Eric Gibbons

CONTACT INFORMATION

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SCHOLARSHIP INTERESTS

My scholarship interests are in improving image quality and scan efficiency for magnetic resonance imaging (MRI). This work spans magnetic resonance physics, power deposition management from radio frequency pulses, image processing algorithms, machine learning, and clinical implementation, all with the purpose of advancing human health care.

EDUCATION

Stanford University, Stanford, California, USA

Ph.D., Bioengineering, June 2017
- Minor: Electrical Engineering
- Advisor: John Pauly
- Thesis: Robust body diffusion-weighted magnetic resonance imaging

M.S., Bioengineering, June 2013
- Concentration: Signal processing

University of Utah, Salt Lake City, Utah, USA

B.S., Biomedical Engineering, May 2011
- Concentration: Signal processing
- Minor: Mathematics
- Thesis: Correlation-based retrospective concatenation of multi-volume 3D microCT data

AWARDS

- NIH T32 Cardiovascular Imaging Training Grant, 2017
- ISMRM Educational Stipend Award, 2013, 2014, 2015, 2016
- National Science Foundation Graduate Fellowship, 2012
- Stanford University School of Engineering Dean's Doctoral Diversity Fellowship, 2011
- University of Utah College of Engineering Arel Berrier Scholarship, 2010
- University of Utah Barry M. Goldwater Scholar Nominee, 2010
- University of Utah Presidential Scholarship, 2005 - 2011
- Member of Tau Beta Pi, 2009 - Present
- Eagle Scout, 2003

POSITIONS

Utah Center for Advanced Imaging Research, Salt Lake City, Utah USA

Postdoctoral Fellow July 2017 to Present

Working with Dr. Edward DiBella to improve, assess, and apply MRI techniques. Work includes unique MRI reconstruction algorithms using deep learning techniques, RF pulse design, and improved diffusion-weighted imaging. Work is done in conjunction with scientists and engineers from Siemens.

MedWhat San Francisco, California USA

Deep Learning Engineer November 2015 to January 2017

Developed novel machine learning algorithms for the purposes of computer vision and natural language processing. In particular, used convolutional neural network algorithms to identify dermatological conditions and developed a robust question-answer system for questions in the medical domain. Developed business strategy and engaged with Silicon Valley venture capitalists. Developed company IP portfolio.

Stanford University, Stanford, California USA

Graduate Research Assistant April 2012 to June 2017

Developed a rapid diffusion-weighted MRI sequences for pediatric imaging cases. Pulse sequence development included RF pulse design, power deposition analysis, and image processing techniques. This work resulted in a robust protocol that is used routinely at Lucille Packard Children's Hospital

at Stanford. This work was done in conjunction with scientists and engineers from General Electric. Financial support for this project also came from General Electric.

University of Utah, Salt Lake City, Utah USA

Edward W. Hsu Research Group December 2009 to June 2011
Worked to improve dynamic imaging resolution through higher order frequency reconstruction. Developed cross-correlation volumetric stitching algorithm for CT volumes. Ran CT scanner as well as performed image analysis on CT volumes.

Center for Neural Interfaces December 2008 to November 2009
Developed a neural cuff to hold Utah Slant Electrode Array in place while also providing electrical shielding. Conducted over 60 small animal (Fischer rat) surgeries to implant the device. Monitored post surgery walking behavior, explantation, and perfusions to verify biological response to cuff.

University of Utah Nanofab July 2008 to August 2009
Specialized on environmental scanning electron microscopy. Characterized biological materials through various surface analysis tools.

Teaching Experience

Stanford University, Department of Electrical Engineering

EE 102A: Signals and Systems
Sophomore and junior level course in continuous- and discrete-time signal and system analysis.

Primary Instructor Summer 2015, Summer 2016
Developed syllabus, created homework, taught lectures, held office hours.

Teaching Assistant, with John Pauly Winter 2013, Winter 2014, Winter 2016
Held office hours, held recitation sessions, lectured occasionally.

Note: Teaching evaluations for this class can be found at `ekgibbons.github.io/teaching`.

EE 369B: Medical Imaging Systems II
Graduate level course on imaging internal structures within the body from a systems viewpoint.

Teaching Assistant, with Dwight Nishimura Spring 2016
Held office hours, held recitation sessions, lectured occasionally.

EE 369C: Medical Imaging Reconstruction
Graduate level course on medical imaging reconstruction algorithms.

Teaching Assistant, with John Pauly Fall 2015
Held office hours, mentored class projects.

EFS/Lang 688: Writing for Engineering and Science
Class for incoming international graduate students on academic writing, listening, discussion, oral presentation, and spoken usage.

Academic Consultant, with Lisa Quijano Summer 2014
Held office hours, occasionally lectured, consulted on writing projects.

University of Utah, Department of Biomedical Engineering

BIOEN 3900: Biosignals Analysis
Sophomore and junior level course in signal processing and analysis with biomedical applications.

Teaching Assistant, with Edward Hsu Spring 2011
Graded, held office hours, held recitation.

BIOEN 5101: Bioinstrumentation
Junior and senior level course in electronics and signal processing with biomedical applications.

Teaching Assistant, with Edward Hsu Fall 2009, Fall 2010
Developed an entirely new laboratory component for the course, graded, held office hours, held recitation, lectured occasionally.

Publications

[1] **E. K. Gibbons**, Y. Tian, A. S. Chaudhari, and E. V. R. DiBella, "Rapid STCR cardiac perfusion reconstruction using convolutional neural networks," *Magnetic Resonance in Medicine*, in preparation for submission in January 2019.

[2] A. S. Chaudhari, J. Wood, , K. J. Stevens, **E. K. Gibbons**, A. D. Desai, Z. Fang, J. H. Lee, G. E. Gold, and B. A. Hargreaves, "Super-resolution musculoskeletal MRI using deep learning," *Journal of Magnetic Resonance Imaging*, in preparation for submission in December 2018.

[3] **E. K. Gibbons**, K. K. Hodgson, A. S. Chaudhari, L. G. Richards, J. J. Majersik, G. Adluru, and E. V. R. DiBella, "Simultaneous cross parameter map generation from subsampled q-space imaging using deep learning," *Magnetic Resonance in Medicine*, vol. 00, no. 1, pp. 1–13, 2018.

[4] A. S. Chaudhari, Z. Fang, F. Kogan, J. Wood, K. J. Stevens, **E. K. Gibbons**, J. H. Lee, G. E. Gold, and B. A. Hargreaves, "Super-resolution musculoskeletal MRI using deep learning," *Magnetic Resonance in Medicine*, vol. 80, no. 5, pp. 2139–2154, 2018.

[5] **E. K. Gibbons**, S. S. Vasanawala, J. M. Pauly, and A. B. Kerr, "Body diffusion-weighted imaging using magnetization prepared single-shot fast spin echo and extended parallel imaging signal averaging," *Magnetic Resonance in Medicine*, vol. 79, no. 6, pp. 3032–3044, 2018.

[6] **E. K. Gibbons**, P. Le Roux, S. S. Vasanawala, J. M. Pauly, and A. B. Kerr, "Robust self-calibrating nCPMG aquisition: Application to body diffusion-weighted imaging," *IEEE Transactions on Medical Imaging*, vol. 37, no. 1, pp. 200–209, 2018.

[7] **E. K. Gibbons**, P. Le Roux, J. M. Pauly, and A. B. Kerr, "Slice profile effects on nCPMG SS-FSE," *Magnetic Resonance in Medicine*, vol. 79, no. 1, pp. 430–438, 2018.

[8] **E. K. Gibbons**, P. Le Roux, S. S. Vasanawala, J. M. Pauly, and A. B. Kerr, "Body diffusion weighted imaging using non-CPMG fast spin echo," *IEEE Transactions on Medical Imaging*, vol. 36, no. 2, pp. 549–559, 2017.

Conference Proceedings

[1] **E. K. Gibbons**, K. K. Hodgson, A. S. Chaudhari, L. G. Richards, J. J. Majersik, G. Adluru, and E. V. R. DiBella, "Using CNNs for computing diffusion spectrum imaging parameters without image preprocessing," in *Proceedings of International Society for Magnetic Resonance in Medicine, 27th Annual Meeting, Montreal, Canada*, in submission.

[2] A. S. Chaudhari, Z. Fang, **E. K. Gibbons**, J. H. Lee, G. E. Gold, and B. A. Hargreaves, "Super-resolution enhances morphological and quantitative MRI on prospectively-sampled low-resolution data," in *Proceedings of Medical Imaging Meets NIPS, 32nd Conference on Neural Information Processing Systems, Montreal, Canada*, in submission.

[3] A. S. Chaudhari, Z. Fang, F. Kogan, J. Wood, K. J. Stevens, **E. K. Gibbons**, J. H. Lee, G. E. Gold, and B. A. Hargreaves, "Using artificial intelligence to enhance MRI efficiency for imaging OA," in *International Workshop on Osteoarthritis Imaging, Menton, France*, 2018.

[4] E. V. R. DiBella, **E. K. Gibbons**, J. Mendes, Y. Tian, and G. Adluru, "Using artificial intelligence to transform cardiac MRI reconstruction methods," in *Engineering in Medicine and Biology Society (EMBC), 2018 Annual International Conference of the IEEE*, invited.

[5] **E. K. Gibbons**, A. S. Chaudhari, and E. V. DiBella, "Deep slice: expanding cardiac SMS coverage through deep learning slice interpolation," in *Proceedings of International Society for Magnetic Resonance in Medicine, 26th Annual Meeting, Paris, France*, 2018, p. 3514.

[6] A. S. Chaudhari, Z. Fang, F. Kogan, J. Wood, K. J. Stevens, **E. K. Gibbons**, J. H. Lee, G. E. Gold, and B. A. Hargreaves, "Enhancing MRI resolution and fully-automating tissue segmentation using deep learning," in *Proceedings of the Nvidia GPU Technology Conference (GTC), San Jose, California, USA*, *Best poster award.

[7] **E. K. Gibbons**, A. S. Chaudhari, and E. V. R. DiBella, "Expanding SMS coverage in cardiac perfusion MRI through deep learning for temporal interpolation," in *Proceedings of the ISMRM Workshop on Machine Learning, Pacific Grove, California, USA*, 2018.

[8] A. S. Chaudhari, Z. Fang, F. Kogan, J. Wood, K. J. Stevens, **E. K. Gibbons**, J. H. Lee, G. E. Gold, and B. A. Hargreaves, "Deep-learning-based super-resolution and segmentation for clinical and research musculoskeletal MRI," in *Proceedings of the ISMRM Workshop on Machine Learning, Pacific Grove, California, USA*, 2018.

[9] **E. K. Gibbons**, P. LeRoux, S. Vasanawala, J. M. Pauly, and A. B. Kerr, "Robust nCPMG SS-FSE with accelerated acquisition and reconstruction," in *Proceedings of International Society for Magnetic Resonance in Medicine, 25th Annual Meeting, Honolulu, Hawaii*, 2017, p. 3514.

[10] **E. K. Gibbons**, J. M. Pauly, and A. B. Kerr, "Slice profile effects on non-CPMG SS-FSE acquisitions," in *Proceedings of International Society for Magnetic Resonance in Medicine, 24rd Annual Meeting, Singapore, Singapore*, 2016, p. 1894.

[11] **E. K. Gibbons**, S. S. Vasanawala, J. M. Pauly, and A. B. Kerr, "Body DWI using nCPMG FSE," in *Proceedings of International Society for Magnetic Resonance in Medicine, 23rd Annual Meeting, Toronto, Canada*, 2015, p. 2540.

[12] **E. K. Gibbons**, J. M. Pauly, and A. B. Kerr, "Single-shot isotropic diffusion weighting with eddy current compensation," in *Proceedings of International Society for Magnetic Resonance in Medicine, 22nd Annual Meeting, Milan, Italy*, 2014, p. 2559.

[13] **E. K. Gibbons**, J. M. Pauly, M. Saranathan, B. Rutt, and A. B. Kerr, "A T2-diffusion-prepared cube sequence for brain lesion detection at 7T," in *Proceedings of International Society for Magnetic Resonance in Medicine, 21st Annual Meeting, Salt Lake City, Utah, USA*, 2013, p. 2512.

[14] **E. K. Gibbons**, S. J. Holdsworth, M. Aksoy, M. B. Ooi, and R. Bammer, "Analysis of ghosting artifacts for real-time motion correction using EPI," in *Proceedings of International Society for Magnetic Resonance in Medicine, 20th Annual Meeting, Melbourne, Australia*, 2012, p. 3431.

[15] C. Petty, **E. K. Gibbons**, R. A. Normann, and G. A. Clark, "Containment for the Utah Slanted Electrode Array," in *5th Annual Mountain West Biomedical Engineering Conference*, 2009.

Relevant Coursework Introduction to digital communication, medical image reconstruction, RF pulse design, convex optimization, machine learning, linear dynamical systems, digital signal processing, image processing, medical imaging systems, convolutional neural networks for visual recognition

Teaching Areas Introductory circuits courses, signal processing, power engineering, communication theory, scientific computing, machine learning, optimization, and medical imaging systems

Languages English, native language
Mandarin Chinese, conversational spoken and basic reading/writing skill

Academic Service Organizer, University of Utah Department of Radiology Machine Learning Working Group
Reviewer, IEEE Transactions on Biomedical Engineering
Reviewer, Magnetic Resonance in Medicine
Reviewer, International Society of Magnetic Resonance in Medicine

Professional Memberships International Society for Magnetic Resonance in Medicine
IEEE

Interests Cycling, skiing, fly fishing, backpacking, analog stereo equipment