Zois Boukouvalas — Curriculum Vitae

CONTACT INFORMATION	Don Myers 222, Math & Stat American University 3501 Nebraska Ave NW Washington, DC 20016	*E-mail:* boukouva@american.edu `https://zoisboukouvalas.github.io`

Last updated: June 19, 2024

ACADEMIC APPOINTMENTS

American University, Washington, DC USA

Assistant Professor, Mathematics and Statistics	**August 2019 - Present**
Affiliated Faculty, Computer Science	**October 2022 - Present**
Faculty Fellow, Center for Data Science	**February 2023 - Present**

EDUCATION

University of Maryland Baltimore County, Baltimore, Maryland USA

Ph.D., Applied Mathematics, May 2017

- Dissertation Topic: "*Development of ICA and IVA Algorithms with Application to Medical Image Analysis*"
- Advisor: Dr. Tülay Adalı

M.S., Applied Mathematics, January 2013

Rochester Institute of Technology, Rochester, New York USA

M.S., Applied and Computational Mathematics, August 2011

- Master Thesis: "*Distance Metric Learning for Medical Image Registration*"
- Advisor: Dr. Nathan Cahill

University of Patras, Patras, Greece

B.S., Mathematics, September 2008

- Degree Thesis: "*Matrix Groups and Topology*"
- Advisor: Dr. Andreas Arvanitoyeorgos

RESEARCH INTERESTS

Machine learning, Differential Geometry, Statistical Signal Processing, Numerical Optimization, Big Data and Social Science.

RESEARCH EXPERIENCE

Department of Computer Science and Electrical Engineering, University of Maryland Baltimore County, Baltimore, Maryland USA

Visiting Assistant Professor   **October 2018 - October 2019**
Collaboration with Dr. Tülay Adalı on grant proposals. Close research interaction with other Machine Learning for Signal Processing Laboratory (MLSP-Lab) members.

The IDEAL Lab, University of Maryland, College Park, College Park, Maryland USA

Postdoctoral Research Associate   **September 2017 - July 2019**
Development of machine learning models and algorithms for big data, by combining aspects from information geometry, mathematical statistics, and numerical optimization.
- Support: Office of Naval Research, *Machine Learning for Energetic Materials.*
- Written or provided technical support of research proposals submitted to: DARPA, US Army.
- Mentoring undergraduate students.

Machine Learning for Signal Processing Laboratory (MLSP-Lab), University of Maryland Baltimore County, Baltimore, Maryland USA

Research Assistant   **October 2013 - May 2017**
Development of blind source separation algorithms and study of their application to functional magnetic resonance imaging (fMRI) data.

- Provided technical supported in successful research proposal submitted to NIH "A Unified Framework for Flexible Brain Image Analysis".
- Team leader for multiple collaborative research projects.

Advanced Document Imaging (ADI) LLC, Rochester, New York USA

Research Assistant   **November 2010 - March, 2011**

Development of text segmentation algorithms for the separation between text and images in a given document.

RESEARCH GRANTS AND CONTRACTS

Funded

Energetics Technology Center
Title: Human Assisted Machine Learning and Natural Language Processing Approaches for Energetics-Supplement
Single PI: Zois Boukouvalas. $59,974.00 Start: 10/2023. End: 10/2024

Energetics Technology Center
Title: Data-Driven Multi-modal Fusion for the Analysis of Energetic Material Systems-Supplement
Single PI: Zois Boukouvalas. $54,950.00 Start: 05/2023. End: 12/2024

Blair Jones Mathematics Endowment
Title: Summer 2024-2025 Research Program for the Expansion of Student Opportunities in Mathematics. Mainly supports high school students from the DMV area and undergraduate students at American University.
PI: Zois Boukouvalas (w/ PI: Michael Baron). $30,000.00 Start: 06/2024. End: 08/2025

Previous funded research

Energetics Technology Center
Title: Human Assisted Machine Learning and Natural Language Processing Approaches for Energetics
Single PI: Zois Boukouvalas. $160,000 Start: 10/2020. End: 10/2023
Role: (subcontractor to Energetics Technology Center) Develop human assisted machine learning and natural language processing (NLP) approaches to infer information about energetic materials and long-range precision fires technologies from highly technical open literature sources.

Energetics Technology Center
Title: Data-Driven Multi-modal Fusion for the Analysis of Energetic Material Systems
Single PI: Zois Boukouvalas. $200,000 Start: 08/2020. End: 05/2023
Role: (subcontractor to Energetics Technology Center) Using Advanced Machine Learning techniques and data from multiple sources, and of different nature, i.e. multi-modal, to design, prototype, and evaluate an end-to-end system for the synthesis, analysis, and handling of energetic materials.

Office of Naval Research/Energetics Technology Center
Title: Machine Learning for Energetic Materials
Single PI: Zois Boukouvalas. $40,000 Start: 10/2019. End: 07/2020
Role: (subcontractor to Energetics Technology Center) Using Machine Learning techniques to accelerate the discovery and design of new energetic materials.

CAS Faculty Mellon Fund (American University)
Title: Data Analysis, Visualization, and Knowledge Discovery for Early Detection of Child Victimization
PI: Zois Boukouvalas. $4,000 Start: 10/2019. End: 05/2021
Role: (Collaborative with faculty from Math & Stat and CS department) Using Machine Learning

for knowledge discovery in emergency situations and early detection of child victimization.

In preparation

National Science Foundation (NSF)
Anticipated Submission Date: February 19 2025 ATD: Explainable Data Fusion for Fair Assessment of Human Behavior in Peaceful and Violent Events
Lead PI: Zois Boukouvalas. $467,355.00 (w/ Co-PIs N. Japkowicz, R. Corizzo)

PUBLICATIONS **Books**

1. N. Japkowicz, **Z. Boukouvalas**, "Machine Learning Evaluation: Towards Reliable and Responsible AI", Cambridge University Press, 420 pages, ISBN-10 : 1316518868, (In press - Expected September 2024)

Journal articles

1. **Boukouvalas, Z**, & Shafer A., Role of Statistics in Detecting Misinformation: A Review of the State of the Art, Open Issues, and Future Research Directions, Annual Review of Statistics and Its Application, Volume: 11, Year: 2024.

2. Balakrishnan S, VanGessel FG, Barnes BC, Doherty RM, Wilson WH, **Boukouvalas Z**, Fuge MD, Chung PW. Machine learning for shock compression of solids using scarce data. Journal of Applied Physics. 2023 Apr 21;133(15).

3. Damasceno LP, Shafer A, Rexhepi E, Whitehouse I, Japkowicz N, Cavalcante CC, Corizzo R, **Boukouvalas Z.** Exploiting Sparsity and Statistical Dependence in Multivariate Data Fusion. Machine Learning, Pages: 1–23, Springer US New York, 2023.

4. Wilson, W. H., Chung, P. W., **Boukouvalas, Z.**, & Elan, M. (2022). Application of machine learning and artificial intelligence methods to energetics science and technology. In Energetics Science and Technology: An integrated approach (pp. 4.1-4.22).

5. Balakrishnan S, VanGessel FG, **Boukouvalas Z**, Barnes BC, Fuge MD, Chung PW. Locally Optimizable Joint Embedding Framework to Design Nitrogen-rich Molecules that are Similar but Improved. Molecular Informatics. 2021 Jul;40(7):2100011.

6. D. C. Elton, **Z. Boukouvalas**, M. D. Fuge, and P. W. Chung, "Deep learning for molecular design-a review of the state of the art", *Molecular Systems Design & Engineering, Royal Society of Chemistry*, vol. 4, pp. 828-849, 2019.

7. A. von Lühmann, **Z. Boukouvalas**, T. Adalı, and K. R. Müller, "A new blind source separation framework for signal analysis and artifact rejection in functional Near-Infrared Spectroscopy", *NeuroImage*, Elsevier, 2019.

8. R. Mowakeaa, Q. Long, **Z. Boukouvalas**, and T. Adalı, "IVA Using Complex Multivariate GGD: Application to fMRI Analysis", *Multidimensional Systems and Signal Processing, Springer*, pp. 1-20, 2019.

9. D. C. Elton, **Z. Boukouvalas**, M. S. Butrico, M. D. Fuge, and P. W. Chung, "Applying machine learning techniques to predict the properties of energetic materials", *Nature Scientific reports*, vol. 8, no. 1, (2018): 9059.

10. **Z. Boukouvalas**, Y. Levin-Schwartz, V. D. Calhoun, and T. Adalı, "Sparsity and Independence: Balancing of two Objectives in Optimization for Source Separation with Application to fMRI Analysis," *Elsevier, Journal of the Franklin Institute (JFI)*, 355, no. 4, 2018: 1873-1887.

11. Q. Long, S. Bhinge, Y. Levin-Schwartz, **Z. Boukouvalas**, V. D. Calhoun, and T. Adalı, "The Role of Diversity in Data-driven Analyses of Multi-subject fMRI Data: Comparison of Approaches Based on Independence and Sparsity Using Global Performance Metrics", *Human Brain Mapping*, no. 2, pp. 489-504, 2018.

12. D. Emge, , Y. Levin-Schwartz, **Z. Boukouvalas**, and T. Adalı, "Power Spectra Constrained IVA for SSVEP Detection," *Biomedical Physics & Engineering Express*, 5(1), 015008, 2018.

13. **Z. Boukouvalas**, S. Said, L. Bombrun, Y. Berthoumieu and T. Adalı, "A New Riemannian Averaged Fixed-Point Algorithm for MGGD Parameter Estimation," *IEEE Signal Proc. Letts.*, vol. 22, no. 12, pp. 2314–2318, Dec. 2015.

14. **Z. Boukouvalas**, A. Arvanitoyeorgos, "A coordinate system for the three-sphere in the Euclidean four space," *Mathematical Review of the Greek Mathematical Society*, (2006) 65.

Peer-reviewed conference publications

1. Roberto Corizzo, Nora Lewis, Lucas P Damasceno, Allison Shafer, Charles C Cavalcante, **Zois Boukouvalas**, "Multimodal One-class Learning for Malicious Online Content Detection", 2023 IEEE International Conference on Big Data (BigData), 2146-2151, IEEE.

2. Lucas P Damasceno, Egzona Rexhepi, Allison Shafer, Ian Whitehouse, Charles C Cavalcante, Roberto Corizzo, **Zois Boukouvalas**, "Independent vector analysis with sparse inverse covariance estimation: An application to misinformation detection", 2023 IEEE 33rd International Workshop on Machine Learning for Signal Processing (MLSP), 1-6, IEEE.

3. Damasceno LP, Shafer A, Japkowicz N, Cavalcante CC, **Boukouvalas Z.** Efficient Multivariate Data Fusion for Misinformation Detection During High Impact Events. InDiscovery Science: 25th International Conference, DS 2022, Montpellier, France, October 10–12, 2022, Proceedings 2022 Nov 6 (pp. 253-268). Cham: Springer Nature Switzerland.

4. Puerto M, Kellett M, Nikopoulou R, Fuge MD, Doherty R, Chung PW, **Boukouvalas Z.** "Assessing the trade-off between prediction accuracy and interpretability for topic modeling on energetic materials corpora." available on arXiv preprint arXiv:2206.00773. 2022 Jun 1., New Trends in Research of Energetic Materials (NTREM), Pardubice, Czech Republic, April, 2022.

5. C. O'Ryan, F.G. VanGessel, I. Michel-Tyler, R. Doherty, W. Wilson, J. Fischer, **Z. Boukouvalas**, M.D. Fuge, P.W. Chung, "Development of an Automated Approach for Chemical Synthesis Knowledge Graphs Directly from Text Corpora," New Trends in Research of Energetic Materials (NTREM), Pardubice, Czech Republic, April, 2022.

6. A. Garcia, C. O'Ryan, G. Kumar, **Z. Boukouvalas**, M.D. Fuge, P.W. Chung, "Quantitative Properties through Semantic Learning," New Trends in Research of Energetic Materials (NTREM), Pardubice, Czech Republic, April, 2022.

7. Liu Y, **Boukouvalas Z**, Japkowicz N. A semi-supervised framework for misinformation detection. InDiscovery Science: 24th International Conference, DS 2021, Halifax, NS, Canada, October 11–13, 2021, Proceedings 24 2021 (pp. 57-66). Springer International Publishing.

8. C. Moroney, E. Crothers, S. Mittal, A. Joshi, T. Adalı, C. Mallinson, N. Japkowicz and **Z. Boukouvalas**, "The Case for Latent Variable vs Deep Learning Methods in Misinformation Detection: An Application to COVID-19," *24th International Conference on Discovery Science*, (Accepted)

9. L. P. Damasceno, C. C. Cavalcante, T. Adalı, and **Z. Boukouvalas**, "Independent Vector Analysis using Semi-Parametric Density Estimation via Multivariate Entropy Maximization," *IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP)*, Toronto, ON, Canada, pp. 3715–3719.

10. B. Gabrielson, M. A. B. S. Akhonda, **Z. Boukouvalas**, and T. Adalı, "ICA with Orthogonality Constraint: Identifiability and a New Efficient Algorithm," *IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP)*, Toronto, ON, Canada, pp. 3720-3724.

11. **Z. Boukouvalas**, M. Puerto, D. C. Elton, P. W. Chung, and M. D. Fuge, "Independent Vector Analysis for Molecular Data Fusion: Application to Property Prediction and Knowledge Discovery of Energetic Materials," *IEEE 28th European Signal Processing Conference (EUSIPCO)*, 2020, pp. 1030-1034.

12. SK. Popuri, and **Z. Boukouvalas**, "Efficient Parameter Estimation for Semi-Continuous Data: An Application to Independent Component Analysis," *IEEE Machine Learning for Signal Processing Workshop (MLSP)*, October 2019, IEEE, pp. 1-6.

13. **Z. Boukouvalas**, D. C. Elton, P. W. Chung, and M. D. Fuge, "Independent Vector Analysis for Data Fusion Prior to Molecular Property Prediction with Machine Learning", *Machine Learning for Molecules and Materials NIPS 2018*.

14. **Z. Boukouvalas**, Y. Levin-Schwartz, R. Mowakeaa, G.-S. Fu, and T. Adalı, "Independent Component Analysis Using Semi-Parametric Density Estimation via Entropy Maximization," *IEEE Statistical Signal Processing Workshop*, June 2018, pp. 403-407.

15. D. C. Elton, D. Turakhia, N. Reddy, J. Tan, **Z. Boukouvalas**, P. W. Chung, and M. D. Fuge, "Using natural language processing techniques to extract information on the properties and functionalities of energetic materials from large text corpora", *22nd International Seminar in New Trends in Research of Energetic Materials, NTREM 2019.*

16. B. C. Barnes, D. C. Elton, **Z. Boukouvalas**, D. E. Taylor, W. D. Mattson, M. D. Fuge, and P. W. Chung, "Machine Learning and Discovery for Energetic Materials", *16th International Detonation Symposium*, Cambridge MD, USA, July 2018.

17. Q. Long, C. Jia, **Z. Boukouvalas**, B. Gabrielson, D. Emge, V. D. Calhoun, and T. Adalı, "Consistent Run Selection for Independent Component Analysis: Application to fMRI Analysis", *Proc. IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP)*, Calgary, Alberta, Canada, April 2018, pp. 2581–2585.

18. D. Emge, **Z. Boukouvalas**, Y. Levin-Schwartz, S. Bhinge, Q. Long, and T. Adalı, "Power Spectra Constrained IVA for Enhanced Detection of SSVEP Content,"*Proc. Conf. on Info. Sciences and Systems (CISS)*, Baltimore, USA, March 2017, pp. 1–5.

19. **Z. Boukouvalas**, Y. Levin-Schwartz, and T. Adalı, "Enhancing ICA performance by exploiting sparsity: Application to fMRI Analysis." *IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP)*, New Orleans, USA, March 2017, pp. 2532–2536.

20. S. Bhinge, Q. Long , Y. Levin-Schwartz, **Z. Boukouvalas**, and T. Adalı, "Non-orthogonal constrained independent vector analysis: Application to data fusion." *Proc. IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP)*, New Orleans, USA, March 2017, pp. 2666–2670.

21. R. Mowakeaa, **Z. Boukouvalas**, and T. Adalı, "On the Characterization, Generalization, and Efficient Estimation of the Complex Multivariate Generalized Gaussian Distribution," in *Proc. IEEE Sensor Array and Multichannel Signal Processing Workshop (SAM)*, Rio de Janeiro, Brazil, July 2016, pp. 1–5.

22. S. Bhinge, **Z. Boukouvalas**, Y. Levin-Schwartz, and T. Adalı, "IVA for Abandoned Object Detection: Exploiting Dependence Across Color Channels," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP)*, Shanghai, China, March 2016, pp. 2494–2498.

23. G.-S. Fu, **Z. Boukouvalas**, and T. Adalı, "Density estimation by entropy maximization with kernels," in *Proc. IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP)*, Brisbane, Australia, April 2015, pp. 1896–1900.

24. **Z. Boukouvalas**, G.-S. Fu, and T. Adalı, "An Efficient Multivariate Generalized Gaussian Distribution Estimator: Application to IVA," in *Proc. Conf. on Info. Sciences and Systems (CISS)*, Baltimore, MD, March 2015, pp. 1–4.

Non peer-reviewed publications

1. Kikkisetti, Dhanush; Mustafa, Raza Ul; Melillo, Wendy; Corizzo, Roberto; **Boukouvalas, Zois**; Gill, Jeff; Japkowicz, Nathalie, "Using LLMs to discover emerging coded antisemitic hate-speech emergence in extremist social media," arXiv preprint arXiv:2401.10841 (2024).

2. **Z. Boukouvalas**, C. Mallinson, E. Crothers, N. Japkowicz, A. Piplai, S. Mittal, A. Joshi, and T. Adalı, "Independent Component Analysis for Trustworthy Cyberspace during High Impact Events: An Application to Covid-19," arXiv:2006.01284 (2020).

3. **Z. Boukouvalas**, J. Zhou, M. D. Fuge, and S. Said, "MGGD Parameter Estimation on the Space of SPD Matrices," *International Conference on Machine Learning (ICML), Geometry in Machine Learning (GiMLi)*, Stockholm International Fairs, Stockholm, Sweden, July 2018.

4. **Z. Boukouvalas**, R. Mowakeaa, G.-S. Fu, and T. Adalı, "Independent Component Analysis by Entropy Maximization with Kernels," arXiv:1610.07104 (2016).

Research projects and collaborations

1. **Translational AI Framework for Technology Innovation and Acceleration (TITAn)**: *Submitted in Response to: Generative AI Call For Information (2023)*, Department of Mechanical Engineering, University of Maryland, College Park, Maryland, Department of Mathematics and Statistics, American University, Washington, DC, Energetics Technology Center, Indian Head, Maryland.

   This document, submitted for the 2023 Generative AI Call for Information, outlines the Translational AI Framework for Technology Innovation and Acceleration (TITAn). A collaboration between the University of Maryland, American University, and Energetics Technology Center, TITAn focuses on AI techniques for defense-related energetic materials, using NLP and large language models to address data scarcity and specialized language challenges, aiding in innovation and knowledge preservation.

2. **Top Project**: Dr. Zois Boukouvalas, Dr. Maria Barouti, Dr. Konstantinos Koukoulakis, Chace Paulson, Zachary Lessner, Shalini Racmachandra, AirMotionDC: The team's product compiles and analyzes real-time data on traffic patterns and air pollution in the District of Columbia, allowing policymakers to explore the effects of transportation on air quality, 2020. For opportunity visit this link and for tool visit the following link.

Media

1. **Podcast**: *Fighting the Pandemic Misinformation*, Faculty Cross Talks Conversations, Dr. Japkowicz and Dr. Boukouvalas discuss their interdisciplinary project using machine learning techniques to automatically detect and mark misinformation about the Sars-CoV-2 pandemic on Twitter.

2. **Interview**: The Car in the Age of Artificial Intelligence, Discussion with Anastasios Mantzanis about the Car in the Age of Artificial Intelligence.

3. **Short video**: Self-driving car, discuss the different levels of self-driving cars, in collaboration with Anastasios Mantzanis.

HONORS AND
AWARDS

- Gold Standard for outstanding online course development (DATA 641) and advocacy through the Eagle Online Excellence program, January 2024.

- Nominated by Dr. Mary Gray for the Sloan Research Fellowship, September 2021.

- Nominated by Dr. Michael Baron for the Outstanding Scholarship, Research, Creative Activity, and Other Professional Contributions Award at American University, February 2021.

- Third place in the Best Paper Competition, 22nd "New Trends in Research of Energetic Materials" (NTREM) Conference, April 2019.

- Outstanding Graduate Researcher in the Field of Mathematics, UMBC, 2017.

- Outstanding Graduate Teaching Assistant in the Field of Mathematics, UMBC, 2012.

INVITED
TALKS

- *Roundtable: Application of Artificial Intelligence and Machine Learning to Novel Energetic Materials* 14th International Workshop on Combustion and Propulsion (IWCP), Micro and Nano-Sized Advanced Energetic Materials for Propulsion and Energetic Applications, Pescara, Italy, July 2024.

- *Spotlight on Faculty Research and Innovation*, Virtual Admitted Grad Student Day, Washington DC, April, April 2024.

- *AI and NLP Advancements in Energetics: Challenges and Opportunities*, "ML/AI Working Group meeting, Naval Surface Warfare Center Indian Head Division (NSWC IHD)", October 2023.

- *Exploiting Statistical Dependence in Multivariate Data Fusion: An Application to Misinformation Detection for High-Impact Events.*, "RIT Mathematical modeling seminar", February 2023.

- *Independent Component and Vector Analyses for Explainable Detection of Misinformation During*

High Impact Events, Georgetown Math/Stats Colloquium, October 2021.

- *Independent Vector Analysis for Multimodal Fusion: Application to Misinformation Detection*, "Multi-modal data mining methods and applications based on coupled matrix/tensor factorizations", SIAM Conference on Applied Linear Algebra, Virtual Conference, May 2021.

- *Independent Component and Vector Analyses for Explainable Detection of Misinformation During High Impact Events*, Quant Seminar, U.S. Securities and Exchange Commission, April 2021.

- *Independent Component and Vector Analyses for Explainable Detection of Misinformation During High Impact Events*, Math/Stat Department Colloquia, American University, Washington DC, March 2021.

- *Independent Vector Analysis using a Riemannian Averaged Fixed-Point Algorithm for MGGD Parameter Estimation*, DFT 2020: The District Fourier Talks, American University, Washington DC, October 2020.

- *Data Fusion in the Age of Data: Recent Theoretical Advances and Applications*, Math/Stat Department Colloquia, American University, Washington DC, September 2019.

- *Machine Learning Applications in Energetics*, U.S. Army Research Laboratory, Aberdeen Proving Ground, MD, April 2018.

- *Independent Component Analysis: Algorithms and Applications to Medical Imaging and Video Surveillance*, Math/Stat Department Colloquia, American University, Washington DC, February 2017.

- *A New Riemannian Averaged Fixed-Point Algorithm for MGGD Parameter Estimation: Application to IVA*, UMBC Graduate Student Seminar, Baltimore MD, March 2016.

- *Multivariate Generalized Gaussian Distribution Estimation Algorithms for Independent Vector Analysis*, UMBC Graduate Student Seminar, Baltimore MD, March 2015.

- *Introduction to Independent Component Analysis*, UMBC Graduate Student Seminar, Baltimore MD, April 2014.

- *Image Deblurring, Spectra and Filtering*, UMBC Graduate Student Seminar, Baltimore MD, April 2013.

- *Medical Image Registration*, UMBC Graduate Student Seminar, Baltimore MD, April 2012.

- *Text Segmentation*, RIT Summer Mathematics Institute Teachers' Workshop, Rochester NY, June 2011.

CONFERENCE PRESENTATIONS

- *Balancing Accuracy and Interpretability in Machine-Aided Energetic Research Topic Identification*, DoD Artificial Intelligence for Energetics (AI4E) Workshop, 12-14 March, 2024, (Presented by my student Hatice Erdogan).

- *A Machine Learning Framework to Predict Unreacted Shock Compression Response of Solids Under Scarce Data*, Balakrishan, Sangeeth and VanGessel, Francis and Barnes, Brian and Boukouvalas, Zois and Fuge, Mark and Wilson, William and Doherty, Ruth and Chung, Peter, Bulletin of the American Physical Society, volume 68, 2023, (presented by Balakrishan Sangeeth).

- *A Data Fusion Approach for Quantitative Property Prediction Using Natural Language Processing*,

Garcia, Allen and Boukouvalas, Zois and VanGessel, Francis and Doherty, Ruth and Chung, Peter, Bulletin of the American Physical Society, volume 68, 2023, (presented by Allen Garcia).

- *Evaluation of germline variants in retinoblastoma using non-negative matrix factorization*, Lesley M. Chapman Hannah, Jung Kim, Douglas R. Stewart, and Zois Boukouvalas, American Society of Human Genetics, November 1-5, 2023, (presented by my student Lesley M. Chapman Hannah).

- *An exploratory analysis of non-coding variants within pediatric low grade glioma using Bayesian logistic regression*, Lesley M. Chapman Hannah, Jung Kim, Douglas R. Stewart, and Zois Boukouvalas, CSHL Probabilistic Modeling in Genomics, March 8-11, 2023, (presented by my student Lesley M. Chapman Hannah).

- *Efficient Multivariate Data Fusion for Misinformation Detection During High Impact Events*, Discovery Science: 25th International Conference, DS 2022, Montpellier, France, October 10–12, 2022, (presented by Zois Boukouvalas).

- *Evaluation of germline variants in pediatric low grade glioma using non-negative matrix factorization*, Lesley M. Chapman Hannah, Jung Kim, Douglas R. Stewart, and Zois Boukouvalas, CSHL Mechanisms and Models of Cancer, August 16-20, 2022, (presented by my student Lesley M. Chapman Hannah).

- *Assessing the trade-off between prediction accuracy and interpretability for topic modeling on energetic materials corpora*, International Seminar in New Trends in Research of Energetic Materials, NTREM 2022, Czech Republic, April 2022, (presented by Zois Boukouvalas).

- *Survival analysis and evaluation of somatic genomic patterns across multiple cancers using boosted trees and model interpretability*, Lesley M Chapman, Zois Boukouvalas, American Society of Human Genetics, October 18, 2021, (presented by my student Lesley M. Chapman Hannah).

- *Using Natural Language Processing Techniques to Extract Information on the Properties and Functionalities of Energetic Materials from Large Text Corpora*, 22nd International Seminar in New Trends in Research of Energetic Materials, NTREM 2019, Czech Republic, April 2019, (presented by Zois Boukouvalas).

- *Independent Vector Analysis for Data Fusion Prior to Molecular Property Prediction with Machine Learning*, Conference on Neural Information Processing Systems (NIPS) 2018, Machine Learning for Molecules and Materials, Montreal, Canada, December 2018, (presented by Zois Boukouvalas).

- *MGGD Parameter Estimation on the Space of SPD Matrices*, International Conference on Machine Learning (ICML), Geometry in Machine Learning (GiMLi), Stockholm International Fairs, Stockholm, Sweden, July 2018, (presented by Zois Boukouvalas).

- *Independent Component Analysis Using Semi-Parametric Density Estimation via Entropy Maximization*, IEEE Statistical Signal Processing Workshop, Freiburg, Germany, June 2018, (presented by Zois Boukouvalas).

- *Sparsity and Independence: Balancing Two Objectives in Optimization for Source Separation*, 12th Annual Machine Learning Symp., The New York Academy of Sciences, New York, March 2018, (presented by Zois Boukouvalas).

- *Sparsity and Independence: Balancing Two Objectives in Optimization for Source Separation*, Machine Learning for Materials Science (MLMR), College Park, USA, June 2017, (presented by Zois Boukouvalas).

- *Development of ICA and IVA Algorithms with Application to Medical Image Analysis*, IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP), New Orleans, USA, March 2017, (presented by Zois Boukouvalas).

- *Enhancing ICA performance by exploiting sparsity: Application to fMRI Analysis*, IEEE Int. Conf. Acoust., Speech, Signal Processing (ICASSP), New Orleans, USA, March 2017, (presented by Zois Boukouvalas).

- *IVA for Abandoned Object Detection: Exploiting Dependence Across Color Channels*, Research Presentation, UMBC, Baltimore MD, November 2016, (presented by Zois Boukouvalas).

- *An Efficient Multivariate Generalized Gaussian Distribution Estimator: Application to IVA*, Conference on Information Sciences and Systems (CISS), Johns Hopkins University, Baltimore MD, March 2015, (presented by Zois Boukouvalas).

- *Classification Algorithms for Medical Image Registration*, Graduate Research Conference, UMBC, Baltimore MD, February 2013, (presented by Zois Boukouvalas).

- *Medical Image Registration using Distance Metric Learning*, RIT Graduate Research Symposium, Rochester NY, July 2011, (presented by Zois Boukouvalas).

TEACHING EXPERIENCE

Course development (In person)

Developed and taught new courses, DATA 442/642, DATA 445/645, and DATA 441/641, which are now regular courses in the American University catalog. These courses serve as electives for the MS in Data Science specialized methods track and will be core courses for the upcoming PhD program in Data Science at American University.

- DATA 442/642, Advanced Machine Learning
- DATA 441/641, Applied Natural Language Processing
- DATA 445/645, Neural Networks and Deep Learning

Course development (Hybrid)

Developed proposals for new courses: SPA 621 and SPA 622. Courses serve as data science workshops for professionals aiming to enhance their skills in deep learning and natural language processing and will be offered as a one credit courses under the Data Science Center at American University.

- SPA 622, Deep Learning
- SPA 621, Natural Language Processing

Course development (Online)

Developed comprehensive online versions of DATA 641 and DATA 642 for the specialized methods track in the MS in Data Science program. Ensured proper development by incorporating interactive elements, including video lectures, coding tutorials, and discussion forums to enhance student engagement and learning outcomes.

- DATA 641, Applied Natural Language Processing (`https://zoisboukouvalas.github.io/DATA_641_Course_Overview.mp4`)
- DATA 642, Advanced Machine Learning (`https://zoisboukouvalas.github.io/DATA_642_Course_Overview.mp4`)

Teaching

American University, Washington, DC USA

Assistant Professor   **August 2019 - Present**

- DATA 645, Neural Networks and Deep Learning, (online) Spring 2024
- DATA 641, Applied Natural Language Processing, (online) Spring 2024
- DATA 445/645, Neural Networks and Deep Learning, Spring 2024
- DATA 496/696, Neural Networks and Deep Learning, Spring 2023
- DATA 441/641, Applied Natural Language Processing, Spring 2022, Spring 2023, Spring 2024
- DATA 442/642, Advanced Machine Learning, Fall 2021, Fall 2022, Fall 2023
- DATA 793, Data Science Practicum, Spring 2021.
- STAT 469/696, Applied Natural Language Processing, Spring 2021.
- STAT 469/696, Advanced Machine Learning, Fall 2020.
- STAT 427/627, Statistical Machine Learning, Spring 2020, Fall 2020.
- STAT 415/615, Regression, Fall 2019.
- STAT 412/612, Statistical Programming in R, Fall 2019.

Adjunct Professorial Lecturer   **January 2018 - May 2018**

- STAT 204, Intro to Business Statistics, Spring 2018.

University of Maryland Baltimore County, Baltimore, Maryland USA

Guest Lecturer   **September 2015 - May 2018**

- ENEE 620, Probability and Random Processes, Fall 2015, Fall 2016, Fall 2017.
- ENEE 712, Special Topics in Signal Processing, Spring 2016, Spring 2018.
- ENEE 621, Detection and Estimation Theory, Spring 2017.

Instructor   **May 2012 - July 2017**

- MATH 150, Precalculus, Summer 2012, Summer 2015, Summer 2017.
- MATH 151, Calculus I, Summer 2013, Summer 2014.
- MATH 155, Applied Calculus, Summer 2016.

Math Teaching Assistant   **August 2011 - May 2016**
Head teaching assistant. Duties included mini lectures and worksheet preparation, shared administrative responsibilities with faculty instructor, fielding of all student inquiries, provide assistance with calculus-related questions, and grade weekly quizzes for over 100 students.
Courses: Precalculus, Applied Calculus, Calculus I, II.

STUDENT ADVISING   **Graduate students**

Federal University of Ceara (UFC) - Brazil

Lucas Damasceno, Teleinformatics Engineering - DETI (PhD student)   **Spring 2020 - Present**

American University Master Thesis

Egzona Rexhepi, Statistics (MS thesis–Completed)	**Fall 2021 - Summer 2022**
Lesley Chapman, Statistics (MS thesis–Completed)	**Spring 2021 - Spring 2024**
Morgan Tompkins, Statistics (MS thesis–Completed)	**Spring 2022 - Summer 2022**

American University Research Assistants

Sunday Okechukwu[1], Data Science	**Spring 2023 - Present**
Hatice Erdogan[2], Data Science	**Spring 2023 - Present**
Spencer Grewe[2], Data Science	**Spring 2024 - Present**
Rachel Rolle [2], Data Science,	**Fall 2022 - Present**
Javad Rajabi, Computer Science	**Spring 2023 - Spring 2024**
Max Calzada Munoz[2], Data Science,	**Fall 2022 - Spring 2023**

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[1]Supported by the department of Mathematics and Statistics and under internal grant

Michelle Wheatley[2], Data Science	**Summer 2022 - Fall 2023**
Michael Knight[2], Data Science	**Fall 2021 - Fall 2022**
Mason Kellett[2], Data Science	**Spring 2021 - Spring 2022**
Allison Shafer, Data Science	**Winter 2020 - Spring 2021**
Monica Puerto[2], Data Science	**Spring 2020 - Spring 2021**
Caitlin Moroney[2], Data Science	**Summer 2020 - Spring 2021**
Yueyang Liu, Computer Science	**Spring 2021**
Peter Matarrese Data Science	**Spring 2021**
Allison Ragan, Data Science	**Winter 2020 - Spring 2021**
Huong Doan, Computer Science	**Winter 2020 - Spring 2021**
Chace Paulson, Data Science	**Spring 2020**
Dustin Pierce[2], Data Science	**Summer 2020**
Dong Ding, Statistics	**Spring 2020**
Ziyan Wang, Statistics	**Spring 2020**

Undergraduate students

American University Research Assistants

Christopher Pedretti[2], Computer Science	**Spring 2023 - Present**
Elif Ak[2], Data Science	**Spring 2023 - Spring 2024**
Collin Coil[2], Mathematics and Statistics	**Spring 2023 - Spring 2024**
Rodanthi Nikopoulou[2], Chemistry	**Winter 2020 - Spring 2023**
David Leshchiner, International Studies & Data Science	**Summer 2021**
Santiago Nule, Data Science	**Summer 2021**
Parker Brotman[2], Math & Stat	**Summer 2020**

University of Maryland, Baltimore County

Joshua Slaughter, Computer Engineering	**Spring 2020**

University of Maryland, College Park

Chuanmudi Qin, Mathematics	**Spring 2019**
Rohith Venkatesh, Computer Science	**Fall 2018**
Austin Kim, Computer Science	**Fall 2018**

High school students students (Blair Jones Mathematics Endowment)

Aiden Cheong,	**Summer 2023**
Angelica Hu,	**Summer 2022**
Ziyin (Jenny) You,	**Summer 2022**
Dagm Henok,	**Summer 2022**
Tigist Gebreslassie,	**Summer 2021**
Klint Faber,	**Summer 2021**

<table>
<tr><td>PROFESSIONAL
SERVICE</td><td colspan="3">Ph.D. committee member and dissertation reader</td></tr>
<tr><td></td><td>Selim Yaman
Essays on Political Text Analysis</td><td>American University, Dept. of Government</td><td>Spring 2024</td></tr>
<tr><td></td><td>Le Bao
A New Measurement of Political Polarization and its Implications</td><td>American University, Dept. of Government</td><td>Summer 2022</td></tr>
<tr><td></td><td>Qunfang Long</td><td>UMBC, Dept. of CSEE</td><td>Summer 2020</td></tr>
</table>

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[2]Supported by grant Human Assisted Machine Learning and Natural Language Processing Approaches for Energetics and grant Data-Driven Multi-modal Fusion for the Analysis of Energetic Material Systems

Data-driven Techniques for the Study of Brain Dynamics and Identification of Subgroups: Application to Multi-subject Resting-state fMRI Data

Suchita Bhinge   UMBC, Dept. of CSEE   **Fall 2019**
Adaptive Constrained Independent Vector Analysis: Application to Large-Scale fMRI Analysis

Darren K. Emge   UMBC, Dept. of CSEE   **Spring 2018**
Independent Vector Analysis for Steady State Visually Evoked Potential Data Analysis.

MS committee member

Chenxi Liao   AU, Neuroscience   **December 2022**
Unsupervised learning reveals interpretable latent representation for translucency perception

Ruiqi Sun   AU, Math & Stat   **Summer 2020**
Estimating Preferential Pairing in Polyploids

Conferences Special Sessions Organizer

- Session chair, 14th International Workshop on Combustion and Propulsion (14-IWCP), July 29-July 31, 2024.

- Co-organizer, Latent Variable Methods: Theoretical Advances and Applications in the Age of Machine Learning, EUSIPCO 2020 (January 2021), Virtual conference

- Co-organizer, Machine Learning for Knowledge Discovery in the Social Sciences, MLSP 2019 (October 2019), Pittsburgh, PA, US

Grant application reviewer
Swiss National Science Foundation (Feb. 2022)

Journal paper reviewer and conference program committee member
- Journal:
    Journal of Neuroscience methods (Elsevier) (**Certificate of Reviewing**)
    Neural Processing Letters (Springer)
    Transactions on Signal Processing (IEEE)
    Journal of Machine Learning Research
    Machine Learning
    Artificial Intelligence Review
    Computational and Mathematical Methods in Medicine (Hindawi)
    Journal of the Franklin Institute (Elsevier)
- Conference:
    IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2016-2023
    The Ninth IEEE Sensor Array and Multichannel Signal Processing Workshop (SAM),2016
    Latent Variable Analysis and Signal Separation (LVA/ICA), 2015
    IEEE International Workshop on Machine Learning for Signal Processing (MLSP), 2015, 2016, 2018, 2019, 2020, 2022

Department of Math/Stat American University service
- Hiring committee member, Department of Mathematics and Statistics (2023)
- Student research Committee, (Committee Chair)
- Major Program Review Committee, Summary and Future plans
- Graduate Studies Committees, Data Science, (Committee Chair)
- Website Committee, (Committee Chair)

American University service
- Hiring committee member, Department of Computer Science (2022)