

## **CURRENT AFFILIATIONS:**

Information Scientist (Full), RAND Corporation  
Core Professor, Frederick S. Pardee RAND Graduate School  
Adjunct Professor & Post-Doctoral Researcher, University of Southern California

## **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  
MS, Electrical Engineering, University of Southern California (2007)  
BS, Electrical & Computer Engineering, University of Rochester (2005)  
Honors: With High Distinction                      *Minor:* Mathematics

**RESEARCH DOMAINS:** Artificial Intelligence/Machine Learning, AI Policy, Algorithmic Decision-making, Statistical Signal Processing, Data Privacy

**PROGRAMMING:** Python, R, Mathematica, MATLAB

**TOOLS:** LaTeX, Git, Cloud services, Tableau

## **AWARDS:**

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

## **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)

## **SELECTED TALKS:**

"Making AI Fair," TEDxManhattanBeach, Nov-2017.  
"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.

- "The Future of Artificial Intelligence," RAND Policy Circle Panel, Dec-2016.
- "Dengue Forecasting with Time-Delayed Neural Networks," White House - Office of Science and Technology Policy (OSTP), Sep-2015.
- "Addressing Population Mismatch in Social Media Data," RAND Center for Causal Inference Brownbag Seminar, Nov-2016.
- "Noise-benefits in Backpropagation Training," Institute for Neural Computation, University of California San Diego, Jun-2014
- "Bayesian Inference with Adaptive Fuzzy Priors and Likelihoods," Probability and Statistics Seminar, Department of Mathematics, University of Southern California, Sep-2011

## **TECHNICAL PUBLICATIONS: JOURNAL PAPERS**

- Davis, J. S., and O. Osoba. "Improving Privacy Preservation Policy in the Modern Information Age." *Health and Technology*, pp. 1-11, 2018
- O. Osoba, B. Kosko. "Noisy Expectation-Maximization: Applications and Generalizations." *arXiv preprint arXiv:1801.04053* (2018).
- 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, B. Kosko, "The Noisy Expectation-Maximization Algorithm for Multiplicative Noise Injection," *Fluctuation and Noise Letters*, Mar. 2016
- K. Audhkhasi, O. Osoba, and B. Kosko, "Noise-Enhanced Convolutional Neural Networks," *Neural Networks*, vol.78, no.0, pp.15-23, Jan. 2016
- O. Osoba, S. Mitaim, B. Kosko, "The Noisy Expectation Maximization Algorithm," *Fluctuation and Noise Letters*, vol.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, "Triply Fuzzy Function Approximation for Hierarchical Bayesian Inference," *Fuzzy Optimization and Decision Making*, vol.11, no.3, pp.241-268, Sept. 2012
- 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
- B. Kosko, K. Audhkhasi, O. Osoba, "Noise Benefits in Backpropagation and Deep Bidirectional Pretraining," *[in preparation]*

## **TECHNICAL PUBLICATIONS: CONFERENCE PAPERS**

- K. Audhkhasi, O. Osoba, and B. Kosko, "Noise Benefits in Convolutional Neural Networks," *Proceedings of the 2014 International Conference on Advances in Big Data Analytics (ABDA-2014)*, 2014
- K. Audhkhasi, O. Osoba, and B. Kosko, "Noise Benefits in Backpropagation and Deep Bidirectional Pre-Training," *International Joint Conference on Neural Networks (IJCNN)*, pp.2254-2261, Aug. 2013
- K. Audhkhasi, O. Osoba, and B. Kosko, "Hidden Markov Models for Speech Recognition," *International Joint Conference on Neural Networks (IJCNN)*, pp.2738-2743, Aug. 2013
- O. Osoba, S. Mitaim, B. Kosko, "Noise Benefits in the Expectation-Maximization Algorithm: NEM Theorems and Models," *International Joint Conference on Neural Networks (IJCNN)*, pp.3178-3183, Aug. 2011
- O. Osoba, S. Mitaim, B. Kosko, "Triply Fuzzy Function Approximation for Bayesian Inference," *International Joint Conference on Neural Networks (IJCNN)*, pp.3105-3111, Aug. 2011
- O. Osoba, S. Mitaim, B. Kosko, "Adaptive fuzzy priors for Bayesian inference," *International Joint Conference on Neural Networks (IJCNN)*, pp.2380-2387, Jul. 2009

## **BOOK CHAPTERS:**

- Osoba, O. A., "Technocultural Pluralism: A 'Clash of Civilizations' in Technology?" In *Artificial Intelligence in Strategic Context*, Ed. Edward Parson, Ed. Richard Re, Alicia Solow-Niederman, Ed. Elana Zeide. UCLA AI PULSE 2019.  
<https://aipulse.org/technocultural-pluralism/>
- Osoba, O. A. and Kosko, B., "Causal Modeling with Feedback Using Fuzzy Cognitive Maps." In *Social and Behavioral Systems Modeling*, Ed. Paul K. Davis, Ed. Angela O'Mahony [to Appear]
- Osoba, O. A. and Davis, P. K., "An Artificial Intelligence/Machine Learning Perspective on Social Simulation: New Data and New Challenges." In *Social and Behavioral Systems Modeling*, Ed. Paul K. Davis, Ed. Angela O'Mahony [to Appear] [https://www.rand.org/pubs/working\\_papers/WR1213.html](https://www.rand.org/pubs/working_papers/WR1213.html)
- Welser, W., Balebako, R., Colquhoun, C., Osoba, O. A., "The Latency Potential of Privacy Technologies: How Our Future Will Be Shaped by Today's Privacy." In *Strategic Latency: Red, White, and Blue: Managing the National and International Security Consequences of Disruptive Technologies*, Ed. Zachary

S. Davis, Ed. Michael Nacht. Livermore, CA: Lawrence Livermore National Laboratory, 2018

## **POLICY PUBLICATIONS:**

Davis, Paul K., Angela O'Mahony, Timothy R. Gulden, Osonde A. Osoba, and Katharine Sieck, Priority Challenges for Social and Behavioral Research and Its Modeling. Santa Monica, CA: RAND Corporation, 2018.

[https://www.rand.org/pubs/research\\_reports/RR2208.html](https://www.rand.org/pubs/research_reports/RR2208.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](https://www.rand.org/pubs/research_reports/RR1744.html).

Welser, William IV, Dave Baiocchi, Osonde A. Osoba, and Christina Steiner, Assessing the Need for Supercomputing Resources Within the Pacific Area of Responsibility. Santa Monica, CA: RAND Corporation, 2017.

[https://www.rand.org/pubs/research\\_reports/RR1427.html](https://www.rand.org/pubs/research_reports/RR1427.html).

O'Mahony, Angela, Thomas S. Szayna, Christopher G. Pernin, Laurinda L. Rohn, Derek Eaton, Elizabeth Bodine-Baron, Joshua Mendelsohn, Osonde A. Osoba, Sherry Oehler, Katharina Ley Best, and Leila Bighash, The Global Landpower Network: Recommendations for Strengthening Army Engagement. Santa Monica, CA: RAND Corporation, 2017.

[https://www.rand.org/pubs/research\\_reports/RR1813.html](https://www.rand.org/pubs/research_reports/RR1813.html).

Pernin, C.G., O'Mahony, A., Szayna, T.S., Eaton, D., Best, K.L., Bodine-Baron, E., Mendelsohn, J. and Osoba, O. A., 2017. "What is the global landpower network and what value might it provide?." *Defense & Security Analysis*, 33(3), pp.209-222.

Manheim, D., Chamberlin, M., Osoba, O. A., Vardavas, R., Moore, M., "Improving Decision Support for Infectious Disease Prevention and Control: Aligning Models and Other Tools with Policymakers' Needs." Santa Monica, CA: RAND Corporation, 2016. [http://www.rand.org/pubs/research\\_reports/RR1576.html](http://www.rand.org/pubs/research_reports/RR1576.html).

## **COMMENTARIES:**

Osoba, O. A, "Keeping Artificial Intelligence Accountable to Humans." Santa Monica, CA: RAND Corporation, 2018.

<https://www.rand.org/blog/2018/08/keeping-artificial-intelligence-accountable-to-humans.html>. (published in TechCrunch: <https://techcrunch.com/2018/08/20/keeping-artificial-intelligence-accountable-to-humans/> ).

Osoba, O. A., Davis, J. S., (co-first authors), "Rethinking Data Privacy." Santa Monica, CA: RAND Corporation, 2016.  
<http://www.rand.org/blog/2016/10/rethinking-data-privacy.html>.

## **SERVICE ACTIVITIES & PROFESSIONAL AFFILIATIONS**

Leader: Tech & Narrative Lab – AI/ML Track, Pardee RAND Graduate School (TNL-PRGS)

Member: 2019 Admissions Committee, Pardee RAND Graduate School (PRGS)  
Dissertation Committee Member (PRGS)

Program Committee: ACM Conference on Fair, Accountable, and Transparent Machine Learning (ACM-FAT\*)

Advisory Group: RAND Center for Causal Inference (CCI)

Member: Institute of Electrical and Electronics Engineers (IEEE)

Reviewer: International Joint Conference on Neural Networks (IJCNN)

## **RESEARCH EXPERIENCE:**

### **The RAND Corporation**

*Researcher*

*Summer Research Intern*

**Santa Monica, CA**

*July 2014 - Present*

*Summer 2012*

Policy-oriented research and analysis on technical topics. 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.
- "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 dengue outbreaks": machine learning modeling to forecast Dengue epidemic trends for the CDC. Task lead for the modeling effort. Contributed to initial concept development and proposal.
- "rand-match": designed, implemented, and tested a recommendation system solution for matching researchers to mentors in an internal labor market.
- "Social Media Data Analysis for Policy": study on best practices and common pitfalls in the statistical analysis of social media data. Explored common population problems in SM analysis. Extended the work by identifying methods to address proxy population mismatches

#### - **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.
- “Risks of AI to Security and the Future of Work”: Explored the implications of algorithmic decision-making (and AI/ML more broadly) for policy-sensitive domains like security, labor markets, and insurance.
- 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.
- **Defense policy:**
  - Summer associate research: Analysis of PortMan, a proprietary portfolio management algorithm for optimally allocating funds over R&D project portfolios. Performed analysis and stress-testing.

**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.

**Intel Corporation**

**Hillsboro, OR**

*Graduate Technical Intern*

*Summer 2009*

- Analyzed power delivery networks in x86 microprocessors to identify high-power-consumption instruction sequences. Developed an identification method based on wavelet decomposition and PCA/SVD analysis.

**TEACHING EXPERIENCE:**

**Frederick S. Pardee RAND Graduate School**

**Santa Monica, CA**

*Core Professor*

*2015 - Present*

- “Machine Learning for Public Policy” Course: Developed/taught course on machine learning applied to policy questions. Advised students on projects, dissertation directions, and job opportunities related to data science and machine learning.
- “Empirical Analysis I” Course: Taught core introductory course on Probability theory and Statistics methods.
- “Effective and Equitable Policing” Course: Co-designed and co-taught new studio-format course exploring policy questions around the topic of fair and effective policing. Part of the *PRGS Redesign* effort.

**Viterbi School of Engineering (USC)**

**Los Angeles, CA**

*Adjunct Faculty*

*2013 - Present*

- Probability and Simulation Methods: Developed and taught courses on probabilistic simulation methods covering random number generation, resampling methods, Monte Carlo techniques, & Markov chains Monte Carlo methods (e.g. Metropolis, Simulated Annealing).

- Stochastic Processes: Developed and taught course on stochastic processes covering Markov random processes, Poisson processes, Brownian Motion, and Stochastic Differential Equations. Included emphasis on simulation methods for random processes.

**FUNDING GRANTS:**

RAND Sponsored Research: "Multi-agent AI for Agent-Based Modeling"

RAND Sponsored Research: "Assessing Algorithmic Equity"

RAND Institute for Civil Justice: "Fairness in Algorithmic Insurance Pricing" co-PI with Michael Dworsky

RAND Center for Global Risk and Security: "Bias Risks in Artificial Intelligence" co-led with William Welser IV

RAND Center for Causal Inference Seed Grant: "Methods for matching social media data with survey data"