Ryan Reece, Ph.D.

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Machine learning engineer / data scientist / physicist
Mountain View, CA

EXPERIENCE

Machine Learning Engineer | Apr 2018 - Aug 2022 (4 yrs 4 mos)
Cerebras Systems, Sunnyvale, CA

- Unicorn startup building high-performance machine learning accelerators, the first to achieve Wafer-Scale Integration
- Developed end-to-end model references in both pytorch and tensorflow, including the input data pipeline for Cerebras Wafer-Scale Engines
- Trained benchmark models and did exploratory optimization of various models for computer vision (ResNets) and NLP (GNMT, Transformer, Linformer, BERT, RoBERTa, GPT-2); explored impacts of using mixed precision, bucketing by sequence length, activation sparsity
- Model references and data pipeline code delivered to customer in the Model Zoo with several examples and detailed documentation
- Helped develop a new normalization layer, OnlineNorm, that uses streaming statistics to allow normalization of activations with small batch sizes [*NeurIPS 2019*]
- Triaged, explored, and tested customer-shared models; represented customer requirements to compiler engineers
- Directly engaged and supported customers in meetings and on-sites; helped in the development of demos; debugged model and data pipeline issues for customers
- Co-authored a blog about Getting started with PyTorch BERT models on the Cerebras CS-2 System

Artificial Intelligence Fellow | Jan 2018 - Mar 2018 (2 mos)
Insight Data Science, Palo Alto, CA

- Learned about data science and machine learning applications in a variety of business domains
- Developed cloud-based hyperparameter optimization platform: HYPR.AI, for automating the testing of many ML models using AWS/Paperspace in docker containerized jobs

Postdoctoral Research Fellow | Jul 2013 - Aug 2017 (4 yrs 2 mos)
Santa Cruz Institute for Particle Physics, The University of California, Santa Cruz, and
The European Council for Nuclear Research (CERN), Geneva, Switzerland

- 10 years (postdoc and Ph.D.) as a member of the ATLAS experiment, a 3000+ person collaboration looking for new physics in high energy proton-proton collisions at the Large Hadron Collider (LHC)
- Long involvement in codebase of more than 10 million lines of C++ and almost as many lines of Python
- Expert in petabyte data reduction (ATLAS ~10 PB/year), world-wide grid computing, and data visualization as a user and primary supporter of our group's 200-CPU computing cluster, accumulated more than 350k CPU-hours
- Lead analysis groups as "Editor" in different searches for signals of supersymmetry and exotic decays, contributed to 6 research publications, and defended their approval
- 2015-17, full-time support the operations of the data acquisition system (DAQ) and detector monitoring systems of the SCT (a tracking sub-detector in ATLAS)
- 2016-17, built more expertise in machine learning techniques, deep learning frameworks using Keras to build CNNs for particle classification, and another project using sklearn for anomaly detection

Graduate Researcher | Jun 2006 - Jul 2013 (7 yrs)
The University of Pennsylvania, Philadelphia, PA, and
The European Council for Nuclear Research (CERN), Geneva, Switzerland

- First summers as a student with Penn (2006-08) at CERN participating in the integration and commissioning of custom electronics for the Transition Radiation Tracker (TRT), the outermost sub-detector of the ATLAS tracker

- 2009-12, throughout most of the running of the LHC, rotated the on-call responsibility for the TRT DAQ
- Ph.D. research with the data from ATLAS focused on the identification of decays of tau leptons and their use in searches for new physics, a pattern recognition problem to identify a type of particle
- 2009-10, was the lead developer of the cut-based tau identification used with the first ATLAS data
- 2010-12, helped develop advanced tau identification using Boosted Decision Trees (BDTs) which superseded the above
- Knack for developing data analysis frameworks: *e.g.* pyframe has been used by several analyses in ATLAS
- The ATLAS and CMS experiments at the LHC discovered the long-sought-after Higgs boson, evidence of which was announced on July 4, 2012 [*Physics Letters B*, arxiv:1207.7214]

EDUCATION

- **Ph.D. Experimental Particle Physics**, The University of Pennsylvania (Philadelpha, PA), Jun 2006 - Jul 2013
  thesis: "A search for new physics in high-mass ditau events in the ATLAS detector"
- **B.S. Physics with Honors**, The University of Texas (Austin, TX), Aug 2003 - May 2006
  thesis: "Late pulsing in the Hamamatsu R1408 PMT used in the Sudbury Neutrino Observatory"

PUBLICATIONS

- Chiley, V. *et al*. (2019). Online normalization for training neural networks. *NeurIPS 2019*. [arxiv:1905.05894]
- Albertsson, K. *et al*. (2018). Machine learning in high energy physics community white paper. [arxiv:1807.02876]
- As a member of the ATLAS collaboration since June 1, 2008, I am an "author" of more than 800 publications (google scholar, inspire), however, my list of selected publications is here: rreece.github.io/publications, but in particular:

  1. Search for supersymmetry in a final state containing two photons and missing transverse momentum in $\sqrt{s} = 13$ TeV pp collisions at the LHC using the ATLAS detector. *European Physical Journal C, 76,* 517 (2016). [arxiv:1606.09150]
  2. Identification and energy calibration of hadronically decaying tau leptons with the ATLAS experiment in pp collisions at $\sqrt{s} = 8$ TeV. *European Physical Journal C, 75,* 303 (2015). [arxiv:1412.7086]
  3. A search for high-mass resonances decaying to $\tau^+\tau^-$ with the ATLAS detector. *Physics Letters B, 719,* 242-260 (2013). [arxiv:1210.6604]
  4. Performance of the ATLAS detector using first collision data. *Journal of High Energy Physics, 9,* 56 (2010). [arxiv:1005.5254]

SKILLS

- **General:** deep learning (NLP and CV), statistical analysis, data visualization, data-driven modeling, anomaly detection, neural network classifiers, boosted decision trees, petabyte data reduction, object-oriented design, polymorphic interfaces, writing technical reports, working independently and in groups, presenting my ideas, graduate level physics and mathematics
- **Programming languages (fluent):** C/C++/STL (17+ years), Python (15+ years);
  (experienced): javascript, SQL; **Markup languages:** LaTeX, Markdown, (x)html with css
- **ML / Data science software:** pytorch, tensorflow, keras, HuggingFace, matplotlib, numpy, scipy, scikit-learn, pandas, jupyter, AWS (EC2, S3), docker, singularity, ROOT, RooStats, TMVA
- **General software:** Linux, bash, git, svn, UML, QT, Mathematica
- **Hobbies:** poker, philosophy, cycling, climbing

Last updated: August 23, 2022