Tessa A. Rhinehart

103 Clapp Hall, Fifth and Ruskin Aves, Pittsburgh, PA, 15260
tessa.rhinehart@pitt.edu · (814) 331-7131 · tessarhinehart.com

Education

Swarthmore College · *Swarthmore, PA* · GPA: 3.88 2013-2017

- B.A., Biology, May 2017.
  - Awarded **Leo M. Leva Memorial Prize** for students whose work shows unusual promise
- B.A., Mathematics, May 2017.
  - Awarded **Heinrich W. Brinkmann Mathematics Prize** for exemplary service to Math Department
  - Senior conference paper: Markov-chain Monte Carlo methods for the construction of phylogenetic trees

Additional Training

University of Pittsburgh Graduate School of Public and International Affairs · GPA: 4.0 2019-present

- Graduate courses to supplement interests in environmental and energy policy

UC Davis Data Intensive Biology Summer Institute Jul 2017

- Two week-long courses, in Python and in R, geared toward using languages for large-scale data analysis

Research Experience

Research Programmer · *Kitzes Lab, University of Pittsburgh* Feb 2018-Present

- Create machine learning models to classify animal vocalizations, for use in automated acoustic surveys
- Develop and implement methods for data analysis, including Bayesian hierarchical models programmed in R
- Supervise lab operations: maintain computing resources, manage data collection and field operations
- Develop data collection protocols and train collaborators; instruct and oversee undergraduate researchers

Research Collaborator · *Cornell Lab of Ornithology* Nov 2017-Feb 2018

- Collaborated on project programming a neural network to classify recordings of Red Crossbills (*Loxia curvirostra*)

Metagenomics Analyst · *Swarthmore College & UC Santa Barbara* Jan 2017-Aug 2017

- Applied bioinformatic data analysis to understand phototrophic diversity in "pink berry" microbial aggregate
- Teaching Assistant for Advanced School of Quantitative Biology, Kavli Institute of Theoretical Physics at UCSB

Frances Velay Research Fellow, Swarthmore College · *Swarthmore, PA* May 2016-Sep 2016

- Described and identified function of a newly discovered behavior in Satin Bowerbirds, *Ptilonorhynchus violaceus*
- Used Google Apps Script (Javascript) to manage video database and behavioral data

Bird Banding Research Assistant · *Allegheny Plateau Region, NY & PA* Jun-Aug 2014-2017

- Worked in teams to mist net, collect biometric data, and keep records (1341 net-hours, 319 birds processed)
- Assisted in training new volunteers on banding skills and educating visitors on applications of collected data

Data Archivist, USDA Forest Service · *Irvine, PA* Jun 2014-Aug 2014

- Implemented Excel macros to find irregularities in long-term data
- Wrote metadata and compiled reference documents for study: experimental background, materials, and methods

Publications

Journal Articles

Rhinehart, T.A., Turek, D., Kitzes, J. *In preparation.* A generalized occupancy model for autonomous biodiversity surveys.

Miao, Z.H.*, **Rhinehart, T.A.***, Lapp, S., Kitzes, J. *In preparation.* Machine learning models for the acoustic identification of 500 North American bird species. * - *Authors contributed equally*

Chronister, L., **Rhinehart, T.A.**, Kitzes, J. *Submitted.* Evidence of acoustic avoidance in a community of Eastern North American birds. Behavioral Ecology.

Kitzes, J., Blake, R., Bombaci, S., Chapman, M., Durán, S.; Huang, T., Joseph, M., Lapp, S., Marconi, S., Oestreich, W., **Rhinehart, T.A.**, Schweiger, A., Song, Y., Surasinghe, T., Yang, D., Yule, K. *Submitted.* Expanding NEON biodiversity surveys with new instrumentation and machine learning approaches. Ecosphere.

Chronister, L.C., **Rhinehart, T.A.**, Kitzes, J.K. *In review.* An annotated set of audio recordings of Eastern North American birds containing frequency, time, and species information. Ecology.

Rhinehart, T.A., Chronister, L.M., Devlin, T., Kitzes, J. 2020. Acoustic localization of terrestrial wildlife: Current practices and future opportunities. Ecology and Evolution, 10(13):6794-6818.

Magazine Articles

Rhinehart, T.A.. 2020. Eavesdropping on Birds: Bird conservation powered by breakthroughs in machine learning. Birding, April 2020:44-49.

Datasets

Rhinehart, T.A., Weldon, C.A., Stout, S.L. 2016. Kane Experimental Forest: Overstory tree data from a thinning study in Allegheny hardwoods. Fort Collins, CO: Forest Service Research Data Archive.

Presentations

Submitted

"Free, open-source machine learning classifiers for acoustic recognition of 500 common North American bird species"
Contributed Talk, Ecological Society of America Annual Meeting Aug 2020

"A free, open-source machine learning model for identifying the songs of 500 common North American bird species"
Contributed Talk, North American Congress for Conservation Biology Aug 2020

"OpenSoundscape: Machine learning for scalable acoustic surveys"
Contributed Poster, Ecological Society of America Annual Meeting Aug 2019

Invited & Professional

"Listening to a Landscape: perspectives on big data from the field of bioacoustics"
Invited Seminar, University of Kansas Sept 2020

"Eavesdropping on Animals: Autonomous acoustic wildlife surveys"
Webinar, Ecological Society of America Jul 2020

"How do I scale up acoustic surveys with AudioMoths and automated processing?"
Tutorial, WILDLABS Tech Tutors Jul 2020

Science Communication & Outreach

Bucks County Birders Sept 2020

Three Rivers Birding Club Aug 2020

Kirtland Bird Club May 2020

American Birding Association Apr 2020

State College Bird Club Oct 2019

IEEE Pittsburgh Section Jul 2019

Teaching Experience

Teaching

Teaching Assistant, Advanced School of Quantitative Biology, UC Santa Barbara Jul-Aug 2017
Kavli Institute of Theoretical Physics

- Supported students' efforts to sequence & analyze metagenomic data; culture & assess kelp microbiome diversity
- Attended concurrent lecture series, *Eco-Evolutionary Dynamics in Nature and the Lab*

Grader, Swarthmore College Department of Mathematics and Statistics Sep 2015-May 2017
Discrete Mathematics (Spring & Fall 2015, Spring 2016, Spring 2017) · Statistical Methods (Fall 2016)

- Developed grading scheme for students' problem sets and provided individual feedback on work and writing style

Teaching Associate & Tutor, Swarthmore College Dept. of Biol. · *Cellular & Molecular Biology* Sep-Dec 2015

- Facilitated discussions in group study sessions, clarifying gaps in knowledge
- Tutored one-on-one to strengthen students' understanding of course material and to set comprehension goals

Environmental Education and Interpretation Intern, Allegany State Park · *Salamanca, NY* Jun-Sep 2014

- Created and presented interpretive hikes on local wildlife and identification of invasive species

Undergraduates mentored

Lauren Chronister · *University of Pittsburgh* 2018-Present

Anna Lippert · *University of Pittsburgh* 2019-2020

Lydia Zimmerman · *University of Pittsburgh* 2018

Selected Honors & Awards

Heinrich W. Brinkmann Mathematics Prize · *Swarthmore College Department of Mathematics and Statistics* 2017

Leo M. Leva Memorial Prize · *Swarthmore College Department of Biology* 2017

Frances Velay Research Fellowship · *Panaphil Foundation* 2016

Robert K. Enders Scholarship · *Swarthmore College* 2015, 2016

The Patty Y. and A.J. Bekavac Scholarship · *Swarthmore College* 2015, 2016

LeRoy G. Erickson Memorial Scholarship 2013, 2014, 2015, 2016

Margaret Johnson Hall '41 Scholarship for the Performing Arts · *Swarthmore College* 2013, 2014, 2015

PSECU Scholarship · *Pennsylvania State Employees' Credit Union* 2013, 2015, 2016

YWCA Women in Leadership – Young Leader · *Bradford, PA* 2013

National Merit Scholarship · *National Merit Scholarship Corporation* 2013

National Advanced Placement Scholar Award · *The College Board* 2012

Professional Activities

Secretary, Pennsylvania Ornithological Records Committee · *Penn. Society for Ornithology* May 2020-Present

- Circulate and manage ornithological records for the state of Pennsylvania
- Maintain records committee website

Member, Ecological Society of America May 2018-Present

Founder & President, Women+ in Mathematics & Statistics · *Swarthmore College* May 2016-May 2017

- Arranged club meetings, academic development workshops, meet-and-greets with professors, and social events

Member, Sigma Xi Scientific Research Honor Society 2016-2018

Service, Leadership, and Other Employment

Pennsylvania Voter Protection · *Pennsylvania Democrats* Aug 2020-Nov 2020

- Used data science techniques to identify fraud in Pennsylvania petition records
- Created script to automatically email legal documents to poll watching volunteers

Sheraden Kiwanis Club · *Pittsburgh, PA* Apr 2018-Present

- Volunteer to serve the Sheraden, Pittsburgh community; promote early childhood learning and safety

Three Rivers Birding Club · *Pittsburgh, PA* Nov 2018-Present

- Assist with interpretive guided walks; introduce speakers for club meetings

Coordinator, Volunteer Income Tax Assistance (VITA) · *Swarthmore College Lang Center* Nov-May 2014-2017

- Managed volunteer recruitment, training, scheduling, and transportation to VITA sites in Delaware County, PA

Preparer, Volunteer Income Tax Assistance · *Community Action Agency of Delaware County* Jan 2014-Apr 2017

- Applied knowledge of federal law to interview, advise, & prepare accurate tax returns for low-income and elderly residents

Volunteer, PA District 161 State Representative campaign · *Delaware County, PA* Aug-Nov 2014

- Canvassed door-to-door & by phone, engaging constituents in discussions about candidate's stance on PA issues

Skills & Interests

Analytical techniques: Hierarchical modeling, Bayesian statistics, convolutional neural networks, occupancy modeling

Programming languages: Python, R, Javascript, Google Apps Script, C

Markup languages: LaTeX, HTML, CSS

Applications: GitHub, Audacity, Raven, Slurm Workload Manager, Amazon Web Services, MATLAB, GIMP, Microsoft Office, Google Apps & Extensions

Field skills: Avian surveying (eBird profile), mist net extraction and bird banding