**Madeleine S. Gastonguay**

(860) 578-7177 • [Madeleine.Gastonguay@uconn.edu](mailto:Madeleine.Gastonguay@uconn.edu)

<https://madeleine-gastonguay.netlify.app/>

**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 (JAX), Bar Harbor, ME  Topic: A Bayesian approach to mediation analysis of complex traits with measurement noise  Advisor: Gary Churchill, PhD | June 2020 - present |

* Contributing to the development and validation of an R package implementing a Bayesian model selection approach to mediation analysis that is flexible in both data inputs and possible inferences, and extending it to allow for inference of moderated mediation
* Diagnosing the effect of measurement noise in the inference of mediation
* 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  Topic: A quantitative pipeline for cancer reversion analysis in triple negative breast cancer  Advisor: Paola Vera-Licona, PhD | September 2018 - May 2020 |

* 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 Cytoscape and GeneXplain
* Applied a structure-based control method for nonlinear systems implemented in python to identify putative targets that can steer the system to any desired attractor
* Conducted virtual screenings using the topology of the network and a signal propagation algorithm to identify concerted perturbations of control targets resulting in reversion of the CL TNBC phenotype

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| **Summer Intern,** Metrum Research Group, Simsbury, CT  Topic: Developing an open and general maternal-fetal physiologically based pharmacokinetic model for drugs metabolized by cytochromes P450 isoenzymes  Advisor: Ahmed Elmokadem, PhD and Mathew Riggs, PhD | June - August 2018 |

* Modeled maternal and fetal drug exposures at different gestational ages by incorporating anatomical, biochemical, and physiological changes associated with pregnancy as a system of differential equations using R and *mrgsolve*
* Performed local sensitivity analysis, optimized model parameters, and validated the model by comparing model predictions to external published data

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| **Holster Scholar,** UConn Department of Molecular and Cellular Biology, Storrs, CT  Topic: The effect of host genetic variability on Epstein Barr Virus (EBV)-derived cancer susceptibility  Advisor: Rachel O’Neill, PhD | January - September 2017 |

* Reviewed relevant literature to identify genes that may impact EBV-derived cancer susceptibility
* Utilized wet lab techniques such as Polymerase Chain Reactions, Gel Electrophoresis, Cloning, and Sanger Sequencing to sequence the genes of interest in several EBV-derived cancer cell lines
* Aligned the genetic sequence of target genes to identify common and distinct single nucleotide polymorphisms across EBV-derived cancers using the software Geneious and BLAST

**Publications and Pre-Prints**

Gastonguay, M. S., Keele, G. R., & Churchill, G. A., (2021). The impact of measurement noise on mediation analysis of complex traits. *Manuscript in preparation for publication*

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>, *submitted at PLOS genetics*

Utsey K, Gastonguay MS, Russell S, Freling R, Riggs MM, Elmokadem A. Quantification of the Impact of Partition Coefficient Prediction Methods on Physiologically Based Pharmacokinetic Model Output Using a Standardized Tissue Composition. *Drug Metab Dispos*. 2020;48(10):903 LP-916. doi:10.1124/dmd.120.090498

Zuppa AF, Benitez 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. Crit Care Med. 2019 Jun;47(6):e485-e494. doi: 10.1097/CCM.0000000000003741. PMID: 30920410.

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. Crit Care Med. 2019 Apr;47(4):e301-e309. doi: 10.1097/CCM.0000000000003638. PMID: 30672747; PMCID: PMC6432942.

**Presentations**

Oral Presentations

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

Poster Presentations

Gastonguay MS, Marazzi L, Vera-Licona P, *Identification of Combinations of Pharmacologic 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 2019 |
| **Holster Scholar**  University of Connecticut Honors Program ($4,000) | May 2017 |

**Honors and Awards**

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| **Blue Ribbon Poster Award,**International Society of Pharmacometrics Quantitative Systems Pharmacology Student Symposium | 2021 |
| **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, Matlab, SQL, Julia, and bash shell; Git; LaTeX; OpenRefine; High Performance Computing with SLURM; *mrgsolve*; *shiny*; JAGS; Bayesian Data Analysis

**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

**Teaching:** Certified Instructor with The Carpentries

**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,** JAX | Oct. 2020 |
| **Introduction to HPC,** JAX | Sep. 2020 |
| **Human and Mammalian Genetics and Genomics: The 61st McKusick Short Course,** JAX | July 2020 |
| **Shiny Reproducibility**, Joe Cheng at R/pharma 2019 | Aug. 2019 |
| **Machine Learning**, Max Kuhn at R/pharma 2019 | Aug. 2019 |

Teaching Assistant

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

**Professional Associations**

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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**

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| **Rubyfruit A Cappella,** The University of Connecticut | 2016 - 2020 |

* Elected as President (2019-2020), Assistant Music Director (2018 - 2019), and Treasurer (2017- 2018)
* Coordinated funding, schedules, and rehearsals to record an album and distribute it on Spotify and Apple Music
* Communicated with other executive board members to run productive fundraisers, rehearsals, and gigs

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| **Math Motivators,** The University of Connecticut | 2017 - 2019 |

* Tutored high school freshmen from underprivileged schools in Hartford, CT

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| **iGEM Genetic Engineering Team,** The University of Connecticut | 2016 - 2017 |

* Developed and presented a project proposal for the iGEM jamboree with a team of students

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| **Husky for a Day Volunteer,** The University of Connecticut | 2016 - 2018 |

* Guided prospective students around campus and answered questions about UConn