Brandon N. Benton, PhD

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 bnb32

Summary

Senior Software/Data Engineer at the National Renewable Energy Lab with a record of achievement in data science, machine learning, and scientific computing. Multiple publications and presentations relating to generative machine learning, renewable resource modeling, and earth system modeling. Additional experience instructing physics and mathematics classes for undergraduates and overseeing graduate student research programs.

Education

Cornell University   *Ithaca, NY*
PhD in Physics   *Jan 2016 – Jan 2019*

Cornell University   *Ithaca, NY*
MS in Physics   *Jan 2012 – Jan 2016*

Georgia Southern University   *Statesboro, GA*
BS in Physics   *Jan 2008 – Jan 2012*

Experience

Senior Software/Data Engineer   *Golden, CO*
National Renewable Energy Lab   *Jan 2022 – present*

- Lead developer on National Solar Radiation Database project (NSRDB).
- Streamlined NSRDB pipeline enabling 5x faster yearly reprocessing runs.
- Generalized NSRDB application scope and extended database beyond 60N latitude cap to full polar region.
- Added temperature-dependent snowy albedo model to improve accuracy of surface radiation predictions.
- Developed cloud property prediction and radiative transport models.
- Lead developer on Super Resolution for Renewable Energy Resource Data (SUP3R)
- Developed novel GAN-based downscaling methods, for SUP3R project, increasing speed of downscaling 300x over dynamical approaches.
- Led applications of this method to generate high-resolution wind resource data over Ukraine, Southeast Asia, and South America.
- Publicly released sup3r framework, consisting of comprehensive suite for feature engineering, data handling, model prototyping, training, and inference.

Post-Doctoral Fellow   *Ithaca, NY*
Cornell University   *Jan 2020 – Jan 2022*

- Designed and carried out research in areas of computer vision, climatology, weather patterns, and COVID modelling.
- Developed tools for detecting hurricane conditions in satellite images using computer vision techniques.
- Developed AWS interface to allow general public to perform climate simulations.
- Developed and planned hyperlocal weather forecasting system designed to improve winter-storm emergency response and enhance natural disaster coordination for New York state's rural communities.
- Led team of four undergraduate students using this code to perform on-demand weather forecasting for Tompkins County.
- Led research on effect of heat anomalies injected into aquaplanet SSTs and surface fields on polar vortex.
- Built custom compartmental infectious disease model including asymptomatic, symptomatic, hospitalization, and death projections for entire United States.

- Updated and improved complex database of tree ring information from variety of disparate, obscure, and hard-to-access data sources.

Data Scientist
Ithaca, NY
Independent Researcher
Jan 2012 – Jan 2021
- Designed and built working quadcopter with GPS-enabled navigation, remote control capability, and computer control interfaces.
- Developed Twitch bot to filter offensive content in channels, achieving 98% success rate and currently in use on Twitch channel.

Graduate Teaching Assistant
Ithaca, NY
Cornell University
Jan 2012 – Jan 2019
- Instructed classes in Climate & Energy, Computer Graphics, Numerical Analysis, and Fundamentals of Physics.
- Prepared examinations and classroom materials.
- Led class projects and lab sessions.

PhD Researcher
Ithaca, NY
Cornell University
Jan 2013 – Jan 2019
- Designed and carried out research in areas of fluid dynamics, condensed matter, and climate science.
- Developed and implemented numerical models to simulate complex physical systems.
- Analyzed large datasets using statistical and machine learning techniques.
- Published findings in peer-reviewed journals and presented at international conferences.

Skills

High Performance Computing: Well versed in distributed systems, job scheduling, and parallel optimization

Physics: Excellent understanding of atmospheric and climate physics

Programming: Proficient in Python, Bash, MATLAB, Mathematica, C++, Fortran

Machine Learning: Well versed in TensorFlow, Keras, Scikit-Learn

Mathematics: Excellent understanding of differential equations, statistics, finite difference methods, calculus, and linear algebra

Publications

The influence of cloud cover on the reliability of satellite-based solar resource data
Feb 2025
Yu Xie, Manajit Sengupta, Jaemo Yang, Aron Habte, Grant Buster, Brandon Benton, Michael Foster, Andrew Heidinger, Yangang Liu
Renewable and Sustainable Energy Reviews

Potential effects of climate change and solar radiation modification on renewable energy resources
Jan 2025
Andrew Kumler, Ben Kravitz, Caroline Draxl, Laura Vimmerstedt, Brandon Benton, Julie K Lundquist, Michael Martin, Holly Jean Buck, Hailong Wang, Christopher Lennard, Ling Tao
Renewable and Sustainable Energy Reviews

Tackling extreme urban heat: a machine learning approach to assess the impacts of climate change and the efficacy of climate adaptation strategies in urban microclimates
Nov 2024
Grant Buster, Jordan Cox, Brandon N. Benton, Ryan King
arXiv preprint arXiv:2411.05952

Integration of a Physics-Based Direct Normal Irradiance (DNI) Model to Enhance the National Solar Radiation Database (NSRDB)
Dec 2023

Yu Xie, Manajit Sengupta, Jaemo Yang, Grant Buster, Brandon Benton, Aron Habte, Yangang Liu
doi.org/10.1016/j.solener.2023.112195 (Solar Energy)

Super-resolution for Renewable Energy Resource Data with Wind from   July 2024
Reanalysis Data (Sup3rWind) and Application to Ukraine

Brandon N. Benton, Grant Buster, Pavlo Pinchuk, Andrew Glaws, Ryan N. King, Galen Maclaurin, Ilya Chernyakhovskiy

arXiv preprint arXiv:2407.19086. Wind Energy (Under Review)

High-Resolution Meteorology with Climate Change Impacts from Global   April 2024
Climate Model Data Using Generative Machine Learning

Grant Buster, Brandon N. Benton, Andrew Glaws, Ryan King

doi.org/10.1038/s41560-024-01507-9 (Nature Energy)

Intrinsic Century-Scale Variability in Tropical Pacific SSTs and Their   Dec 2022
Influence on Western US Hydroclimate

Colin P Evans, Sloan Coats, Carlos M Carrillo, Xiaolu Li, Marc J Alessi, Dimitris A Herrera, Brandon N Benton, Toby R Ault

Geophysical Research Letters

Minor Impacts of Major Volcanic Eruptions on Hurricanes in Dynami-   Sept 2022
cally-Downscaled Last Millennium Simulations

Brandon N Benton, Marc J Alessi, Dimitris A Herrera, Xiaolu Li, Carlos M Carrillo, Toby R Ault

Climate Dynamics

Approximate Mean-Field Equations of Motion for Quasi-2D Bose-Einstein   Nov 2012
Condensate Systems

Mark Edwards, Michael Krygier, Hadayat Seddiqi, Brandon Benton, Charles W Clark

Physical Review E

Prototyping Method for Bragg-Type Atom Interferometers   Oct 2011

Brandon Benton, Michael Krygier, Jeffrey Heward, Mark Edwards, Charles W Clark

Physical Review A

Momentum-Space Engineering of Gaseous Bose-Einstein Condensates   March 2011

Mark Edwards, Brandon Benton, Jeffrey Heward, Charles W Clark

Physical Review A