Curriculum Vitae:

Jared Galloway

Scientific Programmer — Evolutionary Biologist

Personal details

Birth	January 13, 1995
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Education

BSc. Computer and Information Science, Honors 2014-2018

University of Oregon

3.99 Major GPA, 4.0 Basis. Graduated with departmental honors upon completion of an undergraduate thesis: *Speeding up the Tortoise* A Case Study in Optimizing Forward-Moving Evolutionary Simulations (see Honors). In conjunction with my computational background, my interests in biological mechanisms led me to explore population genetics through the use of simulation and theory. (see Projects — Papers)

Minor in Product Design 2014-2018

University of Oregon

My background in user-product interaction fuels my interest in building tools (primarily software) that provide a natural feeling solution to the obstacle at hand. I consider design to be a progressively impactful aspect of software engineering as more of the scientific community becomes reliant on technological solutions to diverse problems.

Honors Diploma 2009-2013

Bozeman High School

completed 300+ hours of community service through Montana Conservation Corps. Advanced Placement courses in Biology, Psychology, and Micro Economics.

Work experience

Scientific Programmer 2018-present

Institute of Ecology and Evolution, University of Oregon, Full-time

To further investigate my interests in computational biology, I have been working full time in both the Ralph Lab, and the Kern Lab making pipelines to train neural networks with simulated genomic data. I use my background in data structures and algorithms to create efficient methods of storing, processing, and feeding large data sets into deep learning models. (see Projects — Papers)

Research Assistant 2017-2018

Mathematics department, University of Oregon, Full-time

As an introduction to population genetics and simulations, I worked in the Ralph Lab and the Cresko Lab exploring the dynamics of rapid and parallel local adaptation of stickleback fish populations in Alaska. Using large, forward moving simulations I was tasked with producing and analyzing large data sets through the use of plotting and summary statistics. (see Projects — Papers)

Discrete Math Grader 2015-2017

University of Oregon, Part-time

Graded assignments for two series of discrete mathematics class. The material was centered around an introduction to proofs, combinatorics, and graph theory.

Skills

Preferred Workflow	Unix CLI, Git, Vim, LaTeX, Slack
Programming Languages	Python (fluent) C/C++ (proficient) Bash (proficient) Makefiles (proficient) - I like cmake Java (proficient) R (proficient) Haskell (intermediate) Javascript (intermediate)
Mathematics	Calculus I/II/III Linear Algebra I/II Discrete Math Graph Theory Statistics
Evolutionary Simulators	SLiM, msprime
Deep Learning Packages	Keras, Tensor Flow, numpy, matplotlib

Relevant Projects — Papers

Population genetic parameter inference, deep learning 2018-present

In progress

I am currently working to infer population genetic parameters (starting with ρ, for now) given the genotype matrix of a set of samples from a simulated population. As of now, vanilla architectures such as an LSTM are competitive to industry standards such as **LD Hat** when trained and tested on basic coalescent simulations. While impressive, we are not only interested in what deep learning *can* do, but also what limitations exist in terms of dealing with more complex demographic data. Moving forward, I'm personally interested in the representations and augmentations of data that allow neural nets to perform.

Undergraduate Thesis, *Speeding up the tortoise* 2017-2018

Accepted by department

For my undergraduate thesis, I implemented the first stages of genealogical tree sequence recording (*TreeSeq*) for a forward moving evolutionary simulator, **SLiM** 3.0. Using C/C++, our lab integrated the data structures and algorithms used in the backend of **msprime** for the *treeSequence* object with the core code of SLiM. By giving simulations the ability to avoid tracking neutral mutations, *TreeSeq* resulted in one-to-two orders of magnitude speedup in certain simulations. In the thesis, I describe; the concepts behind genealogical tree sequence recording, the algorithms and data structured needed to implement it in a forward moving simulation, and optimizations made to improve it. The paper does not describe testing and compilation methods used to bring the software together.

link: UO Report Portal

Tree Sequence Recording Applications 2017-2018

Under Review — Molecular Ecology Resources

Here, we describe the applications of genealogical tree sequence recording (*TreeSeq*). This includes the types of simulations which could benefit from the ability to avoid tracking neutral mutations. Many examples in the paper also describe how to read in the tree sequence produced into python and use the **msprime** API to extract a multitude of information from the object.

link: bioArxiv

The Sweet Spot for Local Polygenic Adaptation 2017-2018

Final stages of editing

Threespine stickleback fish provide a striking example of local adaptation in the context of recurrent gene flow. This Northern hemisphere-wide metapopulation includes both marine populations and a large number of smaller freshwater populations that have repeatedly adapted to freshwater conditions, often by using standing genetic variation. Here we use genealogical simulations to determine the levels of gene flow can best match the observed patterns of allele sharing among habitats in stickleback, and to provide a framework for better understanding of the dynamics of gene flow and local adaptation for the maintenance and reuse of standing genetic variation.

link: manuscript

Squirrel Suiter 2016

Google Play app store

Squirrel Suiter is an "endless flyer" game where you play as a jetpack-equipped flying squirrel, avoiding obstacles and munching acorns to gain the highest score.

link: Google Play

Image manipulator 2016

github

This is an object oriented, source-sink, approach to image augmentation written purely in C++ with only the vector library. It takes in pnm images, applies a desired set of filters to it, and returns the augmented image.

link: description and examples

References

— Dr. Peter L. Ralph

Principal Investigator, (University of Oregon) plr@uoregon.edu

— Dr. William R. Cresko

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— Dr. Andrew D. Kern

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