**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

**Research Experience**

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| **Research Data Analyst I,** The Jackson Laboratory, Bar Harbor, ME | June 2020 - present |

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

Mentor: Gary Churchill, PhD

* Contributing to the development and validation of an R package for Bayesian model selection
* Extending current methods for mediation analysis to include moderated mediation
* Understanding how to diagnose the accuracy of mediation inferences in the presence of measurement noise
* Applying developed tools to identify the effect of sex and diet on mechanisms of protein expression in Diversity Outbred Mouse Liver

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| **Undergraduate Research Assistant,** Center for Quantitative Medicine at UConn Health, Farmington, CT | September 2018 – May 2020 |

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

Mentor: Paola Vera-Licona, PhD

* Awarded 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 targets whose perturbation can steer the system to any desired attractor
* 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

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| **Summer Intern,** Metrum Research Group, Simsbury, CT | June -August 2018 |

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

Mentor: Ahmed Elmokadem, PhD and Mathew Riggs, PhD

* Described the physiological pharmacokinetics of midazolam, metoprolol, and caffeine in nonpregnant women with a system of differential equations with *mrgsolve*
* Adapted the model for nonpregnant women to predict maternal and fetal drug exposures at any gestational age by incorporating anatomical, biochemical, and physiological changes associated with 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

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| **Holster Scholar,** UConn Department of Molecular and Cellular Biology, Storrs, CT | January -September 2017 |

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

Mentor: Rachel O’Neill, PhD

* 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 and Pre-Prints**

Crouse, W. L., Keele, G. R., Gastonguay, M. S., Churchill, G. A., & Valdar, W. (2021). A Bayesian model selection approach to mediation analysis. *BioRxiv*, 2021.07.19.452969. https://doi.org/10.1101/2021.07.19.452969

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,* International Society of Pharmacometrics Quantitative Systems Pharmacology Student Symposium, April 28th, 2021

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

**Fellowships and Grants**

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

**Honors and Awards**

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| **Blue Ribbon Poster Award,**International Society of Pharmacometrics Quantitative Systems Pharmacology Student Symposium  **Babbidge Scholar**, The University of Connecticut | 2017, 2019 |
| **New England Scholar**, The University of Connecticut | 2018 |
| **Global Citizenship Scholarship**, The University of Connecticut Education Abroad | 2017 |
| **Dean’s List**, The University of Connecticut | 2016-2020 |
| **Academic Excellence Scholarship**, The University of Connecticut | 2016 -2020 |

**Skills & Certifications**

**Technical:** R, basic Python and Matlab, Git, LaTeX, basic Unix shell, High Performance Computing, certified Carpentries instructor

**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**

Attendee

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| **Advanced Shiny,** Phil Bowsher with RStudio | Sept. 2021 |
| **Introduction to Bayesian Data Analysis**, Juliacon | July 2021 |
| **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 | Oct. 2020 |
| **Introduction to HPC,** The Jackson Laboratory | 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 |

Assistant

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| **Introductory Statistics with R,** Bioinformatics Training Program at the Jackson Laboratory | Sept. 2021 |
| **Introduction to R and RStudio,** Bioinformatics Training Program at the Jackson Laboratory | June 2021 |

**Memberships**

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| 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