

ROHITH KRISHNA REDDY

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EDUCATION

Ph.D. in Bioengineering

University of Illinois at Urbana Champaign (UIUC), 2013

Advisor: Dr. Rohit Bhargava

Dissertation: Mid-infrared Spectroscopic Imaging and Tomography

Minor in Computational Science and Engineering (CSE)

Bachelor's (B.Tech.) in Electrical Engineering and

Master's (M.Tech.) in Communication and Signal Processing (Dual Degree)

Indian Institute of Technology (IIT) Madras, India, 2006

Advisor: Dr. K.M.M.Prabhu

POST-DOCTORAL TRAINING

Harvard University

Advisor: Dr. Guillermo J. (Gary) Tearney

Harvard Medical School, Massachusetts General Hospital

Nov 2013 – Dec 2017

University of Illinois at Urbana Champaign,

Beckman Institute for Advanced Science and Technology

Advisor: Dr. Rohit Bhargava

June 2013 - Oct 2013

AWARDS AND DISTINCTIONS

- 2016 **Innovation award** given by **FACSS** for the most innovative and **outstanding new research advancement** from among all the scientific work presented at the **SciX 2016** conference. This award recognizes my post-doctoral work on a swallowable capsule endoscopy for Barrett's esophagus diagnosis based on Optical Coherence Tomography.
- 2015 An award from **Massachusetts General Hospital** given to two post-docs each year to present their research at a conference. This award is presented by the Massachusetts General Post-doc Association.
- 2014 **William F. Meggers award** for 2014. This is **the best paper award** in the spectroscopy community. It is awarded annually by the Society of Applied Spectroscopy (**SAS**).
- 2012 **Tomas Hirschfeld Award** for 2012, an **international award** given to a student in recognition of **outstanding research** by the Federation of Analytical Chemistry and Spectroscopy Societies (**FACSS**).
- 2012 **Innovation award** given by **FACSS** for the most innovative and **outstanding new research advancement** presented at the **SciX 2012** conference. This conference Science Exchange (SciX) was held in Kansas City, MO, Sept. 30th to Oct 5th, 2012.
- 2011 **William G. Fateley Student Award** for 2011, an **international award** given to **the exceptional student** in the field of spectroscopy. This is given to one student each year.
- 2011 **Society of Applied Spectroscopy Student Award** for 2011, a **national award** for **outstanding research** in light-matter interaction and image formation in mid-infrared.
- 2011 **Coblentz Student Award** for 2011, an **international award** recognizing contribution to the field of vibrational spectroscopy.

- 2011 **Among the 40 US students selected** to attend the NSF-NSC Summer Institute on Biosensing-Bioactuation (BSBA) 2011 held at National Taiwan University, Taiwan. This program was sponsored jointly by National Science Foundation (**NSF**) of USA and National Science Council (**NSC**) of Taiwan.
- 2011 **Best Student Poster Award** at Federation of Analytical Chemistry and Spectroscopy Societies (**FACSS '11**) annual conference, Reno NV, USA.
- 2010 Bioengineering@Illinois **Graduate Student Award (2010)** for an outstanding poster among more than 80 submissions spanning all bioengineering related research at Urbana-Champaign.
- 2009 **Among the 50 students selected** from all over the world to attend the NanoBiophotonics Summer School 2009 sponsored by National Science Foundation (**NSF**) and Network for Computational Nanotechnology (**NCN**)
- 2009 **Best Student Poster Award** at Federation of Analytical Chemistry and Spectroscopy Societies (**FACSS '09**) annual conference, Louisville KY, USA.
- 2009 Department of Bioengineering **Graduate Student Achievement Award** for distinction in research among all graduate students in Bioengineering at Urbana-Champaign.
- 2007 **Best Student Poster Award** at Federation of Analytical Chemistry and Spectroscopy Societies (**FACSS '07**) annual conference, Memphis TN, USA.
- 2007 Co-author of the **Bronze Medal winning paper** at Genetic and Evolutionary Computation Conference (**GECCO**) 2007, London, UK.
- 2001 **33rd Rank (99.98 Percentile)** in IIT Joint Entrance Exam-2001 (Round 1) and **148th Rank (99.9 Percentile)** in IIT Joint Entrance Exam-2001 (Round 2). The IITs are among the most prestigious educational institutions in India.
- 2000 **1st Rank** in the state and **13th Rank** All India in National Science Olympiad, 2000-01 conducted by Science Olympiad Foundation, New Delhi. **22nd Rank** All India in the final round of the same.
- 2000 **Among the top 200 students** in the nation in the **Indian Chemistry Olympiad (IChO)**, June 2000.

PUBLICATIONS

Patents

1. R. Bhargava, F.N. Pounder, **R.K. Reddy**, "Automated Detection of Breast Cancer Lesions in Tissue", U.S. Patent Application No. 13/222,623, filed on August 31, 2011.
2. G.J. Tearney, **R.K. Reddy**, "Apparatus for controlling the propagation and transmission of light in flexible waveguides", filed April 2014.
3. G.J. Tearney, **R.K. Reddy**, "Optical imaging device powered by light", filed April 2015.
4. G.J. Ughi, K.Singh, A.M. Fard, **R.K. Reddy**, G.J. Tearney, Anatomically correct 3D reconstruction of luminal objects, filed July 2015.
5. G.J. Tearney, **R.K. Reddy**, M.J. Gora, K.K. Chu, M. Beatty, "Actively controlled optical imaging device", filed September 2015.

Peer Reviewed Publications

1. **R.K. Reddy**, R. Bhargava, "Accurate histopathology from low signal-to-noise ratio spectroscopic imaging data", *Analyst*, **135**, 2818-2825, 2010
2. M.V. Schulmerich, **R.K. Reddy**, A.K. Kodali, L.J. Elgass, K. Tangella and R. Bhargava, "Dark Field Raman Microscopy", *Anal. Chem.*, **82**(14), 6273-6280, 2010
3. R. Kong, **R.K. Reddy**, R. Bhargava "Characterization of Tumor Progression in Engineered Tissue using Infrared Spectroscopic Imaging" *Analyst*, **135**(7), 1569-1578, 2010
4. X. Llorca, **R. Reddy**, B. Matesic, R. Bhargava, "Towards Better than Human Capability in Diagnosing Prostate Cancer Using Infrared Spectroscopic Imaging", *Genetic and Evolutionary Computation Conference (GECCO)*, 2007
5. **R.K. Reddy**, B. Davis, P.S. Carney, R. Bhargava, "Modeling Fourier Transform Infrared Spectroscopic Imaging of Prostate and Breast Cancer Tissue Specimens", *International Symposium of Biomedical Imaging (ISBI)*, 2011 (IEEE)
6. **R. Reddy**, D. Mayerich, M. Walsh, M. Schulmerich, P. S. Carney, R. Bhargava, "Optimizing the Design of FT-IR Spectroscopic Imaging Instruments to Obtain Increased Spatial Resolution of Chemical Species", *International Symposium of Biomedical Imaging (ISBI)*, 2012 (IEEE)
7. M.J. Walsh, **R.K. Reddy**, R. Bhargava, "Label-free Biomedical Imaging with Mid- Infrared Spectroscopy", *IEEE Journal of Selected Topics in Quantum Electronics focusing on Biophotonics* **2**, **18**(4), 1502-1513, 2012
8. J.T. Kwak, **R.K. Reddy**, S. Sinha, R. Bhargava, "Analysis of Variance components in Spectroscopic Imaging data of Tissue Microarray", *Anal. Chem.*, **84**(12), 1063-1069, 2012

9. **R.K. Reddy**, D. Mayerich, M. Walsh, P. S. Carney, R. Bhargava, "Rigorous Electromagnetic Model of Fourier Transform Infrared (FT-IR) Spectroscopic Imaging Applied to Automated Histology of Prostate Tissue Specimens", World Academy of Science, Engineering and Technology, *International Journal of Medical, Health, Biomedical, Bioengineering and Pharmaceutical Engineering* 6.3, 47-51, 2012
10. M.R. Kole, **R.K. Reddy**, M.V. Schulmerich, M.K. Gelber, R. Bhargava, "Discrete frequency infrared microspectroscopy and imaging with a tunable quantum cascade laser", *Anal. Chem.*, **84**(23), 10366-10372, 2012
11. **R.K. Reddy**, M.J. Walsh, M.V. Schulmerich, P. S. Carney, R. Bhargava, "High-definition Infrared Spectroscopic Imaging", *Appl. Spectrosc.*, **67**(1), 93-105, 2013
12. B.Deutsch, **R.K. Reddy**, D.Mayerich, R. Bhargava, P. S. Carney, "Compositional prior information in computed infrared spectroscopic imaging", *Journal of the Optical Society of America A*, **32**(6) 1126-1131, 2015
13. F.N. Pounder, **R.K. Reddy**, R. Bhargava, "Chemical Imaging for Human-Competitive Histologic Recognition Following Breast Cancer Screening", *Faraday discussions* 187, 43-68, 2016
14. B. Yin, K.K. Chu, C. Liang, K. Singh, **R. Reddy**, Guillermo J. Tearney, "μOCT imaging using depth of focus extension by self-imaging wavefront division in a common-path fiber optic probe," *Opt. Express* **24**, 5555-5564, 2016

Book Chapters

1. **R.K. Reddy** and R. Bhargava, "Chemometric methods for biomedical Raman spectroscopy and imaging" Book Ref: M.D. Morris, P.Matousek, "Emerging Raman Applications and Techniques in Biomedical and Pharmaceutical Fields", Springer-Verlag, Berlin Heidelberg, 2010
2. K. Yeh, **R.K. Reddy** and R. Bhargava, "Fourier transform infrared spectroscopic imaging: An emerging label-free approach for molecular imaging" Book Ref: M. Anastasio, P.J. La Riviere, "Emerging Imaging Technologies in Medicine", Taylor & Francis, Philadelphia, USA, 2012

Ph.D Thesis

1. **R.K. Reddy**, "Mid-Infrared Spectroscopic Imaging and Tomography", University of Illinois at Urbana Champaign, 2013.

PRESENTATIONS

Invited Talks

1. **R.K. Reddy**, D. Mayerich, M.J. Walsh, P.S.Carney, R. Bhargava, "Design of high resolution FT-IR spectroscopic imaging instruments for improved breast cancer detection", SPIE Photonics West, San Francisco, CA, Feb. 10th, 2015
2. **R.K. Reddy**, "Building mid-infrared spectroscopic imaging instruments for improved breast cancer detection", Wellman Center for Photomedicine, Massachusetts General Hospital, Harvard Medical School, Feb. 3rd, 2015
3. **R.K. Reddy**, D. Mayerich, M.J. Walsh, P.S.Carney, R.Bhargava, "High Resolution FT-IR Imaging for Improved Breast Cancer Detection", Science Exchange (SciX) conference organized by Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, Oct. 1st, 2014
4. **R.K. Reddy**, K.K. Chu, T.N.Ford, K. Singh, R.W. Carruth, D. Hyun, H. Ma, D. Mojahed, C. Unglert, G.J. Tearney, "Seeing the unseen in human tissue", Science Exchange (SciX) conference organized by Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, Oct. 1st, 2014
5. **R.K. Reddy**, P.S.Carney, R.Bhargava, "Mid-infrared Spectroscopic Imaging and Tomography", Massachusetts General Hospital, July 9th, 2013
6. **R.K. Reddy**, R.Bhargava, "Instrumentation for Infrared Spectroscopic Imaging", Lam Research, Fremont, California, October 23rd, 2012
7. **R.K. Reddy**, Thomas van Dijk, R.Bhargava, "Vibrational Spectroscopy", Roger Adams Laboratory, University of Illinois at Urbana Champaign, Jan 31st, 2012
8. **R.K. Reddy**, D. Mayerich, M.J. Walsh, M.V. Schulmerich, P.S.Carney, R.Bhargava, "Fourier Transform Infrared (FT-IR) Spectroscopic Imaging of Human Tissue Specimens", Beckman Graduate Seminar, Beckman Institute for Advanced Science and Technology, Urbana IL, Nov 2nd, 2010

Conference Presentations

9. **R.K. Reddy**, J. Dong, M.J. Gora, M. Beatty, W. Trasischker, K. Singh, R. Carruth, A. Soomro, C.N. Grant, M. Rosenberg, G.J. Tearney, "An Inexpensive Medical Device for Barrett's esophagus Screening", SPIE Photonics West, San Francisco, CA, Jan 30th, 2017.

10. **R.K. Reddy**, J. Dong, M.J. Gora, M. Beatty, W. Trasischker, K. Singh, R. Carruth, A. Soomro, C.N. Grant, M. Rosenberg, G.J. Tearney, "An Inexpensive Medical Device for Barrett's esophagus Screening", Science Exchange (SciX) conference organized by Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Minneapolis, MN, Sept. 23rd, 2016
11. **R.K. Reddy**, M.J. Gora, R. Carruth, T.N. Ford, J. Dong, G.J. Tearney, "Tethered Capsule Endomicroscopy for Barrett's Esophagus Screening", Science Exchange (SciX) conference organized by Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Providence, RI, Oct. 1st, 2015
12. **R.K. Reddy**, K.K. Chu, T.N. Ford, K. Singh, R.W. Carruth, D. Hyun, H. Ma, D. Mojahed, C. Unglert, G.J. Tearney, "Functional micron-resolution imaging with micro-optical coherence tomography", Science Exchange (SciX) conference organized by Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, Oct. 2nd, 2014
13. **R.K. Reddy**, D. Mayerich, M.J. Walsh, M.V. Schulmerich, R. Bhargava, "Improved Breast Cancer Detection from High-Resolution Fourier Transform Infrared (FTIR) Spectroscopic Imaging", Science Exchange (SciX) conference organized by Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Milwaukee, WI, Oct. 3rd, 2013
14. **R.K. Reddy**, D. Mayerich, M.J. Walsh, M.V. Schulmerich, R. Bhargava, "Classification of Prostate and Breast Tissue Data from High-Resolution Fourier Transform Infrared (FTIR) Spectroscopic Imaging", Science Exchange (SciX) conference organized by Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Kansas City, MO, Oct. 1st, 2012
15. **R.K. Reddy**, M.J. Walsh, M. Schulmerich, P.S. Carney, R. Bhargava "High resolution FT-IR spectroscopic imaging instruments for cancer detection", (Poster) Univ. of Illinois at Urbana Champaign Community at Illinois Symposium, Chicago, April 5th, 2012
16. **R.K. Reddy**, D. Mayerich, M. Walsh, P. S. Carney, R. Bhargava, "Rigorous Electromagnetic Model of Fourier Transform Infrared (FT-IR) Spectroscopic Imaging Applied to Automated Histology of Prostate Tissue Specimens", International Conference on Optics, Lasers and Spectroscopy (ICOLS), Madrid, Spain, March 28th, 2012
17. **R.K. Reddy**, M.J. Walsh, M. Schulmerich, P.S. Carney, R. Bhargava "Design of high resolution FT-IR spectroscopic imaging instruments for cancer detection", (Poster) Univ. of Illinois at Chicago Cancer Center Research Forum, Chicago, March 6th, 2012
18. **R. Reddy**, D. Mayerich, M. Walsh, M. Schulmerich, P.S. Carney, R. Bhargava, "High Definition Fourier Transform Infrared (FT-IR) Spectroscopic Imaging" Midwest ACS meeting, Oct. 19th, 2011
19. **R.K. Reddy**, P.S. Carney, R. Bhargava, "Overcoming Spectral Distortions in Fourier Transform Infrared (FT-IR) Spectroscopic Imaging", Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, Oct. 2nd, 2011
20. R. Bhargava, T. van Dijk, **R.K. Reddy**, P.S. Carney "Theory of resolution and image quality in mid-IR imaging", FACSS '11, Reno, October 3rd, 2011.
21. **R.K. Reddy**, R. Bhargava, "High-Definition FT-IR Spectroscopic Imaging", Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, Oct. 4th, 2011
22. **R.K. Reddy**, M.J. Walsh, M. Schulmerich, P.S. Carney, R. Bhargava "High Definition Fourier Transform Infrared (FT-IR) Spectroscopic Imaging", (Poster) FACSS '011, Reno, NV, Oct. 4th, 2011
23. **R.K. Reddy**, R. Bhargava, "Fourier-Transform Infrared Spectroscopic Imaging for Histopathology", (Poster) BioSensing and BioActuation Summer Institute 2011, National Taiwan University, Taiwan, July 22nd, 2011
24. **R.K. Reddy**, B.J. Davis, P.S. Carney, R. Bhargava "Modeling Fourier transform infrared spectroscopic imaging of Prostate and breast cancer tissue specimens" IEEE International Symposium on Biomedical Imaging (ISBI), Chicago, March 30th, 2011
25. **R.K. Reddy**, B.J. Davis, P.S. Carney, R. Bhargava, "Enhanced Models for Fourier Transform Infrared (FT-IR) Spectroscopic Imaging of Human Tissue Specimens", Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Rayleigh, NC, Oct. 4th, 2010
26. **R.K. Reddy**, F.N. Pounder, R. Bhargava, "Modeling, Data Visualization and Histopathology using Fourier Transform Infrared (FT-IR) Spectroscopic Imaging of Human Tissue Specimens" (Poster), Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Louisville, KY, Oct. 19th, 2009
27. **R.K. Reddy**, R. Bhargava, "Modeling, Data Visualization and Histopathology using Fourier Transform Infrared (FT-IR) Spectroscopic Imaging of Human Tissue Specimens", Biomedical Engineering Society Conference (BMES), Pittsburgh, PA, Oct. 8th, 2009
28. **R.K. Reddy**, R. Bhargava, "Fourier-Transform Infrared Spectroscopic Imaging", (Poster) NanoBiophotonics Summer School 2009, Urbana IL, June 4th, 2009

29. **R.K. Reddy**, R. Bhargava, “Advances in Automated Histopathology using Fourier Transform Infrared (FT-IR) Spectroscopic Imaging” (Poster) Univ. of Michigan at Ann Arbor, Midwestern Biomedical Engineering Conference, April 3rd, 2009
30. **R.K. Reddy**, R. Bhargava, “Robustness of Tissue Classification using FT-IR Imaging”, Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, Sept. 30th, 2008
31. R. Bhargava, F.N. Pounder, **R.K. Reddy**, X. Llorca, “Enhancing the tissue segmentation capability of fast infrared spectroscopic imaging via chemometric methods,” Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, Sept. 30th, 2008
32. **R.K. Reddy**, R. Bhargava, “Advances in Automated Histopathology using Fourier Transform Infrared (FT-IR) Spectroscopic Imaging”, (Poster) Biomedical Engineering Society Conference (BMES), St.Louis, MO, Oct 3rd, 2008
33. **R. Reddy**, R.Bhargava, “Computational Methods for Enhancing Infrared Spectroscopic Imaging”, Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Memphis TN, Oct 14th, 2007

Conference Papers (Other)

34. T.H. Nguyen, **R.K. Reddy**, M. J. Walsh, M. Schulmerich, G. Popescu, M.N. Do, R. Bhargava, “Denoising and deblurring of Fourier-transform infrared spectroscopic imaging”, Society of Photo-Optical Instrumentation Engineers (SPIE) Photonics West, Paper No. 8296-20, 2012
35. R. Bhargava, P.S. Carney, **R.K. Reddy** “Re-imagining FT-IR imaging and applications with new theory and instruments” SciX ‘12, Kansas City, October 2012
36. R. Bhargava, A.K. Kodali, X. Llorca, **R.K. Reddy**, M.J. Walsh, P.S. Carney “Development of highly sensitive and specific vibrational spectroscopic imaging guided by new theory” EAS 2011, Somerset, NJ, November 2011
37. F.N. Pounder, **R.K. Reddy**, M. Walsh and R. Bhargava, “Validating the cancer diagnosis potential of mid-infrared spectroscopic imaging,” Society of Photo-Optical Instrumentation Engineers (SPIE ‘09) Photonics West, Paper No. 7186-14, 2009
38. R. Bhargava, F.N. Pounder, **R.K. Reddy**, “Validating the cancer diagnosis potential of mid-infrared spectroscopic imaging,” Society of Photo-Optical Instrumentation Engineers (SPIE) Photonics West, San Jose, CA, Jan. 27th 2009
39. F.N. Keith, **R.K. Reddy**, and R. Bhargava, “Practical protocols for ultrafast histopathology by Fourier transform infrared imaging,” Society of Photo-Optical Instrumentation Engineers (SPIE) Photonics West, Paper No. 6853A-5, 2008

Master’s Thesis

40. **R.Reddy**, K.M.M.Prabhu, “3D Warped Discrete Cosine Transform and its application in Image Compression”, Indian Institute of Technology Madras, Chennai, India, July 2006.

SERVICE AND LEADERSHIP

- I have **organized four conference sessions** on **biomedical imaging** at the SciX 2014, SciX 2015 and SciX 2016 conferences. SciX has been one of the most important annual spectroscopy conferences for more than 40 years.
- I have been a **reviewer** for several **journals** including Science Advances, Applied Spectroscopy and Journal of the Optical Society of America.
- Member of SPIE, IEEE, Society for Applied Spectroscopy (SAS) and Coblenz society.
- The MGH Scientific Advisory Committee ([SAC](#)) consisting of representatives from Harvard, MIT, Yale, University of Texas Southwestern Medical Center, University of Maryland School of Medicine **requested my inputs** into the challenges facing the research community at MGH. A video excerpt from my involvement can be found [here](#).
- I have **mentored** three undergraduate students successfully. I have co-authored papers and posters with them. One student (Brian Matesic) is now jointly a graduate student at the Stanford Medical School and Harvard Business School.
- I am currently the co-chair (**co-president**) of the **Massachusetts General Hospital Post-doc Association (MGPA)**
- As a co-chair of the postdoc association, helped create the **create the Office of Postdoctoral fellows** to improve the quality of life of all post-docs at MGH.
- I have served as the **vice-president (vice-chair)** of the **Massachusetts General Hospital Post-doc Association**.

- I have served on the **board of the Engineering Graduate Student Advisory Committee (EGSAC)** representing the engineering student body and helping shape policy in association with the Dean's office.
- I have served on the **board of Asha for Education, a non-profit** that works towards education of underprivileged children in India.

INDUSTRY EXPERIENCE

- **Procter and Gamble (P&G)**, Miami Valley Research Center, Cincinnati, OH
June 2008 to Aug 2008: Intern
- **Analog Devices Inc.**, Product Development Centre, Bangalore, India
May 2004 to July 2004: Intern

TEACHING EXPERIENCE

Teaching Assistant at the University of Illinois at Urbana-Champaign for

- Biomedical Instrumentation Lab (BIOE415/ECE415)
- Signals and Systems for Bioengineering (BIOE398)
- Virtual Bio-imaging Lab (BIOE507)

Teaching Assistant at Indian Institute of Technology Madras for

- Computational Engineering (CS110)
- Broadband Communication (EE636)

COMPUTER SKILLS

- Languages & Software: C, MATLAB, IDL, LabVIEW, Zemax, SCILAB, GW-BASIC, Assembly Level Programming (with INTEL 8086), SPICE, ADICE, AutoCAD, TKGate, HTML.
- Comfortable with Linux, Mac and Windows.

LANGUAGE SKILLS

- Native speaker of English, Kannada and Telugu
- Proficient speaker of Hindi