

# Aravind Rajeswaran

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## Research Interests

Mathematical foundation and applications of machine learning and optimization. In particular:

- Deep Reinforcement Learning and stochastic optimization for robotics
- Multi-task and transfer learning in RL and more broadly in ML
- Stochastic optimization for neural networks

## Education

### University of Washington, Seattle

*Sep 2016 - present*

PhD in Machine Learning

- **Co-advised** by Profs. [Sham Kakade](#) and [Emo Todorov](#)
- **Coursework** : Machine Learning, Statistical methods in CS, Neural control of movement

### Indian Institute of Technology, Madras

*Aug 2011 - July 2015*

BTech (Hons) with focus on optimization, signals, & systems

- **Thesis** : Topological search over networks (*best undergraduate thesis award*)
- **Key Courses** : Machine Learning, Reinforcement Learning, Convex Optimization, Multivariate Data Analysis, Time Series Analysis, Optimal Control, Design of Algorithms, Complex Networks.
- **Advisers** : Profs. Balaraman Ravindran and Shankar Narasimhan

## Academic awards and Honors

- PhD fellowship from University of Washington *2016*
- PhD fellowships from UC Berkeley and Caltech among others (*declined*) *2016*
- Bhagyalakshmi and Krishna Ayengar award for best undergraduate thesis. *2015*
- Summer student fellowship award from the CS and Statistical Physics groups of IMSc, India. *2014*

## Research Experience

- **Computer Science Dept, UWashington** - Graduate Research Assistant  
Mentors : Profs. [Sham Kakade](#) and [Emo Todorov](#) *Aug 2016 - present*  
Development of faster and more robust stochastic optimization algorithms for policy search. Our focus is on continuous control tasks like dexterous robotic manipulation. I'm also working towards reconciling policy search with trajectory optimization in order to fully utilize the potential of model-based methods.
- **Computer Science Dept, UWashington** - Remote Summer Researcher  
Mentor : Prof. [Sergey Levine](#) *May 2016 - Aug 2016*  
Developed an Ensemble Policy Optimization (EPOpt) approach for training expressive neural network policies that can transfer from simulated source tasks to real-world target tasks. EPOpt combines a form of adversarial training and Bayesian model adaptation to find robust policies on a collection of simulated tasks that can generalize to several target tasks.
- **Computer Science Dept, IIT Madras** - Research Assistant  
Mentor: Prof. [Balaraman Ravindran](#) *Oct 2015 - June 2016*  
Studied the problem of safe reinforcement learning (S-RL), where guarantees about stability, robustness, and safety are required during exploration. On the practical side, we developed systems and algorithms to empirically showed safety. We also developed S-RL algorithms in the KWIK paradigm which *guarantee* safety, but don't scale very well.

- **Interdisciplinary Laboratory for Data Sciences, IIT Madras**

Mentor(s) : Profs. [Shankar Narasimhan](#) and [Sridharakumar Narasimhan](#) *Jan 2014 - July 2015*

Worked on theory and applications of optimization for **infrastructure system developments**. Used network structure analysis, integer programming, data mining, and optimal control: to model and operate complex networks like water, transportation, and power (smart) grids.

- **The Institute of Mathematical Sciences - Summer Intern**

Mentor : [Prof. Sitabhra Sinha](#) *May 2014 - Jan 2015*

Using Monte Carlo simulations, we proved that the random walk betweenness centrality (RWBC) is a statistically robust indicator of a unit's role in propagating a cascade, in complex networks with conserved flows (eg power grids).

## Computer Skills

- **Programming Languages:** Python, C++, Julia
- **Software & Applications:** Matlab, R, Mathematica
- **Libraries:** Theano, TensorFlow, Caffe, Keras
- **Modelling Tools:** CVX, Yalmip, Tomlab, GAMS
- **Operating Systems:** Comfortable with Ubuntu and Windows platforms.

## References

- [Dr. Sham Kakade](#), Associate Professor (CSE & Statistics), UW Seattle.
- [Dr. Emo Todorov](#), Associate Professor (CSE & Applied Math), UW Seattle.
- [Dr. Sergey Levine](#), Assistant Professor (EECS), UC Berkeley.
- [Dr. Balaraman Ravindran](#), Associate Professor (CSE), IIT Madras.