2 panel, NSF-CBET, 2009

Regular reviewer of

   IEEE Transactions on Medical Imaging (TMI), Image Processing (T-IP), Signal Processing (T-SP), Pattern Analysis and Machine Intelligence (TPAMI), Biomedical Engineering (TBME), IEEE Signal Processing Letters, Magnetic Resonance in Medicine (MRM), Signal Processing, International Journal of Computer Vision (IJCV), Journal of Mathematical Imaging and Vision (JMIV) Advances in Computational Mathematics (ACM)

PEER REVIEWED JOURNAL PAPERS

1. I. Bhattacharya, M. Jacob, Compartmentalized low-rank recovery for high resolution lipid unsuppressed MRSI, Magnetic Resonance in Medicine, in review.

2. M. Mani, M. Jacob, D. Kelley, V. Magnotta, Multi-shot multi-channel diffusion data recovery using structured low rank matrix completion, Magnetic Resonance in Medicine, in review.

3. S. Biswas, S. Dasgupta, R. Mudumbai, M. Jacob, Subspace aware recovery of low rank and jointly sparse signals, IEEE Trans. Image Processing, in review.

4. H. Achanta, S. Biswas, S. Dasgupta, B. Dasgupta, M. Jacob, R. Mudumbai, The Spark of Fourier Matrices: Connections to Vanishing Sums and Coprimeness, Digital Signal Processing, Elsevier, in review.

5. G. Ongie, M.Jacob, Super-resolution recovery of multidimensional images, SIAM Journal on Imaging Sciences, in press.

6. Y. Mohsin, S.G. Lingala, E. DiBella, M. Jacob, "PRICE: Accelerated Dynamic MRI using Patch Regularization for Implicit motion CompEnsation (PRICE)", Magnetic Resonance in Medicine, in press

7. C. Liao, C. Ying, M. Mani, M.Jacob, J. Zhong, Efficient Parallel Reconstruction for High Resolution Multi- shot Spiral Diffusion Data with Low Rank Constraint, Magnetic Resonance in Medicine, in press

8. S.Bhave, S.G Lingala, J. Newell, S. Nagle, M.Jacob, Blind Compressed Sensing Enables 3D Dynamic Free Breathing MR Imaging of Lung Volumes and Diaphragm Motion, Investigative Radiology, in press.

9. S.Poddar, M.Jacob, Dynamic MRI using Smoothness Regularization on Manifolds (SToRM), IEEE Transactions on Medical Imaging, in press.

10. S. Bhave, S.G. Lingala, C.P. Johnson, V.A. Magnotta, M. Jacob, "Accelerated whole-brain multi-parameter mapping using blind compressed sensing", Magnetic Resonance in Medicine, 2015.

11. S. Biswas, H. Achanta, M. Jacob, S. Dasgupta, R. Mudumbai, Recovery of Low Rank and Jointly Sparse Matrices with Two Sampling Matrices, IEEE Signal Processing Letters, 22 (11), pp 1945 - 1949, 2015.

12. G. Ongie, M. Jacob, Recovery of discontinuous signals using group sparse higher degree total variation, IEEE Signal Processing Letters, 22 (9), pp 1414 - 1418, 2015.

13. Y. Mohsin, G. Ongie, M. Jacob, Iterative shrinkage algorithm for patch smoothness regularized medical image recovery, IEEE Trans. Medical Imaging, 34(12), pp 2417-28, 2015.

14. S.G. Lingala, E. DiBella, M. Jacob, Deformation corrected compressed sensing (DC-CS): a novel framework for accelerated dynamic MRI, IEEE Transactions on Medical Imaging, 34(1):72-85, 2015. (supplementary videos)

15. M. Mani, M. Jacob, V. Magnotta, J. Zhong, Fast iterative algorithm for the reconstruction of multi-shot non-Cartesian diffusion data, Magnetic Resonance in Medicine, 74 (4), pp 1086–1094, 2015.

16. M. Mani, M. Jacob, A. Guidon, V. Magnotta, J. Zhong, Acceleration of high angular and spatial resolution diffusion imaging using compressed sensing with multichannel spiral data, Magnetic Resonance in Medicine, 73, pp 126–138, 2015.

17. C. Cui, X. Wu, J. Newell, M. Jacob, Fat water decomposition using GlObally Optimal Surface Estimation (GOOSE) algorithm, Magnetic Resonance in Medicine, Volume 73, Issue 3, pages 1289–1299, 2015.

18. Y. Hu, G. Ongie, M. Jacob, Generalized Higher Degree Total Variation (HDTV) Regularization, IEEE Transactions on Image Processing, vol 23 (6), pp 2423-2435, 2014.

19. Z. Yang, M. Jacob, Mean square optimal NUFFT approximation for efficient non-Cartesian MRI reconstruction , Journal of Magnetic Resonance, vol 242, pp 126-135, May 2014.

20. A. Daducci,E. Rodrıguez, M. Descoteaux, E. Garyfallidis, Y. Gur, Y. Lin, M. Mani, S. Merlet, M. Paquette, A. Manzanares, M. Reisert, P. Rodrigues, F. Sepehrband, E. Caruyer, J. Choupan, R. Deriche, M. Jacob, G. Menegaz, V. Prckovska, M. Rivera, Y. Wiaux, J. Thiran, Quantitative comparison of reconstruction methods for intra-voxel fiber recovery from diffusion MRI, IEEE Transactions on Medical Imaging, vol 33 (2), 384-399, 2014.

21. S. Bhave, R. Eslami, M. Jacob,"A sparse spectral deconvolution algorithm for non-Cartesian MRSI", Magnetic Resonance in Medicine, pages 469–476, Feb 2014

22. S. G. Lingala, M. Jacob, Blind Compressed Sensing Dynamic MRI", IEEE Transactions on Medical Imaging, pp 1132-1145, vol.32(6), June 2013. [software]

23. S. G. Lingala, E.DiBella, G. Adluru, C. McGann,M. Jacob, Accelerating free breathing myocardial perfusion MRI using multi coil radial k-t SLR, Physics in Biology and Medicine, vol.58(20), pp. 7309-7327, Sep 2013. (link to supplementary material). [software]

24. Z. Yang, M. Jacob,"Nonlocal regularization of inverse problems: a unified variational framework", IEEE Trans. Image Processing, pp: 3192-203, vol.22(8), Aug 2013.

25. Y. Hu, M. Jacob,"Higher degree total variation (HDTV) regularization for image recovery", IEEE Trans. Image Processing, pp 2559-2571, Vol 21, No 5, May 2012. [software]

26. Y. Hu, S. G. Lingala, M. Jacob, "A fast majorize-minimize algorithm for the recovery of sparse and low rank matrices", IEEE Trans. Image Processing, pp 742-753, Vol 21, No 2, Feb 2012.

27. S. G. Lingala, Y. Hu, E. DiBella, M. Jacob, "Accelerated dynamic MRI exploiting sparsity and low-rank structure", IEEE Trans. Medical Imaging, pg 1042-1054, vol 30, May 2011. [software]

28. K. Satyananda, M. Jacob,"Non-iterative regularized reconstruction algorithm for non-Cartesian MRI", Magnetic Resonance Imaging, Feb 2011.

29. R. Eslami, M. Jacob, "Robust Reconstruction of MRSI Data Using a Sparse Spectral Model and High Resolution MRI Priors", IEEE Transactions on Medical Imaging, June 2010, vol 29, issue 6, pp 1297-309

30. Y. Lin, T. Gu, C. Zhong, S. Kennedy, M. Jacob, J. Zhong, "High-resolution MRS in the presence of field inhomogeneity via intermolecular double-quantum coherences on a 3T whole-body scanner", Magnetic Resonance in Medicine, Jan 2010.

31. M. Jacob, "Optimized least square non uniform fast Fourier transform (OLS-NUFFT)" , IEEE Transactions of Signal Processing, vol. 57, issue 6, pp. 2165-2177, Feb 2009

32. R. Frazin, M. Jacob, M. Wakin, H. Morgan, "Toward reconstruction of coronal mass ejection density from only three points of view", Astrophysical Journal, April 2009, pp 636-641.

33. M. Jacob, B. Sutton, "Algebraic decomposition of water and fat in MRI", IEEE Transactions of Medical Imaging, Feb 2009, pp 173-84.

34. M. Jacob, X. Zhu, A. Ebel, N.Schuff, and Z.P. Liang, "Improved model-based magnetic resonance spectroscopic imaging", IEEE Transactions of Medical Imaging, Oct 2007, 1305-18.

35. I. Khalidov,D. Van De Ville,M.Jacob, F. Lazeyras, M. Unser, "BSLIM: Spectral localization by imaging with explicit B0 field inhomogeneity compensation", IEEE Transactions on Medical Imaging, Feb 2007, 990-1000.

36. N. Cao, A. Neharoi, M.Jacob, "Image reconstruction for diffuse optical tomography using sparsity regularization and expectation-maximization algorithm", Optics Express,2007,pp 13695-13708

37. M. Jacob, Y. Bresler, V. Toronov, X. Zhang, and A. Webb, "A level-set algorithm for the reconstruction of functional activation in near-infrared spectroscopic imaging", Journal of Biomedical Optics, Dec 2006, 064029.

38. A. Amzallag, C. Vaillant, M.Jacob, M. Unser, J.Bednar, JD. Kahn, J.Dubochet, A. Stasiak, JH. Maddocks, "3D reconstruction and comparison of shapes of DNA minicircles observed by cryo-electron microscopy,Nucleic Acids Res, Sept. 2006.

39. M. Jacob, T.Blu, C.Vaillant,J.Maddocks and M. Unser, "3-D shape estimation of DNA from stereo cryo-electron micro-graphs using a projection-steerable snake", IEEE Transactions on Image Processing, 214-27, Jan 2006.

40. M. Jacob, M. Unser, "Design of steerable filters for feature detection using Canny-like criterion", IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 26, no. 8, pp. 1007-1019, Aug. 2004.

41. E.Meijering, M. Jacob, J. C. F. Sarria, P. Steiner, H. Hirling and M. Unser, "Design and validation of a tool for neurite tracing and analysis in fluorescence microscopy", Cytometry, vol. 58A, no. 2, pp. 167-176, April 2004.

42. M. Jacob, T. Blu, M. Unser, "Efficient energies and algorithms for parametric snakes", IEEE Transactions on Image Processing, vol. 13, no. 9, pp. 1231-1244, Sep. 2004.

43. M. Jacob, T. Blu, M. Unser, "Sampling of Periodic Signals: A Quantitative Error Analysis", IEEE Transactions on Signal Processing, vol. 50, no. 5, pp. 1153-1159, May 2002.

44. M. Jacob, T. Blu, M. Unser, "An Exact Method for Computing the Area Moments of Wavelet and Spline Curves, IEEE Transactions on Pattern Analysis and Machine Intelligence", vol. 23, no. 6, pp. 633-642, June 2001.

PEER REVIEWED CONFERENCE PAPERS

1. G. Ongie, M. Jacob, A fast algorithm for structured low-rank matrix recovery with application to undersampled MRI, ISBI 2016.

2. I. Bhattacharya, M. Jacob, Compartmentalized low-rank algorithm for high resolution MRSI, ISBI, 2016.

3. S.G. Lingala, Y.Mohsin, S. Bhave, X.Miao, Y.Guo, K.S. Nayak, E. DiBella, M. Jacob, "Data-adaptive reconstruction algorithms for accelerated dynamic MRI: an open-source MATLAB package." ISMRM workshop on Data Sampling and Image Reconstruction, Sedona, Arizona,Jan 2016.

4. S. Biswas, S. Dasgupta, M. Jacob, R. Mudumbai, Spark under 2 D Fourier Sampling, EUSIPCO, Nice, France, 2015.

5. G. Ongie, M. Jacob, Recovery of piecewise smooth images from few Fourier samples, Sampling Theory and Applications, Washington D.C, 2015.

6. Y. Mohsin, S.G. Lingala,E Dibella, M Jacob, Motion compensated free breathing myo-cardial perfusion MRI using iterative non-local shrinkage, ISMRM, Toronto, Canada, 2015

7. S. Bhave, S.G. Lingala, A Comellas, J Newell, M Jacob, Dynamic 3D- MRI of the whole lung using constrained reconstruction with learned dictionaries, ISMRM, Toronto, Canada, 2015

8. S. Bhave, S.G. Lingala, C.P. Johnson, V.A. Magnotta, M. Jacob, Whole brain multi-parameter mapping using dictionary learning, ISMRM Toronto Canada, 2015.

9. I.Bhattacharya, M.Jacob, High Resolution 1H MRSI Without Lipid Suppression at short echo times using variable density spirals, ISMRM, Toronto, Canada, 2015.

10. S.Poddar, J.Newell, M.Jacob, Free breathing CINE with Low Rank aided Manifold smoothness Regularization, ISMRM, Toronto, Canada, 2015.

11. M. Mani, M. Jacob, V. Magnotta, Diffusion Imaging Of Head And Neck At High Angular And Spatial Resolution Using Multi-Shot Spirals, ISMRM, Toronto, Canada, 2015.

12. G. Ongie, M. Jacob, Super-resolution MRI using finite rate of innovation curves, IEEE ISBI 2015, in press.

13. A. Balachandrasekaran, M. Jacob, Accelerated dynamic MRI using self expressiveness prior, IEEE ISBI, New York City, USA, 2015.

14. S. Poddar, M. Jacob, Low rank recovery with manifold smoothness prior: theory and application to accelerated MRI, IEEE ISBI, New York City, USA, 2015.

15. S. Biswas, S. Poddar, S. Dasgupta, R. Mudumbai, M. Jacob, Two step recovery of jointly sparse and low-rank matrices: theoretical guarantees, IEEE ISBI 2015, in press

16. H.K. Achanta, S. Dasgupta, M. Jacob, B.N. Dasgupta, R. Mudumbai, Coprime conditions for Fourier Sampling for Sparse recovery, A Coruna, Spain, 2014.

17. S. Biswas, S. Poddar, S. Dasgupta, R. Mudumbai, M. Jacob, Subspace based low rank and joint sparse matrix recovery, Asilomar, Pacific Grove, USA, 2014

18. S. Bhave, S. G. Lingala, M. Jacob, A variable splitting based algortihm for Fast Multi-coil Blind Compressed sensing MRI Reconstruction, EMBC, Chicago, USA, 2014.

19. Y. Mohsin, G. Ongie, M.Jacob, "Accelerated MRI using iterative non-local shrinkage", EMBC, Chicago, USA, 2014.

20. Y. Mohsin, Z. Yang, S.G.Lingala, M.Jacob, "Motion compensated dynamic imaging without explicit motion estimation", ISMRM, Milan, Italy, 2014.

21. M. Mani, V. Magnotta, M.Jacob, "Fast motion compensated ODF reconstruction from undersampled multichannel non-Cartesian MRI diffusion imaging data ", ISMRM, Milan, Italy, 2014.

22. C. Cui, X. Wu, J. Newell, M. Jacob, "3D GlObally Optimal Surface Estimation (3D-GOOSE) algorithm for fat and water separation", ISMRM, Milan, Italy, 2014.

23. S.Poddar, S.G.Lingala, M.Jacob, "Real Time Cardiac MRI using Manifold Sensing", ISMRM, Milan, Italy, 2014.

24. S.G. Lingala, Y.Mohsin, J.Newell, J.Sieren, D.Wang, D.Thedens, M.Jacob, "Towards 3D dynamic MRI of the lung using blind compressed sensing", ISMRM, Milan, Italy, 2014.

25. S. Poddar, S.G. Lingala, M. Jacob, "Joint recovery of undersampled signals on a manifold: application to free breathing MRI", ICASSP, Florence, Italy, 2014.

26. G. Ongie, Y. Hu, M. Jacob, Higher Degree Total Variation for 3-D Image Recovery, ISBI 2014, China.

27. S. Bhave, Jinsuh Kim, C. P. Johnson, M. Jacob, Accelerated CEST MRI using Compressive Sensing and Multi-shot Spiral Acquisitions, ISMRM, Salt Lake city, Utah, April 2013

28. S. G. Lingala, E.DiBella, M. Jacob, Accelerated myocardial perfusion MRI using motion compensated compressed sensing (MC-CS), ISMRM, Salt lake city, Utah, April 2013.

29. S. G. Lingala, M. Jacob, Blind compressed sensing with sparse dictionaries for accelerated dynamic MRI, IEEE ISBI, San Francisco, April 2013.

30. S. G. Lingala, M. Jacob, A blind compressed sensing framework for dynamic MRI, IEEE ISBI, Barcelona, May 2012

31. Y. Hu, M. Jacob Improved higher degree total variation regularization, IEEE ISBI, Barcelona, May 2012

32. Z. Yang, M. Jacob Robust non-local regularization framework for motion compensated dynamic imaging without explicit motion estmation, IEEE ISBI, Barcelona, May 2012

33. M. Mani, M. Jacob, A. Guidon, C. Liu, A. Song, V. Magnotta, J. Zhong Acceleration of high angular and spatial resolution diffusion imaging using compressive sensing, IEEE ISBI, Barcelona, May 2012

34. M. Mani, M. Jacob, A. Guidon, V. Magnotta, J.Zhong, Accelerating non-Cartesian SENSE for large coil arrays, application to motion compensation in multi-shot DWI, IEEE ISBI, Barcelona, May 2012

35. R.Eslami, M. Jacob, "A sparse reconstruction algorithm for parallel spiral MR spectroscopic imaging", IEEE ISBI, Chicago, April 2011.

36. S.G. Lingala, Y. Hu, E. DiBella, M. Jacob,"Accelerated first pass cardiac perfusion MRI using improved k-t SLR", IEEE ISBI, Chicago, April 2011.

37. Z.Yang, M. Jacob,"A unified energy minimization framework for nonlocal regularization", IEEE ISBI, Chicago", April 2011.

38. S.G. Lingala, M. Nadar, C. Chefd'hotel, Li Zhang, M. Jacob,"Unified reconstruction and motion estimation in cardiac perfusion MRI", IEEE ISBI, Chicago, April 2011.

39. Y. Hu, M. Jacob,"Image recovery using improved total variation regularization", IEEE ISBI, Chicago, April 2011.

40. S.G. Lingala, Y. Hu, M. Jacob,"Real-time cardiac MRI using low-rank and sparsity penalties", IEEE ISBI, Rotterdam", April 2010.

41. K. Satyananda, M. Jacob,"A fast & accurate non-iterative algorithm for regularized non-Cartesian MRI, IEEE ISBI, Rotterdam", April 2010.

42. R. Eslami, M. Jacob,"Spatial Spectral Modeling for Robust MRSI, IEEE EMBS, Minneapolis", Sept 2009.

43. R. Eslami, M. Jacob, "Reduction of distortions in MRSI using a new signal model", IEEE international symposium on biomedical imaging, 2009.

44. Z. Yang, M. Jacob, "Efficient NUFFT algorithm for non-Cartesian MRI reconstruction",, IEEE international symposium on biomedical imaging, 2009.

45. M. Jacob, "Optimized non-uniform fast Fourier transform (NUFFT) for iterative tomographic reconstruction", IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2009.

46. R. Eslami, M. Jacob, "Correction of B0 inhomogeneity distortion in magnetic resonance spectroscopic imaging", IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2009.

47. M.Jacob, H. Le-houllier, S. Bora, S. McAleavey, D. Dalecki, J. McDonough,"The use of speckle tracking for the recovery of displacement and velocity information from sequences of ultrasound images of the tongue", International Seminar on Speech Production, Proceedings of ISSP 2008.

48. R.Shankar, T. Gu, J. Zhong, M. Jacob,""Improved IDQC reconstruction for inhomogeneity corrected MR spectroscopy", IEEE International Symposium on Biomedical Imaging, Proceedings of ISBI 2008.

49. M. Jacob, B. Sutton,"Non-iterative decomposition of fat and water", IEEE International Symposium on Biomedical Imaging, Proceedings of ISBI 2007.

50. R. Morrisson, M. Jacob, M. Do, "Multichannel estimation of coil sensitivities in parallel MRI", IEEE International Symposium on Biomedical Imaging, Proceedings of ISBI 2007

51. M. Jacob, B. Sutton, "Non-iterative decomposition of fat and water using chemical shift",Proceedings of the ISMRM, 2007, in press

52. M. Jacob, V. Toronov, A. Webb and Y. Bresler, "A new level-set algorithm for the diffuse optical imaging of the brain", Proceedings of the SPIE: Photonics West (2006)

53. M. Jacob, B. Sutton, J. Haldar, Z.P. Liang, "On Model Based Spectroscopic Imaging", Proceedings of the IEEE International Symposium on Biomedical Imaging (ISBI'06).

54. M. Jacob, V. Toronov, Y. Bresler, X. Zhang, A. Webb, "Reconstruction of functional activations in diffuse optical imaging", Proceedings of the ISBI 2006.

55. J. Haldar, M. Jacob, A. Ebel, X. Zhu, N. Schuff, B. Sutton, Z.P. Liang, "Regularized inversion of noisy, incomplete MR spectroscopic imaging data with anatomical prior",Proceedings of the IEEE International Symposium on Biomedical Imaging, 2006

56. M. Jacob, B. Sutton, J. Haldar, Z.P. Liang, "Improved spectroscopic imaging using echo-planar scans and sparse reconstruction", Proceedings of the ISMRM, 2006.

57. J. Haldar, M. Jacob, A. Ebel, X. Zhu, N. Schuff, B. Sutton, Z.P. Liang, "Constrained spectroscopic imaging with hard and soft anatomical boundary constraints", Proceedings of the ISMRM, 2006.

58. I. Khalidov, D. Van De Ville, M.Jacob, F. Lazeyras, M. Unser, "Improved MRSI with Field In-homogeneity Compensation," Proceedings of the SPIE: International Symposium on Medical Imaging: Image Processing, 2006.

59. F. Aguet, M. Jacob, M. Unser,"Three-Dimensional Feature Detection Using Optimal Steerable Filters", Proceedings of the 2005 IEEE International Conference on Image Processing (ICIP'05), Genova, Italy, September 11-14, 2005, pp. II-1158-II-1161 .

60. D. Xu, M. Jacob, Z. P. Liang,"Optimal sampling of k-space on Cartesian grids for parallel imaging", Proceedings of ISMRM 2005, Miami, Florida

61. D. Xu, L. Ying, M. Jacob, Z. P. Liang,"Optimizing SENSE for Dynamic Imaging", Proceedings of ISMRM 2005, Miami, Florida.

62. M. Jacob, T. Deller, X.Zhu, Z. P.Liang,"High-resolution spectroscopic imaging using a deformable spatial spectral model", Proceedings of ISMRM 2005,

63. M. Jacob, D. Xu, Z.P. Liang,"Optimal Selection of Phase Encodings in Parallel MR Imaging", Second International Workshop on Parallel MRI, ETH Zurich, Switzerland, 15-17 October 2004

64. M. Jacob, T. Blu, M. Unser,"Shape estimation of 3-D DNA molecules from stereo cryo-electron micro-graphs", Accepted for publication at Proceedings of the International Conference on Image Processing, Singapore, October 2004.

65. E. Meijering, M. Jacob, J-C. F.Sarria, M. Unser,"Neurite Tracing in Fluorescence Microscopy Images using Ridge Filtering and Graph Searching: Principles and Validation", Proceedings of ISBI, 2004, pp. 1219-1222.

66. E. Meijering, M. Jacob, J-C. F.Sarria, M. Unser,"A Novel Approach for Neurite Tracing and Analysis in Fluorescence Microscopy Images", Proceedings of the Fifth IASTED International Conference on Signal and Image Processing, August 13-15, 2003, Honolulu, USA , pp. 491-495.

67. M. Jacob, M. Unser,"Optimal steerable filters for feature detection", Proceedings of the International Conference on Image Processing 2003, September 14-17.

68. M. Jacob, T. Blu, M. Unser,,"3-D reconstruction of DNA filaments from stereo cryo-electron micrographs ", Proceedings of the First 2002 ISBI 2002, vol.II, pp. 597-600.

69. M. Feilner, M. Jacob, M. Unser,"Orthogonal Quincunx Wavelets with Fractional Orders ", Proceedings of the 2001 IEEE International Conference on Image Processing, October 7-10, 2001, vol. I, pp. 606-609.

70. M. Jacob, T. Blu, M. Unser,"A Unifying Approach and Interface for Spline-Based Snakes ", Proceedings of the SPIE International Symposium on Medical Imaging: Image Processing, February 17-22, 2001, vol. 4322, Part I, pp. 340-347.

71. M. Jacob, T. Blu, M. Unser,"An Error Analysis for the Sampling of Periodic Signals", Proceedings of the Fourth International Conference on Sampling Theory and Applications (SampTA'01), 2001, pp. 45-48.

72. M. Jacob, T. Blu, M. Unser,"Exact Computation of Area Moments for Spline and Wavelet Curves",Proceedings of the Fifteenth International Conference on Pattern Recognition (ICPR'00), Barcelona, Spain, September 3-8, 2000, vol. III, pp. 131-134.

INVITED TALKS

1. Advances in model based dynamic imaging, Gordon Research Conference on Image Science, 2016

2. Model based dynamic imaging, Biomedical Engineering, Carnegie Mellon University, 2016

3. Super-resolution recovery of images, SPIE Conference on Optics & Photonics: Wavelets and Sparsity XIV, San-Diego, April 2015.

4. Model based algorithms for image recovery, Iowa State University, 2014

5. Adaptive algorithms for dynamic imaging, SIAM annual meeting, 2013

6. Accelerated Dynamic MRI, EPFL, Lausanne, Switzerland, 2013

7. Accelerated Dynamic MRI, University of Geneva, 2013

8. Adaptive algorithms for dynamic MRI, KAIST, South Korea, 2013

9. Signal Processing methods for MRI, Inverse Problems, South Korea, 2013

10. Accelerated perfusion MRI using k-t SLR, SPIE Conference on Optics & Photonics: Wavelets and Sparsity XIV, San-Diego, April 2011.

11. Biomedical image recovery using higher degree total variaton (HDTV) regularization, SPIE Conference on Optics & Photonics: Wavelets and Sparsity XIV, San-Diego, April 2011.

12. kt-SLR: a novel scheme for accelerated dynamic MR imaging, ECE Department, IISc Bangalore and IEEE SP Bangalore Chapter, Bangalore, India, Sept 2010

13. Accelerated dynamic MR imaging using kt-SLR, NIT Calicut Golden Jubilee celebration, Inaugural lecture, Calicut, India Sept 2010.

14. Accelerated dynamic MR imaging using kt-SLR, Cornell Medical Center, NY, July 2010.

15. kt-SLR: a novel scheme for accelerated dynamic MR imaging, Siemens Corporate Research, Princeton, NJ, 2010.

16. Robust reconstruction of MRSI data using high-resolution MRI priors, EMBC, Minneapolis, 2009.

17. Model based MR spectroscopic imaging, Asilomar Conference on Signals, Systems, and Computers, 2008.

18. M. Jacob, "Model based algorithms for Biomedical Imaging" in IEEE-EMBS summer school on Biomedical Imaging, 2008.

RESEARCH SUPPORT

Current

1R01EB019961-01A1   Jacob (PI)   04/2016 - 03/2020
Agency: NIH/NIBIB
Total Costs: 2,144,993
Title: Novel Computational Framework for Free-Breathing & Ungated Dynamic MRI
Summary: The main focus is to develop a novel framework to enable implicit motion compensated and motion resolved reconstruction of free breathing and ungated MRI datasets of the whole heart and lung from highly under sampled data. We will quantitatively determine the utility of the free-breathing & ungated framework to provide reconstructions that are equivalent to current breath-hold acquisitions in obese subjects who have difficulty in holding their breath.

ONR: 11231001   **Jacob(PI)**   01/2013-12/2017
Agency: Office of Naval Research
Total Costs: $875,000
Title: CIF: Multi-Image Co-prime Sensing: Theory and Applications to MRI

Summary: The main goals of this project are (1) explore the links between coprime sensing and multi-image compressed sensing and (2) to apply the proposed tools to significantly improve MR imaging applications.

CCF: 1116067   Jacob(PI)   08/2011 – 07/2016
Agency: NSF/CCF
Total Costs: $433,897
Title: CIF: Adaptive signal representation for accelerated multidimensional imaging
Summary: The main goals of this project are (1) to develop adaptive image representations for accelerated MR imaging and (2) to apply the proposed tools to significantly accelerate free breathing cardiac MRI.

RSG-11-267-01-CCE   Jacob(PI)   01/2011-07/2016
Agency: American Cancer Society
Total Costs: $720,000
Title: Improved MR spectroscopic imaging for glioma treatment planning
Summary: The major goals of this project are (a) to develop novel MR spectroscopic imaging sequences and reconstruction algorithms to improve the quality of the spectra and (2) to demonstrate the utility of the resulting scheme in radiation therapy planning.

DMS 1557593   Jacob(PI: Iowa component)   01/2016-12/2016
Agency: National Science Foundation
Total Costs: $100,000
Title: QuBBD: Collaborative Proposal: Interactive Ensemble Clustering for Mixed Data with Application to Mood Disorders
Summary: The major goals of this project are (a) to develop novel MR spectroscopic imaging sequences and reconstruction algorithms to improve the quality of the spectra and (2) to demonstrate the utility of the resulting scheme in radiation therapy planning.

Univ. Iowa, Aging of the Brain & Mind **(PIs: Voss & Jacob)**   1/16-1/17
Direct Costs: $25,000
Title: Probing the molecular mechanisms in cognitive aging & protective factors with novel quantitative MR imaging
Summary: The main focus is on the development of quantitative MRI biomarkers that are predictive of cognitive aging.

Pending

CCF   Jacob(PI)   08/2016 – 07/2019
Agency: NSF/CCF
Total Costs: $491,317
Title: CIF:Small: Structure-exploiting super-resolution recovery for multidimensional imaging
Summary: The main focus is to introduce a novel super-resolution framework and efficient algorithms that are capable of exploiting the extensive structure present in imaging problems.

Completed

1R21HL109710-01A1 Jacob(PI)   01/2012-12/2013
Agency: NIH/NHLBI
Total Costs: $427,611
Title: Novel algorithm for contrast enhanced myocardial perfusion MRI
Summary: The main goal of this project is to establish the clinical utility of the novel k-t SLR algorithm in improving the spatial resultion and quality of first-pass myocardial perfusion MRI data.

CCF-0844812   Jacob (PI)   07/2009 - 06/2014
Agency: National Science Foundation
Total Costs: $399,600
Title: CAREER: Efficient Image Sparsifying Operators: Theory, Algorithms and Applications
Summary: Many image processing applications rely on a transform or an operator to eliminate the redundancies in images, thus sparsifying the data. The main focus of this proposal is to develop multidimensional image sparsifying operators that are invariant to translations and rotations and is competent in representing edges. This research leads to fundamental advances in several areas of multidimensional signal recovery. Specifically, we plan to apply the framework to significantly accelerate the acquisition of dynamic and spectroscopic magnetic resonance imaging (MRI) data.

CTSI Faculty Pilot   Jacob (PI)   06/2008 - 5/2009
Agency: Clinical Translational Research Institute, University of Rochester

Total Costs: $50,000
Title: MR spectroscopic imaging of brain cancer progression
Summary: The main focus is on the development of parallel 1-D EPSI schemes using the 12 channel head array to aid therapy planing in glioblastoma multiforme.