Jessica R. Conrad Hammer

Curriculum Vitae

University of Michigan
Department of Mathematics
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Summary of Qualifications

Ms. Conrad works on developing and analyzing mathematical, computational, and statistical models for the spread of infectious diseases. She has worked on smallpox, Ebola, dengue, Zika, Chikungunia, malaria, Chagas, influenza, SARS-CoV, and COVID-19. She is interested in modeling emerging and re-emerging infectious diseases and determining effective control strategies to halt disease transmission.

Education

Jan 2020 - Present **PhD in Applied & Interdisciplinary Mathematics and Scientific Computing**, *University of Michigan*, Advisor: Dr. Marisa Eisenberg and Dr. Trachette Jackson, GPA: 3.82.

Jan 2016 - May 2018 **Master of Science in Public Health, Biostatistics**, *Tulane University*, Advisors: Dr. John Lefante and Dr. Latha Rajan, Public Health Analysis: An Assessment of Polynomial Distributed Lag in Mosquito-Born Disease Risk Modeling, GPA: 3.97.

Aug 2013 - Dec 2016 **Bachelor of Science, Mathematics**, *Tulane University*, Advisors: Dr. James (Mac) Hyman and Dr. Claudia Herrera, Thesis: Mitigating Chagas Disease: Fighting an Infection with an Infection, GPA: 3.88.

Aug 2013 - Dec 2016 **Bachelor of Science, Public Health**, *Tulane University*, GPA: 3.88.

Grants and Fellowships

2019 Clare Boothe Luce Fellowship

Michigan Institute for Computational Discovery and Engineering Fellowship

2015 Louisiana Supervised Undergraduate Research Experience (SURE) Grant

Select Travel Grants SIAM-SEAS Conference (2018), Penny Jessop Travel Grant (2017), Student Government Association Grant (2017), ICMA-VI Conference (2017), SAMSI Undergraduate Workshop (2017), Newcomb-Tulane College Travel Grant (2015), SACNAS First Time Travel Grant (2015), Research Training Group Workshop on Agent-Based Modeling (2015)

Competitive Awards

2022 R&D 100 Award: Software/Services Category

R&D Special Recognition Medalists Silver: Battling COVID-19

Los Alamos National Laboratory 2022 Spot Award for Service to the Lab

2020 Los Alamos National Laboratory 2020 Spot Award for Emergency COVID Response

2020 Los Alamos National Laboratory 2020 Spot Award for Outstanding Performance

2017 Tulane 34 Award

NSF's SEES Fellows Award: Modeling for sustainability in a changing environment

2013 Presidential Scholar Award for Tulane University

Air Force Type II Four Year Scholarship

Professional Experience

May 2020 – Present **Graduate Research Assistant**, *Theoretical Division, T-6*, Los Alamos National Laboratory (LANL), I continue work to develop a database and models for 30 diseases of interest to the Defense Threat Reduction Agency, specific focus on emergency COVID modeling and response efforts.
PI: Dr. Paul Fenimore; **Role:** Research Assistant

July 2018 – Aug 2019 **Postmasters Research Assistant**, *Theoretical Division, T-6*, Los Alamos National Laboratory (LANL), I developed a database and models for 30 diseases of interest to the Defense Threat Reduction Agency; conducted anomaly analysis for driving factors of mosquitoes carrying West Nile Virus prevalence in the United States through internal LANL funding; and collected clinical, syndromic, and genomic data for the seasonal flu; I also conducted preliminary research assessing the accuracy of influenza diagnosis in clinical settings for the Department of Homeland Security.
PI: Dr. Paul Fenimore; **Role:** Research Assistant

Jan – Dec 2017 **Public Health Analysis Masters Thesis**, *School of Public Health and Tropical Medicine*, Tulane University, I constructed a polynomial distributed lag model under different truncation lag criteria (simple, marginal, and minimized AIC) to predict reported dengue cases in Ceará, Brazil. I determined which predictors were most significant for dengue transmission in Ceará.
Advisor(s): Dr. John Lefante Dr. Latha Rajan; **Role:** Research Assistant

May – Dec 2017 **Graduate Research Assistant**, *SEES Fellows*, New Mexico Consortium and LANL, I processed and analyzed raw data from climate, satellite imagery, Google Health Trends, Twitter, demographic information, and reported Dengue fever case counts in Brazil; generated ARMA prediction models in R for future dengue incidence from provided data streams; created a database to store raw data using MySQL for easier data access and manipulation.
PI: Dr. Carrie Manore; **Role:** Research Assistant

Jan 2017– May 2018 **Graduate Teaching Assistant**, *Department of Public Health*, Tulane University, I mentored and tutored 60 students per semester of the undergraduate "The Cell, the Individual, and the Community" course. This included preparing teaching materials before class, organizing course records, and grading quizzes, as well as providing tutoring assistance outside of class hours.
Professor: Dr. Latha Rajan; **Role:** Teaching Assistant

Jan – Dec 2016 **Undergraduate Research Assistant**, *Honors Thesis*, Tulane University, I researched theoretical mitigation strategies for Chagas disease in the USA using deterministic Susceptible-Infected-Removed (SIR) modeling techniques; programmed in Matlab to create a host-vector competing infection model; generated a comprehensive project technical report in LaTex. In addition, I conducted field research collecting data on Chagas prevalence in the greater New Orleans area.
Advisor(s): Dr. James Hyman and Dr. Claudia Herrera; **Role:** Research Assistant

May – Aug 2015 **Undergraduate Research Assistant**, *Mathematical and Theoretical Biology Institute (MTBI)*, Arizona State University, I conducted research on incentivizing reform programs in the Louisiana prison system, created a compartmental model and analysis using Matlab, Maple, and Mathematica programming.
Advisor(s): Dr. Christopher Kribs and Dr. Benjamin Morin, **Role:** Research Assistant

Aug 2014 – May 2015 **Undergraduate Research Assistant**, *Mathematical Modeling of Biological Systems*, Tulane University, I constructed epidemiological models using SIR techniques to summarize the impact of behavior change on Ebola incidence rates during the 2014 West Africa epidemic; compared results to a stochastic model; developed analytical and numerical simulations to solve linear and nonlinear differential equations.
PI: Dr. James Hyman, **Role:** Research Assistant

Sep – Dec 2014 **Smoke Free Ban Needs Assessment Coordinator**, *Louisiana Public Health Institute (LPHI)*, Tulane University, I conducted a needs assessment of New Orleans bar owners for LPHI, produced a literature review on the financial impact of smoking bans on bars and clubs, and reported results to LPHI to be used in the development of a government policy, the Smoke Free Ban.
Advisor(s): Dr. Elisabeth Gleckler, **Role:** Needs Assessment Coordinator

Selected Activities

Professional Associations

Rotary International, *Rotary Club of New Orleans Riverbend, New Orleans, LA*, An international service organization that provides humanitarian service to advance goodwill and peace around the world (2018).
Role: Volunteering through Rotary since January 2014. I worked with the Rotary Youth Exchange program as a Local Youth Exchange Coordinator

Delta Omega National Honorary Society, *Eta Chapter of Tulane University, New Orleans, LA*, Public health honorary society for accredited schools and programs of public health. (2018).

Omicron Delta Kappa Honors Fraternity, *Circle of Tulane University, New Orleans, LA*, National leadership honor society in the United States. (2017).
Role: Served as President of the Tulane Circle from Jan.–Dec. 2017. Organized and coordinated advisory board meetings with Tulane administrators

Rotaract, *Rotaract of Tulane, New Orleans, LA*, A service, leadership, professional and community service organization sponsored by Rotary International. (2014).
Role: Founding member of the Rotaract at Tulane club. Served as President from July 2016 – July 2017. Organized volunteer events with over 30 organizations in the New Orleans area and abroad, including transportation, event details, and recruitment of volunteers for each event, and received $2000 grant funding for community outreach in Kisumu, Kenya, for a water well project

Volunteer Activities

Refugee Health Program of the New Mexico Department of Health, *Santa Fe, NM*, (**2018-19**).
Role: Organized joint database for clinical and mental health information on refugees in New Mexico, and analyzed data from 2013-2018 for a 5-year retrospective EpiReport on the status of programs offered by the Refugee Health Program.

Graduate Student Government Association Networking Subchair, *Tulane University, New Orleans, LA*, (**2017-18**).
Role: Solely planned networking event with the aid of SGA for students of the Tulane School of Public Health and Tropical Medicine (SPHTM) for 150 guests with $6000 budget, and organized hotel contract and space, contacted alumni and students, and managed the budget for the Preceptor Thank You and Networking event.

Diversity Committee Member, *Tulane University, New Orleans, LA*, (**2017-18**).
Role: Served on graduate school diversity committee to improve student life.

Invited Presentations

2022 Summer School Instructor, **MSRI Summer School on Algebraic Geometry**, St. Mary's College, Moraga, California (July 12-16)

2021 Seminar Speaker, **AIM Student Seminar**, University of Michigan, Ann Arbor, Michigan (September 17)

2020 Seminar Speaker, **AIM Student Seminar**, University of Michigan, Ann Arbor, Michigan (October 30)

Guest Speaker for Class, **COMM 307: Social Networks**, University of Michigan, Ann Arbor, Michigan (September 30)

2019 Workshop Speaker, **Workshop on Modeling the Spread of Infectious Diseases**, Tulane University, New Orleans, Louisiana (February 22)

Guest Speaker for Class, **SPHU 1010: Introduction to Public Health**, Tulane University, New Orleans, Louisiana (February 22)

2018 Seminar Speaker, **Michigan Institute for Data Science Seminar**, University of Michigan, Ann Arbor, Michigan (September 27)

2016 Seminar Speaker, **Applied Mathematics Seminar**, Vassar College, Poughkeepsie, New York (October 28)

Private Presentation Speaker, **Ministry of Education of El Salvador**, San Salvador, El Salvador (February 24)

Conference Speaker, **Primer Congreso Internacional de Modelaje Matematico**, La Universidad de Francisco Gavidia, San Salvador, El Salvador (February 23)

Contributed Presentations

2018 Society for Industrial and Applied Mathematics, **42nd SIAM Southeastern Atlantic Sectional Conference**, Chapel Hill, North Carolina

Seminar Speaker, **CNLS Summer Talk Series**, Center for Nonlinear Studies (CNLS), Los Alamos National Laboratory, Los Alamos, New Mexico

Scientific Computing Around Louisiana, **SCALA 2018**, Baton Rouge, Louisiana

2017 American Geophysics Union **2017 AGU Fall Meeting**, New Orleans, Louisiana

American Society of Tropical Medicine and Hygiene, **2017 ASTMH Annual Meeting**, Baltimore, Maryland

International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems, **2017 ICMA-IV Conference**, Tuscon, Arizona

Seminar Speaker, **CNLS Summer Talk Series**, Center for Nonlinear Studies (CNLS), Los Alamos National Laboratory, Los Alamos, New Mexico

2015 Society for the Advancement of Chicanos and Native Americans in Science **2015 SACNAS National Conference**, Washington, D.C.

Tulane School of Science and Engineering, **SSE Research Day** , New Orleans, Louisiana

Publications

Book Chapters

[1]**Conrad, J. R.**, Xue, L., Dewar, J., & Hyman, J. M. "Modeling the Impact of Behavior Change on the Spread of Ebola." Mathematical and Statistical Modeling for Emerging and Re-emerging Infectious Diseases. (2016) *Springer.*

Peer Reviewed Journals

[1] Shutt, D. P., Goodsman, D. W., Hemez, Z. J. L., **Conrad, J. R.**, Xu, C., Osthus, D., Russel, C., Hyman, J. M., Manore, C. A. "A Process-based Model with Temperature, Water, and Lab-derived Data Improves Predictions of Daily Mosquito Density." (2022) *Journal of Medical Entomology.*

Peer Reviewed Conference Proceedings

[1]**Conrad, J. R.**, Ziemann A., Refeld, R., Parikh, N., Siraj, A., Generous, N., Del Valle, S., Fairchild, G., & Manore, C. "Understanding polynomial distributed lag models: truncation lag implications for a mosquito-borne disease risk model in Brazil." Algorithms, Technologies, and Applications for Multispectral and Hyperspectral Imagery XXV. (2019) *International Society for Optics and Photonics.*

[2] Ziemann, A., Fairchild, G., **Conrad, J.**, Manore, C., Parikh, N., Del Valle, S., and Generous, N. "Predicting Dengue Incidence in Brazil Using Broad-Scale Spectral Remote Sensing Imagery." IGARSS 2018-2018 IEEE International Geoscience and Remote Sensing Symposium. (2018) *IEEE*.

Technical Reports

[1] **Conrad, J. R.**, Guan, L., and Geneus, C. "Parameters Estimation, Identification and Uncertainty Quantification for Epidemic Models." (2018) Tulane University.

[2] **Conrad, J. R.**. "Public Health Analysis: An Assessment of Polynomial Distributed Lag in Mosquito-Born Disease Risk Modeling." (2018) Tulane University.

[3] **Conrad, J. R.**. "Honors Thesis: Mathematical Analysis for a Model to Control Chagas Disease: Fighting as Infection with an Infection." (2017) Tulane University.

[4] Hamins-Puertolas, M., **Conrad, J. R.**, Islas, G., Bossogo-Egoume, A., Kribs, C., and Morin, B. "Minimizing recidivism by optimizing profit: a theoretical case study of incentivized reform in a Louisiana prison." (2015) Mathematical and Theoretical Biology Institute.

[5] **Conrad, J. R.**, Hajmurad, F., Patel, N., Reddy, A., and Shukla, A. "Needs Assessment: The Louisiana Institute of Public Health Tobacco Free Living Campaign." (2014) Tulane University and the Louisiana Public Health Institute.

Pre-prints

[1] Mourant, J. R., Wilding, K., **Conrad, J. R.**, Miner, J. C., Atchley, A. L., Fenimore, P. W. "EpiGrid: Consistent parameterization of three diseases using a single model." (2021).

[2] Manore, C., Fairchild, G., Ziemann, A., Parikh, N., Kempfert, K., Martinez, K., Castro, L., Osthus, D., Siraj, A., **Conrad, J.**, Generous, N., Del Valle, S. "Unlocking the Predictive Power of Heterogeneous Data to Build an Operational Dengue Forecasting System." (2020) *bioRxiv*.

Proficiencies

Programming: R, Python, C++, LaTex, SAS, SQL, Matlab, Mac OS, Windows

Languages: Spanish (Conversational), German (Conversational)

Professional: Grant writing, mentorship, event planning, fundraising, disaster relief, media production

Selected Media Coverage

2020 Michigan Institute for Computational Discovery & Engineering, **Introducing the new Clare Boothe Luce Graduate Fellows at the University of Michigan**, 24 June 2019.

2017 New Mexico Consortium, **Student Research Seeks to Predict Dengue Fever Outbreaks**, 5 December 2017.

Scientific American, **Forecasting Outbreaks–1 Image at a Time**, 10 Aug 2017.

Tulane New Wave, **The Power of Tulane - Jessica Conrad**, 13 July 2017.

Tulane New Wave, **2017 grad applies math to track Ebola outbreak**, 28 Apr 2017.

References

Marisa Eisenberg, Ph.D., M.S.
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Epidemiology, Complex Systems, and Mathematics Departments, University of Michigan
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Dr. Eisenberg is my PhD advisor.

James "Mac" Hyman, Ph.D.
Evelyn and John G. Phillips Distinguished Professor
Mathematics Department, Tulane University
Email: mhyman@tulane.edu, Phone: (504) 862-3433
Dr. Hyman was my undergraduate mathematics advisor and headed two of my research projects, including my undergraduate thesis.

Carrie Manore, Ph.D.
Scientist
Information Systems and Modeling, LANL
Email: cmanore@lanl.gov, Phone: (541) 207-7969
Dr. Manore is the PI for the research project investigating driving factors for mosquitos and West Nile.

Paul Fenimore, Ph.D.
Scientist
Theoretical Biology and Biophysics, LANL
Email: paulf@lanl.gov, Phone: (505) 665-7744
Dr. Fenimore is the PI for the research developing a universal model for 30 diseases of interest to the Defense Threat Reduction Agency.