Alexander Lavin

alexdlavin@gmail.com
lavin.io
@theAlexLavin

RESEARCH INTEREST

My research interests lie in the realm of probabilistic machine learning and artificial intelligence (Ghahramani '15). I am specifically passionate about the emerging paradigm of **probabilistic programming**—expressing probabilistic models as computer programs—as well as the theory and applications of **Gaussian processes and Bayesian optimization** (as powerful methods of reasoning with uncertainties). I have strong interest in applying these methods towards personalized and predictive medicine applications. Additionally, I have background and continued interest in using neuro- and cognitive sciences as inspiration for AI, specifically developing probabilistic graphical models with influence from the neocortex.

EXPERIENCE

Vicarious AI
Senior Research Engineer | 10/16 – 10/18
- Project lead for developing robotic motion planning and trajectory optimization algorithms based on Gaussian processes
- Probabilistic graphical models (PGM) for robotic vision, with inspiration from primate visual cortex
- Lead software architect for mono-repo of Python, C++, and ROS code

Numenta
Senior Software & Research Engineer | 10/14 – 10/16
- Prototyped algorithms from neocortical theory, developed into natural language processing (NLP) and time-series analysis products
- A leader of the open-source community, and main developer of the Numenta Anomaly Benchmark

NASA Ames
Research Associate | Summer 2013
- Designed a re-entry system for on-demand return of scientific payloads from the International Space Station

Northwestern University
Visiting Researcher | 6/12 – 12/12
- Provided energy company with a new approach (k-NN clustering) to better classify customers based on true energy usage patterns and investigate energy efficiency traits

Technion Institute of Technology
Rocket Propulsion Intern | 6/12 – 12/12

EDUCATION

Carnegie Mellon University
MS Mechanical Engineering | 2013 – 2014
- Focus in spacecraft robotics
- Research advisors: Kenji Shimada, Red Whittaker
- Google Lunar XPrize team lead, awarded 3/3 milestone prizes for $1.75M

Cornell University
BS Mechanical Engineering | 2008 – 2012
- Focus in aerospace engineering
- Research advisor: Mason Peck
- Dean's List honoree (multiple times)
- Sibley Engineering Fellow (awarded twice)

PUBLICATIONS

George, D., Lehrach, W., Kansky, K., Lazaro-Gredilla, M., Laan, C., Marthi, B., Lou, X., Meng, Z., Liu, Y., Wang, H., Lavin, A., Phoenix, D. S. A generative vision model that trains with high data-efficiency and breaks text-based CAPTCHAs. *Science*, 2017.

Lavin. Doubly Bayesian Optimization. *arXiv preprint*, 2018.

Lavin & Mansinghka. Probabilistic programming for data-efficient robotics. *Int'l Conference on Probabilistic Programming (ProbProg)*, 2018.

George, Lavin, Guntupalli, Mely, Hay, Lazaro-Gredilla. Cortical Microcircuits from a Generative Vision Model. *Conference on Cognitive Computational Neuroscience (CCN)*, 2018.

Lavin, Guntupalli, Lazaro-Gredilla, Lehrach, George. Explaining Visual Cortex Phenomena using Recursive Cortical Network. *Conference on Cognitive Computational Neuroscience (CCN)*, 2018.

Ahmad, Lavin, Purdy, Agha. Unsupervised real-time anomaly detection for streaming data. *Neurocomputing*, 2017.

Hawkins, Ahmad, Purdy, Lavin. Biological and Machine Intelligence. online textbook, 2016.

Lavin & Ahmad. Evaluating Real-time Anomaly Detection Algorithms - the Numenta Anomaly Benchmark. *Int'l Conference Machine Learning Applications (ICMLA)*, 2015.

Lavin. A Pareto Optimal D* Search Algorithm for Multiobjective Path Planning. *arXiv preprint*, 2015.

Lavin. A Pareto Front-Based Multiobjective Path Planning Algorithm. *Int'l Conference on Intelligent Robots and Systems (IROS)*, 2014.

Lavin & Klabjan. Clustering Time-Series Energy Data from Smart Meters. *Energy Efficiency*, 2015.

Technical reports

Lavin, Greco, Shimada (2016). Finite Element-Based Structural Optimization of Large System Models Under Buckling Constraints.

Lavin (2012). Structures Design for Flux-Pinned CubeSat-scale Spacecraft Array.

Lopez, Lavin, Carreira, Gany (2013). Rocket Performance Characteristics Using Hybrid Propulsion Systems of Plexiglas and Paraffin with Nitrous Oxide.