PETE B. RIGAS

rigas.pete@gmail.com • https://github.com/peter-beep

EDUCATION

CORNELL UNIVERSITY DEPARTMENT OF STATISTICAL SCIENCE, ITHACA, NY
Master of Professional Studies (MPS) in Applied Statistics (Option I), May 2020
GPA: 3.691

CORNELL UNIVERSITY, ITHACA, NY
B.S. in Mathematics, *summa cum laude*, May 2019
GPA: 3.541
Honors:Dean's List: Fall 2016, Fall 2017, Spring 2018, Spring 2019
Activities: Volunteer, Mathematics Club
Member, CNS Journal Club
Regular Attendee, Probability Seminar

Graduate Coursework: Real Analysis, Algebra I & II, Commutative Algebra, Probability Theory I & II, Homological Algebra, Complex Analysis, Differentiable Manifolds, Topics in Probability Theory (Statistical Mechanics, Percolation), Riemannian Geometry, Algebraic Number Theory, Genomics/Genetics, Topics in Probability Theory (Random Dispersive Equations), Databases & SAS HPC with DBMS, Statistical Computation with SAS, Probability Models & Inference

WORKING ARTICLES

P. Rigas & C. Kulkarni, *Modeling exponential decay in maximum capacitance across specified flight patterns in small aircraft* (https://github.com/peter-beep/NASA/blob/master/PHM2020_Pete%20(6).pdf), *abstract submitted for PHM conference*

X. Xu, P. Rigas, Y. Sun, C. Itoga, K. Lam, J. Delgado, E.M. Callaway, E. Kim, *Genetically modified rabies tracing of global circuit connections to corticotopin-releasing hormone neurons in the hypothalamic paraventricular nucleus* (https://github.com/peter-beep/xulab/blob/master/CRH_PVN_tracing_0426.docx.pdf)

TALKS

- Annual Conference of the Prognostics and Health Management Society
  - upcoming presentation in virtual conference

- APS Physics March Meeting
  - presentation originally planned for March 2020, likely to resubmit for March 2021
  - abstract available at https://meetings.aps.org/Meeting/MAR20/Session/S20.13

RESEARCH EXPERIENCE

Interests: Discrete Probability, Statistical Mechanics

Languages: Matlab, Python, familiarity with SAS and SQL

PHIL SOSOE, DEPARTMENT OF MATHEMATICS, CORNELL UNIVERSITY, ITHACA, NY
Research Assistant *in Probability*, Sept. 2018 –

- Statistical Mechanics I: Studied different types of percolation, configurations of physical systems, Poisson point processes.

- Supervised reading on *Subcritical phase of d-dimensional Poisson-Boolean Percolation and its vacant set (2018)*, the *Existence of phase transition for percolation using the Gaussian Free Field (2018)*, and *Upper bound on the decay of correlations in a general class of O(N) symmetric models (2014)*.

GUILLAUME LAMBERT, Applied and engineering physics, Cornell University, Ithaca, NY

Research Assistant *in Probability/Data Analysis*, Sept. 2019 –

- Statistical Mechanics II: Studied binding energies of the FnCas12a protein, developing generalizations of a thermodynamic model to predict binding energies for wider families of Cas proteins (https://github.com/peter-beep/Lambert-Lab)
  - Supervised reading on *Massively parallel CRISPRi arrays reveal concealed thermodynamic determinants of dCas12a binding (2018)*
  - Generalized work from aforementioned paper to compute randomized partition functions for a thermodynamic model of Cas protein binding, under random permutations of base pair mismatches, from contributions of an exponential random variable. Derived upper bounds by enforcing the criterion that the transition probabilities of the random walk strictly decrease across base pair mismatches (https://github.com/peter-beep/Lambert-Lab/blob/master/Lambert_Lab_update%20(3).pdf)

PETER MCMAHON, Applied and engineering physics, Cornell University, Ithaca, NY

Research Assistant *in PDE, quantum computing, fluid mechanics*, January 2020-

- Solving PDEs with Quantum Computing: Formalized, and applied, quantum variational algorithm for solving non-linear problems in various PDEs, primarily focusing on the Navier-Stokes equations (https://github.com/peter-beep/McMahon-Lab).
  - Supervised reading on *Variational quantum algorithms for nonlinear problems*
  - Developed implementations in Python to study nonlinearities of the Navier Stokes, Poisson and Euler equations.

NASA Ames Research Center, MPS PROJECT, Cornell University, Ithaca, NY

Research Assistant to *Dr. Chetan Kulkarni*, in *battery fault detection,* January 2020 -

Modeling Battery Health: (https://github.com/peter-beep/NASA).

- Supervised reading on *Verification of Prognostic Algorithm to Predict Remaining Fliying Time for Electric Unmanned Vehicles*
- Generated prognostics predictions for chamber experiments on small aircraft by computing exponential decaying, time dependent quantities.

SMITH LAB, Cornell University, Ithaca, NY

Research Assistant *in Analysis*, June 2018 – Dec. 2019

- Hippocampus & Retrosplenial Cortex Project: Explored the connection of the hippocampus with learning and memory (https://github.com/peter-beep/Smith-Lab).
  - Developed implementations in Matlab to *(i)* view Dot plots, heatmaps, and place fields, *(ii)* calculate p-values, rate remapping indices, correlation values for left and right hemispheres in hippocampal recordings
  - Processed hippocampal ripple data by *(i)* identifying beginning and ending times of sharp wave ripples, *(ii)* quantifying the number of spikes 3 seconds before the onset of each sharp wave ripple, *(iii)* identifying the maximum times of unique cell firing, *(iv)* approximating the final time of each sharp wave ripple
  - Dynamically modeled firing rates to study memory representations and formations in the hippocampus and retrosplenial cortex, by *(i)* computing different initial firing rates in the retrosplenial cortex, *(ii)* correlating initial rate of firing in the retrosplenial cortex to firing rates in the hippocampus, *(iii)* performing principal components analysis to determine whether representations in the hippocampus, on the neuronal ensemble level, are numerically correlated to firing rates in the retrosplenial cortex.

GLENN HEALEY, Uc irvine samueli, Irvine, CA

Research Assistant *in Probability*, June 2019 – Aug. 2019

- Statistical Mechanics III: Implemented Simulated Annealing (SA) algorithm for surface fitting.
    - Supervised reading on *Bayesian method for computing intrinsic pitch values (2018)*
    - Developed implementations in Matlab to *(i)* group velocities from 2014 MLB player data into groups based on numeric thresholds, *(ii)* compared relative energies of different pitches, from the initial and final velocities.
    - *(i)* Calculated different initial and final temperatures *T*, cooling factors, energy norms, *(ii)* generated smooth surfaces by cross correlating different groups of data points, *(iii)* empirically determined data of pitch values that minimized errors *E_i*.

KECK SCHOOL OF MEDICINE OF USC, Los Angeles, CA

Research Assistant *to Ophthalmologist Cheryl M. Craft*, June 2019 – Aug. 2019

- Clusterin Project: Studied whether injections of the clusterin protein impact the degeneration of eyesight in rats and mice, as a human model for studying ophthalmic disorders, in addition to other human models for lung and liver cancers (https://github.com/peter-beep/Craft-Lab).
    - Developed implementations in Matlab to *(i)* detect, and count, dots representing nuclei of cells on the eyes of rats and mice, *(ii)* 'sketch,' and calculate, the area of Voronoi domains corresponding to nuclei, *(iii)* distributionally represent the area of Voronoi domains, *(iv)*, calculate, and compare, values of Clusterin coefficients for individual Voronoi domains.
    - Analyzed ERG data to *(i)* calculate mean Voronoi domain area, *(ii)* construct Voronoi tessellations through colorings of Voronoi domains on the lattice.

XU LAB, UC Irvine, Irvine, CA

Research Assistant *in Optogenetics & Data Analysis*, Oct. 2013 – Aug. 2017

- SADDG-EGP Project: Made use of the retrograde SADDG-EGP virus, in addition to the CAV2-Cre adenovirus tracing to study connectivity between anterodorsal BNST (adBNST), and other areas of the brain. Determined that a SADDG-EGP retrograde virus, in comparison to the canine adenovirus, labeled less neurons in the paraventricular, medial and lateral hypothalamus, and amygdale-hippocampal area.
- BNST Project: Quantified more than 20,000 fluorescent labels of bodies sharing neural pathways with the central and medial amygdala, visual cortices, and brain stem from either the medial or lateral BNST.
- PVN Project: Enumerated regions that received significant input, which include the dorsomedial, ventromedial and lateral hypothalamus, lateral and medial preoptic nuclei, and arcuate nuclei.