Madeleine S. Gastonguay

(860) 578-7177 • 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

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

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
Advisor: 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 Cytoscape and GeneXplain
- Applied a structure-based control method for nonlinear systems to identify putative control targets
- Conducted virtual screenings to identify concerted perturbations resulting in reversion of the CL TNBC phenotype through machine learning clustering and classification methods

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
Advisor: Ahmed Elmokadem, PhD and Mathew Riggs, PhD

- 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 with *mrgsolve*
- Performed local sensitivity analysis, optimized model parameters, and validated the model by comparing model predictions to external published data

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
Advisor: 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

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

Summer Undergraduate Research Fund (SURF) Trimble Family Award May 2019
University of Connecticut Office of Undergraduate Research ($4,000)

Holster Scholar May 2017
University of Connecticut Honors Program ($4,000)

Honors and Awards

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 Carpentries Instructor

Professional Development and Continuing Education

Attendee

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

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

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, The University of Connecticut — 2016 - 2020
- 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
- Collaborated with other executive board members to run productive fundraisers, rehearsals, and gigs

Math Motivators, The University of Connecticut — 2017 - 2019
- Tutored high school freshmen from underprivileged schools in Hartford, CT

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

Husky for a Day Volunteer, The University of Connecticut — 2016 – 2018
- Guided prospective students around campus and answered questions about UConn