Nathaniel Rivera Saul

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Development Experience

Washington State University — Vancouver, WA

Graduate Research Assistant — *Aug 2017 - Present*

- Extending methods of Topological Data Analysis extract shape information from complex data sets.
- Exploring applications of Mapper to understanding predictions of Machine Learning and Deep Learning models.

Pacific Northwest National Laboratory — Richland, WA

Visiting Graduate Researcher — *May 2018 - August 2018*

- Incorporated mathematically rigorous unsupervised learning methods into visual data exploration tools.
- Leveraged compressed sensing techniques for inpainting handwriting interferometer imaging.

Rohde and Schwarz — Beaverton, OR

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

- Maintained and extended end-to-end test framework for radio-communication hardware in Python and C++.
- 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*

- Implemented xUnit port for a proprietary language and encouraged testing in software development process.
- Designed functional programming language features into proprietary in-house scripting language.

Corios Group, LLC — Portland, OR

Junior Analytics Consultant — *Jul 2015 - Apr 2016*

- Developed hyperparameter optimization extension for a SAS client increasing marketing campaign profits by 2%.
- Developed a translator for a bespoke fraud modeling language to executable SAS code in Python.

University of Hawai'i at Mānoa — Honolulu, HI

Undergraduate Research Assistant — *Sep 2013 - Jun 2015*

- 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.

Skills

Languages: Python, Javascript, HTML, LaTeX

Frameworks & Technologies: scikit-learn, NumPy, Pandas, Flask, pytest, matplotlib, Git, Sphinx, D3.js, React

Education

Washington State University — Vancouver, WA

Masters of Science in Mathematics — *May 2019*

Courses: Statistical Learning Theory, Nonlinear Optimization, Computational Topology, Graph Theory, Analysis, Algebraic Topology, Network Optimization, Point-Set Topology, Science Communication, Regression Analysis.

University of Hawai'i at Mānoa — Honolulu, HI

Bachelor of Arts in Mathematics — *June 2015*

Courses: Probability and Statistics, Data Structures and Algorithms, Linear Algebra, Numerical Analysis, Real Analysis, Metric Analysis, Abstract Algebra.

Projects

Scikit-TDA (scikit-tda.org): I develop, curate, and maintain a suite of Python libraries for Topological Data Analysis intended for industry and academic data scientists.

Academic Work

N. Saul, and D. L. Arendt, "Explainable Machine Learning with Topological Data Analysis." Demo in VISxAI Workshop at IEEE Vis 2018. Berlin, Germany, October 2018.

E. Corbett, **N. Saul**, and M. Pirrung, "Interactive Machine Learning Heuristics" in Learning from Users Workshop at IEEE Vis 2018. Berlin, Germany, October 2018.

C. Tralie, **N. Saul**, and R. Barr-on, *Ripser.py, A Lean Persistent Homology Library for Python* in The Journal of Open Source Software, September 2018.

L. McInnes, J. Healy, **N. Saul**, and L. Groberger, *UMAP: Uniform Manifold Approximation and Projection* in The Journal of Open Source Software, September 2018.

B. Krishnamoorthy, **N. Saul**, and B. Wang, "Stitch Fix for Mapper" in Young Researchers Forum at International Symposium on Computational Geometry. Budapest, Hungary, June 2018.

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.

Presentations

Stitch-Fix for Mapper
SIAM CSE 2019 - Spokane, WA *Feb 2019*

Explainable Machine Learning with Topological Data Analysis
Mathematics and Statistics Seminar - Washington State University Vancouver *Aug 2018*

Stitch Fix for Mapper; Composing Mappers Together
Young Researchers Forum - International Symposium on Computational Geometry, Budapest, Hungary *June 2018*

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 and Statistics 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*

Volunteer Experience

SIAM CSE 2019 Student Volunteer - Registration desk

Cascadia Wild Camera maintanence crew

PyCon 2017 Volunteer - Speaker runner