

# Curriculum Vitae

Nathan Ratliff

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Robotics Institute  
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## **Education:**

Carnegie Mellon University, August 2004 – present  
Robotics Institute, Ph.D. program  
*Advised by James Andrew Bagnell*

University of Washington, October 1999 – June 2003  
Bachelor of Science in Computer Engineering  
Bachelor of Science in Mathematics  
*Graduated with Honors*

## **Research Interests:**

I am interested in solving the problem of imitation learning. Utilizing theory from mathematical areas such as convex optimization and functional analysis, I am developing analyzing and implementing computationally efficient and robust algorithms for solving large-scale and structured prediction problems in both batch and online settings. Much of my inspiration comes from difficult problems found in autonomous mobile and legged robotics, including the problem of training a robot to make decisions intelligently while considering long-term consequences of these decisions.

## **Research and Professional Experience:**

**Research Assistant** – *Carnegie Mellon University, Robotics Institute*  
August 2004 – present

- Developing imitation learning techniques for solving problems in robotics including autonomous mobile robot navigation and quadruped locomotion.
- Exploring generalized gradient-based techniques for solving large-scale problems in machine learning with a particular focus on functional gradient and subgradient techniques.

**Teaching Assistant** – *Carnegie Mellon University, Robotics Institute*  
September 2006 – present

- Select lectures for Professor J. Andrew Bagnell's course on Statistical Techniques in Robotics.
- Lead review sessions, held regular office hours, and graded homework.

**Software Development Engineer** – *Amazon, Inc.*  
June 2003 – June 2004

- Worked with team of developers on integration software for third-party merchants.
- Migrated merchant contact point SOAP server to robust third-party Systinet WASP Server for C++ web services framework.

**Autonomous Robotic Systems Software Developer** – *Intel Research (Seattle)*  
July 2002 – September 2002

- Implemented object detection and a potential field based reactive navigation system for the ActivMedia Pioneer2-DXe mobile robot as part of the Intel Research / UW PlantCare project.
- Developed line finding and circle detection algorithms for laser scan vision processing.
- Extended an FLTK / OpenGL based laser range finder display system.

**Autonomous Robotics Research Assistant** – *University of Washington*, Computer Science and Engineering

October 2001 – June 2002

- Designed high-level behavioral skills and implemented lower-level behavioral skills such as reactive mobile robot navigation under Dr. Dieter Fox.
- Implemented a dead-reckoning system used as input to a particle filter based localization module.

**Teaching Assistant** – *University of Washington*, Computer Science and Engineering

January 2002 – March 2002

- Taught a weekly recitation section to review lecture material, and held office hours for individual instruction.
- Proctored and graded midterm and final exams; graded homework.

**Software Developer** – *Applied Physics Laboratory*, University of Washington under Keith Kerr, MS  
June 2000 – September 2001; October 2002 – June 2003

- Implemented multithreaded Java middleware for delivering scientific data.
- Developed a Java Web Start distributed High Seas Warning software package used by the Navy.

**Papers:**

N. Ratliff, J.A. Bagnell & M. Zinkevich. “(Approximate) Subgradient Methods for Structured Prediction”, *Artificial Intelligence and Statistics (AISTats)*, San Juan, Puerto Rico, March 2007.

N. Ratliff & J.A. Bagnell. “Kernel Conjugate Gradient for Fast Kernel Machines”, *International Joint Conference on Artificial Intelligence*, Hyderabad, India, January 2007. (*oral presentation*)

N. Ratliff, D. Bradley, J.A. Bagnell, J. Chestnutt. “Boosting Structured Prediction for Imitation Learning.” *Neural Information Processing Systems*, Vancouver, B.C., Canada, December 2006. (*single track oral presentation, 1 of 25*)

N. Ratliff, J.A. Bagnell & M. Zinkevich. “Subgradient Methods for Maximum Margin Structured Learning”, *International Conference on Machine Learning Workshop on Learning in Structured Output Spaces*, Pittsburgh, PA, June 2006.

N. Ratliff, J.A. Bagnell & M. Zinkevich. “Maximum Margin Planning”, *International Conference on Machine Learning*, Pittsburgh, PA, June 2006. (*oral presentation*)

J.A. Bagnell, N. Ratliff & M. Zinkevich. “Maximum Margin Planning”, *Neural Information Processing Systems Workshop on Machine Learning Based Robotics in Unstructured Environments*, 2005.

N. Ratliff and J.A. Bagnell. “Kernel Conjugate Gradient”, *Tech Report CMU-RI-TR-05-30*, Robotics Institute, Carnegie Mellon University, June 2005.

N. Ratliff. “Autonomous Mobile Robot Reactive Approach Methodologies”, *Undergraduate senior thesis*, University of Washington, Seattle, WA, June 2003

## **Selected Coursework:**

### *Graduate:*

Statistical techniques in robotics, statistical machine learning, machine learning, probabilistic graphical models, intermediate statistics, mathematical physics, mathematical fundamentals for robotics, computer vision, kinematics dynamic systems and control, algorithms, mobile robotics, artificial intelligence II – intelligent user interfaces, computational neuroscience

### *Undergraduate:*

Algorithms, theory of computation, numerical analysis, modern algebra, complex analysis, honors advanced calculus, probability I&II, software for embedded systems

## **Recognition:**

Microsoft Endowed Scholarship recipient (2001-2002 academic year)

Member of the Golden Key National Honor Society

Member of the National Society of Collegiate Scholars

Member of the Phi Eta Sigma National Honor Society

## **References:**

### **Drew Bagnell**

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### **Dieter Fox**

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### **Tony Stentz**

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### **James Kuffner**

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