

**Madeleine S. Gastonguay**  
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## Education

<b>University of Connecticut</b> , Storrs, CT Bachelor of Science, Applied Mathematics Summa Cum Laude with Honors in the Major GPA: 3.98/4.00 Minor: Bioinformatics Thesis: A Quantitative Pipeline for The Identification of Combinations of Targets for Claudin-Low Triple Negative Breast Cancer Reversion Advisor: Dr. Paola Vera-Licona	May 2020
<b>La Sorbonne University</b> , Paris, France Course de Civilisation Française	January 2018-May 2018

## Research Experience

<b>The Jackson Laboratory (JAX)</b> , Bar Harbor, ME Research Data Analyst I	June 2020 - present
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Topic: A Bayesian approach to mediation analysis of complex traits with measurement noise

- 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

<b>UConn Health Center for Quantitative Medicine</b> , Farmington, CT Undergraduate Research Assistant	September 2018 - May 2020
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Topic: A quantitative pipeline for cancer reversion analysis in triple negative breast cancer

- 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

<b>Metrum Research Group</b> , Simsbury, CT Summer Intern	June - August 2018
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Topic: Developing an open and general maternal-fetal physiologically based pharmacokinetic model for drugs metabolized by cytochromes P450 isoenzymes

- 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

<b>University of Connecticut</b> , Department of Molecular and Cellular Biology, Storrs, CT Undergraduate Research Assistant/Holster Scholar	January - September 2017
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Topic: The effect of host genetic variability on Epstein Barr Virus (EBV)-derived cancer susceptibility

- 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

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

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>, under review at *PLOS genetics*

Utsey, K., Gastonguay, M. S., Russell, S., Freling, R., Riggs, M. M., & Elmokadem, A. (2020). Quantification of the Impact of Partition Coefficient Prediction Methods on Physiologically Based Pharmacokinetic Model Output Using a Standardized Tissue Composition. *Drug Metabolism and Disposition*, 48(10), 903 LP – 916. <https://doi.org/10.1124/dmd.120.090498>

Zuppa, A. F., Benitez, G. R., Zane, N. R., Curley, M. A. Q., Bradfield, J., Hakonarson, H., Gastonguay, M. S., Moorthy, G., Prodell, J., & Gastonguay, M. R. (2019). Morphine Dose Optimization in Critically Ill Pediatric Patients With Acute Respiratory Failure. *Critical Care Medicine*, 47(6), e485–e494. <https://doi.org/10.1097/CCM.0000000000003741>

Zuppa, A. F., Conrado, D. J., Zane, N. R., Curley, M. A. Q., Bradfield, J., Hakonarson, H., Gastonguay, M. S., Moorthy, G., Prodell, J., & Gastonguay, M. R. (2019). Midazolam Dose Optimization in Critically Ill Pediatric Patients With Acute Respiratory Failure. *Critical Care Medicine*, 47(4), e301–e309. <https://doi.org/10.1097/CCM.0000000000003638>

## Oral Presentations

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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 23<sup>rd</sup>, 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 30<sup>th</sup>, 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 26<sup>th</sup>, 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 8<sup>th</sup>, 2018

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

## Poster Presentations

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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 28<sup>th</sup>, 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 15<sup>th</sup> – 18<sup>th</sup>, 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 16<sup>th</sup>, 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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<b>Summer Undergraduate Research Fund (SURF) Trimble Family Award</b>	May 2019
University of Connecticut Office of Undergraduate Research (\$4,000)	
<b>Holster Scholar</b>	May 2017
University of Connecticut Honors Program (\$4,000)	

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## Honors and Awards

<b>Blue Ribbon Poster Award</b> , ISoP Quantitative Systems Pharmacology Student Symposium	April 2021
<b>Dean's List</b> , The University of Connecticut	Sept. 2016 - May 2020
<b>Academic Excellence Scholarship</b> , The University of Connecticut	Sept. 2016 - May 2020
<b>Babbidge Scholar</b> , The University of Connecticut	Dec. 2017, 2019
<b>New England Scholar</b> , The University of Connecticut	Dec. 2018
<b>Global Citizenship Scholarship</b> , The University of Connecticut Education Abroad	Jan. 2017

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## Skills & Certifications

**Technical:** R; basic Python, Matlab, SQL, Julia, and bash shell; Git; LaTeX; OpenRefine; High Performance Computing with SLURM; *mrgsolve*; *shiny*; *tidyverse*; JAGS; Bayesian Data Analysis  
**Wet Lab:** Polymerase Chain Reactions, Gel Electrophoresis, Gel Extraction, Sanger 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

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## Professional Development and Continuing Education

### Attendee

<b>Advanced Shiny</b> , Phil Bowsher with RStudio	Sept. 2021
<b>Introduction to Bayesian Data Analysis</b> , Juliacon	July 2021
<b>Carpentries Instructor Training</b> , The Carpentries	Mar. 2021
<b>Shiny, RMarkdown, and RStudio Connect</b> , Phil Bowsher with RStudio	Mar. 2021
<b>Quantitative Trait Mapping in the Diversity Outbred</b> , University of Wisconsin-Madison	Dec. 2020
<b>Containerization with Singularity</b> , JAX	Oct. 2020
<b>Introduction to HPC</b> , JAX	Sep. 2020
<b>Human and Mammalian Genetics and Genomics: The 61<sup>st</sup> McKusick Short Course</b> , JAX	July 2020
<b>Shiny Reproducibility</b> , Joe Cheng at R/pharma 2019	Aug. 2019
<b>Machine Learning</b> , Max Kuhn at R/pharma 2019	Aug. 2019

### Instructor or Teaching Assistant

<b>Data Carpentry Genomics Workshop</b> , Bioinformatics Training Program at JAX (Instructor)	Nov. 2021
<b>Introductory Statistics with R</b> , Bioinformatics Training Program at JAX (TA)	Sept. 2021
<b>Introduction to R and RStudio</b> , Bioinformatics Training Program at JAX (TA)	June 2021

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## Professional Associations

Society for Industrial and Applied Mathematics (SIAM)  
International Society of Pharmacometrics (ISoP)  
American Statistics Association (ASA)

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## Volunteer Work and Extra-Curricular Activities

<b>Rubyfruit A Cappella</b> , The University of Connecticut	Sept. 2016 - May 2020
<ul style="list-style-type: none"><li>Elected as President (2019-2020), Assistant Music Director (2018 - 2019), and Treasurer (2017- 2018)</li><li>Coordinated funding, schedules, and rehearsals to record an album and distribute it on Spotify and Apple Music</li><li>Communicated with other executive board members to run productive fundraisers, rehearsals, and gigs</li></ul>	
<b>Math Motivators</b> , The University of Connecticut	Oct. 2017 - May 2019
<ul style="list-style-type: none"><li>Tutored high school freshmen from underprivileged schools in Hartford, CT</li></ul>	
<b>iGEM Genetic Engineering Team</b> , The University of Connecticut	Sept. 2016 - Dec. 2017
<ul style="list-style-type: none"><li>Developed and presented a project proposal for the iGEM jamboree with a team of students</li></ul>	
<b>Husky for a Day Volunteer</b> , The University of Connecticut	Sept. 2016 - May 2017
<ul style="list-style-type: none"><li>Guided prospective students around campus and answered questions about UConn</li></ul>	