

# Raul Astudillo

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## Contact and citizenship information

Address: Rhodes Hall 288, Cornell University, Ithaca, NY 14850

Email: [ra598@cornell.edu](mailto:ra598@cornell.edu)

Website: <https://raulastudillo.netlify.com/>

Citizenship: Mexico

## Education

2016-Present **Cornell University, USA.**

Ph.D. in Operations Research and Information Engineering

- Expected graduation date: May 2022

- Advisor: Peter I. Frazier

- Minors: Computer Science and Statistics

2011-2016 **University of Guanajuato, Mexico.**

B.S. in Mathematics. GPA: 9.7/10

- Highest GPA of the class 2011-2016

## Research interests

Bayesian Optimization, Preference Elicitation, Simulation Optimization, Adaptive Experimentation, Optimal Learning

## Publications and working papers

1. Z. Cosenza, R. Astudillo, P.I. Frazier, K. Baar, and D.E. Block "Multi-information source Bayesian optimization of cell culture media", *Working paper*.
2. B. Sha, R. Astudillo, and P.I. Frazier, "Mixed integer linear programming under preference uncertainty " (A preliminary version of this paper was finalist at the 2020 INFORMS Undergraduate Operations Research Prize Competition), *Working paper*.
3. Z. Lin, R. Astudillo, P.I. Frazier, and E. Bakshy, "Preference exploration for efficient Bayesian optimization with multiple experimental objectives", *Forthcoming in International Conference on Artificial Intelligence and Statistics, 2022*.
4. R. Astudillo, and P.I. Frazier, "Thinking inside the box: A tutorial on grey-box Bayesian optimization", *Advanced Tutorial at the Winter Simulation Conference, 2021*.
5. R. Astudillo, D.R. Jiang, M. Balandat, P.I. Frazier, and E. Bakshy, "Multi-step budgeted Bayesian optimization with unknown evaluation costs", *Advances in Neural Information Processing Systems, 2021*.
6. R. Astudillo and P.I. Frazier, "Bayesian optimization of function networks", *Advances in Neural Information Processing Systems, 2021*.
7. S. Cakmak, R. Astudillo, P.I. Frazier and E. Zhou, "Bayesian optimization of risk measures", *Advances in Neural Information Processing Systems, 2020*.

8. R. Astudillo and P.I. Frazier, "Multi-attribute Bayesian optimization with interactive preference learning", *International Conference on Artificial Intelligence and Statistics*, 2020.
9. R. Astudillo and P.I. Frazier, "Bayesian optimization of composite functions", *International Conference on Machine Learning*, 2019.
10. R. Astudillo and P.I. Frazier, "Multi-attribute Bayesian optimization under utility uncertainty", *NIPS Workshop on Bayesian Optimization*, 2017.

## Selected presentations

- Dec 2021 "Thinking inside the box: A tutorial on grey-box Bayesian optimization", *Advanced Tutorial at the Winter Simulation Conference, Phoenix, AZ*.
- Dec 2021 "Multi-step budgeted Bayesian optimization with unknown evaluation costs", *NeurIPS 2021, Virtual*.
- Dec 2021 "Bayesian optimization of nested functions", *NeurIPS 2021, Virtual*.
- 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*.

## Selected graduate coursework

- Applied Stochastic Processes
- Mathematical Programming
- Bayesian Statistics and Data Analysis
- Numerical Methods for Data Science
- Bayesian Machine Learning
- Statistical Learning Theory
- Advanced Machine Learning
- Optimal Learning

## Industry experience

- Oct 2020 **Facebook, Menlo Park, CA.**
- Mar 2021 Visiting Researcher
- Developed novel non-myopic Bayesian optimization algorithms for problems with unknown evaluation costs and implemented them on Facebook's adaptive experimentation pipeline
- Jun-Sep 2020 **Facebook, Menlo Park, CA.**
- Intern
- Developed novel non-myopic Bayesian optimization algorithms for problems with unknown evaluation costs
  - Mentor: Daniel R. Jiang

- Jul-Aug 2019 **ExxonMobil Upstream Research Company, Houston, TX.**  
 Intern  
 ○ Developed novel Bayesian optimization algorithms for improving reservoir development planning under geological uncertainty  
 ○ Mentors: Liz Curry and Xiao-Hui Wu
- Jun-Aug 2018 **ExxonMobil Upstream Research Company, Houston, TX.**  
 Intern  
 ○ Developed novel Bayesian optimization algorithms for improving reservoir development planning under geological uncertainty  
 ○ Mentors: Damian Burch and Xiao-Hui Wu

## Teaching experience

- Cornell University, USA.**  
 Instructor
- |             |                                  |               |
|-------------|----------------------------------|---------------|
| Summer 2021 | Engineering Stochastic Processes | Undergraduate |
|-------------|----------------------------------|---------------|
- Cornell University, USA.**  
 Teaching Assistant
- |             |                                  |               |
|-------------|----------------------------------|---------------|
| Fall 2018   | Statistical Principles           | Graduate      |
| Spring 2017 | Engineering Stochastic Processes | Undergraduate |
| Fall 2016   | Basic Probability and Statistics | Undergraduate |
- Center for Research in Mathematics (CIMAT), Mexico.**  
 Teaching Assistant
- |           |                                |          |
|-----------|--------------------------------|----------|
| Fall 2015 | Measure Theory and Probability | Graduate |
|-----------|--------------------------------|----------|
- University of Guanajuato, Mexico.**  
 Teaching Assistant
- |             |                          |               |
|-------------|--------------------------|---------------|
| Spring 2015 | Complex Analysis         | Undergraduate |
| Fall 2014   | Elementary Number Theory | Undergraduate |

## Selected awards

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|-----------|---|
| 2021      | NeurIPS 2021 Outstanding Reviewer Award   |
| 2015      | Second Prize - XXII International Mathematics Competition for University Students, Blagoevgrad, Bulgaria. |
| 2014      | Third Prize - XXI International Mathematics Competition for University Students, Blagoevgrad, Bulgaria.   |
| 2014      | <i>Orgullo UG</i> Academic Excellence Award - University of Guanajuato.                                   |
| 2012-2016 | Academic Excellence Fellowship - Center for Research in Mathematics.                                      |

## Computer skills

- |             |                      |
|-------------|----------------------|
| Development | MATLAB, Python, R    |
| Tools       | Git, $\text{\LaTeX}$ |

## Languages

- English (proficient), Spanish (native)