Aaron Webb

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Qualifications

- Ph.D. in High Energy Particle Physics, with research emphasizing AI, deep learning, big data, and statistical analysis. Strong background in mathematics, statistics and quantitative research
- Developed and implemented over 30 deep learning models for extremely large datasets which were used in published physics results, using Tensorflow, Keras, Pytorch, and XGBoost
- Extensive experience with Python, R, and C++ for data analysis and software development, writing code for 7 major published results as well as code used by over 4000 scientists

Education

Expected Spring 2021	Ph.D. Candidate in Particle Physics, The University of Texas at Austin Thesis: "Applying Deep Learning to Search for Physics Beyond the Standard Model in Higgs-Top Quark Interactions" | Advisor: Prof. Peter Onyisi
2015	B.S. in Physics, Duke University Graduated with Highest Distinction Thesis: "Vector Boson Scattering at the LHC" | Advisor: Prof. Alfred Goshaw

Skills

Expertise:	Machine Learning, Big Data, Data Visualization, Statistical Analysis Detectors and Sensors, Advanced Mathematics, Technical Writing
Machine Learning:	PyTorch, Tensorflow, Keras, ScikitLearn, H2O, XGBoost, TMVA
Programmings:	Python, C++, R, Shell, Numpy, Pandas, Git, Mathematica, ROOT, LaTeX

Professional Development

- Relevant Coursework - Introduction to Supervised Learning, Statistical Models for Big Data, Bayesian Statistics, Physics of Sensors
- Coursera - Deep Learning Specialization, Tensorflow for Artificial Intelligence, Data Structures and Algorithms in Python, SQL for Beginners
- Personal Projects - Used Convolutional Neural Networks in Keras, Tensorflow to achieve 98% accuracy on MNIST handwriting dataset, over 94% accuracy classifying images of dogs and cats
- Kaggle Competitions - Scored in the top 10% in fraud detection, loan prediction competitions using XGBoost, Pytorch

Experience

Artificial Intelligence and Machine Learning

- Designed and implemented over 30 deep learning models used in published particle physics results, including deep neural networks, boosted decision trees
- Built a neural network in PyTorch to reconstruct the momentum of the Higgs boson from detector information
- Used a deep learning model in Tensorflow to identify which of dozens of combinations of particles originated from the decay of a Higgs Boson, Top Quark
- Designed machine learning models in Keras, XGBoost to distinguish rare signal events from much larger backgrounds
- Produced hundred of plots in MatPlotLib, Seaborn, and ROOT visualizing data and evaluating performance of machine learning models

- Developed a custom pipeline for using industry standard AI tools within the framework of physics analyses

Statistical Analysis and Big Data

- Performed full data analysis for three major papers, generating and validating TBs of Monte Carlo simulations, and performed maximum likelihood fits which accounted for dozens of backgrounds, over 200 sources of systematic uncertainty
- Eight years of experience in physics research, performing data and statistical analysis used in seven published scientific results, and writing thousands of lines of code, primarily in C++ and python

Software Development

- Wrote code in C++ and Python to generate Monte Carlo simulations and process data. Code was used by myself and others to process hundreds of terabytes of data on a distributed computing network
- Responsible for maintaining and improving the backend data quality infrastructure of the ATLAS collaboration, used by over 4,000 scientists. Work included testing and deploying new releases, writing new features, and automating CI tests
- Developed monitoring software in C++ and Python tracking Data Quality server responsiveness and automatically responding to down times.

Teaching, Mentoring, and Communication

- Presented the results of my work at 6 major conferences, as well as dozens of talks in ATLAS research meetings
- Primary instructor of an inquiry based physics course for 4 semesters - responsible for teaching, designing the course curriculum, and writing all course materials. Received a 4.9/5 average rating from student evaluations
- Managed 3 Teaching Assistants as an instructor, and mentored several undergraduate students in physics research