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

Relevant Coursework: Honors Multivariable Calculus, Honors Differential Equations, Linear Algebra, Partial Differential Equations, Honors Probability, Introduction to Mathematical Modeling, Transition to Advanced Mathematics, Analysis 1, Numerical Analysis, Number Theory, Discrete Chaos, Statistical Methods, Statistical Computing, Biostatistics, Introduction to Biology, Abridged Organic Chemistry, Genetic Engineering Tech Incubator, Honors Human Genetics, Biochemistry, Big Data for Biologists, Introduction to Computer Science

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 Fellowship 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 though 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 drugs metabolized by CYP1A2, 3A4, 2B6, and 2D6 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
- Conducted simulations to explore the change in drug exposure throughout pregnancy

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 could 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

Metrum Research Group, Simsbury, CT
Student Intern and Independent Study (September 2015-August 2016)
Topic: The effect of genetic variability on morphine and midazolam pharmacokinetics

- Estimated the effects of pediatric risk of mortality score on midazolam clearance using population pharmacokinetic modeling to estimate the magnitude of effect on drug exposure
- Collaborated with the Children's Hospital of Philadelphia
- Analyzed single nucleotide polymorphism variability in the sample dataset to determine which were most valuable to study

Skills

Computer: R programming including the packages shiny, tidyverse, and mrgsolve; Git; LaTeX; basic Python
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

Fellowships and Grants

Summer Undergraduate Research Fellowship (SURF) Trimble Family Award, University of Connecticut ($4,000) 2019
Holster Scholar, University of Connecticut Honors Program ($4,000) 2017

Honors and Awards

Babbidge Scholar 2017, 2019
New England Scholar 2018
Dean's List 2016-2020
Honors Scholar 2016 -2020
Academic Excellence Scholarship 2016 -2020

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

Publications and Presentations

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, 2019

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

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

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, 2017

Professional Development and Continuing Education

Dec. 2020	**Quantitative Trait Mapping in the Diversity Outbred,** University of Wisconsin-Madison
Oct. 2020	**Containerization with Singularity,** The Jackson Laboratory
Sep. 2020	**Introduction to HPC,** The Jackson Laboratory
July 2020	**Human and Mammalian Genetics and Genomics: The 61st McKusick Short Course,** The Jackson Laboratory