RYAN T. WHITE, PH.D.

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NETS Lab	Google Scholar	GitHub	Website

SUMMARY

Mathematician, Assistant Professor, and Director of the NEural TransmissionS (NETS) Lab at Florida Institute of Technology. My lab brings deep learning, computer vision, NLP, and data science to problems in engineering, medicine, and the sciences. Primary support by DoD clients and scientific research grants.

A major time investment since 2021 was as PI on a U.S. Space Force (via AFRL) grant to develop fast, on-board guidance and navigation algorithms for autonomous on-orbit servicing operations. The effort includes extensive data development, building and tuning deep learning models, hardware-in-the-loop testing, sensor fusion, hardware integration, flightpath planning, flight simulations, and flight tests.

In addition to overall responsibility for technical direction and management of projects, I hire cross-discipline student research teams, mentor individual students and sub-teams, contribute to the technical work everywhere needed, forge collaborations, ensure compliance with DoD and university policies, and manage internal, industrial, and DoD stakeholders.

EXPERIENCE

2020-Present **Senior Advisor on Data Sciences, Engage-AI**
Leading data science projects in global development, primarily in the MENA region.

2019-Present **Assistant Professor, Florida Institute of Technology**
Research and teaching in deep learning, data science, and stochastic analysis in the Department of Mathematics and Systems Engineering.

2019-Present **Principal - Data Science Practice, White Associates R&D, LLC**

2015-2019 **Instructor, Florida Institute of Technology**

2008-2018 **Senior Consultant, White Associates R&D, LLC**

EDUCATION

2015 **Ph.D. in Applied Mathematics, Florida Institute of Technology**
Dissertation: Random Walks on Random Lattices and Their Applications

2011 **M.S. in Applied Mathematics, Florida Institute of Technology**

2008 **B.S. in Mathematics, Chadron State College**

RESEARCH

Background in probability, analysis of stochastic processes, and the underlying mathematics: in short, the study of randomness. Past work on reliability theory, random walks, game theory, and queueing theory. Continued research in these areas but with a primary focus on multidisciplinary deep learning projects in astronautics, computer vision, synthetic data generation, and blood flow dynamics.

Current Projects

- Real-time on-board satellite component tracking and flightpath planning to safely capture non-cooperative satellites in orbit (supported by US Space Force, Energy Management Aerospace LLC)
- Modeling information flow through neural networks to develop efficient architectures, optimize training, enhancing model interpretability, and detecting data bias (supported by US Army Corps of Engineers)
- Developing fast-interence object tracking algorithms with time-series regression analysis of bounding boxes to exploit temporal patterns in video feeds on edge hardware (supported by NVIDIA)
- Performance evaluation of ML algorithms using synthetic and observed waveforms; Modeling and detection/identification of infrasound sources (with US Air Force Technical Applications Center)
- Physics-informed neural networks for modeling bloodflow velocity fields in aneurysms (i.e. learnable fluid dynamics) (with K. Chivukula)
- NLP analysis of incident reports in the Aviation Safety Reporting System and aerospace requirements, including text classification, summarization, and standardization (with A. Tikayat Ray)
- Synthetic data generation and swarm-based computer vision to characterize geometry and dynamics of non-cooperative spacecraft on orbit
- Automated segmentation of glaciers in multispectral satellite imagery for modeling evolution through time (with N. Kachouie)
- Data science for UN SDGs. Building a data platform to ingest diverse data and facilitate ML/AI. Emphasis on healthcare, gender equity, and economics in the MENA region (with Engage-AI)
- Stochastic analysis of multidimensional marked random walks – deriving probabilistic information about their exits, applications to stochastic networks, queueing, and reliability (with J. H. Dshalalow)
- Tracking the evolution of minimal-volume, sufficient-probability sets for stochastic paths – developing the mathematics to do this and algorithms for practical use for stochastic processes

Funding

- US Army Corps of Engineers: development of explainable computer vision models by leveraging information theory (PI, 2023-2024, $49,735)
- Energy Management Aerospace, LLC: contract work on computer vision, sensor fusion, and GNC on spaceflight hardware (PI, 2023, $55,536)
- U.S. Space Force (AFWERX) STTR Phase II Grant: Machine Intelligence System for Autonomous Feature Recognition and Trajectory Planning Around Non-Cooperative Resident Space Objects (Academic PI, 2021-23, $465,000)
- NVIDIA Applied Research Accelerator Program (PI, 2021-, $7,000)
- NSF Statistical Models with Applications in Geosciences REU Program (senior personnel, 2021-2023, $300,000)
- Google Cloud Platform Educational Grant (PI, 2020-2022, $9,600)
- European Space Agency: Analysis of Glaciers in Multispectral Satellite Imagery (PI, 2021-23, $2400)
- Florida Tech Summer Research Program (PI, 2020-2021, $20,000)

TECHNICAL SKILLS

Skilled with deep learning, computer vision, NLP, dataviz, explainable ML, Python (+ TensorFlow, PyTorch, Keras), edge computing, LaTeX, Mathematica, MATLAB

Some experience with Arduino, Blender, C, C++, CSS, Fortran, Java, JavaScript, Linux, Objective-C/Cocoa (iOS dev), R, SQL, VBA

ACADEMIC

Teaching

- 11 years of teaching experience (2 as a TA, 4 as Instructor, 5 as Assistant Professor). Overwhelmingly positive evaluations for teaching from students (at least 4.5/5) and supervisors (at least 9/10).
- **2019 Professor of the Year** in the College of Engineering and Science award from the FIT Student Government Association.
- **Courses designed**: MTH/CSE 4224 Intro to Machine Learning, MTH 4320/5320 Deep Learning, MTH 5050 Special Topics (Edge AI)
- **Courses taught**: MTH 4320/5320 Neural Networks/Deep Learning, MTH/CSE 4224 Introduction to Machine Learning, MTH 5050 Special Topics (Explainable AI, Information Theory), MTH 6050 Research in Applied Mathematics (Computer Vision in Medical Imagery, 3D Facial Kinematics, PINNs/Learnable CFD), MTH 4999 Undergraduate Research (DL models for glacier-tracking, pose estimation), MTH 2401 Probability and Statistics, MTH 1020 Honors Calculus 2

Research Supervision

- Nehru Attsz. Object Tracking on the Edge. PhD work, ongoing.
- Minh Nguyen. Learning Representations of Electronic Health Records for Synthetic Data Generation. PhD work, ongoing.
- Mackenzie Meni, Kayla Taylor, Mehek Niwas. Information-theoretic Analysis of Neural Networks for Optimizing Compute, Training, and Explainability. Undergraduate research and PhD work, ongoing.
- Emma Sandidge, Michael Hon. Visio-temporal deep learning models for on-orbit satellite pose estimation. Senior capstone project, ongoing.
- Blake Gisclair, Alex Merino. Modeling and detection/identification of infrasound sources. Research with U.S. Air Force Technical Applications Center, ongoing.
- Trupti Mahendrakar, Andrew Ekblad, Ashley Tisaranni, Nathan Fischer, Anthony Garcia, Mallory Roy, Nehru Attsz, Mackenzie Meni, Nehru Attzs, Josseanne Duarte, Emily Happy, Miles Svikhart, Maxwell Caiazza, Steven Holmberg, Sam Lovelace, and Dylan Barnes. Machine Intelligence System for Autonomous Feature Recognition and Trajectory Planning Around Non-Cooperative Resident Space Objects. Research for U.S. Air Force Research Lab Space Vehicles Directorate (U.S. Space Force) and Energy Management Aerospace, ongoing.
- Michelle Madera and Maxwell Jiang. Segmentation Glaciers in Multispectral Satellite Imagery. Statistical Models with Applications to Geoscience Summer REU, 2023.
- William Stern, Nathan Pichette, Stephane Baruch, and Hanibal Alazar. Synthetic Data Pipeline for Satellite Pose Estimation. Senior capstone project, 2022-23.
- William Harrington. Clinical Facial Landmark Tracking and Speech Analysis iOS Devices. MS thesis, successful defense in 2022.
- Maya Jacob and Michelle Weathersby. Comparing Pollen Size Distributions in South America to Identify Significant Temporal Changes. Statistical Models with Applications to Geoscience Summer REU, 2022.
- Merrill Storch and Grace Stroh. Mountain Glacier Segmentation to Quantify Glacier Variations Due to Climate Change. Statistical Models with Applications to Geoscience Summer REU, 2022.

- Emily Happy, Anthony Garcia, Neel Shettigar. Semantic Segmentation of Glaciers in Multispectral Satellite Imagery with Deep Neural Networks. Senior capstone project, 2022.
- William Stern, Shiv Vyas, Maria Chun, Giulio Martini. Pattern Recognition in Moroccan UN SDG Data. Graduate and undergraduate research, 2021-22.
- Nikhil Iyer, Alex Bugielski. Deep Learning-based 6-Degree-of-Freedom Spacecraft Pose Estimation. Senior capstone project, 2022.
- Machine Learning in Global Development. Florida Tech Summer Research Program for local high school students (3 students), Summer 2021.
- Thu Thu Hlaing and Jonathan Webb. The Impact Of Climate Change On Mountain Glaciers. Statistical Models with Applications to Geoscience Summer REU, 2021.
- Rebecca Beltran and Alyssa Sharma. Assessing The Impact Of Benthic Communities On Water Filtration In A Coastal Estuary (with K. Hunsucker). Statistical Models with Applications to Geoscience Summer REU, 2021.
- Shiv Vyas. A Study of Inflation-dependence of UN SDG Indicators. Spring 2021.
- Abdulla Al-Nabit and Hanibal Alazar. An AI-Enhanced Data Platform for Sustainable Global Development. Senior capstone project, 2021.
- Kelly van Woesik. Tuning Tuna Models with Machine Learning. Senior capstone project, 2021.
- Candice Chambers. Multi-Language Handwriting Recognition with Trees of CNN Ensembles. Senior capstone project, Spring 2021.
- Graham Neustel. Last Exits of 2D Random Walks. Senior capstone project, 2020.
- COVID-19 Modeling and Simulation in Python. Florida Tech Summer Research Program, supervised 8 high school students, 2020.

Selected Speaking Engagements

1. Information-Informed Neural Networks: Probabilistically Interpretable Neural Decisionmaking. *Frontiers in Geoscience Seminar*, Earth and Environmental Sciences (EES) division and the Center for Space and Earth Science (CSES), Los Alamos National Lab, Los Alamos, NM, Aug 13, 2023.
2. What is AI? Definitions and Use-Cases in Global Development. *Engage-AI Seminar Series.* June 30, 2022.
3. "How and where should Morocco be engaged in further research and development on AI in the context of Morocco's development" discussion panel. *AI4D Conference 2022.* Al Akhawayn University, Ifrane, Morocco. Sept 16, 2022.
4. Computer Vision Beyond Image Classification. Speaker at Startup Grind Columbus. Oct 2021.
5. Exiting Patterns of Multivariate Renewal-Reward Processes. *Joint Annual Meetings of the MAA-Florida Section and FTYCMA*. State College of Florida, Bradenton, FL. Feb 19-21, 2021.
6. On the Evolution of Minimal-Volume, Sufficient-Probability Sets for Stochastic Paths. *14th International Conference in Monte Carlo & Quasi-Monte Carlo Methods in Scientific Computing.* Oxford University, Oxford, UK. August 10-14, 2020.
7. Fluctuation Analysis in Parallel Queues with Hysteretic Control. *AMS Fall Southeastern Sectional Meeting 2019.* University of Florida, Gainesville, FL. Nov 1-3, 2019.
8. On Exits of Oscillating Random Walks Under Delayed Observation. *AMS/MAA Joint Mathematical Meetings.* San Diego, CA. Jan 10-13, 2018.
9. Time Sensitive Analysis of d-dimensional Independent and Stationary Increment Processes. *AMS Fall Southeastern Sectional Meeting.* University of Central Florida, Orlando, FL. Sept 23-24, 2017.

PUBLICATIONS

[1] R. T. White and A. Tikayat Ray. *Practical Discrete Mathematics*. Packt Publishing, Feb. 2021.

[2] A. Tikayat Ray, O. J. Pinon-Fischer, D. N. Mavris, R. T. White, and B. F. Cole. aeroBERT-NER: Named-entity recognition for aerospace requirements engineering using BERT. In *AIAA SCITECH 2023 Forum*. American Institute of Aeronautics and Astronautics, jan 2023.

[3] A. Tikayat Ray, O. Pinon, R. T. White, B. F. Cole, and D. N. Mavris. aerobert-ner: Aerospace corpus and language model for named-entity-recognition for aerospace requirements engineering. *submitted to Journal of Aerospace Information Systems*, 2023.

[4] A. Tikayat Ray, B. F. Cole, O. J. P. Fischer, R. T. White, and D. N. Mavris. aeroBERT-classifier: Classification of aerospace requirements using BERT. *Aerospace*, 10(3):279, mar 2023.

[5] A. Tikayat Ray, A. P. Bhat, R. T. White, V. M. Nguyen, O. J. P. Fischer, and D. N. Mavris. Examining the potential of generative language models for aviation safety analysis: Case study and insights using the aviation safety reporting system (ASRS). *Aerospace*, 10(9):770, aug 2023.

[6] J. Y. Park and R. T. White. Integrated data modeling into calculus courses. In *2023 Joint Mathematical Meetings*, 2023.

[7] B. M. Nagda, V. M. Nguyen, and R. T. White. Hard pattern mining and ensemble learning for detecting DNA promoter sequences. *submitted to IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 2023.

[8] M. J. Meni, R. T. White, M. Mayo, and K. Pilkiewicz. Entropy-based guidance of deep neural networks for accelerated convergence and improved performance. *submitted to Information Systems*, Aug. 2023, 2308.14938.

[9] M. Mattei, R. Hillner, M. Meni, K. Chivulkula, and R. T. White. Evaluating performance of physics-informed neural networks for predicting 3d blood flow patterns. *submitted to Cardiovascular Engineering and Technology*, 2023.

[10] T. Mahendrakar, R. T. White, M. Wilde, and M. Tiwari. SpaceYOLO: A human-inspired model for real-time, on-board spacecraft feature detection. In *2023 IEEE Aerospace Conference*. IEEE, mar 2023.

[11] T. Mahendrakar, R. T. White, M. Tiwari, and M. Wilde. Real-time, on-board spacecraft feature detection with lightweight cnns. *submitted to IEEE Transactions on Aerospace and Electronic Systems*, 2023.

[12] T. Mahendrakar, S. Holmberg, A. Ekblad, E. Conti, R. T. White, M. Wilde, and I. Silver. Autonomous rendezvous with non-cooperative target objects with swarm chasers and observers. *33rd AAS/AIAA Space Flight Mechanics Meeting*, 2023.

[13] T. Mahendrakar, M. N. Attzs, J. M. Duarte, A. L. Tisaranni, R. T. White, and M. Wilde. Impact of intra-class variance on YOLOv5 model performance for autonomous navigation around non-cooperative targets. In *AIAA SCITECH 2023 Forum*. American Institute of Aeronautics and Astronautics, jan 2023.

[14] A. Ekblad, T. Mahendrakar, R. White, M. Wilde, I. Silver, and B. Wheeler. Resource-constrained FPGA design for satellite component feature extraction. In *2023 IEEE Aerospace Conference*. IEEE, mar 2023.

[15] A. Despeignes, A. Sharma, R. Beltran, S. Rech, M. Gilligan, K. Hunsucker, R. T. White, and N. N. Kachouie. Impact of benthic organisms to mitigate water pollution in the indian river lagoon. *Water, Air, & Soil Pollution*, 234(8), aug 2023.

[16] B. Caruso, T. Mahendrakar, V. M. Nguyen, R. T. White, and T. Steffen. 3D reconstruction of non-cooperative resident space object using Instant NeRF and D-NeRF. *33rd AAS/AIAA Space Flight Mechanics Meeting*, 2023.

[17] M. N. Attzs, T. Mahendrakar, M. J. Meni, R. T. White, and I. Silver. A comparison of tracking-by-detection algorithms for real-time satellite component tracking. In *37th Annual Small Satellite Conference*, 2023.

[18] R. T. White. On the exiting patterns of multivariate renewal-reward processes with an application to stochastic networks. *Symmetry*, 14(6):1167, jun 2022.

[19] T. Mahendrakar, A. Ekblad, N. Fischer, R. White, M. Wilde, B. Kish, and I. Silver. Performance study of YOLOv5 and faster R-CNN for autonomous navigation around non-cooperative targets. In *2022 IEEE Aerospace Conference (AERO)*. IEEE, mar 2022.

[20] M. Gilligan, K. Hunsucker, S. Rech, A. Sharma, R. Beltran, R. T. White, and R. Weaver. Assessing the biological performance of living docks—a citizen science initiative to improve coastal water quality through benthic recruitment within the indian river lagoon, florida. *Journal of Marine Science and Engineering*, 10(6):823, jun 2022.

[21] J. H. Dshalalow and R. T. White. Fluctuation analysis of a soft-extreme shock reliability model. *Mathematics*, 10(18):3312, sep 2022.

[22] J. H. Dshalalow and R. T. White. First passage analysis in a queue with state dependent vacations. *Axioms*, 11(11):582, oct 2022.

[23] J. H. Dshalalow, V. M. Nguyen, R. R. Sinden, and R. T. White. Determination of mutation rates with two symmetric and asymmetric mutation types. *Symmetry*, 14(8):1701, aug 2022.

[24] T. Mahendrakar, M. Wilde, and R. White. Use of artificial intelligence for feature recognition and flight-path planning around non-cooperative resident space objects. In *ASCEND 2021*. American Institute of Aeronautics and Astronautics, nov 2021.

[25] T. Mahendrakar, R. T. White, M. Wilde, B. Kish, and I. Silver. Real-time satellite component recognition with YOLOv5. In *35th Annual Small Satellite Conference*, 2021.

[26] J. H. Dshalalow and R. T. White. Random walk analysis in a reliability system under constant degradation and random shocks. *Axioms*, 10(3):199, aug 2021.

[27] J. H. Dshalalow and R. T. White. Current trends in random walks on random lattices. *Mathematics*, 9(10):1148, may 2021.

[28] J. H. Dshalalow, K. Nandyose, and R. T. White. Time sensitive analysis of antagonistic stochastic processes and applications to finance and queueing. *Mathematics and Statistics*, 9(4):481–500, jul 2021.

[29] J. H. Dshalalow, A. Merie, and R. T. White. Fluctuation analysis in parallel queues with hysteretic control. *Methodology and Computing in Applied Probability*, 22(1):295–327, mar 2020.

[30] R. T. White and J. H. Dshalalow. Characterizations of random walks on random lattices and their ramifications. *Stochastic Analysis and Applications*, 38(2):307–342, dec 2019.

[31] J. H. Dshalalow and R. T. White. Time sensitive analysis of independent and stationary increment processes. *Journal of Mathematical Analysis and Applications*, 443(2):817–833, nov 2016.

[32] J. H. Dshalalow, K. Iwezulu, and R. T. White. Discrete operational calculus in delayed stochastic games. *Neural, Parallel, and Scientific Computations, 24: 55-64*, Jan. 2016, 1901.07178.

[33] R. T. White. *Random walks on random lattices and their applications*. PhD thesis, Florida Institute of Technology, 2015.

[34] J. H. Dshalalow and R. T. White. On strategic defense in stochastic networks. *Stochastic Analysis and Applications*, 32(3):365–396, 2014.

[35] J. H. Dshalalow and R. T. White. On reliability of stochastic networks. *Neural, Parallel, and Scientific Computations, 21, 141-160*, 21:141–160, Jan. 2013, 1901.07137.

[36] R. T. White. Reliability of networks under stochastic attacks. *(manuscript in progress)*.

[37] R. T. White. On exits and overshoots of dependent jump processes. *(manuscript in progress)*.

[38] A. Garcia Romano, E. Happy, N. Shettigar, R. T. White, and N. N. Kachouie. Glacier segmentation in satellite imagery with mask r-cnn with cluster fusion. *(manuscript in progress)*.