

Cosmo Harrigan

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Education

- **University of Washington** **Seattle, WA**
Bachelor of Science (Honors) 2002 – 2004, 2014 – 2016
Applied Computational Mathematical Sciences: Discrete Math & Algorithms
 - Graduated with Departmental Honors
 - Honors Thesis: Deep Reinforcement Learning with Direct Policy Search and Regularized Convolutional Neural Fitted Q Iteration (Supervisor: Dr. Dieter Fox, co-author of Probabilistic Robotics)
<http://machineintelligence.org/papers/deep-reinforcement-learning.pdf>
 - Returned to university to restart my research career after ten years building my own companies, combining my entrepreneurial background with a research focus on reinforcement learning and algorithmic information theory
 - Developed a novel batch algorithm incorporating regularization for deep reinforcement learning
 - Applied neuroevolution as a direct policy search deep reinforcement learning method
 - Co-founder of Machines Who Learn, the first machine learning student organization at UW
 - **Artificial General Intelligence Society** **Beijing, China**
Artificial General Intelligence Summer School 2013
 - **Singularity University** **NASA Research Park, CA**
Graduate Studies Program 2012
 - Selected for a class of 80 admitted students out of over 3000 applicants
 - Participated in an intensive three-month curriculum on the potential applications and societal impacts of artificial intelligence and other technologies through a combination of research and product development
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Publications

- Harrigan, Cosmo. Deep Reinforcement Learning with Direct Policy Search and Regularized Convolutional Neural Fitted Q Iteration. Honors B.S. Thesis, University of Washington, 2016.
<http://machineintelligence.org/papers/deep-reinforcement-learning.pdf>
 - Harrigan, Cosmo. Deep Learning for Artificial General Intelligence: Survey of Recent Developments. Invited Talk, International Conference on Artificial General Intelligence, 2016.
<http://machineintelligence.org/deep-learning-for-agi.pdf>
 - Harrigan, Cosmo, et al. Guiding Probabilistic Logical Inference with Nonlinear Dynamical Attention Allocation. Artificial General Intelligence. Springer International Publishing, 2014. 238-241.
http://link.springer.com/chapter/10.1007/978-3-319-09274-4_24
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Projects

- Neuroevolution as a direct policy search deep reinforcement learning method, implemented using Keras and DEAP. <https://github.com/cosmoharrigan/neuroevolution>
- Regularized Convolutional Neural Fitted Q Iteration algorithm (RC-NFQ). A batch algorithm for deep reinforcement learning. Incorporates dropout regularization and convolutional neural networks with a separate target Q network.
<http://machineintelligence.org/papers/rc-nfq.pdf>
<https://github.com/cosmoharrigan/rc-nfq>
- Google Summer of Code. Mentor for Sebastian Ruder's project on natural language processing, applying probabilistic inference and relation extraction in a cognitive architecture.
<https://github.com/opencog>

- Minecraft Machine Learning Dataset. <https://github.com/cosmoharrigan/minecraft-dataset-generation>
 - Online learning and adaptive clustering: I assisted with the preliminary research led by Itamar Arel that later led to the launch of Apprente, a venture-backed startup building intelligent systems based on neuroscience-inspired AI technology. <https://www.apprente.com/>
 - Approximating Solomonoff induction by sampling the space of BF programs weighted by a complexity prior to induce an unknown environment model to maximize expected long term reward of an agent.
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Core Technical Skills

Tools: Python, C#, Keras, TensorFlow, Jupyter Notebook, Pandas, NumPy, SciPy, C++, Java, \LaTeX , AWS, Azure
Subject Areas: Reinforcement learning, algorithmic information theory, deep learning, statistical learning

Experience

- **ChannelAgility** **Seattle, WA**
Founder, Chief Software Architect 2010 – 2018
 - Founder and chief software architect of a proprietary demand forecasting and price optimization software solution used by e-commerce retailers to improve profitability and in-stock performance on Amazon.com
 - Managed the new feature pipeline and supervised software engineers
 - Delivered multiple invited talks at the Amazon headquarters, providing their product managers and executive management with feature recommendations to integrate into their product roadmap
 - **Streamline Distributing** **Seattle, WA**
Owner 2006 – Present
 - Founded and bootstrapped an e-commerce distribution company to millions in annual revenue
 - Provided financial oversight of multimillion dollar budgets, including cash flow projections and profit and loss management for five separate departments with hundreds of daily transactions
 - Recruited operations, software development and logistics teams for offices distributed across 3 countries
 - Chosen by Amazon in 2011 as their exclusive partner for their first Kaizen process improvement event for sellers, and featured on the Fulfillment by Amazon home page in 2013 in their first series of video interviews with successful CEOs of high volume partner companies
 - **Center for Media and Democracy** **Madison, WI**
Board Member 2012 – Present
 - Responsible for strategic decision making and planning in collaboration with the Executive Director
 - **Harvard University** **Boston, MA**
Visiting Researcher 2015
 - Invited to Harvard's Program for Evolutionary Dynamics to spend a summer researching neural network architectures for learning to control an agent from high-dimensional 3D perception data
 - Designed new Minecraft perception datasets for use as a reusable benchmark for learning algorithms
 - Experimented with new neural network architectures for supervised and unsupervised learning in collaboration with cognitive scientist Dr. Joscha Bach
 - Contributed to weekly discussion groups at Marvin Minsky's home
 - **Google Summer of Code** **Seattle, WA**
Mentor 2014
 - Mentor for Google Summer of Code project on natural language processing, applying probabilistic inference and relation extraction in a cognitive architecture. My student Sebastian Ruder was later awarded internships in natural language processing at Microsoft and IBM and is now an NLP PhD student.
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