Austin J. Brockmeier

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Education

Ph.D., Electrical and Computer Engineering, University of Florida, Gainesville, FL May 2014
"Learning and exploiting recurrent patterns in neural data", Advisor: Jose C. Principe

B.S., Computer Engineering, University of Nebraska–Lincoln, Omaha, NE May 2009
Highest Distinction, 2nd Major: Mathematics, Minor: Computer Science

Experience

Assistant Professor University of Delaware, Newark, Delaware Dec. 2018–Present
Electrical and Computer Engineering; Computer and Information Sciences
Data Science Institute (Resident Faculty)

Research Fellow University of Manchester, United Kingdom Mar. 2017–Oct. 2018
School of Computer Science

Research Associate University of Liverpool, United Kingdom Jun. 2014–Feb. 2017
School of Electrical Engineering, Electronics and Computer Science

Graduate Research Assistant University of Florida May 2010–May 2014
Department of Electrical and Computer Engineering

Research Assistant University of Nebraska–Lincoln (Omaha Campus) Summer 2008 & 2009
Department of Computer and Electronics Engineering

Electronics Engineer Cenatmed, LLC, Omaha, NE Apr. 2008–July 2009

IT Operations Intern Union Pacific Railroad, Omaha, NE Aug. 2006–Aug. 2008

Honors and Awards

International and National

- Top 200 Reviewer, Neural Information Processing Systems (NeurIPS) 2018
- Finalist, IEEE EMBS Conference Student Paper Competition 2013
- NSF East Asia and Pacific Summer Institutes Fellowship 2012
  "Signal processing techniques to separate and analyze brainwaves" hosted by Andrzej Cichocki, RIKEN Brain Science Institute, Japan
- Honorable Mention, NSF Graduate Research Fellowship 2009, 2010, 2011

University of Florida

- Honorable Mention, Outstanding Service, Graduate Student Council 2014
- Graduate School Fellowship 2009–2013

University of Nebraska

- Dean's Award, College of Engineering 2009
- Outstanding Senior, Computer and Electronics Engineering 2009
- Undergraduate Major Honoree, Computer and Electronics Engineering 2009
- 1st Place Senior Thesis Design Team, Computer and Electronics Engineering 2009
- James Earl Mathematics Scholarship, Math. Dept., U. Nebraska Omaha 2008–2009
- Tau Beta Pi Distinguished Freshman Award 2006
- Walter Scott Jr. Scholarship, Peter Kiewit Institute 2005–2009
- University of Nebraska Regents Scholarship 2005–2009

Research Support

- **Office of Naval Research** 2020–2022
  (Subaward from *Minority Serving Institutions Science, Technology, Engineering and Mathematics Research & Development Consortium*) "Development of Bio-Inspired Nano-Sensors for Underwater Explosives and Hazardous Materials"
  Role: Co-PI (PI: Bruce Kim, City College of New York) (UD portion $170,659)

- **University of Delaware Research Foundation**–Strategic Initiatives 2020
  "Advancing machine learning for neuroimaging through topology-aware signal processing" Role: PI, Senior Mentor: Gonzalo Arce ($30,000)
- **Unidel Foundation**, University of Delaware's Data Science Institute 2019–2020
  "Learning to predict systematic errors in machine learning models and alert an expert for improved synergistic performance" ($10,000)

Teaching

University of Delaware, Newark, Delaware, USA

Instructor, Signals and Systems (ELEG 305)	Spring 2020, Spring 2021
Instructor, Large Scale Machine Learning (ELEG/FSAN 817)	Fall 2019, Fall 2020

University of Liverpool, Liverpool, UK

Instructor (5 weeks), Eng. Skills (ELEC 171/172) Matlab module	Spring 2016, Fall 2016
Guest lecturer (8 weeks), Neural Networks (ELEC 320)	Spring 2015

University of Florida, Gainesville, Florida, USA

Guest lecturer, Brain Machine Interfaces (EEL 6935)	Fall 2011, Fall 2013
Teaching Assistant, Microprocessor Applications (EEL 4744)	Fall 2009, Spring 2010

University of Nebraska-Lincoln (Omaha Campus), Omaha, Nebraska, USA

Teaching Assistant, Microprocessor System Design (CEEN 4330)	Spring 2009
Teaching Assistant, Digital Design and Interfacing (CEEN 3110)	Fall 2008

Primary Ph.D. Advisor

Hassan Baker, Electrical and Computer Engineering	Spring 2020–present
Bilal Riaz, Electrical and Computer Engineering	Fall 2019–present
Yüksel Karahan, Electrical and Computer Engineering	Spring 2019–present
Carlos Mendoza-Cardenas, Electrical and Computer Engineering	Winter 2019–present

M.S. Thesis Advisor

Hau Phan, Electrical and Computer Engineering	Winter 2021–present
C. Cesar Claros, Electrical and Computer Engineering	M.S., Summer 2020

Visiting Scholars

Edwin Salcedo, M.Sc., M.B.A., Bolivian Catholic University, La Paz	Summer 2019

Committee Member: Thesis or Ph.D.

Rebecca Clements, Biomedical Engineering	Senior Thesis 2nd reader, Spring 2020–present
Zahra Vahdat, Electrical and Computer Engineering	Ph.D. proposal Dec. 2020
Zhenzhu Zheng, Computer and Information Sciences	Ph.D. proposal Nov. 2020
Kevin Corder, Computer and Information Sciences	Ph.D. proposal Mar. 2020
Kuang Lu, Electrical and Computer Engineering	Ph.D., Nov. 2020
Micahel J. De Lucia, Electrical and Computer Engineering	Ph.D., Mar. 2020
Alejandro Parada-Mayorga, Electrical and Computer Engineering	Ph.D., July 2019

Training in Pedagogy and Mentoring

- Culturally Aware Mentoring, Workshop and Introduction
  CIMER, University of Wisconsin-Madison and University of Delaware Jan. 2021
- Inclusive Teaching Professional Development Workshop Series, University of Delaware
  College of Engineering Diversity Working Group Spring/Fall 2019
- Course Design Institute, University of Delaware June 2019
- Associate Fellow of The Higher Education Academy March 2016
  awarded following "Teaching for Researchers" modules at University of Liverpool

Outreach Activities

- Presenter, "Engineering Your Tomorrow", Sussex County (DE) STEM Alliance 2/2020
- Presenter, Serviam Girls Academy, "Measuring Electric Waves in the Brain" 5/2019
- Project Judge, FIRST LEGO League SE Pennsylvania Regional Championship 2/2019
- Volunteer, Engineering Discovery Day, University of Delaware, AΩE 10/2018
- Volunteer, "Meet the Scientists", at Liverpool's World History Museum 6/2016
- Science Fair Judge (6-8th graders), Alachua County, Florida 2009–2013
- Science Quest (10th graders), University of Florida (UF) 7/2011
- Guest Lecture, Student Science Training Program ($10-12$th graders) UF 2010

University Service

- Neuroscience Planning Committee (Chairs: John Jeka/Anna Klintsova) 8/2019–present

ECE Department Service

- Member, ECE Strategic Planning Committee (Chair: Jamie Phillips) Fall 2020–present
- IEEE Student Chapter Branch Counselor 5/2019–present
- Representative, Blue & Golden Saturdays 3× in 2019, 2× in 2020
- Member, ECE Areas Ad-hoc Committee (Chair: Kenneth Barner) Fall 2019
- Representative, Alumni Weekend: "Mastering Makerspaces!" June 2019
- Representative, Delaware Decision Days (undergraduate visit day) 2× in Spring 2019

CIS Department Service

- Faculty Search Committee, Computer & Information Sciences 2019–2020
  (Chair: Chien-Chung Shen; search resulted in 3 tenure-track faculty hires.)

Data Science Institute Service

- Data Science Community Hour (faculty advisor) 1/2021–present
- Technology & Data Analytics Career Meetup (DSI Representative) 3/4/2020
- Data Science Symposium Planning Committee 4/2019–11/2019
  (Chairs: Greg Dobler & Zachary Collier)
- Mastering Data Science and Statistical Analysis Information Session 11/19/2019
- Mastering Data Science and Statistical Analysis Information Session 3/26/2019

Previous Leadership and Service Roles

- *Student Senator*, University of Florida 2011–2012
- *Volunteer*, Engineering Recruitment Weekend, University of Florida 2010–2014
- *President*, Omaha Student Chapter 5/2008–5/2009
- *Delegate*, Peter Kiewit Institute, University of Nebraska 2007–2009
- *Mentor*, Scott Scholars (undergraduate) 2006–2009
- *Volunteer*, Nebraska Academic Decathlon (9-12th graders) 2006–2008
- *Member*, Nebraska Coalition for Juvenile Justice 2003–2007

Professional Involvement

- IEEE (Institute for Electrical and Electronics Engineers) 2006–Present
  —Signal Processing Society 2013–Present
  —Engineering in Medicine and Biology Society (EMBS) 2010–Present
  University of Delaware Student Branch Counselor 5/2019–Present

Academic Service (Reviewer)

- NSF Reviewer 2021
- *IEEE Transactions on Automatic Control* 1× in 2021
- *IEEE Transactions on Neural Networks and Learning Systems* 2015– (8× in 2020)
- *IEEE Transactions on Knowledge Data Engineering* 2017– (1× in 2020)
- *IEEE Transactions on Signal Processing* 1× in 2019, 1× in 2020
- *IEEE Access* 2× in 2019
- *IEEE Transactions on Biomedical Engineering* 2014, 2018
- *AAAI* 2021/2020/2018; *ICLR* 2021; *ICML* 2021/2019; *NeurIPS* 2020/2019/2018
- *ICASSP* 2021/2020/2019/2018/2009; *MLSP* 2020/2019/2018
- *IEEE EMBS NER* 2021/2019/2017/2013
- *EMNLP* 2018

Book Chapter

A. J. Brockmeier and J. C. Príncipe, "Decoding algorithms for brain machine interfaces," in *Neural Engineering*, Bin He, Ed. Springer, 2013, pp. 223–257.

Patents

U.S. Patent 10,531,806. J. Principe and A. J. Brockmeier, "Brain state advisory system and methods using calibrated metrics and optimal time-series decomposition," 1/14/2020.

Journal Articles

E. N. Hamulyák, A. J. Brockmeier, J. D. Killas, S. Ananiadou, S. Middeldorp, and A. M. Leroi, "Women's health in *The BMJ*: a data science history," *BMJ Open*, 10:e039759, 2020.

X. Evangelopoulos, A. J. Brockmeier, T. Mu, J. Y. Goulermas, "Circular object arrangement using spherical embeddings," *Pattern Recognition*, 103(107192), 2020.

A. J. Brockmeier, M. Ju, P. Przybyła, and S. Ananiadou, "Improving reference prioritisation with PICO recognition," *BMC Medical Informatics and Decision Making*, 19(256), 2019.

P. Przybyła, A. J. Brockmeier, and S. Ananiadou, "Quantifying risk factors in medical reports with a context-aware linear model," *Journal of the American Medical Informatics Association*, 26(6):537–546, 2019.

X. Evangelopoulos, A. J. Brockmeier, T. Mu, J. Y. Goulermas, "Continuation methods for approximate large scale object sequencing," *Machine Learning*, 108(4):595–626, 2019.

P. Przybyła, A. J. Brockmeier, G. Kontonatsios, M.-A. Le Pogam, J. McNaught, E. von Elm, K. Nolan, and S. Ananiadou, "Prioritising references for systematic reviews with RobotAnalyst: A user study," *Research Synthesis Methods*, 9(3):470–488, 2018.

A. J. Brockmeier, T. Mu, S. Ananiadou, and J. Y. Goulermas, "Self-tuned descriptive document clustering using a predictive network," *IEEE Transactions on Knowledge and Data Engineering*, 30(10):1929–1942, 2018.

A. J. Brockmeier, T. Mu, S. Ananiadou, and J. Y. Goulermas, "Quantifying the informativeness of similarity measurements," *Journal of Machine Learning Research*, 18(76):1–61, 2017.

G. Kontonatsios, A. J. Brockmeier, P. Przybyła, J. McNaught, T. Mu, J. Y. Goulermas, and S. Ananiadou, "A semi-supervised approach using label propagation to support citation screening," *Journal of Biomedical Informatics*, 72:67–76, 2017.

J. S. Choi, A. J. Brockmeier, D. McNiel, L. von Kraus, J. C. Principe, and J. T. Francis, "Eliciting naturalistic cortical responses with a sensory prosthesis via optimized microstimulation," *Journal of Neural Engineering*, 13(5):056007, 2016.

A. J. Brockmeier and J. C. Principe, "Learning recurrent waveforms within EEGs," *IEEE Transactions on Biomedical Engineering*, 63(1):43–54, 2016.

M. S. Emigh, E. G. Kriminger, A. J. Brockmeier, J. C. Príncipe, and P. M. Pardalos, "Reinforcement learning in video games using nearest neighbor interpolation and metric learning," *IEEE Transactions on Computational Intelligence and AI in Games*, 8(1):56–66, 2016.

J. C. Principe and A. J. Brockmeier, "Representing and decomposing neural potential signals," *Current Opinion in Neurobiology*, 31:13–17, 2015.

A. J. Brockmeier, J. S. Choi, E. G. Kriminger, J. T. Francis, and J. C. Principe, "Neural decoding with kernel-based metric learning," *Neural Computation*, 26(6):1080–1107, 2014.

L. Li, A. J. Brockmeier, J. S. Choi, J. T. Francis, J. C. Sanchez, and J. C. Príncipe, "A tensor-product-kernel framework for multiscale neural activity decoding and control," *Computational Intelligence and Neuroscience*, Article ID 87016, 2014.

L. Li, I. M. Park, A. Brockmeier, B. Chen, S. Seth, J. T. Francis, J. C. Sanchez, and J. C. Principe, "Adaptive inverse control of neural spatiotemporal spike patterns with a reproducing kernel Hilbert space (RKHS) framework," *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 21(4):532–543, 2013.

J. S. Choi, M. M. DiStasio, A. J. Brockmeier, and J. T. Francis, "An electric field model for prediction of somatosensory (S1) cortical field potentials induced by ventral posterior lateral (VPL) thalamic microstimulation," *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 20(2):161–169, 2012.

Refereed Conference Proceedings (* indicates advisee)

C. H. Mendoza-Cardenas* and A. J. Brockmeier, "Searching for waveforms on spatially-filtered epileptic ECoG", submitted to *IEEE EMBS Conference on Neural Engineering (NER) 2021*, (in press).

H. Baker* and A. J. Brockmeier, "Local and sparse linear causal models for fMRI resting-state signals", submitted to *IEEE EMBS Conference on Neural Engineering (NER) 2021*, (in press).

X. Evangelopoulos, A. J. Brockmeier, T. Mu, and J. Y. Goulermas, "A graduated non-convexity relaxation for large scale seriation," in *SIAM Int. Conf. Data Mining (SDM)*, 2017.

M. Sato, A. J. Brockmeier, G. Kontonatsios, T. Mu, J. Y. Goulermas, J. Tsujii, and S. Ananiadou, "Distributed document and phrase co-embeddings for descriptive clustering," in *European Chapter of the Association for Computational Linguistics (EACL)*, 2017.

A. J. Brockmeier and J. C. Principe, "Explicit versus implicit source estimation for blind multiple input single output system identification," in *IEEE Int. Conf. Acoustics, Speech and Signal Processing (ICASSP)*, 2015.

E. Santana, A. J. Brockmeier, and J. C. Principe, "Joint optimization of algorithmic suites for EEG analysis," in *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2014.

A. J. Brockmeier, E. Santanna, L. Sanchez Giraldo, and J. Principe, "Projentropy: Using entropy to optimize spatial projections," in *IEEE Int. Conf. Acoustics, Speech and Signal Processing (ICASSP)*, 2014.

A. J. Brockmeier, L. G. Giraldo, J. S. Choi, J. T. Francis, and J. C. Principe, "Learning multiscale neural metrics via entropy minimization," in *Int. IEEE/EMBS Conf. Neural Engineering (NER)*, 2013.

A. J. Brockmeier, L. G. Sanchez Giraldo, M. S. Emigh, J. Bae, J. S. Choi, J. T. Francis, and J. C. Principe, "Information-theoretic metric learning: 2–D linear projections of neural data for visualization," in *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2013.

A. J. Brockmeier, J. C. Principe, A. H. Phan, and A. Cichocki, "A greedy algorithm for model selection of tensor decompositions," in *IEEE Int. Conf. Acoustics, Speech and Signal Processing (ICASSP)*, 2013.

A.-H. Phan, A. Cichocki, P. Tichavsky, G. Luta, and A. Brockmeier, "Tensor completion through multiple Kronecker product decomposition," in *IEEE Int. Conf. Acoustics, Speech and Signal Processing (ICASSP)*, 2013.

A. J. Brockmeier, M. K. Hazrati, W. J. Freeman, and J. C. Principe, "Locating spatial patterns of waveforms during sensory perception in scalp EEG," in *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2012.

A. J. Brockmeier, J. S. Choi, M. M. Emigh, J. T. Francis, and J. C. Principe, "Subspace matching thalamic microstimulation to tactile evoked potentials in rat somatosensory cortex," in *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2012.

B. H. Fadlallah, A. J. Brockmeier, S. Seth, L. Li, A. Keil, and J. C. Príncipe, "An association framework to analyze dependence structure in time series," in *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2012.

A. J. Brockmeier, B. Mahmoudi, J. C. Sanchez, and J. C. Principe, "Efficient temporal decomposition of local field potentials," in *IEEE Int. Work. Machine Learning for Signal Processing (MLSP)*, 2011.

A. J. Brockmeier, J. S. Choi, M. M. DiStasio, J. T. Francis, and J. C. Principe, "Optimizing microstimulation using a reinforcement learning framework," in *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2011.

S. Craciun, A. J. Brockmeier, A. D. George, H. Lam, and J. C. Principe, "An information-theoretic approach to motor action decoding with a reconfigurable parallel architecture," in *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2011.

S. Seth, A. J. Brockmeier, J. S. Choi, M. Semework, J. T. Francis, and J. C. Principe, "Evaluating dependence in spike train metric spaces," in *Int. Joint Conf. Neural Networks (IJCNN)*, 2011.

S. Seth, A. J. Brockmeier, and J. C. Principe, "A metric approach toward point process divergence," in *IEEE Int. Conf. Acoustics, Speech and Signal Processing (ICASSP)*, 2011.

A. J. Brockmeier, E. G. Kriminger, J. C. Sanchez, and J. C. Principe, "Latent state visualization of neural firing rates," in *Int. IEEE/EMBS Conf. Neural Engineering (NER)*, 2011.

L. Li, A. Brockmeier, J. T. Francis, J. C. Sanchez, and J. C. Principe, "An adaptive inverse controller for online somatosensory microstimulation optimization," in *Int. IEEE/EMBS Conf. Neural Engineering (NER)*, 2011.

S. Seth, I. Park, A. Brockmeier, M. Semework, J. Choi, J. Francis, and J. Principe, "A novel family of non-parametric cumulative based divergences for point processes," in *Advances in Neural Information Processing Systems (NIPS)*, 2010.

A. J. Brockmeier, I. Park, B. Mahmoudi, J. C. Sanchez, and J. C. Principe, "Spatio-temporal clustering of firing rates for neural state estimation," in *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2010.

Open Peer Reviewed Manuscripts (* indicates advisee)

A. J. Brockmeier, Y. Karahan*, C. C. Claros*, C. H. Mendoza-Cardenas*, M. S. Emigh, and L. G. Sanchez Giraldo, "Max-sliced Bures Distance for Interpreting Discrepancies," https://openreview.net/forum?id=D2Fp_qheYu, 2021.

P. Zingo, A. Brockmeier, A. Novocin, "Transfusion: Reproducibility Study and Analysis," Submitted to *NeurIPS 2019 Reproducibility Challenge*, https://openreview.net/forum?id=3EGF5it-1K, 2020.

Conference Abstracts

K. Nolan, S. Ananiadou, P. Przybyła, A. J. Brockmeier, "RobotAnalyst: An online system to support citation screening in evidence reviewing," at *Global Evidence Summit*, Cape Town, South Africa, Sept. 2017.

S. Dura-Bernal, K. Li, A. J. Brockmeier, C. C. Kerr, S. A. Neymotin, J. C. Principe, J. T. Francis, and W. W. Lytton, "Modulation of virtual arm trajectories via microstimulation in a spiking model of sensorimotor cortex," at *23rd Ann. Computational Neuroscience Meeting: CNS*2014*, Québec City, Canada, July 2014.

E. Kriminger, A. Brockmeier, L. Sanchez-Giraldo, and J. Principe. "Metric learning for invariant feature generation in reinforcement learning," at *Reinforcement Learning and Decision Making*, Princeton, New Jersey, Oct. 2013.

J. S. Choi, A. J. Brockmeier, M. Emigh, L. von Kraus, and J. T. Francis. "Optimizing multi-channel microstimulation pulse trains with a model-predictive controller," at *23rd Ann. Meeting of the Society for the Neural Control of Movement*, San Juan, Puerto Rico, April 2013.

E. K. Anderson, A. J. Brockmeier, N. G. Reyero, D. S. Barber, and N. D. Denslow. "Developing and validating a novel method for selecting class-specific biomarkers in ecotoxicology: A case study using fathead minnow microarray data," at *31st Ann. National SETAC Conf.*, Portland, Oregon, Nov. 2010.

INVITED TALKS/PANELS

Session Chair, "DARWIN for Physics, Engineering, and Computer Science," *DARWIN Computing Symposium*, University of Delaware Data Science Institute, 2/12/2021.

"Mini Report by a JSPS Alumnus," *Japan Society for Promotion of Science (JSPS) Fellowship Info Session*, University of Delaware's Institute for Global Studies; Office of International Students & Scholars, Newark, Delaware, 11/21/2019.

Panelist, "Breakout session: Data science and precision medicine," *2019 Delaware IDeAs Symposium*, Newark, Delaware, 11/7/2019.