

Education

- Sep. 2010 – May 2015 **University of Michigan**, Ann Arbor, MI
M.S., Ph.D. in Electrical Engineering: Systems (Signal Processing)
Thesis: *X-ray CT Image Reconstruction on Highly Parallel Architectures*
Advised by Jeffrey A. Fessler
State-of-the-art image reconstruction speeds via new algorithms and GPUs
- Sep. 2006 – May 2010 **Tufts University**, Medford, MA
B.S., *summa cum laude*, in Electrical Engineering & Mathematics

Research Experience

- May 2015 – present **University of Michigan**, Ann Arbor, MI – *Postdoctoral research fellow*
Plenoptic imaging for 3D reconstruction of translucent objects
Collaborated with colleagues from mechanical engineering and optics
Designed and implemented fast (GPU-friendly) model for plenoptic camera
X-ray CT reconstruction on Parallel Architectures
Worked with GE Healthcare on next-generation GPU-based CT reconstruction
Collaborated with colleagues in comp-sci on fast “SIMD-ized” CT model
Mentored graduate students working on inverse problems
Developed algorithms for distributed and multi-GPU CT reconstruction
- Sep. 2010 – May 2015 **University of Michigan**, Ann Arbor, MI – *Graduate student research assistant*
GPU algorithms
Developed and maintained software for multi-GPU image denoising and CT
Collaborated with GE Healthcare and GE Global Research on two patents
Duality-based methods for fast image reconstruction
Developed fast new algorithms for CT reconstruction on modern hardware
Algorithm “building blocks” development and analysis
Novel work on filter- and “majorizer-” design for accelerated and distributed algorithms
- Jun. 2009 – May 2010 **MIT Lincoln Laboratory**, Group 33, Lexington, MA – *Student intern*
Senior project: Signal processing for X-band inverse synthetic aperture radar
Multi-threaded MUSIC-based algorithm for ISAR super-resolution
Over-the-horizon radar target simulator embedded system
Implemented with USRP running modified FPGA “hardware” and C software

Technical skills

- | | |
|--------------------------|----------------------------------------------------------|
| Problem domains | Inverse problems, GPU programming, distributed computing |
| Design languages | Python, MATLAB |
| Implementation languages | C, C++, Rust, OpenCL, Java (under duress) |
| Presentation languages | L ^A T _E X, HTML/Javascript |
| Operating systems | Linux, OS X, Windows |

Teaching and mentoring

- May 2015 – present Mentor for junior group members
- Fall '11, '12, '14 Teaching assistant: Music Signal Processing
Ran weekly labs, office hours and grading for a class of ≈ 40 students
- Summer '11, '15 Undergraduate research advisor
Directed undergraduate students Joe Kurlito and Shamik Ganguly in GPU-related X-ray CT reconstruction projects
- Spring 2010 Tutor, Introduction to Electromagnetics
- Fall 2008 Grader, Discrete Mathematics
- Spring '07, '08 Teaching assistant, Introduction to Computer Science

Journal papers and preprints

- [1] M. McGaffin and J. A. Fessler. Alternating dual updates algorithm for X-ray CT reconstruction on the GPU. *IEEE Trans. Computational Imaging*, 1(3):186–99, September 2015.
- [2] M. McGaffin and J. A. Fessler. Edge-preserving image denoising via group coordinate descent on the GPU. *IEEE Trans. Im. Proc.*, 24(4):1273–81, April 2015.
- [3] M. G. McGaffin and J. A. Fessler. Algorithmic design of majorizers for large-scale inverse problems, 2015. arxiv 1508.02958.

Patents and invention disclosures

- [1] M. G. McGaffin and J. A. Fessler. Invention disclosure: Accelerated and distributed iterative coordinate descent for model-based X-ray CT reconstruction, January 2016.
- [2] D. Pal, E. Drapkin, J-B. Thibault, S. Srivastava, R. Thome, M. G. McGaffin, D. Kim, and J. A. Fessler. Patent application: Systems and methods for parallel processing of imaging formation, May 2015.
- [3] F. Lin, M. G. McGaffin, Z. Yu, J-B. Thibault, S. Ramani, J. A. Fessler, B. De Man, and D. Pal. Patent 20140369581: Iterative reconstruction in image formation, December 2014.

Selected conference papers and talks

- [1] M. G. McGaffin and J. A. Fessler. Multi-node model-based image reconstruction with GPUs. In *SIAM Conf. Imaging Sci., Abstract Book*, 2016. To appear.
- [2] M. G. McGaffin and J. A. Fessler. Accelerated parallel and distributed iterative coordinate descent (ICD) for X-ray CT. In *Proc. 4th Intl. Mtg. on image formation in X-ray CT*, 2016. To appear. (oral).
- [3] R. Sampson, M. G. McGaffin, T. F. Wenisch, and J. A. Fessler. Investigating multi-threaded SIMD for helical CT reconstruction on a CPU. In *Proc. 4th Intl. Mtg. on image formation in X-ray CT*, 2016. To appear. (poster).
- [4] M. G. McGaffin and J. A. Fessler. Duality-based projection-domain tomography solver for splitting-based X-ray CT reconstruction. In *Proc. 3rd Intl. Mtg. on image formation in X-ray CT*, pages 359–62, 2014.
- [5] M. G. McGaffin and J. A. Fessler. Fast edge-preserving image denoising via group coordinate descent on the GPU. In *Proc. SPIE 9020 Computational Imaging XII*, page 90200P, 2014.

Service

2015 – present	Reviewer, IEEE Signal Processing Letters
2015 – present	Reviewer, IEEE Transactions on Medical Imaging
2015 – present	Reviewer, IEEE Transactions on Image Processing
2015 – present	Reviewer, IEEE Transactions on Computational Imaging
2011 – 2013	EECS SPEECS Student Seminar Series – Co-organizer

Awards

2016	SIAM Early Career Award
2015	Fully3D GPU Award
2012 – 2015	Rackham Travel Grant
2013, 2015	Fully3D Travel Grant
2010	GAANN Fellowship
2010	Amos Emerson Dolbear Scholarship
2006 – 2010	IBM Watson Scholarship