Osonde A. Osoba, Ph.D.

email: oosoba@rand.org
Santa Monica, CA, 90405

CURRENT AFFILIATIONS:

Staff Software Engineer – Machine Learning, LinkedIN

EDUCATION:

PhD, Electrical Engineering, University of Southern California (2013)
Dissertation: "Noise Benefits in Expectation-Maximization Algorithms"
Committee: Bart Kosko (Advisor/Chair), Antonio Ortega, James Moore II

RESEARCH DOMAINS:

Artificial Intelligence & Machine Learning, Algorithmic Decision-making, Responsible AI, Data Privacy

WORK EXPERIENCE:

LinkedIn **CA**
IC (Senior & Staff) *01/2022–present*

SWE IC in the Responsible AI group. Focused on fairness measurement problems:

- ***Strongly Privatized Fairness Measurements at Scale***: Motivated, designed, implemented, and deployed at large-scale a privacy-preserving race/ethnicity fairness measurement solution incorporating differential privacy, homomorphic encryption, and secure multi-party computation. **Impact**: industry-leading responsible AI solution that places LinkedIn at the cutting-edge of private sector RAI methodology.
- ***Addressing Selection Bias in Demographic Data***: Designed and implemented quasi-experimental methods to address selection bias in demographics surveys intended for use in production fairness measurement. Conclusively demonstrated that the surveys could not be sufficiently de-biased for the large-scale measurement use-case. **Impact**: saved the organization multiple quarters of investment in a failing technology.

RAND Corporation **Santa Monica, CA**
Researcher *07/2014–12/2021*

Research in diverse policy domains. Selected areas of focus include:

- ***Machine Learning Modeling***:
  - "Automated Planning": Conceived, developed, and tested different machine learning models for addressing automated planning tasks of simple and intermediate complexity. Worked on generative adversarial network and reinforcement learning planning models. Applications to Space defense and public health. Outcomes: publications and advice to defense decision makers.
  - "Social Behavioral Modeling and Simulation": Exploration and Development of machine learning approaches for modeling and simulating social behavior. Developed models for simulating behaviors like public support of terrorism and belief diffusion. Explored causal modeling tools in ML settings.

- "Modeling and forecasting epidemic outbreaks": machine learning modeling to forecast Dengue epidemic trends for the CDC. Task lead for the modeling effort. Developed adaptive statistical model of aggregate behaviors for COVID19 forecasting models.

- ***AI Policy & Data privacy***:
  - "Fairness/Equity in AI Systems": conceived and led studies on risks and fairness in artificial intelligence and algorithmic decision-making systems. Led interdisciplinary teams to reconceptualize algorithmic equity in a number of diverse applications.
  - Explored the policy implications of the failures of standard privacy preservation mechanisms, paying special attention to privacy-sensitive domains like health. Proposed regulatory schemes that may account robustly for technological innovations.

Signal and Image Processing Institute (USC) **Los Angeles, CA**
Researcher *2006 - Present*

- Research, publication, and technical patent advisement on topics related to stochastic resonance or noise benefits in machine learning and statistical estimation methods.

Graduate-Level Teaching **Los Angeles, CA**
Lecturer, Viterbi School of Engineering (USC) *2013 - 2022*
Core Prof., Pardee RAND Graduate School *2015 - 2022*

- Developed and taught courses on probability, machine learning, stochastic processes, stochastic differential equations & and technology policy.

SERVICE ACTIVITIES & PROFESSIONAL AFFILIATIONS

Commissioner: US Chamber of Commerce Commission on Artificial Intelligence Competitiveness, Inclusion, and Innovation (2022)
Associate Director: Tech & Narrative Lab, Pardee RAND Graduate School (TNL-PRGS)
Co-director: RAND Center for Scalable Computing and Analysis (SCAN)
Judge: XPRIZE – Pandemic Response Challenge (2021)
Area Chair: ACM Conference on Fair, Accountable, and Transparent Machine Learning (ACM-FAccT 2021) - Data and Algorithm Evaluation Track
Reviewer: International Conference on Machine Learning (ICML 2020)
Session Discussant: WE ROBOT Conference 2020
Member: Admissions Committee, Pardee RAND Graduate School (PRGS)
Member and Chair on PRGS Dissertation Committees
Advisory Group: RAND Center for Causal Inference (CCI) (2016-2020)
Member: Institute of Electrical and Electronics Engineers (IEEE)
Reviewer: ACM Conference on Fair, Accountable, and Transparent Machine Learning (ACM-FAT* 2018)
Reviewer: International Joint Conference on Neural Networks (IJCNN 2017)

SELECTED TECHNICAL PUBLICATIONS (SCHOLAR LINK)

S. Badrinarayanan*, O. Osoba*, Miao Cheng, Ryan Rogers, Sakshi Jain, Rahul Tandra, and Natesh S. Pillai. "Privacy-Preserving Race/Ethnicity Estimation for Algorithmic Bias Measurement in the US." arXiv preprint arXiv:2409.04652 (2024). [*: co-first authors]

O. Osoba, "A complex-systems view on military decision making." Australian Journal of International Affairs 78, no. 2 (2024): 237-246.

O. Osoba, B. Boudreaux, and D. Yeung. "Steps Towards Value-Aligned Systems." *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society*, pp. 332-336. Feb. 2020.

S. Navabi, O. Osoba, "A Generative Machine Learning Approach to Policy Optimization in Pursuit-Evasion Games." In 2021 60th IEEE Conference on Decision and Control (CDC), pp. 69-76. IEEE, 2021.

O. Osoba, J. Welburn, J. Lamb, P. Lima, and K. B. Kumar. Exploring Intergenerational Wealth Transfer Dynamics with Agent-Based Models. RAND, 2023.

O. A. Osoba, R. Vardavas, J. Grana, R. Zutshi and A. Jaycocks, "Modeling Agent Behaviors for Policy Analysis via Reinforcement Learning," *2020 19th IEEE International Conference on Machine Learning and Applications (ICMLA)*, Miami, FL, USA, 2020, pp. 213-219. Dec. 2020.

B. Kosko, K. Audhkhasi, and O. Osoba. "Noise can speed backpropagation learning and deep bidirectional pretraining." *Neural Networks* (2020).

J. S. Davis, O. Osoba. "Improving privacy preservation policy in the modern information age." *Health and Technology* 9, no. 1 (2019): 65-75.

O. Osoba, B. Kosko, "Fuzzy Cognitive Maps of Public Support for Insurgency and Terrorism," *Journal of Defense Modeling and Simulation*, vol.14 no.1, pp. 17-32, 2017

O. Osoba, S. Mitaim, B. Kosko, "The Noisy Expectation Maximization Algorithm," *Fluctuation and Noise Letters*, *v*ol.12, no.03, Sept. 2013

O. Osoba, B. Kosko, "Noise-enhanced Clustering and Competitive Learning Algorithms," *Neural Networks*, vol.37, no.0, pp.132-140, Jan. 2013

O. Osoba, S. Mitaim, B. Kosko, "Bayesian Inference with Adaptive Fuzzy Priors and Likelihoods," *IEEE Transactions on Systems, Man, and Cybernetics-B*, vol.41, no.5, pp.1183-1197, Oct. 2011

O. Osoba, "Technocultural Pluralism: A 'Clash of Civilizations' in Technology?." *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society*, pp. 132-137. Feb. 2020.

O. Osoba, B. Kosko. "Beyond DAGs: modeling causal feedback with fuzzy cognitive maps." arXiv preprint arXiv:1906.11247 (2019). [Extended version of published book chapter]

SELECTED POLICY RESEARCH PUBLICATIONS:

Osoba, Osonde A., Benjamin Boudreaux, Jessica Saunders, J. Luke Irwin, Pam A. Mueller, and Samantha Cherney, *Algorithmic Equity: A Framework for Social Applications*. Santa Monica, CA: RAND Corporation, 2019. https://www.rand.org/pubs/research_reports/RR2708.html.

Osoba, Osonde A. and William Welser IV, The Risks of Artificial Intelligence to Security and the Future of Work. Santa Monica, CA: RAND Corporation, 2017. https://www.rand.org/pubs/perspectives/PE237.html.

Osoba, Osonde A. and William Welser IV, An Intelligence in Our Image: The Risks of Bias and Errors in Artificial Intelligence. Santa Monica, CA: RAND Corporation, 2017. https://www.rand.org/pubs/research_reports/RR1744.html.

Wong, Yuna Huh, John M. Yurchak, Robert W. Button, Aaron Frank, Burgess Laird, Osonde A. Osoba, Randall Steeb, Benjamin N. Harris, and Sebastian Joon Bae, Deterrence in the Age of Thinking Machines. Santa Monica, CA: RAND Corporation, 2020. https://www.rand.org/pubs/research_reports/RR2797.html.

Zhang, Li Ang, Jia Xu, Dara Gold, Jeff Hagen, Ajay K. Kochhar, Andrew J. Lohn, and Osonde A. Osoba, Air Dominance Through Machine Learning: A Preliminary Exploration of Artificial Intelligence–Assisted Mission Planning. Santa Monica, CA: RAND Corporation, 2020. https://www.rand.org/pubs/research_reports/RR4311.html.

PATENTS (ASSIGNED TO USC):

"Iterative Estimation of System Parameters Using Noise-Like Perturbations," U.S. Patent 13/949,048 (Jul. 2013)

"Noise-Enhanced Clustering and Competitive Learning Algorithms," U.S. Patent Application 14/553,890 (Dec. 2014)

"Noise-Enhanced Convolutional Neural Networks," U.S. Patent Application 14/803,797 (Jul. 2015)
"Noise Speed-Ups in Hidden Markov Models with Applications for Speech Recognition," U.S. Patent Application 14/802,760 (Jul. 2015)
"Noise-Boosted Back Propagation and Deep Learning Neural Networks," U.S. Patent Application 14/816,999 (Aug. 2015)

AWARDS:

Edwin E. Huddleson, Jr. Award for Outstanding Teaching (PRGS), 2020
Fellow, National Association of Inventors, 2017
RAND Spotlight-Innovation Award, 2016
Ming Hsieh Institute Scholarship, 2012
National GEM Fellowship, 2009
Annenberg Fellowship, 2007
USC All-University Pre-doctoral Fellowship, 2005

SELECTED TALKS:

"AI in Governance: Pitfalls and Promises," RAND 2020 Talks. July-2020.
"Data Privacy-Preservation Mechanisms: Current Theory & Limitations," National Cancer Policy Forum on Applying Big Data to Address Social Determinants of Health in Oncology. October-2019.
"Ethical Problems around Group Action in the Context of National Security," CMU-SOCOM Panel on Ethics, the Law of War, and National Security Policy. May-2019.
"AI and the Equitable Society," CMU K&L Gates Conference on Ethics and AI (Spotlight Talk), Apr-2018.
"Algorithmic Systems: Policy and Ethical Considerations," Deep Learning Indaba, Stellenbosch, South Africa (Session Talk), Sept-2018.
"The Collision of AI and Privacy," RAND Policy Circle Panel, Feb-2018.
"Making AI Fair," TEDxManhattanBeach, Nov-2017.
"Dengue Forecasting with Time-Delayed Neural Networks," White House - Office of Science and Technology Policy (OSTP), Sep-2015.