

MELODY ALSAKER

Gonzaga University | Department of Mathematics
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EDUCATION

- Ph.D. in Mathematics, Colorado State University, 2016
Dissertation: *Computational Advancements in the D-bar Reconstruction Method for 2-D Electrical Impedance Tomography*
 - M.S. in Mathematics, Colorado State University, 2012
Thesis: *Automated Methods for Quantifying the Tortuosity of Microvascular Networks*
 - B.S. in Applied and Computational Mathematics, South Dakota School of Mines and Technology, 2010
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ACADEMIC EMPLOYMENT

- Assistant Professor, Gonzaga University Department of Mathematics, Aug. 2016–present
 - Graduate Teaching and Research Assistant, Colorado State University Department of Mathematics, Fall 2010–Spring 2016
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TEACHING EXPERIENCE

Gonzaga University

MATH 490:	Electrical Medical Imaging (Independent Study)	Sp19, Fa18
MATH 454:	Partial Differential Equations	Sp18
MATH 360:	Selected Topics (Mathematics Seminar)	Sp19, Sp18
MATH 350:	Elementary Numerical Analysis	Sp19
MATH 290:	Biomedical Modeling (Independent Study)	Fa17
MATH 290:	Mathematics of Biomedical Imaging (Independent Study)	Fa17
MATH 260:	Ordinary Differential Equations	Fa18, Sp18, Fa17, Sp17
MATH 259:	Calculus & Analytic Geometry III	Fa19, Fa18, Fa17, Su17
MATH 157:	Calculus & Analytic Geometry I	Sp17, Fa16
MATH 141:	Mathematical Analysis-Business	Fa19

Colorado State University

MATH 340:	Introduction to Ordinary Differential Equations	Sp16, Fa15
MATH 161:	Calculus II for Physical Scientists	Fa14
MATH 160	Calculus I for Physical Scientists	Fa13, Sp11, Fa10

SD School of Mines & Technology

MATH 102L:	College Algebra Lab	Fa07, Sp08, Fa09
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PUBLICATIONS

Refereed Journal Publications

- M.M. Mellenthin, J.L. Mueller, E.D.L.B. de Camargo, F.S. de Moura, T.B.R. Santos, R.G. Lima, S.J. Hamilton, P.A. Muller, M. Alsaker, “The ACE1 Electrical Impedance Tomography System for Thoracic Imaging.” Accepted in *IEEE Transactions on Instrumentation & Measurement*. To appear 2019.
- M. Alsaker, J.L. Mueller, and R. Murthy, “Dynamic Optimized Priors for D-bar Reconstructions of Human Ventilation using Electrical Impedance Tomography,” *Journal of Computational and Applied Mathematics*, Vol. 362, 276–294, 2019.
- M. Alsaker and J.L. Mueller, “EIT Images of Human Inspiration and Expiration using a D-bar Method with Spatial Priors,” *Applied Computational Electromagnetics Society (ACES) Journal*, Vol. 34, Issue 2, 325–330, 2019.
- M. Alsaker and J.L. Mueller, “Use of an Optimized Spatial Prior in D-bar Reconstructions of EIT Tank Data,” *Inverse Problems and Imaging*, Vol. 12, Issue 4, 883–901, 2018.
- J.L. Mueller, P. Muller, M. Mellenthin, R. Murthy, M. Capps, M. Alsaker, R. Deterding, S. Sagel, E. DeBoer, “Estimating Regions of Air Trapping from Electrical Impedance Tomography Data,” *Physiological Measurement*, Vol. 39, Issue 5, 05NT01, 2018.
- P. Muller, J.L. Mueller, M. Mellenthin, R. Murthy, M. Capps, B.D. Wagner, M. Alsaker, R. Deterding, S.D. Sagel, J. Hoppe, “Evaluation of a Surrogate Measure of Pulmonary Function Derived from Electrical Impedance Tomography Data in Children with Cystic Fibrosis,” *Physiological Measurement*, Vol. 39, Issue 4, 045008, 2018.
- M. Alsaker, S.J. Hamilton, and A. Hauptmann, “A Direct D-bar Method for Partial Boundary Data Electrical Impedance Tomography with A Priori Information,” *Inverse Problems and Imaging*, Vol. 11, Issue 3, 427–454, 2017.
- S.J. Hamilton, J.L. Mueller, and M. Alsaker, “Incorporating a Spatial Prior into Nonlinear D-Bar EIT Imaging for Complex Admittivities,” *IEEE Transactions on Medical Imaging*, Vol. 36, Issue 2, 457–466, 2017.

- M. Alsaker and J.L. Mueller, “A D-bar Algorithm with A Priori Information for 2-D Electrical Impedance Tomography,” *SIAM Journal on Imaging Sciences*, Vol. 9, Issue 4, 1619–1654, 2016.
- M. Dodd (Alsaker) and J.L. Mueller, “A Real-time D-bar Algorithm for 2-D Electrical Impedance Tomography Data,” *Inverse Problems and Imaging*, Vol. 8, Issue 4, 1013–1031, 2014.

Refereed Conference Papers

- M. Alsaker and J.L. Mueller, “Spatial Priors in the D-bar Method for Human Thoracic Electrical Impedance Tomography Data,” *2018 International Applied Computational Electromagnetics Society Symposium - Denver (ACES 2018)*, March 2018.
- M. Dodd (Alsaker) and J.L. Mueller, “Fast D-bar Reconstructions of Ventilation and Perfusion on a Pairwise Current Injection System,” in *Proceedings of the 15th International Conference on Biomedical Applications of Electrical Impedance Tomography*, Ed. A. Adler and B. Grychtol, Ottawa: Carleton University, April 2014, p. 81.

SELECTED PROFESSIONAL PRESENTATIONS

International Conference Presentations

- Ultrasound Data as a Prior in Thoracic Imaging with Electrical Impedance Tomography. Inverse Problems: Modelling and Simulation Conference, University of Malta, Malta, May 2020 (Invited).
- Incorporating Ultrasound Data into Direct EIT Reconstructions of 2D Thoracic Phantom. Applied Inverse Problems Conference, Université Grenoble-Alpes, Grenoble, France, 11 July 2019 (Invited).
- Nonlinear D-bar Reconstructions of 2D Human EIT Data with an Optimized Spatial Prior. SIAM Conference on Imaging Science, University of Bologna, Bologna, Italy, 6 June 2018 (Organizer).
- A D-bar Algorithm with A Priori Information for 2-D Electrical Impedance Imaging. Applied Inverse Problems Conference, University of Helsinki, Helsinki, Finland, 28 May 2015 (Invited).
- Fast D-bar Reconstructions of Ventilation and Perfusion on a Pairwise Current Injection System. 15th International Conference on Biomedical Applications of EIT, Gananoque, Ontario, Canada, 25 April 2014.

National Conference Presentations

- Advancements in Spatial Resolution of D-bar Reconstructions for Human Thoracic Imaging. SIAM Conference on Computational Science and Engineering, Spokane, Washington, 28 February 2018 (Organizer).
- Electrical Impedance Tomography Imaging of Experimental Data Using a D-bar Method with an Optimized Prior. Joint Mathematics Meetings, Atlanta, Georgia, 4 January 2017.
- An a priori Method for 2-D D-bar Reconstructions of Conductivities. Joint Mathematics Meetings, Seattle, Washington, 8 January 2016.
- An Introduction to the Mathematics of Electrical Impedance Tomography. Joint Mathematics Meetings, Seattle, Washington, 8 January 2016.

Regional Conference Presentations

- D-bar Reconstructions with Prior Spatial Information for 2-D Human Thoracic EIT Data. SIAM Central States Section Meeting, Colorado State University, Fort Collins, Colorado, 1 October 2017 (Invited).
- Going Backward: The Mathematics of Inverse Problems. MAA RMS Meeting, Colorado Mesa University, Grand Junction, Colorado, 9 April 2016.
- An Introduction to Electrical Impedance Tomography and the D-bar Algorithm. MAA RMS Meeting, Colorado College, Colorado Springs, Colorado, 18 April 2015.
- Real-Time Electrical Impedance Tomography Imaging with a Fast D-bar Algorithm. MAA RMS Meeting, University of Wyoming, Laramie, Wyoming, 29 March 2014.
- A Fast Implementation of the D-bar Algorithm for Electrical Impedance Tomography. SIAM Front Range Applied Mathematics Student Conference, University of Colorado - Denver, Colorado, 1 March 2014.
- An Introduction to Electrical Impedance Tomography. MAA RMS Meeting, Adams State University, Alamosa, Colorado, 26 April 2013.

Invited Seminar Presentations

- Improved D-bar Reconstructions of Human Ventilation from Electrical Impedance Tomography Data. Mathematics Colloquium, University of Montana, Missoula, Montana, 5 November 2018 (Invited).
- Optimized a priori D-bar Reconstructions of Experimental 2-D EIT Data. Inverse Problems Seminar, University of Helsinki, Helsinki, Finland, 16 June 2017 (Invited).
- D-bar Reconstruction Methods for Electrical Impedance Tomography: Background and Recent Advances. Mathematics Seminar, Bern University of Applied Sciences, Bern, Switzerland, 1 June 2017 (Invited).
- An Introduction to Electrical Impedance Imaging. Mathematics Departmental Seminar, Bucknell University, Lewisburg, Pennsylvania, 2 February 2016 (Invited).

- Applications and Mathematics of Electrical Impedance Tomography. Mathematics and Computer Science Departmental Seminar, Saint Mary's College, Notre Dame, Indiana, 29 January 2016 (Invited).
- The Mathematics of Medical Imaging with Electrical Impedance Tomography. Mathematics Departmental Seminar, California State University Bakersfield, Bakersfield, California, 15 January 2016 (Invited).
- The Inverse Conductivity Problem and Imaging Applications. Air Force Research Laboratory Materials State Awareness Branch / University of Dayton Research Institute Seminar, Wright-Patterson Air Force Base, Dayton, Ohio, 11 January 2016 (Invited).
- Computational Advancements in the D-bar Method for EIT Reconstruction. Biomedical Engineering Seminar, University of Minnesota, Minneapolis, Minnesota, 23 November 2015 (Invited).

Local and Departmental Presentations

- Electric Imaging: Safer, Faster, More Refined. College of Arts and Sciences Dean's Research Forum, Gonzaga University, 20 September 2018.
- The Mathematics of Electrical Impedance Tomography: Basics and Beyond. Spokane Regional Mathematics Colloquium, Gonzaga University, 1 March 2017.
- 2-D Electrical Impedance Tomography using the D-bar Algorithm with a Priori Information. Inverse Problems Seminar, Colorado State University, 3 September 2015.
- Active Complex Electrode System (ACE1) Electrical Impedance Tomography (poster). Graduate Student Showcase, Colorado State University, 23 February 2015.
- Achieving Real-Time EIT Imaging with the D-bar Algorithm in MATLAB. Greenslopes Seminar, Colorado State University, 17 April 2014.
- An Introduction to Magnetic Resonance Imaging. Greenslopes Seminar, Colorado State University, 29 November 2012.
- The Belousov-Zhabotinsky Oscillator. Applied Dynamics Lab Seminar, Colorado State University, 10 December 2010.

SERVICE

Service to the University

- Panelist, Mission and Transition Panel, Student Orientation, 25 August 2018
- Member (Letter Drafter), Committee on Health Science Careers, Spring 2019-Summer 2020
- Member, Publications Board, Fall 2018–present
- Member, Speakers Series Committee, Fall 2017–present
- Member, Commencement Awards Committee, Fall 2017–Spring 2019

Service to the Department

Gonzaga University Department of Mathematics

- Member, Mathematics Department Hiring Committee, Fall 2018–Spring 2019
- Member, Mathematics Department Lecturer Hiring Committee, Spring 2019
- Member, Mathematics Department Hiring Committee, Fall 2017–Spring 2018
- Member, Applied Math Committee, Spring 2017–present
- Member, Calculus Committee, Fall 2016–Fall 2018
- Member, Major Assessment Committee, Fall 2016–Spring 2018

Colorado State University Department of Mathematics

- Graduate Teaching Mentor to second-year mathematics Graduate Teaching Assistants, Colorado State University, 2015–2016
- Treasurer, SIAM Colorado State University Student Chapter, 2014–2015
- Volunteer worker, Math Day (competition and outreach for high school students), Colorado State University, October 2010, 2011, 2012, 2015
- Graduate Teaching Mentor to first-year mathematics Graduate Teaching Assistants, Colorado State University, 2014
- Instructor & Chaperone, Math Circles Camp (outreach for middle and high school students), Colorado State University, June 2011, 2012, 2014
- Liaison to prospective mathematics graduate students, Graduate Recruitment Day, Colorado State University, 27 March 2014
- Panelist, Graduate School for Undergraduates Presentation, Colorado State University, 11 November 2013

Service to the Profession

- Peer Reviewer, Inverse Problems in Science & Engineering, 2019
- Peer Reviewer, Measurement Science and Technology, 2019
- Peer Reviewer, SIAM Journal on Applied Mathematics, 2019
- Co-organizer, minisymposium: “Inverse Problems in Medical Imaging,” SIAM Conference on Computational Science and Engineering, Spokane, Washington, 28 February 2019
- Peer Reviewer, Inverse Problems and Imaging, June 2018
- Co-organizer, 3-part minisymposium: “Advances in Reconstruction Methods for Electrical Impedance Tomography,” SIAM Conference on Imaging Science, Bologna, Italy, 6 June 2018
- Peer Reviewer, IEEE Transactions on Medical Imaging, May 2018

- Peer Reviewer, BioMedical Engineering OnLine, September 2017
- Peer Reviewer, Journal of Inverse and Ill-posed Problems, March 2017
- Panelist, Beyond an Undergraduate Mathematics Degree Panel Presentation, Pikes Peak Regional Undergraduate Mathematics Conference, Colorado State University - Pueblo, February 2013

UNDERGRADUATE RESEARCH ADVISEES

- Spring 2019: Emma Kar and Benjamin Bladow. Studying artifact removal in D-bar reconstructions of human thoracic EIT data. Funded by the McDonald Work Award.
Emma and Ben were listed as co-authors on my presentation: Advancements in Spatial Resolution of D-bar Reconstructions for Human Thoracic Imaging, at the SIAM Conference on Computational Science and Engineering, 28 February 2019.
Presentation (by Ben): Medical Imaging with Electrical Impedance Tomography, Part I of II: Background, MAA PNW Section Meeting, University of Portland, 13 April 2019
Presentation (by Emma): Medical Imaging with Electrical Impedance Tomography, Part II of II: Recent Advances, MAA PNW Section Meeting, University of Portland, 13 April 2019
Presentation (by Emma and Ben): Mathematics Seminar, Gonzaga University, 26 April 2019
- Fall 2018: Emma Kar, Benjamin Bladow, and Erick Holguin. Studying the D-bar reconstruction method for electrical impedance tomography. Funded by the McDonald Work Award
- Summer 2018: Benjamin Bladow and Erick Holguin. Studying the D-bar reconstruction method for electrical impedance tomography
- Fall 2017: Reid Whitson. Studying the modeling of oncolytic viruses with systems of differential equations. Funded by the McDonald Work Award
Presentation (by Reid): Modeling Oncolytic Virus Spread, Math Club Meeting, Gonzaga University, 29 Nov. 2017
- Fall 2017: Sean Cassatt. Studying the mathematics of biomedical imaging, with intent to pursue a multi-semester independent research project. Funded by the McDonald Work Award

SELECTED HONORS & AWARDS

- McDonald Work Award: \$3,825, for undergraduate student research in electrical impedance tomography, Gonzaga University, Fall 2019
- Research Council Award: \$1,700, for funding of the research proposal *Computational Research in Electrical Impedance Tomography*, Summer 2019
- McDonald Work Award: \$4,407, for undergraduate student research in electrical impedance tomography, Gonzaga University, Fall 2018
- Faculty Award for Professional Contributions for tenure-track faculty, Gonzaga University, Spring 2018

- McDonald Work Award: \$825, for undergraduate student research in biomedical modeling, Gonzaga University, Fall 2017
- Outstanding Graduate Teaching Assistant Award, Colorado State University Department of Mathematics, Spring 2016
- Yates Summer Graduate Fellowship, Colorado State University Department of Mathematics, Summer 2015
- Award for best student paper presented at 15th International Conference on Biomedical Applications of Electrical Impedance Tomograph, 2nd Place, April 2014
- Govan Travel Award, Colorado State University Department of Mathematics, February 2014
- Graduated *summa cum laude* from South Dakota School of Mines & Technology, May 2010

PROFESSIONAL MEMBERSHIPS

- Tau Beta Pi Engineering Honor Society, 2008–present
- Society for Industrial and Applied Mathematics (SIAM), 2010–present