Harley Hanes | Curriculum Vitae

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Education

Degree Granting

Tulane University
M.S. in Computational Science *2019–2020*
GPA: 4.0
Tulane University
B.S. in Mathematics *2015–2019*
B.S.P.H. in Public Health
GPA: 3.8

Awards

Terry C. Lawson Prize in Mathematics
Tulane University School of Science and Engineering *May 2019*

Graduated Magna Cum Laude
Tulane University *May 2019*

Outstanding Research Presentation In Applied Mathematics
SACNAS Diversity in STEM Conference *October 2018*

Dean's List
Newcomb-Tulane College *2016-2019*

Summer Programs

Industrial Math/Stat Modeling Workshop
Statistical and Applied Math Sciences Institute (SAMSI) *July 2019*
Research workshop where myself and a group of graduate students partnered with Pacific Northwest National Labs (PNNL) to solve an industry focused research question.

Mathematical and Theoretical Biology Institute (MTBI)
Arizona State University *June–August 2018*
Undergraduate Research Experience where I researched control of Lyme Disease transmission and received introductions to stochastic and deterministic modeling, relevant mathematical concepts, and programs and languages such as Matlab, R, Mathematica, Maple, and Python.

Critical Language Scholar
U.S. Department of State *June–July 2016*
The Critical Language Scholar program sends students studying State Department target languages to native countries for 8 weeks of language and culture immersion. I studied Arabic in Madaba, Jordan, lived with a Jordanian host family, and had 40 hours a week of Arabic instruction. My cohort could only speak Arabic for the duration of the program.

Employment

Research Assistant
Tulane University School of Public Health and Tropical Medicine *August 2018–Present*

I am responsible for conducting the math modeling and some statistical analysis for the Herrera and Dumonteil labs' projects. My primary responsibility is creating a mathematical model for the transmission of *T. cruzi*, the causative agent for Chagas Disease, between its sylvatic and domestic cycles in the New Orleans area and using this model to estimate human risk and identify areas for intervention to reduce infected vectors in homes. I have also assisted with writing the mathematical modeling component of an NIH R01 grant application.

Resident Advisor

Tulane University Housing and Residence Life *August 2017–May 2019*

My responsibilities as a Resident Advisor in first year residence halls followed two main tracks of conduct enforcement and community building. I was on call approximately once a week to monitor and answer any issues in the dorm whether they be underage drinking or crises such as sexual assault or self-harm of residents. I also lived in the dorm and was responsible for building a community among my floor's residents by supporting them through personal difficulties, advising them on academic and course related issues, and organizing events to help build community. I also acted as a liaison between residents and Tulane faculty and staff running seminars or events.

Skills

Programming: Matlab, R, C++, Mathematica, HTML, JavaScript
Software: Latex, Linux, Git, MPI, VTK, Paraview, d3
Research: Proposal and grant writing, project presentation, high performance computing, data visualization, computational analysis, constructing literature reviews, modeling biological systems.
Linguistic: Arabic (Intermediate-Advanced), German (Intermediate).
Interpersonal: Significant mentoring experience, strong teamwork and conflict mediation skills.

Research Projects

Thesis Project (Ongoing)

'Sylvatic and Domestic T. cruzi Transmission Cycles and Chagas Disease Risk in New Orleans, Louisiana'

My research on Chagas Disease focuses on building an ordinary differential equation host-vector model of the transmission of *T. cruzi* in the New Orleans area. I seek to use it first to take the limited data sampling for the New Olreans area to construct an estimation of the number of infected vectors in homes, which is where they almost exclusively infect humans. I will also use the model to identify optimal steps of the transmission pathway for intervention so that we can develop new ways for reducing human risk. I have also conducted literature reviews of human case data to estimate the risk for human infection in Louisiana.

MTBI Project (In Review)

'Cost Benefit Analysis of Vaccination in Tick-Mouse Transmission of Lyme Disease'

My research at MTBI used a difference equation model for the transmission of *B. burgdorferi*, the causative agent for Lyme Disease, between ticks and white-footed mice to capture the seasonality of the tick life-cycle and behavior. We then quantified the effectiveness of mice vaccination at various frequencies to determine frequencies required to reduce the number of infected ticks below certain thresholds. Finally, we conducted a cost analysis comparing the yearly cost of different vaccination levels and estimated health expenditures saved by case reduction. We found that not only can vaccination significantly reduce infected nymph populations, it can be cost-effective in high-risk areas.

Industrial Modeling Workshop with PNNL

A Machine Learning Approach for Solving AC Optimal Power Flows

My research group partnered with Pacific Northwest National Labs (PNNL) to use machine learning algorithms to solve for optimal generator settings on small-scale power grids. This problem, otherwise known as optimal power flow (OPF), is usually solved with numerical algorithms, but their long computation time limits operators ability to update generator settings in real time. We generated data sets by perturbing IEEE's predefined 30-bus and 300-bus power flow system and trained neural networks and decision tree regression algorithms (XGBoost). We were able to train accurate and quick algorithms for the 30-bus system but were unable to train either algorithm on 300-bus systems.