Raúl Astudillo

August 21st, 2024

Contact Information

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Education

Jul 2016-Aug 2022 **Cornell University**, *USA*.
Ph.D. in Operations Research and Information Engineering
- Advisor: Peter Frazier
- Minors: Computer Science and Statistics

Aug 2011-Jun 2016 **University of Guanajuato & Center for Research in Mathematics**, *Mexico*.
B.Sc. in Mathematics. GPA: 9.7/10
- Highest GPA of the 2011-2016 class

Academic Positions

Sep 2022-Present **California Institute of Technology**, *Pasadena, CA*.
Postdoctoral Scholar
- Supervisor: Yisong Yue

Industry Positions

Oct 2020-Mar 2021 **Facebook**, *Menlo Park, CA*.
Visiting Researcher
- Supervisor: Eytan Bakshy

Jun-Sep 2020 **Facebook**, *Menlo Park, CA*.
Research Intern
- Supervisor: Daniel R. Jiang

Jun-Aug 2019 **ExxonMobil Upstream Research Company**, *Houston, TX*.
Jun-Aug 2018 Research Intern
- Supervisors: Liz Curry, Damian Burch, and Xiao-Hui Wu

Research Interests

Bayesian Optimization, Preference Elicitation, Simulation Optimization, Active Learning, Adaptive Experimentation, Uncertainty Quantification, Optimal Learning, AI for Science

Publications and Preprints

1. J. Bowden, R. Astudillo, C. Yeh, J. Song, Y. Chen, T. Desautels, and Y. Yue, "New insights on Bayesian optimization with deep kernel learning", *Preprint*.
2. J. Yang, R. Lal, J. Bowden, R. Astudillo, M. Hameedi, Y. Yue, and F. Arnold, "Active learning-assisted directed evolution", *Submitted*.
3. C. Cheng, R. Astudillo, T. Desautels, and Y. Yue, "Practical Bayesian algorithm execution via posterior sampling" (Finalist at the 2024 INFORMS Undergraduate Operations Research Prize Competition), *Submitted*.

4. Q. Xie, R. Astudillo, P. Frazier, Ziv Scully, and A. Terein, "Cost-aware Bayesian optimization via the Pandora's box Gittins index", *Submitted*.
5. V. Mishra, R. Astudillo, P. Frazier, and F. Zhang, "Probably-convergent source seeking with mobile agents" (Early version presented at the NeurIPS 2023 Workshop on Adaptive Experimental Design and Active Learning in the Real World), *Submitted*.
6. R. Astudillo, K. Li, M. Tucker, X. Chen, A. Ames, and Y. Yue, "Preferential multi-objective Bayesian" (Early version presented at the ICML 2023 Workshop on The Many Facets of Preference-Based Learning), *Submitted*.
7. B. Sha, R. Astudillo, and P. Frazier, "Multi-attribute optimization under preference uncertainty" (Finalist at the 2020 INFORMS Undergraduate Operations Research Prize Competition), *Winter Simulation Conference, 2024 (Forthcoming)*.
8. P. Buathong, J. Wan, R. Astudillo, S. Daulton, M. Balandat, and P. Frazier, "Bayesian optimization of function networks with partial evaluations", *International Conference on Machine Learning, 2024*.
9. J. Jannink, R. Astudillo, and P. Frazier, "Insight into a two-part plant breeding scheme through Bayesian optimization of budget allocations", *Crop Science, 2023*.
10. R. Astudillo, Z. Lin, E. Bakshy, and P. Frazier, "qEUBO: A decision-theoretic acquisition function for preferential Bayesian optimization", *International Conference on Artificial Intelligence and Statistics, 2023*.
11. Z. Cosenza, R. Astudillo, P. Frazier, K. Baar, and D. Block, "Multi-information source Bayesian optimization of culture media for cellular agriculture" (Spotlight presentation at the ICML 2022 Adaptive Experimental Design and Active Learning in the Real World Workshop, 7%), *Biotechnology and Bioengineering, 2022*.
12. Z. Lin, R. Astudillo, P. Frazier, and E. Bakshy, "Preference exploration for efficient Bayesian optimization with multiple outcomes", *International Conference on Artificial Intelligence and Statistics, 2022*.
13. R. Astudillo, and P. Frazier, "Thinking inside the box: A tutorial on grey-box Bayesian optimization", *Advanced Tutorial at the Winter Simulation Conference, 2021*.
14. R. Astudillo, D.R. Jiang, M. Balandat, E. Bakshy, and P. Frazier, "Multi-step budgeted Bayesian optimization with unknown evaluation costs", *Advances in Neural Information Processing Systems, 2021*.
15. R. Astudillo and P. Frazier, "Bayesian optimization of function networks", *Advances in Neural Information Processing Systems, 2021*.
16. S. Cakmak, R. Astudillo, P. Frazier and E. Zhou, "Bayesian optimization of risk measures", *Advances in Neural Information Processing Systems, 2020*.
17. R. Astudillo and P. Frazier, "Multi-attribute Bayesian optimization with interactive preference learning", *International Conference on Artificial Intelligence and Statistics, 2020*.
18. R. Astudillo and P. Frazier, "Bayesian optimization of composite functions", *International Conference on Machine Learning, 2019*.

Selected Awards

2024 Rising Star in Management Science and Engineering - Stanford University

2021 Outstanding Reviewer Award - NeurIPS 2021

2015 Second Prize - XXII International Mathematics Competition for University Students

2014 *Orgullo UG* Academic Excellence Award - University of Guanajuato

2012-2016 Academic Excellence Fellowship - Center for Research in Mathematics

Selected Presentations

Jan 2023 "Composite Bayesian optimization for efficient and scalable adaptive experimentation", *Online Reading Group on Modern Adaptive Experimental Design and Active Learning in the Real World, Virtual.*

Dec 2021 "Thinking inside the box: A tutorial on grey-box Bayesian optimization", *Advanced Tutorial at the Winter Simulation Conference, Phoenix, AZ.*

Oct 2021 "Grey-box Bayesian optimization", *Young Researchers Workshop, Cornell University's School of ORIE, Ithaca, NY.*

Mar 2021 "Bayesian optimization of function networks", *SIAM Conference on Computational Science and Engineering, Virtual.*

Feb 2020 "Interactive Bayesian optimization with uncertain preferences", *Facebook Adaptive Experimentation Workshop, New York City, NY.*

Jul 2019 "Bayesian optimization of composite functions with application to computationally expensive inverse problems", *Applied Inverse Problems Conference, Grenoble, France.*

Jun 2019 "Bayesian optimization of composite functions", *International Conference on Machine Learning, Long Beach, CA.*

May 2019 "Bayesian optimization of composite functions", *2nd Uber Science Symposium, San Francisco, CA.*

Mentoring Experience

Graduate Students

Victor Amaya Carvajal - Duke University

Felix Huber - University of Stuttgart

Eliezer Fuentes - Cornell University

Qian Xie - Cornell University

Poompol Buathong - Cornell University

Undegraduate Students

Eric Lee - California Institute of Technology

Andrew Zabelo - California Institute of Technology

Chu Xin (Cloris) Cheng - California Institute of Technology

James Bowden - California Institute of Technology

Bhavik Sha - Cornell University

Teaching Experience

Instructor

Spring 2023 Uncertainty Quantification (Graduate) - California Institute of Technology

Summer 2021 Engineering Stochastic Processes (Undergraduate) - Cornell University

Teaching Assistant

Fall 2018 Statistical Principles (Graduate) - Cornell University

Spring 2017 Engineering Stochastic Processes (Undergraduate) - Cornell University

Fall 2016 Basic Probability and Statistics (Undergraduate)- Cornell University

Fall 2015 Measure Theory and Probability (Graduate) - Center for Research in Mathematics

Spring 2015 Complex Analysis (Undergraduate) - University of Guanajuato

Academic Service

Conference Reviewing: AISTATS, ICLR, ICML, NeurIPS

Journal Reviewing: Artificial Intelligence, INFORMS Journal on Computing, Neural Computation, Operations Research, Technometrics

Languages

English (proficient), Spanish (native)