

John D. Martin

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EDUCATION	University of Alberta Postdoctoral Fellow in the Department of Computing Science	2021 – Present
	Stevens Institute of Technology Ph.D. in Mechanical Engineering	2015 – 2021
	University of Maryland Dual B.S. in Physics and Aerospace Engineering	2009 – 2012
RESEARCH EXPERIENCE	Reinforcement Learning and AI Lab - University of Alberta. <i>Postdoctoral Fellow – Advisor: Michael Bowling</i>	2021 – Present
	I supervise a group of three graduate students that performs fundamental research in reinforcement learning and artificial intelligence. One of my projects studies how RL systems can learn to use different kinds of sensory input without an inductive bias. My other projects study various aspects of model-based RL, focusing on ways to improve the planning process and fast methods to learn transition models. Additionally, my supervisory responsibilities involve reviewing dissertations and participating in thesis defenses.	
	Robust Field Autonomy Laboratory - Stevens Institute of Tech. <i>Graduate Research Assistant – Advisor: Brendan Englot</i>	2015 – 2021
	I studied algorithms for reinforcement learning applied to mobile robots in risky environments. My work lead to new methods for learning and incorporating representations of aleatoric and epistemic uncertainty in the RL process. This served as the basis for a successful NSF CAREER award and an ONR Young Investigator award.	
	DeepMind - Edmonton <i>Research Scientist Intern – Host: Joseph Modayil</i>	June 2020 – Nov. 2020
	I studied how RL systems can adaptively construct nonlinear representations in the incremental online learning setting. This remains a central topic of my current research.	
	Google Brain - Montréal <i>Research Scientist Intern / Student Researcher – Host: Marc G. Bellemare</i>	May 2019 – Feb. 2020
	I conducted two research projects about reinforcement learning in the continual setting. The first studied efficient exploration under symmetrical transition structures. The other project studied how to detect catastrophic interference in deep neural networks, leading to a best poster award at a NeurIPS 2019 workshop.	
	Alfred Gessow Rotorcraft Center - University of Maryland <i>Undergraduate Research Assistant</i>	2011 – 2012
	I developed algorithms to automatically control a miniature tilt-wing air vehicle. This involved dynamic modeling, feedback control, and embedded processor software design.	
	Autonomous Vehicle Laboratory - University of Maryland <i>Undergraduate Research Assistant</i>	2010 – 2011
	I developed algorithms to control novel robotic platforms, including an insect-inspired crawling robot, and a radiation-guided quad-rotor.	
	Robotics@Maryland - University of Maryland <i>Project Leader</i>	2009 – 2011
	I co-lead a team of approximately 20–30 undergraduates designing and fabricating an autonomous underwater robot from scratch.	

PROFESSIONAL EXPERIENCE

Piasecki Aircraft Corporation
Part-time Analytical Consultant

2017 – 2019

I provided technical direction for new autonomy research initiatives. I wrote multiple proposals for several SBIR/STTR, Army, and DARPA programs. One of my proposals resulted in full Phase II SBIR funding.

Sikorsky Aircraft
Robotics and Flight Controls Engineer

2012 – 2015

I worked with a small group of researchers and engineers that took two experimental helicopters to first flight. I was a lead contributor on the X-76 project, which was the first full-scale autonomous helicopter; I wrote and flight tested motion planning and trajectory-following control software. I also contributed on the S-97 coaxial rotorcraft. I designed control algorithms for the main rotor servos and the voting logic for the triply-redundant flight control computers. Additional details are provided below.

- Developed, integrated, and flight-tested motion planning algorithms on a full-scale S-76.
- Implemented a linear program solver to optimize speed during flight.
- Developed, integrated, and tested flight control algorithms on the X-76 OPV and S-97.
- Developed a simulation interface to emulate the entire S-97 avionics system.
- Automatically translated MATLAB to C-code for a real-time operating system.
- Participated in peer reviews to qualify flight-critical software.
- Reviewed and generated avionic-systems wiring schematics.

TEACHING EXPERIENCE

Nepal Applied Mathematics and Informatics Institute
Program Committee.

December 2021

I was the principle organizer of an introductory lecture series on reinforcement learning. This consisted of four ninety-minute lectures, two of which I gave. In addition, I helped find speakers for other introductory machine learning topics.

Stevens Institute of Technology, Advanced Robotics (ME-654) Spring 2020, 2021
Guest Lecture: Seeking Certainty in An Uncertain World

I gave a guest lecture centered on uncertainty-sensitive decision making in RL.

Stevens Institute of Technology, Advanced Robotics (ME-654)
Guest Lecture: Reinforcement Learning Basics

Spring 2017

I co-taught a lecture with other instructors, introducing students to the basics of RL.

REFEREED PUBLICATIONS

Stochastically Dominant Distributional Reinforcement Learning,
John D. Martin, Michal Lyskawinski, Xiaohu Li, Brendan Englot,
37th International Conference on Machine Learning (ICML), (2020).

Variational Filtering with Copula Models for SLAM,
John D. Martin*, Kevin Doherty*, Caralyn Cyr, Brendan Englot, John Leonard,
International Conference on Intelligent Robots and Systems (IROS), (2020).

Autonomous Exploration Under Uncertainty via Deep Reinforcement Learning on Graphs,
Fanfei Chen, **John D. Martin**, Yewei Huang, Jinkun Wang, Brendan Englot
International Conference on Intelligent Robots and Systems (IROS), (2020).

Fusing Concurrent Orthogonal Wide-aperture Sonar Images for Dense Underwater 3D Reconstruction,
John McConnell, **John D. Martin**, Brendan Englot
International Conference on Intelligent Robots and Systems (IROS), (2020).

Sparse Gaussian Process Temporal Difference Learning for Marine Robot Navigation,
John D. Martin, Jinkun Wang, Brendan Englot,
2nd Annual Conference on Robot Learning (CoRL), (2018).

Extending Model-based Policy Gradients for Robots in Heteroscedastic Environments,
John D. Martin, Brendan Englot,
1st Annual Conference on Robot Learning (CoRL), (2017).

WORKING PAPERS

Adapting the Function Approximation Architecture in Online Reinforcement Learning,
John D. Martin*, Joesph Modayil*
ArXiv 2106.09776, (2021)

On Catastrophic Interference in Atari 2600 Games,
William Fedus*, Dibya. Ghosh*, **John D. Martin**, Marc G. Bellemare, Yoshua Bengio, Hugo Larochelle
ArXiv 2002.12499, (2020)

WORKSHOP PUBLICATIONS

The Stochastic Road Network Environment for Robust Reinforcement Learning,
John D. Martin, Paul Szenher, Xi Lin, Brendan Englot
ICRA Workshop on Releasing Robots into the Wild, (2022)

Adapting the Function Approximation Architecture in Online Reinforcement Learning,
John D. Martin*, Joesph Modayil*, Fatima Davelouis Gallardo, Michael Bowling
The Multi-disciplinary Conference on Reinforcement Learning and Decision Making, (2022)

Should Models Be Accurate?,
Esra'a Saleh, **John D. Martin**, Anna Koop, Arash Pourzarab, Michael Bowling
The Multi-disciplinary Conference on Reinforcement Learning and Decision Making, (2022)

Stochastically Dominant Distributional Reinforcement Learning,
John D. Martin, Michal Lyskawinski, Xiaohu Li, Brendan Englot,
New York Academy of Sciences, Machine Learning Symposium, (2020)

MEMENTO: Further Progress Through Forgetting,
William Fedus*, Dibya. Ghosh*, **John D. Martin**, Marc G. Bellemare, Yoshua Bengio, Hugo Larochelle
NeurIPS Workshop on Biological and Artificial RL (2019). (Best Poster Award)

Stochastically Dominant Distributional Reinforcement Learning,
John D. Martin, Michal Lyskawinski, Xiaohu Li, Brendan Englot,
NeurIPS Workshop on Safety and Robust Decision Making (2019).

Distributed Gaussian Process Temporal Differences for Actor-critic Learning,
John D. Martin, Zheng Xing, Zhiyuan Yao, Ionut Florescu, Brendan Englot,
New York Academy of Sciences, Machine Learning Symposium, (2018)

INVITED TALKS

Google Brain, Sparsity Reading Group (Virtual), **August 2021**
Adapting the Function Approximation Architecture in Online Reinforcement Learning.

University of California Berkeley RAIL (Virtual), **November 2020**
Uncertainty, Perception, and Their Lessons for Creating General-purpose Robots.

Massachusetts Institute of Technology (MIT) CSAIL, **November 2019**
From Tasks to Timescales: A path to generalization in reinforcement learning.

Deepmind, Edmonton **October 2019**
From Tasks to Timescales: A path to generalization in reinforcement learning.

Google Robotics, New York **August 2019**
Exploiting Transition Invariance for Multi-stage Reinforcement Learning Tasks.

Stevens Institute of Technology, Senior Design (ME-423)
Sikorsky R&D: Motion Planning for Autonomous Rotorcraft.

Fall 2014

AWARDS

Robert Crooks Stanley Fellow

Jul. 2019, Jul. 2020

Two-time recipient. Provided one year of research funding.

Department of Homeland Security Doctoral Fellow

Sep. 2015

Provided four years of academic and research funding.

American Helicopter Society Howard Hughes Award

Feb. 2015

Accepted on behalf of the Sikorsky Autonomous Research Aircraft team, for achieving completely autonomous flight with an S-76 helicopter, including takeoff, path planning, navigation to an objective, and landing zone selection.

**ACADEMIC
SERVICE**

Organizer: NAAMII Winter AI School 2021, ICML Robust RL Workshop 2021, ICML Reinforcement Learning Social, 2020

Reviewer: ICLR, NeurIPS, ICML, AAAI, CoRL, WAFR, RAL, ICRA, IROS, JOE

Mentor: NeurIPS New in ML Workshop 2020

**COMPUTER
SKILLS**

Languages and Tools

- *Currently Proficient:* PYTHON, JAX, HIAKU, PANDAS, C++, R
- *Was once Proficient:* C, OCAML, YACC, MATLAB, SIMULINK, PDDL, BASH, SED, t, FORTRAN, AWK, LISP, LABVIEW, VBSCRIPT, HTML, XML, CSS, PHP