

Ian Char

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RESEARCH INTERESTS

My main research interests are focused around deep reinforcement learning, decision making under uncertainty, and uncertainty quantification. I am particularly interested in developing algorithms for engineering and the sciences.

EDUCATION

Carnegie Mellon University, Pittsburgh, PA, United States

Ph.D. in Machine Learning
Advisor: Jeff Schneider

August 2018 - Present

University of Colorado Boulder, Boulder, CO, United States

M.S./B.S. in Applied Math and B.S. in Computer Science
Advisor: Manuel Lladser
UGRD GPA: 4.00, GRAD GPA: 3.88

August 2013 - May 2018

RESEARCH EXPERIENCE

Carnegie Mellon University, Pittsburgh, PA, United States

Control for Nuclear Fusion

August 2018 - Present

My research efforts during my Ph.D. have all revolved around learning a controller for a nuclear fusion reactor. In particular, I have worked on Bayesian optimization, reinforcement learning, and uncertainty quantification.

University of Colorado Boulder, Boulder, CO, United States

Stochastic Analysis of Minimal Automata

August 2016 - May 2018

For my master's thesis, I worked with Professor Manuel Lladser to analyze the growth rate of a particular class of minimal deterministic finite automaton. We derived a high probability bound on the number of states that grows polynomially.

WORK EXPERIENCE

Google, Software Engineering Intern

May 2017 - August 2017

- Integrated several components into simulation to evaluate Google's supply chain.
- Leveraged simulation framework to conduct several studies on how varying several quantities such as weeks of supply and lead time affect overall performance.

Terra Bella (Google), Software Engineering Intern

May 2016 - August 2016

- Analyzed historical weather datasets in order to help predict the supply of satellite imagery that could be provided.
- Ingested a new dataset with over 54,000 images into Google Earth Engine for internal use.

Google, Software Engineering Intern

May 2015 - August 2015

- Created an interactive tutorial in order to teach users about AdWords' Conversion Tracking.
- Implemented an Android package name search service in Conversion Tracking.

SOFTWARE

Uncertainty Toolbox, <https://uncertainty-toolbox.github.io/>

2020

- Open source python library for predictive uncertainty quantification, calibration, metrics, and visualizations.
- Currently has more than 1.5k stars on GitHub.

PUBLICATIONS

CONFERENCES AND JOURNALS

Char, I. & Schneider, J. "PID-Inspired Inductive Biases for Deep Reinforcement Learning in Partially Observable Control Tasks." In Advances in Neural Information Processing Systems, 2023.

Char, I., Abbate, J., Bardóczi, L., Boyer, M., Chung, Y., Conlin, R., ... & Schneider, J. (2023, June). "Offline Model-Based Reinforcement Learning for Tokamak Control." In Learning for Dynamics and Control Conference (pp. 1357-1372). PMLR.

Li, X., Mehta, V., Kirschner, J., Char, I., Neiswanger, W., Schneider, J., ... & Bogunovic, I. (2022). "Near-optimal Policy Identification in Active Reinforcement Learning." International Conference on Learning Representations, 2023.

Mehta, V., Char, I., Abbate, J., Conlin, R., Boyer, M., Ermon, S., ... & Neiswanger, W. (2022). "Exploration via planning for information about the optimal trajectory." *Advances in Neural Information Processing Systems*, 35, 28761-28775.

Apostolopoulou, I., Char, I., Rosenfeld, E. & Dubrawski, A. "Deep Attentive Variational Inferences." *International Conference on Learning Representations*, 2021.

Chung, Y., Neiswanger, W., Char, I. & Schneider, J. "Beyond Pinball Loss: Quantile Methods for Calibrated Uncertainty Quantification." In *Advances in Neural Information Processing Systems*, 2021.

Mehta V., Char, I., Neiswanger, W., Chung, Y., Nelson, A. O., Boyer, M., Kolemen E. & Schneider, J. "Neural Dynamics Systems: Balancing Structure and Flexibility in Physical Prediction." *IEEE Conference on Decision and Control*, 2021.

Char, I., Chung, Y., Neiswanger, W., Kandasamy, K., Nelson, A. O., Boyer, M., Kolemen, E. & Schneider, J. "Offline contextual bayesian optimization." In *Advances in Neural Information Processing Systems*, 2019.

Char, I., & Lladser, M. E. "Stochastic Analysis of Minimal Automata Growth for Generalized Strings." *Methodology and Computing in Applied Probability*, 2019.

TECHNICAL REPORTS AND WORKSHOPS

Mehta, V., Abbate, J., Wang, A., Rothstein, A., Char, I., Schneider, J., Kolemen E., Rea C. & Garneir, D. "Towards LLMs as Operational Copilots for Fusion Reactors." *NeurIPS 2023 Workshop AI4Science*.

Char, I.*, Chung, Y.*, Shah, R. & Schneider, J. "Correlated Trajectory Uncertainty for Adaptive Sequential Decision Making." *NeurIPS 2023 Workshop on Adaptive Experimental Design and Active Learning in the Real World*.

Igoe, C., Chung, Y., Char, I. & Schneider, J. "How Useful are Gradients for OOD Detection Really?" <https://arxiv.org/abs/2205.10439>

Char, I.*, Mehta, V.*, Villaflor, A., Dolan, J. & Schneider, J. "BATS: Best Action Trajectory Stitching." *NeurIPS 2021 Offline Reinforcement Learning Workshop*.

Chung, Y., Char, I., Guo H., Schneider, J. & Neiswanger, W. "Uncertainty Toolbox: an Open-Source Library for Assessing Visualizing and Improving Uncertainty Quantification." *ICML 2021 Uncertainty and Robustness in Deep Learning Workshop*.

Chung, Y., Char, I., Neiswanger, W., Kandasamy, K., Nelson, A. O., Boyer, M., Kolemen, E. & Schneider, J. "Offline contextual bayesian optimization for nuclear fusion." *NeurIPS 2019 Machine Learning and the Physical Sciences Workshop*.

AWARDS	Machine Learning Department Teaching Assistant of the Year	2021-2022
	NSF Graduate Research Fellowship	2018
	Chancellor's Award	2018
	Awarded by the chancellor of the University of Colorado for highest GPA university-wide.	

TEACHING	10-606/607: Mathematical/Computational Foundations for Machine Learning	Fall 2021
	<i>Teaching Assistant, Carnegie Mellon University</i>	
	10-716: Advanced Machine Learning: Theory and Methods	Spring 2020
	<i>Teaching Assistant, Carnegie Mellon University</i>	

[Updated 2023-10-31]