# JARED SYLVESTER, PH.D.

# Curriculum Vitæ

May 2006

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# Summary

I am a Computer Scientist and Data Scientist with a background in Neural Networks, Machine Learning and Computational Modeling. I have been programming since the age of 11, and researching since 19. I have applied my skills to fields including cybersecurity, computer vision, AI ethics, biometrics, circuit design, cognitive psychology, social networks, and marketing. I received my doctorate in 2014 for work in biologically-inspired AI. For the last five years I worked as a Data Scientist and Machine Learning researcher at Booz Allen Hamilton, mostly doing research in Deep Learning with application to cybersecurity. More recently I have moved to Amazon to help them establish a Data Science team to support AWS Security. Donald Knuth defined science as 'everything you can explain to a computer.' This is a moving target, and I am interested in the application of algorithmic techniques to those fields where we can't (*yet*) explain things fully to a computer.

# EDUCATION

### • University of Maryland

 Ph.D. in Computer Science
 September 2014

 Dissertation: "Neurocomputational Methods for Autonomous Cognitive Control"
 Committee chair: James Reggia

 M.S. in Computer Science
 May 2010

### • University of Notre Dame

B.S. in Computer Science, Magna cum Laude

## EXPERIENCE

#### • Amazon Web Services

 Data Scientist, AWS Security
 August 2019 – Present

 I build very large scale data analytic tools to enhance the security of AWS and its customers. These tools are deployed and active 24/7, operating up to the petabyte scale to defend some of AWS' most used services by extracting actionable patterns to support both automatic mitigations and hands-on investigations.

• University of Maryland, Baltimore County

Adjunct Professor, Master of Professional Studies in Data Science January 2019 – December 2019 I taught the introductory course to professionals seeking certificates and masters degrees in Data Science. I was responsible for weekly lectures, preparation of presentations & demos, course assignments and grading. The course covered elementary Python, data gathering & cleaning, exploratory data analysis, relevant mathematics, machine learning and visualization.

• Booz Allen Hamilton	
Senior Lead Data Scientist / Lead Associate	January 2019 – August 2019
Lead Data Scientist / Associate	January 2017 – December 2018
Staff Data Scientist / Senior Consultant	October 2014 – December 2016

As a member of the Strategic Innovation Group, I primarily worked to support a contract with the Laboratory for Physical Sciences, a defense research organization. My work focused on Machine Learning research, especially in the domain of computer security. I developed software for feature extraction in cluster environments, and lead a project to evaluate deep learning techniques for our client. I focused on deep neural architectures for application to non-natural languages and cyberdefense, as well as research in neuromorphic computing. I also worked on internal investment projects developing machine learning techniques to mitigate algorithmic bias. Additionally, I assisted my team administratively by acting as our liaison for recruiting.

#### • UMD Smith School of Business, Center for Complexity in Business

 Doctoral Research Assistant
 August 2012 – September 2014

 Studied the role of social networks on conversions to paid memberships in a freemium MMO game environment using large, dynamic, real-world network datasets. Developed software for large-scale data collection, analysis and visualization to study propagation of information and influence in Twitter and other social networks.

 (Research advisor: Dr. William Rand)

#### • Center for Advanced Study of Language

 Doctoral Research Assistant
 August 2008 – July 2012

 Developed neurocomputational models of short-term working memory and executive function. Also investigated Machine Learning models to predict which subjects will benefit from working memory and language training regimes.
 (Research advisor: Dr. James Reggia)

#### • UMD Department of Computer Science

 Graduate Research Assistant
 January 2007 – July 2012

 Investigated topographic map formation in the sensory cortex through the use of Self-Organizing Map

 neural networks resulting in an article published in a top-3 Al journal, Neural Networks.

 Teaching Assistant
 August – December 2006

 Taught twice weekly tutorials for two sections of CMSC 131 (Object Oriented Programming), and conducted lab and office hours in support of the same.

#### • ND Department of Computer Science & Engineering

Teaching Assistant

Lead lab sessions and graded student work for "Advanced Programming in C/C++." *Summer Researcher, NSF Research Experience for Undergraduates* Research in Machine Learning and Data Mining, particularly focused on the application of Genetic Algorithms for heterogeneous ensemble formation, and the role of diversity in combining predictions. (Research advisor: Dr. Nitesh Chawla.)

 Research Assistant, Quantum-dot Cellular Automata Group
 August 2004 – May 2005

 Designed and coded a logic-minimization tool to optimize the design of QCA-based processors, a quantum-molecular alternative to CMOS integrated circuits.
 August 2004 – May 2005

August – December 2005

#### PUBLICATIONS

(Papers are available for download at www.jsylvest.com/home.html#pubs)

#### Journal Papers

- J.SYLVESTER and E. Raff. "Trimming the thorns of AI Fairness research." *IEEE Data Engineering*, vol. 43(4), pp. 76–90. 2020. (Invited.)
- E. Raff, R. Zak, J. SYLVESTER, R. Cox, P. Yacci and M. McLean. "An investigation of byte *n*-gram features for malware classification." *Journal of Computer Virology*, vol. 14(1), pp. 1–20. 2018.
- J.SYLVESTER and J.Reggia. "Engineering Neural Systems for High-Level Problem Solving." Neural Networks, vol. 79, pp. 37–52. 2016.
- J. Reggia, D. Monner and J. SYLVESTER. "The Computational Explanatory Gap." Journal of Consciousness Studies, vol. 21(9–10), pp. 153–178. 2014.
- D. Darmon, J. SYLVESTER, M. Girvan and W. Rand. "Understanding the Predictive Power of Computational Mechanics and Echo State Networks in Social Media." ASE Human Journal, vol. 2(2), pp. 13–24. 2013.
- J. SYLVESTER, J. Reggia, S. Weems and M. Bunting. "Controlling Working Memory with Learned Instructions." *Neural Networks*, vol. 41, Issue on Autonomous Learning, pp. 23–38. 2013.
- J. SYLVESTER and J. Reggia. "Plasticity-induced symmetry relationships between adjacent self-organizing topographic maps." *Neural Computation*, vol. 21(12), pp. 3429–3443. 2009.

#### **Conference Proceedings**

- E. Raff, J. SYLVESTER, S. Forsyth and M. McLean. "Barrage of Random Transforms for Adversarially Robust Defense." Conference on Computer Vision and Pattern Recognition (CVPR). 6–20 June, 2019.
- W. Fleshamn, E. Raff, J. SYLVESTER, S. Forsyth and M. McLean. "Non-Negative Networks Against Adversarial Attacks." AAAI Workshop on Artificial Intelligence for Cyber Security (AICS). 27 January, 2019.
- E. Raff and J. SYLVESTER. "Linear models with many cores and CPUs: A stochastic atomic update scheme." IEEE Conference on Big Data. 10–13 December, 2018.
- E. Raff, J. SYLVESTER and C. Nicholas. "Engineering a Simplified 0-Bit Consistent Weighted Sampling." Conference on Information and Knowledge Management (CIKM). 22–26 October, 2018.
- E. Raff and J. SYLVESTER. "Gradient Reversal Against Discrimination: A Fair Neural Network Learning Approach." IEEE Conference on Data Science and Advanced Analytics (DSAA). 1–4 October, 2018.
- E. Raff and J. SYLVESTER. "Gradient Reversal Against Discrimination." Fairness, Accountability & Transparency in Machine Learning (FAT/ML). 15 July, 2018.
- J.SYLVESTER and E.Raff. "What about applied fairness?" ICML: The Debates. 15 July, 2018.
- E.Raff, J.SYLVESTER and S.Mills. "Fair Forests: Regularized Tree Induction to Minimize Model Bias." AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES). February, 2018.
- E. Raff, J. Barker, J. SYLVESTER, R. Brandon, B. Catanzaro and C. Nicholas. "Malware detection by eating a whole EXE." AAAI Workshop on Artificial Intelligence for Cyber Security (AICS). February, 2018.

- E. Raff, J. SYLVESTER and C. Nicholas. "Learning the PE header: Malware detection with minimal domain knowledge." ACM Workshop on Artificial Intelligence and Security (AISec), pp. 121–132. October, 2017.
- W.Rand, D.Darmon, J.SYLVESTER and M.Girvan. "Will my followers tweet? Predicting Twitter engagement using machine learning." Proc. of the European Marketing Academy Conference. June, 2014.
- J. SYLVESTER, J. Healy, C. Wang and W. Rand. "Space, time, and hurricanes: Investigating the spatiotemporal relationship among social media use, donations, and disasters." Proc. ASE Int'l Conf. on Social Computing. May, 2014.
- J. SYLVESTER and W. Rand. "Keeping up with the (pre-teen) Joneses: The effect of friendship on freemium conversion." Proc. Winter Conf. on Business Intelligence. February, 2014.
- D. Darmon, J. SYLVESTER, M. Girvan and W. Rand. "Predictability of user behavior in social media: Bottomup v. top-down modeling." Proc. ASE/IEEE Int'l Conf. on Social Computing, pp. 102–107. 2013.
- J.SYLVESTER and J.Reggia. "The Neural Executive: Can gated attractor networks account for cognitive control?" Proc. Ann. Mtg. of the Int'l Assoc. for Computing & Philosophy. 2013.
- J. Reggia, D. Monner and J. SYLVESTER. "The computational explanatory gap." Proc. Ann. Mtg. of the Int'l Assoc. for Computing & Philosophy. 2013.
- J.SYLVESTER, J. Reggia and S. Weems. "Cognitive control as a gated cortical net." Proc. of the Int'l Conf. on Biologically Inspired Cognitive Architectures, pp. 371–376. 2011.
- J. SYLVESTER, J. Reggia, S. Weems and M. Bunting. "A temporally asymmetric Hebbian network for sequential working memory." Proc. of the Int'l Conf. on Cognitive Modeling, pp. 241–246. 2010.
- J. SYLVESTER, S. Weems, J. Reggia, M. Bunting and I. Harbison. "Modeling interactions between interference and decay during the serial recall of temporal sequences." Proc. of the Psychonomic Society Annual Meeting. 2009.
- J. Reggia, J. SYLVESTER, S. Weems and M. Bunting. "A simple oscillatory short-term memory." Proc. of the AAAI Biologically-Inspired Cognitive Architecture Symposium, pp. 103–108. 2009.
- N. Chawla and J. SYLVESTER. "Exploiting diversity in ensembles: Improving the performance on unbalanced datasets." Proc. Int'l Conf. on Multiple Classifier Systems, pp. 397–406. 2007.
- J. SYLVESTER and N. Chawla. "Evolutionary ensemble creation and thinning." Proc. of the IEEE Int'l Joint Conf. on Neural Networks, pp. 5148–5155. 2006.
- J.SYLVESTER and N.Chawla. "Evolutionary ensembles: Combining learning agents using genetic algorithms." Proc. of the AAAI Workshop on Multi-Agent Systems, pp. 46–51. 2005.

#### Talks

- J.SYLVESTER and W.Fleshman. "Resisting adversarial attacks on machine learning malware detectors." GPU Technology Conference DC. 22–24 October, 2018.
- J. SYLVESTER, E. Raff and R. Brandon. "Malware Detection by Eating a Whole EXE." GPU Technology Conference DC. October, 2017.

- E.Raff and J.SYLVESTER. "Fighting Malware with Machine Learning." GPU Technology Conference DC. October, 2016.
- J.SYLVESTER. "Predictability of User Behavior in Social Media: Bottom-Up v. Top-Down Modeling." AAAI Fall Symposium on Social Networks and Social Contagion. November 2013. (Invited.)
- J.SYLVESTER and D.Darmon. "Predictability of User Behavior in Social Media." Complexity in Business Conference. November 2013.

# GRADUATE COURSE WORK

Neural Computation Machine Learning Statistical Pattern Recognition Cognitive Science & Artificial Intelligence Geographic & Spatial Information Systems Computational Geometry Advanced Computer Graphics Complex Systems in Business: Agent-Based Modeling & Social Network Analysis Nature-Inspired Artificial Intelligence Algorithmic Game Theory (audited)

## **PROGRAMMING & TECHNICAL SKILLS**

Spark	Python	Shell scripting
Matlab	C/C++	Perl
Ruby	Maya & MEL	SQL, Presto
Processing	Keras, Tensorflow & PyTorch	LaTeX

Certified Instructor, NVIDIA Deep Learning Institute

# Academic Interests

# Personal Interests

Machine Learning & Artificial Intelligence Neural Networks Complex systems modeling & simulation Multi-agent systems Graphics & data visualization Digital & algorithmic art, abstract animation Woodworking, calligraphy & print-making Baking bread