

Nicholas Fasano

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EDUCATION AND HONORS

Princeton University, Princeton, NJ

Doctor of Philosophy in Applied Physics

May 2023

Master of Arts in Applied Physics

Apr 2019

- GPA: 3.68/4.0, Relevant Coursework: Machine Learning and Pattern Recognition
- Awarded a fellowship from the Program in Plasma Science and Technology, covering stipend for 3 years

Syracuse University, Syracuse, NY

May 2017

BS in Aerospace Engineering, BS in Physics, Minor in Mathematics

- Graduated Summa Cum Laude, GPA: 3.93/4.0
- Four-time recipient of the Excellence by Aerospace Engineer award, totaling \$1,000 in received funds

DATA-DRIVEN RESEARCH EXPERIENCE

Postdoctoral Research Associate | Princeton University MAE

June 2023 – Present

Graduate Researcher | Princeton University MAE

Sept 2017 – May 2023

- Curated and wrangled terabyte-scale simulation data on a high-performance computing Linux cluster with the goal of building models for creating an intense ultraviolet light source from light-matter interactions
- Utilized python (numpy and scikit-learn) to model the data with linear regression, finding a 5x reduction in the ultraviolet energy when particle collisions are added to the simulation model
- Spearheaded the data collection and analysis for an experimental campaign which demonstrated a statistically significant 1.6x increase in the generated ultraviolet energy when using a 2-color laser instead of a 1-color laser
- Presented key research findings at six technical conferences and in three peer-reviewed journal articles
- Collaborated with teams at national labs and universities, contributing to experiment execution and data analysis

Undergraduate Researcher | Syracuse University MAE

June 2016 – Aug 2016

- Wrote a C++ program to generate and model a turbine blade for a 3D CAD software

SELECTED DATA SCIENCE PROJECTS (github.com/nfasano)

Movie recommender system via a collaborative topic model (CTM)

Jan 2023 – Present

- Developed an end-to-end movie recommender system and deployed it as a web-based app using gradio
- Engineered a data pipeline for webscraping, cleaning, and processing 160k film scripts using NLP. Synthesized film scripts with external datasets (IMDb and MovieLens) into a coherent database that can be queried with SQL
- Built a CTM (latent Dirichlet allocation + SVD) that shows a modest (1%) improvement in RMSE compared to SVD alone, but alleviates the new item cold-start problem with a recall@20 score of 41% for unrated movies

Colosseum ticket tracker and alert system

Apr 2023 – July 2023

- Built a webscraper that tracks the ticket availability for entry into the Colosseum from the official website
- Cleaned and processed the data to create heatmaps of ticket availability, revealing that tickets are released 30 days, 7 days, a 1 day before the ticket entry and that the tickets released 7 days prior are available for the longest

Sentiment classifier for Black Lives Matter (BLM) tweets

Jan 2021 – May 2021

- Built eight classifiers to predict the sentiment of a tweet toward the BLM movement, utilizing hypothesis testing for feature engineering and evaluation metrics (accuracy, F1-score, precision, recall) for model selection
- Logistic regression achieved the best prediction accuracy with 83%. Naive Bayes had a low accuracy of 73% but a high precision of 92%, suggesting that an ensemble model may improve prediction accuracy

TECHNICAL SKILLS

Programming: Python (numpy, pandas, scikit-learn, matplotlib), SQL, Matlab, High performance computing, Linux

Statistics/Machine Learning: *Regression* (Linear, Lasso/Ridge), *Classification* (Logistic, k-nearest neighbors, Naive Bayes), *Unsupervised* (SVD, Latent Dirichlet allocation)

Data Engineering: Webscraping, data cleaning, preprocessing, and feature engineering with NLP techniques

LEADERSHIP EXPERIENCE AND CERTIFICATES

Research Mentor Princeton University	Jan 2021 – Present
• Mentored undergraduate and graduate students by guiding the advancement of their research projects	
Assistant in Instruction Princeton University	Jan 2019 – Jan 2023
• Led problem-solving precepts, aided in project development, and advised students via office hours	
Physics Coach (Tutor) Syracuse University	Sept 2016 – May 2017
• Mentored students individually or in small groups, covering topics in physics, math, and engineering	
Teaching Transcript Certificate McGraw Center for Teaching, Princeton University	Dec 2022
Deep Learning Specialization Certificate Andrew Ng, Coursera	Sept 2021

SELECTED PUBLICATIONS AND PRESENTATIONS

- **N. M. Fasano**, M.R. Edwards, A. Giakas, et al., “Enhanced Relativistic Harmonic Generation using Plasma-Mirror-Shaped Laser Waveforms,” To be submitted.
- **N. M. Fasano**, M. R. Edwards, and J. M. Mikhailova, “Electron bunch dynamics and emission in particle-in-cell simulations of relativistic laser-solid interactions: on density artifacts, collisions, and numerical dispersions,” *Physics of Plasmas* 30, 063904 (2023).
- **N. M. Fasano**, M. R. Edwards, A. Giakas, et al., “Low-Order Harmonics Emitted from Relativistic Plasma Mirrors Driven by Two-Color and Elliptically Polarized Lasers,” APS DPP meeting, Bulletin of the American Physical Society, (2021). Oral.
- **N. M. Fasano** and J. M. Mikhailova, “High-Power Ultraviolet Vortex Beams Generated from a Relativistic Laser Interacting with an Ultrathin Foil,” CLEO: Conference on Lasers and Electro-Optics, (2021). Oral.
- M. R. Edwards, **N. M. Fasano**, T. Bennett, et al., “A multi-terawatt two-color beam for high-power field-controlled nonlinear optics,” *Optics Letters* **45**, 6542 (2020).
- M. R. Edwards, **N. M. Fasano**, and J. M. Mikhailova, “Electron-nanobunch-width-dominated spectral power law for relativistic harmonic generation from ultrathin foils,” *Physical Review Letters* **124**, 185004 (2020).