

Aaron T. Anderson

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Research Interests

Development of tools and techniques for MR Elastography as a biomarker for detection and staging of human diseases. Incorporate computational algorithms and frameworks, on high performance computational systems, for advanced physical models in MRE.

Education

- 2018 **PhD Theoretical & Applied Mechanics**, *University of Illinois at Urbana-Champaign.*
- 2013 **MS Theoretical & Applied Mechanics**, *University of Illinois at Urbana-Champaign.*
- 2010 **BS Mechanical Engineering**, *University of Wisconsin-Madison.*
- 2010 **BA Physics**, *University of Wisconsin-Eau Claire.*
Math minor

Experience

Research Experience

- 2018– **Carle Foundation Hospital-Beckman Institute Postdoctoral Fellow.**
Advisors: Dr. Bradley P. Sutton, PhD (UIUC) & Dr. Graham R. Huesmann MD/PhD (Carle & UIUC)
 - Develop protocols and execute clinical studies involving MRE at Carle Foundation Hospital.
 - Create and maintain computational tools for collecting MRI data, estimating material properties, and processing data
 - Implement new material models for more physiologically accurate estimation and evaluate estimation algorithms for decreased computation costs
- 2013–2018 **Graduate Research Assistant**, *Mechanical Science & Engineering, UIUC.*
Advisors: Dr. John Georgiadis & Dr. Elijah Van Houten (Université de Sherbrooke)
 - Characterize the effects of excitation direction and inversion parameters on the heterogeneous, isotropic nonlinear inversion (NLI) material property estimation algorithm
 - Use magnetic resonance elastography (MRE) to characterize age-related changes in the mechanical properties of the brain and identify areas most sensitive to aging
 - Utilize NCSA's Blue Waters Sustained Petascale Computing system to realize high-performance computational MR imaging involved in NLI-MRE
- 2010–2013 **Graduate Research Assistant**, *Mechanical Science & Engineering, UIUC.*
Advisor: Dr. Jonathan Freund
 - Conduct computational investigation of jet crackle (aeroacoustic noise) using advanced numerical methods in a massively parallel environment to understand the mechanisms of the noise
 - Write post-processing routines for analysis of simulations to extract a comprehensive physical understanding of the phenomenon under study
- 2008–2010 **Undergraduate Research Assistant**, *Engine Research Center, UW-Madison.*
Advisor: Dr. Scott Sanders
 - Conducted experiments using Fourier Domain Mode-Lock laser for water absorption spectroscopy-based thermometry in combustion environments
 - Used the LabVIEW programming environment to create programs for data acquisition, post-processing of experimental data, and water spectroscopy simulations

2006–2007 **Undergraduate Research Assistant**, *Materials Science Center*, UW-Eau Claire.

Advisors: Dr. Doug Dunham & Dr. Matt Evans

- Gathered data with X-Ray Photoelectron Spectroscopy (XPS) on Manganese bonding with Silicon and chemical properties of Copper-Silver alloy
- Operated Scanning Electron Microscope (SEM); collecting physical and chemical properties of a computer component for a local company

Teaching Experience

2013 **Graduate Teaching Assistant**, *Mechanical Science & Engineering*, UIUC.

Supervisors: Dr. Matthew West & Dr. Elif Ertikin

- TAM 212 - Introductory Dynamics: Spring - TA, Summer - instructor, Fall - TA
- Lead small groups of undergraduate students in weekly analysis of dynamics of real-world problems in order to develop team-based problem solving skills
- Create and update individual assignments which expand on the group assignment towards a broader understanding of the physical phenomenon with an emphasis on technical communication

Industry Experience

Jan–May 2009 **Fielded Engine Performance Co-op**, *General Electric-Aviation*, Evandale, OH.

Supervisor: Ed Yanosik

- Developed a program for running a statistical process within Microsoft Access to analyze deterioration of aero-propulsion turbine engines
- Created a database querying tool to evaluate performance differences between test cells and on-wing levels

May–Aug 2008 **Data Acquisition Intern**, *Turbine Technologies LTD.*, Chetek, WI.

Supervisor: Michael Kutrieb

- Programmed operator's panel and data acquisition system using LabVIEW and National Instruments hardware for development of turbo shaft engine
- Developed electronics support for turbo shaft engine including: servo based fly-by-wire controls, fuel-flow, RPM pick-ups, torque strain gauge, pressure transducers

Skills

Software

Languages Python, FORTRAN 90/95, BASH, Matlab, LabVIEW

Web Jekyll, Markdown, HTML

Publication L^AT_EX, Beamer, MS Office

Other Tools git, GitHub, Make, SQL

Workshops

Apr 2018 **Loh Down on Science Communication Workshop**, *Beckman Institute for Advanced Science and Technology*, Urbana, IL.

Dec 2016 **Software Carpentry Instructor Training**, *National Center for Supercomputing Applications (NCSA)*, Urbana, IL.

Nov 2015 **Presenting Data and Information with Edward Tufte**, *Indianapolis, IN*.

Aug 2014 **LCI Workshop on high performance clustered computing**, *National Center for Supercomputing Applications (NCSA)*, Urbana, IL.

June 2014 **Harness the Power of GPU's: Introduction to GPGPU Programming**, *Indiana University Pervasive Technology Institute*, in person at NCSA, Urbana, IL.

April 2014 **XSEDE HPC Monthly Workshop: OpenACC**, *Pittsburgh Supercomputing Center*, in person at NCSA, Urbana, IL.

Feb 2014 **Scientific Python for Engineers**, *Computational Science & Engineering (UIUC)*, Urbana, IL.

Awards & Honors

- 2015 **2nd place Student Abstract Award**, *MR Elastography - Study Group*, ISMRM.
2014 **James O. Smith Memorial Award**, *Mechanical Science & Engineering*.
Outstanding Theoretical & Applied Mechanics Teaching Assistant

Professional Service

- 2015– **Chapter Founder, President**, *The Hacker Within-Illinois*, Scientific Computing Group.
June 2015 **Graduate Camp Counselor**, *GAMES/GBAM camp*, High school girls STEM camp.
& 2016

Publications

Journal Publications

- 2016 **Aaron T Anderson**, Elijah EW Van Houten, Matthew DJ McGarry, Keith D Paulsen, Joseph L Holtrop, Bradley P Sutton, John G Georgiadis, and Curtis L Johnson. Observation of direction-dependent mechanical properties in the human brain with multi-excitation MR elastography. *Journal of the Mechanical Behavior of Biomedical Materials*, 59:538–546, June 2016. doi: 10.1016/j.jmbbm.2016.03.005.
Curtis L Johnson, Hillary Schwarb, Matthew DJ McGarry, **Aaron T Anderson**, Graham R Huesmann, Bradley P Sutton, and Neal J Cohen. Viscoelasticity of subcortical gray matter structures. *Human Brain Mapping*, 2016. doi: 10.1002/hbm.23314.

Conference Abstracts

- 2018 **Aaron T Anderson**, Curtis L Johnson, Tracey M Wszalek, Bradley P Sutton, Elijah EW Van Houten, and John G Georgiadis. Multi-Excitation MRE in Aging Human Brain. In *26th Annual Meeting of ISMRM*, 2018.
Noel Naughton, Nicolas Gallo, Marcella Viacik, **Aaron T Anderson**, Bradley P Sutton, and John G Georgiadis. Estimation of Extracellular Matrix Diffusion Properties in Decellularized Porcine Myocardium from DTI. In *26th Annual Meeting of ISMRM*, June 2018.
Boris Gutman, **Aaron T Anderson**, Nicolas Gallo, and John G Georgiadis. Magnetic Resonance Elastography Measures Predict White Matter Microstructure and Aging. In *26th Annual Meeting of ISMRM*, June 2018.
- 2017 **Aaron T Anderson**, Curtis L Johnson, Bradley P Sutton, Elijah EW Van Houten, and John G Georgiadis. Mechanical Properties of the Healthy Aging Human Brain. In *First International MRE Workshop*, Berlin, September 2017.
Aaron T Anderson, Curtis L Johnson, Matthew DJ McGarry, Keith D Paulsen, Bradley P Sutton, Elijah EW Van Houten, and John G Georgiadis. Inversion Parameters Based on Convergence and Error Metrics for Nonlinear Inversion MR Elastography. In *25th Annual Meeting of ISMRM*, 2017.
- 2016 **Aaron T Anderson**, Curtis L Johnson, Ligin M Solamen, Matthew DJ McGarry, Keith D Paulsen, Bradley P Sutton, Elijah EW Van Houten, and John G Georgiadis. Study of nonlinear Inversion parameters on MR Elastography of Human Brain. In *International Tissue Elasticity Conference*, 2016.
Aaron T Anderson, Curtis L Johnson, Matthew DJ McGarry, Keith D Paulsen, Bradley P Sutton, Elijah EW Van Houten, and John G Georgiadis. Effect of Nonlinear Inversion Parameters on MR Elastography of Human Brain. In *Biomedical Engineering Society Annual Meeting*, 2016.

Aaron T Anderson, Curtis L Johnson, Matthew DJ McGarry, Keith D Paulsen, Bradley P Sutton, Elijah EW Van Houten, and John G Georgiadis. Convergence of Nonlinear Inversion MR Elastography of Human Brain Mechanical Properties. In *International Conference of the IEEE EMBS*, 2016.

Curtis L Johnson, Joseph L Holtrop, **Aaron T Anderson**, and Bradley P Sutton. Brain MR elastography with multiband excitation and nonlinear motion-induced phase error correction. In *24th Annual Meeting of ISMRM*, 2016.

Graham R Huesmann, Hillary Schwarb, **Aaron T Anderson**, Bradley P Sutton, William C Olivero, Tracey M Wszalek, and Curtis L Johnson. Magnetic Resonance Elastography of the Hippocampus in Mesial Temporal Sclerosis: Initial Results. In *University of Illinois College of Medicine Research Day*, 2016.

- 2015 **Aaron T Anderson**, Curtis L Johnson, Matthew DJ McGarry, Elijah EW Van Houten, and John G Georgiadis. Effect of Nonlinear Inversion Parameters on Brain MR Elastography. In *ASME International Mechanical Engineering Congress and Exposition*, 2015.

Aaron T Anderson, Curtis L Johnson, Joseph L Holtrop, Matthew DJ McGarry, Elijah EW Van Houten, Keith D Paulsen, Bradley P Sutton, and John G Georgiadis. Property Differences in White Matter Structures due to Distinct Wave Propagation Directions in MR Elastography. In *23rd Annual Meeting of ISMRM*, 2015.

Aaron T Anderson, Curtis L Johnson, Joseph L Holtrop, Mathew DJ McGarry, Keith D Paulsen, Bradley P Sutton, Elijah EW Van Houten, and John G Georgiadis. Effect of Isotropic Assumption on Material Property Reconstructions of the Human Brain using Magnetic Resonance Elastography. In *APS March Meeting*. American Physical Society, March 2015.

- 2014 **Aaron T Anderson**, Curtis L Johnson, Joseph L Holtrop, Elijah EW Van Houten, Matthew DJ McGarry, Keith D Paulsen, Bradley P Sutton, and John G Georgiadis. Multi-Direction Excitation for Magnetic Resonance Elastography to Increase the Fidelity of Mechanical Properties. In *22nd Annual Meeting of ISMRM*, 2014.

Aaron T Anderson, Curtis L Johnson, Joseph L Holtrop, Elijah EW Van Houten, Matthew DJ McGarry, Keith D Paulsen, Bradley P Sutton, and John G Georgiadis. Incorporating Multiple Excitation Fields in MR Elastography. In *International Conference of the IEEE EMBS*, 2014.

Aaron T Anderson, Curtis L Johnson, Joseph L Holtrop, Elijah EW Van Houten, Matthew DJ McGarry, Keith D Paulsen, Bradley P Sutton, and John G Georgiadis. Effect of Isotropic Assumption on Material Property Maps of the Human Brain using Non-Linear Inversion for MR Elastography. In *International Tissue Elasticity Conference*, 2014.

David A Buchta, **Aaron T Anderson**, and Jonathan B Freund. Near-field shocks radiated by high-speed free-shear-flow turbulence. In *AIAA/CEAS Aeroacoustics Conference*, 2014.

- 2012 **Aaron T Anderson** and Jonathan B Freund. Source mechanisms of jet crackle. In *AIAA/CEAS Aeroacoustics Conference*, 2012.

Aaron T Anderson and Jonathan B Freund. Mechanisms of "crackle" acoustic radiation from high speed turbulence. *Annual Meeting of the APS Division of Fluid Dynamics*, 57(17), November 2012.

[Invited Seminar](#)

- 2017 **Aaron T Anderson**. Performance of MR Elastography Methods in the Human Brain. U.S. Naval Research Laboratory, August 2017.

- 2014 **Aaron T Anderson**. Effect of Isotropic Assumption on Material Property Maps of the Human Brain. In *Bio-Interest Group Seminar*. Department of Mechanical Science & Engineering, University of Illinois at Urbana-Champaign, October 2014.