Brandon N. Benton, PhD

Data Scientist, Climate Scientist

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Senior Software/Data Engineer at the National Renewable Energy Lab. Record of achievement in the areas of data science, machine learning, and scientific computing. Multiple publications and presentations relating to climate modeling, condensed matter, and fluid dynamics. Additional experience instructing physics and mathematics classes for undergraduates and overseeing graduate student research programs.

Work History

2022-01 – Present
Senior Software/Data Engineer - *NATIONAL RENEWABLE ENERGY LAB, Golden, CO*

Solar:
- Streamlined NSRDB pipeline and led reprocessing for 2022 data update.
- Added temperature dependent snowy albedo model to improve accuracy of surface radiation predictions.
- Developing cloud property prediction and radiative transport models.

Wind:
- Led first-of-a-kind GAN downscaling of wind resource data over South-East Asia and North-America.
- Increased speed of downscaling by order of magnitude over dynamical approaches
- Publicly released robust GAN framework for feature engineering, data handling, model prototyping, training, and inference (Super Resolving Renewable Resource Data - sup3r).

2020-01 – 2022-01
Post-Doctoral Fellow - *CORNELL UNIVERSITY, Ithaca, NY*

Climate AI: *Image classification – Computer vision – python – TensorFlow – Keras*.
- Developing tools for detecting hurricane conditions in satellite images. Will help to identify hurricane conditions before hurricane formation.
- Using satellite composites for all storms after year 2000 for training.

Climate Modelling: *Cloud-based development – python – modelling*.
- Developing AWS interface to allow general public to perform climate simulations.
- Successfully ported CESM to AWS architecture for backend modeling.
- Developed novel tools to streamline CESM paleoclimate modeling.
- $250,000 Grant provided by Carl Sagan Institute.

Weather Forecasting: *Big Data – python – modelling – cloud-based development – applied math – education*.
- Developing and planning hyperlocal weather forecasting system designed to improve winter-storm emergency response and enhance natural disaster coordination for New York state's rural communities.
- Developed python code to setup WRF on AWS and post-processing environment on Amazon Workspace.
- Led team of four undergraduate students using this code to perform on-demand weather forecasting for Tompkins County.

Idealized Planet Simulations: *Cloud-based development – cluster deployment –*

Skills

High Performance Computing
●●●●● Excellent

Machine Learning
●●●●● Excellent

Data Visualization
●●●●● Excellent

Numerical Modeling
●●●●● Excellent

Statistical Analysis
●●●●● Excellent

Scientific Computing
●●●●● Excellent

Development

Python
●●●●● Excellent

Bash
●●●●● Excellent

TensorFlow
●●●●● Excellent

Keras
●●●●● Excellent

Mathematica
●●●●● Excellent

Pandas
●●●●● Excellent

Scikit-Learn
●●●●● Excellent

python – fortran – modelling.
- Led research on effect of heat anomalies injected into aquaplanet SSTs and drycore surface fields on polar vortex.
- Ran aquaplanet and drycore simulations on 5.34-petflop Cheyenne Supercomputer using CESM.

COVID Modeling: *Big Data – cloud-based development – python – modelling – applied math.*
- Built custom compartmental infectious disease model including asymptomatic, symptomatic, hospitalization, and death projections for entire United States.
- Social distancing included along with gradient descent-based parameter estimation.
- Correctly predicted deaths and hospitalizations in New York one month ahead.
- Model hosted on AWS and constantly updated using CovidTracking API.

Low Frequency Climate Variability in Tree Rings: *Big data – python – MATLAB – modelling – statistical analysis.*
- Updated and improved complex database of tree ring information from variety of disparate, obscure, and hard-to-access data sources.

Education

2016-01 – 2019-01 **PhD: Physics,** Cornell University - *Ithaca, NY*
Thesis: Analysis of Low-Frequency Climate Variability Through Computational Modeling and Tree-Ring Data Synthesis

2012-01 – 2016-01 **MS: Physics,** Cornell University - *Ithaca, NY*
Thesis: VR Quadcopter Telepresence Proposal

2008-01 – 2012-01 **BS: Physics,** Georgia Southern University - *Statesboro, GA*
Thesis: Prototyping method for Bragg-type atom interferometers
Graduated magna cum laude, University Honors Program

Certifications

- IBM Data Science Specialization
- Stanford Online Algorithms Specialization
- IBM Advanced Data Science Specialization
- IBM Applied Data Science Specialization

Publications

- Evans, C, Coats, S, Carrillo, C, Li, X, Alessi, M, Herrera, D, **Benton, B.N.**, and Ault, T.; "Intrinsic century-scale variability in tropical Pacific SSTs and their influence on western US hydroclimate," Geophysical Research Letters, 49(23), Dec. 2022.
- **Benton, B.N.**, Alessi, M.J., Herrera, D.A. *et al.* Minor impacts of major volcanic eruptions on hurricanes in dynamically-downscaled last millennium simulations. *Clim Dyn* (2022).
- Edwards, M, Krygier, M, Seddiqi, H, **Benton, B,** and Clark, C; "Approximate mean-field equations of motion for quasi-2D Bose-Einstein condensate systems," Physical Review E, 86(5), Nov. 2012.
- **Benton, B,** Krygier, M, Heward, J, Edwards, M, and Clark, C; "Prototyping method for Bragg-type atom interferometers," Physical Review A, 84(4), Oct. 2011.
- Edwards, M, **Benton, B**, Heward, J, and Clark, C; "Momentum-space engineering of gaseous Bose-Einstein condensates," Physical Review A, 84(4), Dec. 2010.

Git
Excellent

NumPy
Excellent

SciPy
Excellent