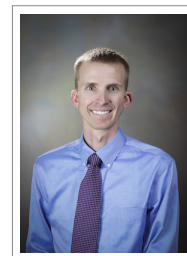


J. Derek Tucker

PO Box 5800 MS 1202
Albuquerque, NM 87185
☎ +1 (505) 379 0572
☎ +1 (505) 284 8415
✉ jdtuck@sandia.gov
🌐 research.tetonedge.net
👤 jdtuck



Education

- 2011–2014 **Statistics**, *Florida State University*, Tallahassee, FL, *Ph.D.*
Thesis Title: Functional Component Analysis and Regression Using Elastic Methods
- 2007–2009 **Electrical Engineering**, *Colorado State University*, Fort Collins, CO, *M.S.*
Thesis Title: Coherence-based Underwater Target Detection for Side-Scan Sonar Imagery
- 2004–2007 **Electrical Engineering**, *Colorado State University*, Fort Collins, CO, *B.S.*
Minor: Mathematics Cum Laude

Ph.D. Thesis

- title *Functional Component Analysis and Regression Using Elastic Methods*
- supervisors Dr. Anuj Srivastava and Dr. Wei Wu
- description Constructing generative models for functional observations is an important task in statistical function analysis. In general, functional data contains both phase (or x or horizontal) and amplitude (or y or vertical) variability. Traditional methods often ignore the phase variability and focus solely on the amplitude variation. Ignoring phase variability leads to a loss of structure in the data, and inefficiency in data models. This dissertation presents three approaches that include phase variability. The first relies on separating the phase (x -axis) and amplitude (y -axis), then modeling these components using joint distributions. The second combines the phase-variability into the objective function for two component analysis methods and the third approach combines the phase-variability into the functional linear regression model.

Experience

- 2020–**Adjunct Professor**, *University of Illinois*, Champaign, IL
Present Teach topics course in functional data analysis, serve on graduate committee, and engagement in the Statistics Department
- 2017–**Principal Member of the Technical Staff**, *Sandia National Laboratories*, Albuquerque, NM
Present Research in pattern theoretic approaches to problems in image analysis, computer vision, signal processing, and functional data analysis
Detailed achievements:
 - Lead research projects in functional data analysis and spatio-temporal correlation of points.
 - Lead research in advancements in nuclear forensics using functional and shape data analysis.
 - Statistics SME for Cybersecurity.
 - Team lead on multiple teams in sensor exploitation and long haul communications.
- 2014–2017 **Senior Member of the Technical Staff**, *Sandia National Laboratories*, Albuquerque, NM
Research in pattern theoretic approaches to problems in image analysis, computer vision, signal processing, and functional data analysis
Detailed achievements:
 - PI on Fellow Directed LDRD project in spatio-temporal correlation of points.
 - Development of algorithms for the registration of remote sensor imagery which provide uncertainty.
 - Development of algorithms for functional statistical process control.
 - Development of methods for statistical analysis of doppler signatures;
 - Team lead on multiple teams in sensor exploitation and long haul communications.
- 2009–2014 **Research Engineer**, *Naval Surface Warfare Center*, Panama City, FL
Sonar analysis and automatic target recognition development.
Detailed achievements:
 - Development of signal processing algorithms for sonar image based target detection and classification.
 - Transition of developed theoretical methods to testing and eventual use in Navy systems.
 - Development of methods of alignment and statistical analysis of sonar signals using a new metric.
 - Team lead in automatic target recognition algorithm development.
- 2007–2009 **Research Engineer**, *Information System Technologies, INC*, Fort Collins , CO
Automatic target recognition development.
Detailed achievements:
 - Development of signal processing algorithms for the detection of transient signals using sensor networks.
 - Developed HMM-based transient detection algorithm for sniper detection and localization.
 - Programming and development of on-board application of signal processing algorithms on motes and specialized FPGA sensor board.

2006–2009 **Research Assistant**, *Colorado State University*, Fort Collins , CO

Automatic target recognition development.

Detailed achievements:

- Developed detection and classification algorithms using coherence-based feature extraction method.
- Applied developed algorithms to sonar imagery for the detection of targets in underwater scenarios.
- Benchmarking and validation of satellite cloud detection and classification using MSG-SEVIRI data.

Honors and Awards

- IEEE Senior Member - 2019
- SNL Mission Innovation Award - 2019
- SNL ERA Team Winner, "Venom Spider Bite" - 2017
- DNI Team Award, "IARPA SLiCE" - 2017
- SNL ERA Team Winner, "Mica Data Link" - 2016
- IEEE Journal of Oceanic Engineering Outstanding Reviewer - 2013-2014
- Top First Year Student in Computational Statistics - Fall 2011
- Tau Beta Pi - April 2006
- Eta Kappa Nu - November 2005
- CSU College of Engineering Dean's List - All Semesters Attended
- Eagle Scout Award - December 1998

Advising

- Current Students
- Joel Upston - Ph.D. Mathematics - UNM - Expected Graduation: Fall 2021 - Topic: Sea Ice Model Calibration using Proper Metrics
- Trevor Harris - Ph.D. Statistics - UIUC - Expected Graduation: Summer 2021 - Topic: Data Depth and Functional Data Analysis

Volunteer Opportunities

Instructor	Jan 2019 - Present NM 4-H. Shooting Sports Coach and Instructor
Chair	Jan 2018 - Present Backcountry Horseman of New Mexico, Albuquerque, NM. Chair of organizing state and chapter activities for volunteer and political action
Board Member	Jan 2016 - Present Backcountry Horseman of New Mexico - Pecos Chapter, Edgewood, NM. Help plan/lead volunteer trail maintenance projects in the Santa Fe and Cibola National Forests.
Assistant District Commissioner	April 2017 - April 2019 Boy Scouts of America, Albuquerque, NM. Assist the Great Southwest Council Sandia District in administration of BSA programs across multiple packs and troops.

Chartered Organization Representa- tive	Jan 2016 - April 2017 Boy Scouts of America, Edgewood, NM. Advisor to a Cub Scout Pack 465 and Boy Scout Troop/Team/Crew 465, involves the mentoring of youth and leaders in a successful program.
Venture Scout Crew Advisor	June 2006 - Jan 2016 Boy Scouts of America, Fort Collins, CO & Chipley, FL. Advisor to a high adventure boy scout crew, involves planning of trips, guiding, and mentoring.
Vice President	Fall 2006 - 2007 Tau Beta Pi, Colorado Delta Chapter, Fort Collins, CO. Supervised Initiation Ceremony of New Members.
Advisor	May 2008 - May 2009 Tau Beta Pi, Colorado Delta Chapter, Fort Collins, CO. Provide assistance and guidance to current student officers of chapter.
Missionary	July 2002 - July 2004 Fort Worth Texas, The Church of Jesus Christ of Latter-day Saints

Professional Memberships

- ASA - Sep. 2011 - Present
- IEEE - Sep. 2004 - Present
- Eta Kappa Nu - Nov. 2005 - Present
- Tau Beta Pi - April 2006 - Present

References

Available upon request

Publications

Journals

X. Zhang, S. Kurtek, O. Chkrebtii, and J. D. Tucker. Elastic k -means clustering of functional data for posterior exploration, with an application to inference on acute respiratory infection dynamics. *Computational Statistics and Data Analysis*, submitted 2021.

J. D. Tucker, L. Shand, and K. C. “. Multimodal bayesian registration of noisy functions using hamiltonian monte carlo. *Computational Statistics and Data Analysis*, pages 1–27, 2021.

D. Ries, A. Zhang, J. D. Tucker, K. Shuler, and M. Ausdemore. A framework for inverse prediction using functional response data. *JCISE*, submitted 2021.

L. Patel, L. Shand, J. D. Tucker, , and G. Huerta. Spatio-temporal extreme event modeling of terror insurgencies. *PNAS*, submitted 2021.

C. King, N. Martin, and J. D. Tucker. Bounding uncertainty in functional data: A case study in reliability. *Quality Engineering*, 1(33), 2021.

- T. Harris, B. Li, and J. D. Tucker. Scalable multiple changepoint detection for functional data sequences. *Envirometrics*, pages 1–32, 2021.
- A. H. Foss, R. B. Lehoucq, W. Z. Stuart, J. D. Tucker, and J. W. Berry. A deterministic hitting-time moment approach to seed-set expansion over a graph. *Journal of Applied Statistics*, submitted 2021.
- T. Harris, J. D. Tucker, B. Li, and L. Shand. Elastic depths for detecting shape anomalies in functional data. *Technometrics*, 2020.
- T. Harris, B. Li, N. J. Steiger, J. E. Smerdon, N. Narisetty, and J. D. Tucker. Testing the exchangeability of two ensembles of spatial processes - evaluating proxy influence in assimilated paleoclimate reconstructions. *Journal of the American Statistical Association*, 2020.
- M. Ahn, J. D. Tucker, W. Wu, and A. Srivastava. Regression models using shapes of functions as predictors. *Computational Statistics and Data Analysis*, pages 1–30, 2020.
- J. D. Tucker, L. Shand, and J. R. Lewis. Handling missing data in self-exciting point process model. *Spatial Statistics*, 29:160–176, March 2019.
- J. D. Tucker, J. R. Lewis, and A. Srivastava. Elastic functional principal component regression. *Statistical Analysis and Data Mining*, 12(2):101–115, April 2019.
- J. D. Tucker, J. R. Lewis, C. King, and S. Kurtek. A geometric approach for computing tolerance bounds for elastic functional data. *Journal of Applied Statistics*, 47(3):481–505, 2019.
- Y. Guan, C. Sampson, J. D. Tucker, W. Chang, A. Mondal, M. Haran, and D. Sulsky. Computer model calibration based on image warping metrics: An application for sea ice deformation. *JABES*, 41:444–463, 2019.
- J. Ramirez, M. Orini, J. D. Tucker, P. Laguna, and E. Pueyo. Variability of ventricular repolarization dispersion quantified by time-warping the morphology of the t-waves. *IEEE Transactions on Biomedical Engineering*, 64(7):1619–1630, July 2017.
- T. G-Michael, B. Marchand, J. D. Tucker, D. D. Sternlicht, T. M. Marston, and M. R. Azimi-Sadjadi. Image-based automated change detection for synthetic aperture sonar. *IEEE Journal of Oceanic Engineering*, 41(3):592–612, July 2016.
- D. Bryner, F. Huffer, J. D. Tucker, and A. Srivastava. Underwater mine detection in clutter data using spatial point process models. *IEEE Journal of Oceanic Engineering*, 41(3):670–681, July 2016.
- D. Bryner, F. Huffer, M. M. Rosenthal, J. D. Tucker, and A. Srivastava. Linear minelayer trajectory estimation using cluttered point cloud data. *Computational Statistics and Data Analysis*, 102:1–22, October 2016.

J. D. Tucker, W. Wu, and A. Srivastava. Analysis of signals under compositional noise with applications to sonar data. *IEEE Journal of Oceanic Engineering*, 39(2):318–330, 2014.

J. D. Tucker, W. Wu, and A. Srivastava. Analysis of proteomics data: phase amplitude separation using an extended fisher-rao metric. *Electronic Journal of Statistics*, 8(2):1724–1733, 2014.

J. D. Tucker, W. Wu, and A. Srivastava. Generative models for functional data using phase and amplitude separation. *Computational Statistics and Data Analysis*, 61:50–66, 2013.

J. D. Tucker and M. R. Azimi-Sadjadi. Coherence-based underwater target detection from multiple sonar platforms. *IEEE Journal of Oceanic Engineering*, 36(1):37–51, Jan 2011.

Publications

X. Zhang, S. Kurtek, O. Chkrebtii, and J. D. Tucker. Elastic k -means clustering of functional data for posterior exploration, with an application to inference on acute respiratory infection dynamics. *Computational Statistics and Data Analysis*, submitted 2021.

J. D. Tucker, L. Shand, and K. C. “. Multimodal bayesian registration of noisy functions using hamiltonian monte carlo. *Computational Statistics and Data Analysis*, pages 1–27, 2021.

D. Ries, A. Zhang, J. D. Tucker, K. Shuler, and M. Ausdemore. A framework for inverse prediction using functional response data. *JCISE*, submitted 2021.

L. Patel, L. Shand, J. D. Tucker, , and G. Huerta. Spatio-temporal extreme event modeling of terror insurgencies. *PNAS*, submitted 2021.

C. King, N. Martin, and J. D. Tucker. Bounding uncertainty in functional data: A case study in reliability. *Quality Engineering*, 1(33), 2021.

T. Harris, B. Li, and J. D. Tucker. Scalable multiple changepoint detection for functional data sequences. *Envirometrics*, pages 1–32, 2021.

A. H. Foss, R. B. Lehoucq, W. Z. Stuart, J. D. Tucker, and J. W. Berry. A deterministic hitting-time moment approach to seed-set expansion over a graph. *Journal of Applied Statistics*, submitted 2021.

T. Harris, J. D. Tucker, B. Li, and L. Shand. Elastic depths for detecting shape anomalies in functional data. *Technometrics*, 2020.

T. Harris, B. Li, N. J. Steiger, J. E. Smerdon, N. Narisetty, and J. D. Tucker. Testing the exchangeability of two ensembles of spatial processes - evaluating proxy

influence in assimilated paleoclimate reconstructions. *Journal of the American Statistical Association*, 2020.

M. Ahn, J. D. Tucker, W. Wu, and A. Srivastava. Regression models using shapes of functions as predictors. *Computational Statistics and Data Analysis*, pages 1–30, 2020.

J. D. Tucker, L. Shand, and J. R. Lewis. Handling missing data in self-exciting point process model. *Spatial Statistics*, 29:160–176, March 2019.

J. D. Tucker, J. R. Lewis, and A. Srivastava. Elastic functional principal component regression. *Statistical Analysis and Data Mining*, 12(2):101–115, April 2019.

J. D. Tucker, J. R. Lewis, C. King, and S. Kurtek. A geometric approach for computing tolerance bounds for elastic functional data. *Journal of Applied Statistics*, 47(3):481–505, 2019.

Y. Guan, C. Sampson, J. D. Tucker, W. Chang, A. Mondal, M. Haran, and D. Sulsky. Computer model calibration based on image warping metrics: An application for sea ice deformation. *JABES*, 41:444–463, 2019.

J. Ramirez, M. Orini, J. D. Tucker, P. Laguna, and E. Pueyo. Variability of ventricular repolarization dispersion quantified by time-warping the morphology of the t-waves. *IEEE Transactions on Biomedical Engineering*, 64(7):1619–1630, July 2017.

T. G-Michael, B. Marchand, J. D. Tucker, D. D. Sternlicht, T. M. Marston, and M. R. Azimi-Sadjadi. Image-based automated change detection for synthetic aperture sonar. *IEEE Journal of Oceanic Engineering*, 41(3):592–612, July 2016.

D. Bryner, F. Huffer, J. D. Tucker, and A. Srivastava. Underwater mine detection in clutter data using spatial point process models. *IEEE Journal of Oceanic Engineering*, 41(3):670–681, July 2016.

D. Bryner, F. Huffer, M. M. Rosenthal, J. D. Tucker, and A. Srivastava. Linear minelayer trajectory estimation using cluttered point cloud data. *Computational Statistics and Data Analysis*, 102:1–22, October 2016.

J. D. Tucker, W. Wu, and A. Srivastava. Analysis of signals under compositional noise with applications to sonar data. *IEEE Journal of Oceanic Engineering*, 39(2):318–330, 2014.

J. D. Tucker, W. Wu, and A. Srivastava. Analysis of proteomics data: phase amplitude separation using an extended fisher-rao metric. *Electronic Journal of Statistics*, 8(2):1724–1733, 2014.

J. D. Tucker, W. Wu, and A. Srivastava. Generative models for functional data using phase and amplitude separation. *Computational Statistics and Data Analysis*, 61:50–66, 2013.

J. D. Tucker and M. R. Azimi-Sadjadi. Coherence-based underwater target detection from multiple sonar platforms. *IEEE Journal of Oceanic Engineering*, 36(1):37–51, Jan 2011.

Magazines

J. D. Tucker and M. R. Azimi-Sadjadi. Coherence-based underwater target detection and classification for side-scan sonar imagery. *Sea Technology Magazine*, 12:10–14, December 2008.

Invited Talks

- “Elastic Functional Tolerance Bounds”, LANL Statistical Colloquium, December 16, 2020 (Organizer: Emily Castleton)
- “Using FDA for Neural Network Explanability”, FSU Industry Engagement Symposium, October 2, 2020 (Organizer: Elizabeth Slate)
- “Elastic Functional Data Analysis”, BYU Statistical Colloquium, December 4, 2019 (Organizer: William Christensen)
- “Sandia Applications of Functional Data Analysis”, UIUC Statistical Colloquium, November 22, 2019 (Organizer: Trevor Harris)
- “Elastic Depth Analysis”, FSU Statistical Colloquium, April 8, 2019 (Organizer: Xufeng Nu)
- “Elastic Functional Data Analysis”, ANU Statistical Colloquium, July 19, 2018 (Organizer: Janice Scealy)
- “Elastic Functional Data Analysis”, UNM Statistical Colloquium, February 15, 2018 (Organizer: Li Li)
- “Event Correlation using Spatio-Temporal Point Processes”, SNL DSRC Colloquium, September 29, 2016 (Organizer: K. Simonson)
- “Doppler Multi-INT Detection and Tracking”, NSWC-PCD Invited Lecture, October 1, 2015 (Organizer: J. T. Cobb)
- “Statistical Analysis and Modeling of Elastic Functions”, Department of Mathematical and Statistical Sciences, University of Alberta, Aug 23, 2011. (Organizer: Yau Shu Wong)
- “Alignment and Analysis of Proteomics Data using Square Root Slope Function Framework”, CTW: Statistics of Time Warpings and Phase Variations 2012, OSU MBI, Nov 7, 2012

Patents

- “Automated Change Detection Technique for Synthetic Aperture Sonar” US Patent No. US10049295B2

Contracts and Grants

- 10/18-7/21 - Statistical Enhancement of Nuclear Forensics - \$600K (PI), NTNFC

- 10/18-9/20 - Data Enrichment for Improved Intelligence Value and Situational Awareness - \$1,059K (PI), SNL LDRD
- 10/18-9/19 - Statistical Uncertainty Quantification for Multivariate Physical Parameter Estimation with Multivariate Outputs - \$500K (CO-PI), SNL LDRD
- 04/16-9/18 - Event Correlation using Spatio-Temporal Point Processes - \$755K (PI), SNL Fellow Directed LDRD
- 10/16-9/18 - Doppler Assited Sensor Fusion - \$875K, (Co-PI with R. M. Naething), OGA
- 09/08-09/11 - Coherence-based Target Detection for Multi-Platform Sonar Imagery - \$200K (Co-PI with M. R. Azimi), Office of Naval Research Code 32
- 09/10-09/12 - In-Situ Learning For CAD/CAC Sonar Imagery - \$200K (Co-PI with M. R. Azimi and N. Wachowski), Office of Naval Research Code 32

Computer skills

Programming Languages	Julia, Python, R, MATLAB, Mathcad, C, C++, Mathematica, Java, HTML, Labview
Assembly Languages	68HC12
Operating Systems	Linux, Mac OS, Windows
Software	Autocad, P-Spice, Logic Works, Adobe Suite, Microsoft Office, Agilent VEE, Macromedia Suite, P-CAD, Inventor
Certifications	Security+, Linux+

Brief Biography

J. Derek Tucker received his B.S. in Electrical Engineering Cum Laude and M.S. in Electrical Engineering from Colorado State University in 2007 and 2009, respectively. Upon completion of these degrees, he began working as a Research Scientist at the Naval Surface Warfare Center Panama City Division in Panama City, FL. In 2014 he received the Ph.D. degree in Statistics from Florida State University In Tallahassee, FL under the co-advisement of Dr. Anuj Srivastava and Dr. Wei Wu. While at NSWC-PCD he led various development efforts in automatic target recognition algorithms for synthetic aperture sonar imagery. In the summer of 2014 he joined Sandia National Laboratories and is currently in the Statistical Sciences department. He currently is leading research projects in the area of satellite image registration and point processes modeling for monitoring applications. His research is focused on pattern theoretic approaches to problems in image analysis, computer vision, signal processing, and functional data analysis. In 2017, he received the Director of National Intelligence Team Award for his contributions to the Signal Location in Complex Environments (SLiCE) team.