

Madeleine S. Gastonguay
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Education

University of Connecticut, Storrs, CT

Bachelor of Science, Applied Mathematics, May 2020

Summa Cum Laude with Honors in the Major

Minor: Bioinformatics

Advisor: Dr. Paola Vera-Licona

Thesis: A Quantitative Pipeline for The Identification of Combinations of Targets for Claudin-Low Triple Negative Breast Cancer Reversion

GPA: 3.98/4.00

La Sorbonne University, Paris, France

Course de Civilisation Française, January 2018-May 2018

Fellowships and Grants

Summer Undergraduate Research Fund (SURF) Trimble Family Award, University of Connecticut Office of Undergraduate Research (\$4,000)	May – August 2019
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Holster Scholar, University of Connecticut Honors Program (\$4,000)	May – August 2017
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Honors and Awards

Babbidge Scholar, The University of Connecticut	2017, 2019
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New England Scholar, The University of Connecticut	2018
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Global Citizenship Scholarship, The University of Connecticut Education Abroad (\$600)	2017
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Dean's List, The University of Connecticut	2016-2020
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Academic Excellence Scholarship, The University of Connecticut (\$26,000)	2016 -2020
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Research Experience

The Jackson Laboratory Churchill Lab, Bar Harbor, ME

Research Data Analyst I (June 2020 – present)

Topic: A Bayesian approach to mediation analysis of complex traits with measurement noise

- Contributing to construction and validation of an R package for Bayesian model selection
- Extending current methods for mediation analysis to include moderated mediation
- Uncovering the impact of measurement noise on mediation analysis results
- Building a Bayesian model to incorporate prior knowledge of measurement noise to increase the accuracy of mediation analysis
- Applying developed tools to determine if the effect of diet on protein expression is mediated through gene expression in the Diversity Outbred Mice, and if said effect is moderated by sex

Center for Quantitative Medicine, University of Connecticut Health Center, Farmington, CT

Computational Systems Medicine Team Undergraduate Research Assistant (September 2018 – May 2020)

Topic: A quantitative pipeline for cancer reversion analysis in triple negative breast cancer

- Earned a Summer Undergraduate Research Fund through UConn to fund my work
- Constructed a static intracellular signaling network for a claudin-low triple negative breast cancer (CL TNBC) cell line with multi-omics data using the Cytoscape and GeneXplain programs
- Applied a structure-based control method for nonlinear systems to identify putative control targets
- Approximated the attractor landscape of the static network and conducted virtual screenings of concerted perturbations of control targets using a topological estimation of signal flow
- Identified perturbations resulting in reversion of the CL TNBC phenotype through machine learning clustering and classification methods

Metrum Research Group, Simsbury, CT

Summer Intern (June 2018-August 2018)

Topic: Developing an open and general maternal-fetal physiologically based pharmacokinetic model for drugs metabolized by cytochromes P450 isoenzymes

- Described the physiological pharmacokinetics of midazolam, metoprolol, and caffeine in nonpregnant women with a system of differential equations
- Adapted the model for nonpregnant women to predict maternal and fetal drug exposures at different gestational ages by incorporating anatomical, biochemical, and physiological changes a woman undergoes throughout pregnancy
- Calibrated the model with local sensitivity analysis and optimization of model parameters
- Validated the model by comparing predicted concentration profiles to published data for several other drugs metabolized by CYP1A2, 3A4, 2B6, and 2D6

Dr. Rachel O'Neill Laboratory, Department of Molecular and Cellular Biology, Storrs, CT

Undergraduate Research Assistant and Holster Scholar (January 2017-September 2017)

Topic: The effect of host genetic variability on Epstein Barr Virus (EBV)-derived cancer susceptibility

- Identified target genes that may impact EBV-derived cancer susceptibility through a literature search
- Utilized wet lab techniques such as Polymerase Chain Reactions, Gel Electrophoresis, Cloning, and DNA Sequencing
- Aligned the genetic sequence of target genes to identify common single nucleotide polymorphisms across EBV-derived cancers using the software Geneious and BLAST

Publications

Kiersten Utsey, **Madeleine S. Gastonguay**, Sean Russell, Reed Freling, Matthew M. Riggs and Ahmed Elmokadem, *Impact of Partition Coefficient Methods on PBPK Modeling*, Drug Metabolism and Disposition October 1, 2020, 48 (10) 903-916; DOI: <https://doi.org/10.1124/dmd.120.090498>

Zuppa AF, Brown GR, Zane NR, Curley MAQ, Bradfield J, Hakonarson H, **Gastonguay MS**, Moorthy G, Prodell J, Gastonguay MR, *Morphine Dose Optimization in Critically Ill Pediatric Patients with Acute Respiratory Failure: A Population Pharmacokinetic-Pharmacogenomic Study*, Critical Care Medicine, June 2019

Zuppa AF, Conrado DJ, Zane NR, Curley MAQ, Bradfield J, Hakonarson H, **Gastonguay MS**, Moorthy G, Prodell J, Gastonguay MR, *Midazolam Dose Optimization in Critically Ill Pediatric Patients with Acute Respiratory Failure: A Population Pharmacokinetic-Pharmacogenomic Study*, Critical Care Medicine, January 21st, 2019

Presentations

Talks

Gastonguay MS, Russell S, Freling R, Utsey K, and Elmokadem A, *Prediction of maternal-fetal exposures of CYP450-metabolized drugs using physiologic pharmacokinetic modeling implemented in R and mrgsolve.*, R/Pharma Conference, Cambridge, MA, August 23rd, 2019

Gastonguay MS, Marazzi L, Vera-Licona P, *Identification of Combinations of Targets for Claudin-Low Triple Negative Breast Cancer Reversion*, UConn Center for Quantitative Medicine, July 30th, 2019

Gastonguay MS, Marazzi L, Vera-Licona P, *Identification of Combinations of Targets for Claudin-Low Triple Negative Breast Cancer Reversion*, UConn Center for Cell Analysis and Modeling Summer Seminar, July 26th, 2019

Gastonguay MS, Russell S, Freling R, Utsey K, and Elmokadem A, *Development of an Open and General Physiologically Based Pharmacokinetic Model to Predict Maternal-Fetal Exposures for Drugs Metabolized by CYP Isoenzymes*, R/Medicine Conference, New Haven, CT, September 8th, 2018

Gastonguay MS, *The Effect of Host Genetic Variability on Epstein Barr Virus-derived cancer susceptibility*, UConn Holster Scholar Symposium, October 2017

Posters

Gastonguay MS, Marazzi L, Vera-Licona P, *Identification of Combinations of Targets for Claudin-Low Triple Negative Breast Cancer Reversion*, Joint Meeting in Mathematics, Denver, CO, January 15th – 18th, 2020

Gastonguay MS, Russell S, Freling R, Utsey K, and Elmokadem A, *Development of an Open-source Physiologically-Based Pharmacokinetic Model to Predict Maternal-Fetal Exposures of CYP450-Metabolized Drugs*, International Society of Pharmacometrics Regional Quantitative Systems Pharmacology Day, Princeton, NJ, July 16th 2019

Gastonguay MS, Russell S, Freling R, Utsey K, and Elmokadem A, *Development of an Open-source Physiologically-Based Pharmacokinetic Model to Predict Maternal-Fetal Exposures of CYP450-Metabolized Drugs*, University of Connecticut Frontiers in Undergraduate Research, April 2019

Skills & Certifications

Technical: R, basic Python and Matlab, Git, LaTeX, basic Unix shell, High Performance Computing

Wet Lab: Polymerase Chain Reactions, Cloning, Gel Electrophoresis, Gel Extraction, DNA sequencing

Language: Proficient in French conversation, reading, and writing; Certified in French level B1.2 by La Sorbonne in Paris

Performance: Certified in Cecchetti Ballet Grades 2-5 and 7

Professional Development and Continuing Education

Carpentries Instructor Training, The Carpentries Mar. 2021

Shiny, RMarkdown, and RStudio Connect, Phil Bowsher with RStudio Mar. 2021

Quantitative Trait Mapping in the Diversity Outbred, University of Wisconsin-Madison Dec. 2020

Containerization with Singularity, The Jackson Laboratory Research IT Oct. 2020

Introduction to HPC, The Jackson Laboratory Research IT Sep. 2020

Human and Mammalian Genetics and Genomics: The 61st McKusick Short Course, The Jackson Laboratory July 2020

Shiny Reproducibility, Joe Cheng at R/pharma 2019 Aug. 2019

Machine Learning, Max Kuhn at R/pharma 2019 Aug. 2019

Memberships

Society for Industrial and Applied Mathematics (SIAM)

International Society of Pharmacometrics (ISoP)

American Statistics Association (ASA)

Volunteer Work and Extra-Curricular Activities

Rubyfruit A Cappella (Treasurer, Assistant Music Director, and President), September 2016-May 2020

- Organized recording an album and releasing it on Spotify and Apple Music
- Communicated with other board members to run productive fundraisers, rehearsals, and gigs

Math Motivators, October 2017- December 2018

- Traveled to Global Communications High School in Hartford once a week to tutor freshmen in algebra

UConn iGem Genetic Engineering Team, September 2016- December 2017

- Aided in the development of a genetic engineering project for the iGEM jamboree