

Brian de Silva

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I am a research scientist in the Applied Mathematics department at the University of Washington working at the intersection between machine learning and dynamical systems.

Education

University of Washington

Seattle, WA

Ph.D. in Applied Mathematics – advanced data science option

March 2020

- Dissertation: *Data-driven discovery and model reduction of complex systems*

University of California at Los Angeles

Los Angeles, CA

B.S. in Applied Mathematics – specialization in computing

December 2014

Experience

University of Washington Applied Mathematics

Seattle, WA

Research Scientist

Mar 2020 – Present

- Design a competition for benchmarking data-driven physical systems models on a variety of datasets.
- Developed a physics-informed anomaly detection method for flagging commercial airplane sensor faults.

Facebook

Seattle, WA

Software Engineer Intern – Machine Learning

Jun 2019 – Sep 2019

- Deployed three image retrieval models and trained a multi-channel (text, image, and preexisting dense embeddings) embedding for scam page detection, resulting in hundreds of scam page takedowns.
- Tools: K-nearest neighbors, proprietary retrieval methods, semantic embeddings, and convolutional neural networks.

Facebook

Seattle, WA

Software Engineer Intern – Machine Learning

Jun 2018 – Sep 2018

- Investigated embedding methods for using cross-domain features with in-domain models (transfer learning).
- Tools: Sparse neural networks, two-tower neural networks, and nonlinear embeddings.

Projects

PySINDy

May 2019 – Present

I co-wrote and maintain PySINDy, a Scikit-learn style open source Python package using sparse regression to infer nonlinear dynamical system models from measurement data. PySINDy is being actively developed and receives numerous pull requests each month. GitHub: <https://github.com/dynamicslab/pysindy>.

Course projects

Sep 2016 – Jun 2018

- *Fraud detection*: Anomaly detection with cost-sensitive classifiers (GBDT, neural network, random forests).
- *Computer generated haiku*: Trained a character-level LSTM to write haiku using a handcrafted haiku dataset.
- *Visualizing water polo shot statistics*: Visualization available at <https://cse512-18s.github.io/A3-water-polo-shots/>.

Additional information

- **Programming Languages**: I mostly use Python in my research for its object-oriented approach, extensibility, and quick development pace. I also have some experience with C++, SQL, and TensorFlow.
- **Relevant Graduate Coursework**: machine learning, data visualization, numerical optimization, statistics, numerical linear algebra, mathematical data analysis, and numerical analysis.
- **Teaching experience**: taught four applied math classes and acted as a TA for many others. I restructured a course to use mastery-based grading, improving student outcomes including retention and confidence in mathematical ability.
- **Extracurriculars**: Founded programs including a women's mentorship program and an annual graduate school panel as part of the Applied Math Diversity Committee (2017 – Present). Gave tutorials on Python, Make, Sublime Text, and other topics as the numerical analysis research club organizer (2015 – 2018). Sailing instructor (2018 – Present).

Selected publications

Brian de Silva, Kathleen Champion, Markus Quade, Jean-Christophe Loiseau, J Nathan Kutz, and Steven L Brunton. Pysindy: A python package for the sparse identification of nonlinear dynamical systems from data. *Journal of Open Source Software*, 2020.

Brian de Silva, David M. Higdon, Steven L. Brunton, and J. Nathan Kutz. Discovery of physics from data: Universal laws and discrepancies. *Frontiers in Artificial Intelligence*, 3:25, 2020.