Nathaniel Saul

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Experience

Washington State University — Vancouver, WA

Graduate Research Assistant — *Aug 2017 - Present*

- Developing theory and algorithms in Topological Data Analysis (TDA) for visual exploration and feature extraction of complex data.
- Exploring applications of TDA to classifying astrophysics spectroscopy and interactive machine learning.
- Maintaining KeplerMapper, a **Python** library for data exploration that preserves the underlying topology of data.

Rohde and Schwarz — Beaverton, OR

Software Development Engineer in Test, Contract — *Mar 2017 - Aug 2017*

- Maintained and extended end-to-end test framework for radio-communication hardware in **Python** and **C++**.
- Developed and maintained **Jenkins** continuous integration infrastructure.
- Developed custom Jenkins automation tools and exposed interfaces to team using **Javascript** and **Flask**.

Performance Logic, Inc — Portland, OR

Applications Developer — *Apr 2016 - Mar 2017*

- Maintained and expanded cloud based hospital management software using **Javascript** and **C++**.
- Developed an xUnit port for an in-house scripting language and helped incorporate testing into software development process.
- Helped design and incorporated modern language features into in-house scripting language built on **C++**.
- Developed bug tracking tools and tracking integration for bespoke project management software using **Python**.

Corios Group, LLC — Portland, OR

Junior Analytics Consultant — *Jul 2015 - Apr 2016*

- Consulted with clients to design and develop custom analytics and modeling solutions in **SAS**.
- Developed a parser in **Python** to translate a bespoke fraud model from a proprietary format to functioning **SAS**.
- Developed hyper-parameter optimization **SAS** extension that increased client marketing campaign profits by 2%.

University of Hawai'i at Mānoa — Honolulu, HI

Undergraduate Research Assistant — *Sep 2013 - Jun 2015*

- Extended **CGAL** library to parameterize surfaces of MRI and implemented statistical tests on surfaces in **Python**.
- Implement swarm robotic control algorithms and oil spill simulation using **Python** and **NumPy**.
- Developed a real-time plotting application in **Python** for monitoring robotic components.
- Coauthored one publication on tracking algorithms in leading robotics conference.

Idaho National Laboratories — Idaho Falls, ID

Software Development Intern — *Summer 2013*

- Extended decision diagram in **C++** to include in-place upkeep of node probabilities while building the graph.
- Incorporated algorithm into nuclear safety software using **Delphi**.

Projects

KeplerMapper: Maintainer of open source KeplerMapper library in pypi. Designed to integrate with **Scikit-Learn**.

Persim: Developed a Persistence Images implementation in Python designed integrate with Ripser and Dionysus.

Code for Good Conference: Team lead of group developing web app for gathering expert labels.

Balsamroot Consulting: Statistical and technical lead for grant writing and evaluation consultancy.

Around Abouts: Developing blog for presenting concepts from TDA to data scientists.

Education

Washington State University — Vancouver, WA

Doctor of Philosophy in Mathematics; GPA: 3.91 — *Aug. 2017 – Present*

Research Assistantship in TDA with multi-university NSF project on phenomics (tdaphenomics.eecs.wsu.edu).

University of Hawaii — Honolulu, HI

Bachelor of Arts in Mathematics; Major GPA: 3.60 — *June 2015*

Publications

M. Fahad, **N. Saul**, Y. Guo, and B. Bingham, Robotic Simulation of Dynamic Plume Tracking by Unmanned Surface Vessels, in Proceedings of IEEE International Conference on Robotics and Automation, Seattle, WA, May 2015.

B. Bingham L. M. Fitzpatrick, K. Krasnosky, F. A. Sanabria, **N. Saul**, M. Fahad, and Y. Guo, "Experimental Evaluation of Fine-Scale Ocean Plume Structure Using Unmanned Surface Vehicles", IEEE Access Journal, under review.

N. Saul, H. J. van Veen. (2017, November 17). MLWave/kepler-mapper: 186f (Version 1.0.1). Zenodo. http://doi.org/10.5281/zenodo.1054444

Presentations

Understanding data through topology
Graduate Research Showcase - Washington State University Vancouver *Apr 2018*

Sewing with Topology; Stitching Mappers Together
Cascade Regional Applied, Interdisciplinary, and Numerical Mathematics - Portland State University *Apr 2018*

Building lenses into higher dimensions with Topology
Natural Sciences Graduate Student Symposium - Washington State University Vancouver *Feb 2018*

From Reeb Graph to Mapper: an introduction to TDA
Mathematics Seminar - Washington State University Vancouver *Sept 2017*

Grants/Awards

Research Showcase Graduate Podium Award Apr 2018
Second Place *$150*

Classification of galaxy spectra using level-set persistent homology Mar 2018
NASA Space Grant Award *$2,500*

Optimization of multi-vehicle path planning Nov 2016
NITC Scholar Award *$500*

Statistical analysis of the effects of Kinesio-tape Jan 2015
University of Hawai'i Undergraduate Research Opportunities Program *$5,000*

Modeling of fine-scale ocean plume dynamics for robotic control algorithms 2014
University of Hawai'i Undergraduate Research Opportunities Program *$5,000*

Real-time visualization tools for robotic component communications 2013
University of Hawai'i School of Engineering Research Award *$2,000*