Antony Sikorski

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EDUCATION

PhD, MS — Colorado School of Mines (CSM) 2022 - Present
Statistics PhD Candidate (graduation expected in May 2026)
Data Science MS awarded May 2024
Advisors: Douglas Nychka, Daniel McKenzie
Research Focus: Combining machine learning and spatial statistics to create fast, accurate, and interpretable methods for big datasets.

BS — University of California, San Diego (UCSD) 2018 - 2021
Major in Applied Mathematics, Minor in Physics

AWARDS

— **NSF GRFP** 2024
Awarded the National Science Foundation Graduate Research Fellowship in the second year of my PhD.

WORK EXPERIENCE

— **NASA Jet Propulsion Laboratory** May 2023 - Aug 2023
Machine Learning Intern

- Implemented anomaly detection system to predict communication failure modes between spacecraft and the Deep Space Network (DSN) antenna fleet.
- Automated many previously manual data acquisition and pre-processing pipelines.
- Designed pipelines to query LLM's such as GPT to rapidly process large amounts of non-confidential information and bypass web context limits.

— **Excelitas Technologies** Feb 2022 - Mar 2023
Data Consultant Aug 2022 - Mar 2023

- Continued to support data engineering and analysis projects for the improvement of the Excelitas data layer.

Data Analytics Engineer Feb 2022 - Aug 2022

- Identified critical to quality factors and worked with Process and Sustaining engineering teams to drive manufacturing improvements.
- Engineered measurement database to encapsulate all necessary BOM structure measurements.
- Automated the query of data to allow for statistical process control and process capability analysis.

— **Tutors and Friends** Jun 2020 - Feb 2022
Academic Tutor

- Tutored mathematics, physics, ACT, and SAT for all ages, with a focus on high school students and undergraduates.

RESEARCH EXPERIENCE

— **Predictive Models for Large Spatial Data (Thesis Projects)** Aug 2022 - Present
Colorado School of Mines *Advisors: Douglas Nychka, Daniel McKenzie*

- **Project 1:** Sped up the normalization of basis functions for fast Gaussian Process approximations. Two fast algorithms implemented in the `LatticeKrig` R package.

— **LEAP Momentum Fellowship** May 2024 - Aug 2024 (Present)
Columbia University, NYU Courant *Advisor: Sara Shamekh*

- Supervised the research of two undergraduate students
- Used machine learning and equation discovery methods to rediscover and improve parametrizations of vertical turbulent fluxes in the atmosphere. These advances improve the accuracy of long term climate model predictions.

— **Classication of Political Entity Relationships** Jun 2021 - Feb 2022
University of California, San Diego *Advisor: David Meyer*
Focused on quantifying and classifying relationships between countries using data from the ICEWS dataset with the aim of applying structural balance theory to predict changes in power dynamic.

— **Synthesis of Strongly Correlated Quantum Materials** Jan 2019 - Nov 2019
University of California, San Diego *Advisor: Brian Maple*
Used tetra-arcing and Optical Floating zone growths to synthesize superconductors and other strongly correlated quantum material in an attempt to find higher temperature superconductors.

— **Searching for Quantum Spin Liquids** Jun 2016 - Sept 2019
Colorado State University, Fort Collins *Advisor: Kathryn Ross*
Synthesized single crystals of strongly correlated materials in an attempt to study the exciting quantum spin liquid state. Used an Optical Floating Zone to grow crytals of Ytterbium Silicate and analyzed the structure through neutron scattering.

TEACHING EXPERIENCE

— **Introductory Statistics (Math 201)** Jan 2024 - May 2024
Colorado School of Mines
Taught the introductory undergraduate statistics course covering hypothesis testing, confidence intervals, regression, and general data analysis and wrangling proficiency in R.

— **Differential Equations (Math 225)** Aug 2022 - May 2023
Colorado School of Mines
Led recitations for two semesters and graded as a TA for the undergraduate differential equations course.

TECHNICAL SKILLS

— **Python:** Generally used for machine learning and data analysis. Notable proficiencies outside classic scientific computing libraries: PyTorch, TensorFlow, Keras

— **R:** Used for data analysis and statistical modelling. Currently developing an update for significant computational efficiency in `LatticeKrig` package for larga spatial data. Notable packages: fields, LatticeKrig, dpylr, ggplot2

— **typesetting:** proficient with LaTeX and Markdown

— **Other Languages:** Intermediate proficiency in Julia, SQL, Matlab, and version control in Git

— **Human Languages:** English (fluent), Ukrainian (beginner), Russian (fluent)

PUBLICATIONS

— "Normalizing Basis Functions: Approximate Stationary Models for Large Spatial Data" **A. Sikorski**, D. McKenzie, D. Nychka, *arXiv* (2024) – accepted for publication in *Stat* (Sept, 2024)

— "Crystal Growth of Quantum Magnets in the Rare-Earth Pyrosilicate Family $R_2Si_2O_7$, (R= Yb, Er) Using the Optical Floating Zone Method" H. S. Nair, T. DeLazzer, T. Reeder, **A. Sikorski**, G. Hester, & K. A. Ross, *Crystals* (2019)

SOFTWARE

— `LatticeKrig` (R): Computationally efficient methods for fitting and predicting from large spatial datasets. Available on CRAN.

TALKS & PRESENTATIONS

— "Machine Learning for Equation Discovery in Climate Science", **A. Sikorski**, invited talk at *Mines Optimization and Deep Learning Seminar (MODL)* (2024)

— "Parametrizing Turbulent Fluxes in the Planetary Boundary Layer with Symbolic Regression", L. Pong, G. VanZetten, **A. Sikorski**, Y. Qu, S. Shamekh, talk at *NY Climate Change @ LEAP* (2024)

— "Basis For Change: Approximate Stationary Models for Large Spatial Data", **A. Sikorski**, D. McKenzie, and D. Nychka

- Poster at *JSM (Joint Statistical Meeting)* (2024)
- Talk and poster at *IMSC (International Meeting on Statistical Climatology)* (2024)
- Poster at *GRADS (The Graduate Research and Discovery Symposium)* (2024)

— "Fast Prediction and Parameter Estimation for Large Spatial Data with Machine Learning" **A. Sikorski**, invited talk at *AMS Graduate Student Colloquium* (2023)

— "Exploring Neural Likelihood Surfaces for Spatial Processes", **A. Sikorski**, talk at *Mines Optimization and Deep Learning Seminar (MODL)* (2023)

— "Optical Floating Zone Growth of $Yb_2Si_2O_7$", **A. Sikorski**, H.S. Nair, T. Reeder and K.A. Ross, presented at the *APS Four Corners Conference* (October 2017)

SERVICE

— **Undergraduate Students Mentored**

- Laura Pong (LEAP, 2024)
- Greta VanZetten (LEAP, 2024)

— **Organization**

- Session Chair: "Risk Analysis, Management, and Investing" (JSM, 2024)
- Department Representative: Mines Graduate Student Government (GSG)

— **Software Review**

- `darkroast` R package (2024)
- `ZANJ` Python package (2023)

— **Affiliations**

- NASA Jet Propulsion Laboratory (JPL)
- Mines Optimization and Deep Learning (MODL)
- Learning the Earth with Artificial Intelligence and Physics (LEAP) NSF Science and Technology Center (STC)
- Society for Women in Mathematics (SWiM)
- American Statistical Association (ASA)