Ryan Reece, Ph.D.

Data scientist / machine learning scientist / physicist

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OBJECTIVE

I am looking for a challenging and rewarding opportunity in data science, with a focus on machine learning applications. Having completed a Ph.D. and postdoc in particle physics with the ATLAS experiment during the startup of the LHC and the discovery of the Higgs boson, I have 9+ years experience in data science, including techniques in data reduction, visualization, classification, statistical inference, and machine learning.

EXPERIENCE

Postdoctoral Research Fellow | July 2013 - August 2017
Santa Cruz Institute for Particle Physics, The University of California, Santa Cruz, and
The European Organization for Nuclear Research (CERN), Geneva, Switzerland

- ATLAS is a 3000+ person collaboration looking for new physics in high energy proton-proton collisions at the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN) near Geneva, Switzerland. Many theories of physics beyond the Standard Model have revolutionary implications for the concepts of symmetry and space-time, and for our understanding of the early universe.
- I've spent 10 years in ATLAS including time as a postdoc and Ph.D. student.
- LHC data requires a challenging data rate, coding environment, and distributed computing. The ATLAS codebase has more than 10 million lines of C++ and almost as many lines of Python. It is not uncommon for an analysis project to depend directly on parts of the codebase that are order 100 thousand lines, or more.
- I have become an expert in petabyte data reduction, high-throughput computing, and data visualization as the primary adminstrator of our group's 200-CPU computing cluster, on which I have accumulated more than 350k CPU-hours.
- I have played leading roles in analyses searching for signals of supersymmetry in high-mass diphoton events and other exotic decays. In two such projects, I was one of two "Editors" that serve as the management leads of a team of 5-8 analyzers, eventually write the paper, and defend its approval—over a period of about a year.
- 2015-17, I moved to Geneva to be at CERN full-time. I supported the operations of the DAQ and detector monitoring systems of the SCT (a tracking sub-detector in ATLAS), taking on-call shifts for those systems.
- I have also served as a mentor for UCSC students, advising them in issues about analysis, computing, and living abroad.
- For most of 2017, I have been building expertise in machine learning techniques, including deep learning frameworks and probabilistic databases. I have been doing research using Keras to build CNNs for particle classification, and in another project using BayesDB for anomaly detection.

Graduate Researcher | June 2006 - July 2013
The University of Pennsylvania, Philadelphia, PA, and
The European Organization for Nuclear Research (CERN), Geneva, Switzerland

- Penn designed, assembled, and installed the front-end electronics that read out, control, and power the Transition Radiation Tracker (TRT), the outermost sub-detector of the ATLAS tracker. I spent my first summers as a student with Penn (2006-08) at CERN, participating in the integration and commissioning of the custum electronics for the TRT.
- In January of 2009, I moved to the Geneva area to work at CERN full-time with the ATLAS Collaboration, and stayed there for the next four years. ATLAS began taking data from collisions at the LHC in November of 2009. Throughout most of the running of the LHC from 2010-12, I rotated with others the on-call responsibility for the TRT data acquisition system (DAQ).
- The focus of my Ph.D. research with the data from ATLAS has been on the reconstruction of hadronic decays of tau leptons and their use in searches for new physics, basically a pattern recognition problem to identify a type of particle. I helped with the commissioning and validation of the ATLAS offline tau lepton reconstruction with the first data, and the development of the cut-based identification.
- I helped develop a more advanced multivariate tau identification using Boosted Decision Trees (BDTs) which superseded the cut-based tau identification as the ATLAS standard.
- I have a knack for developing data analysis frameworks. One of which, 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 the 4th of July 2012.

EDUCATION

- **Ph.D. Experimental Particle Physics**
  The University of Pennsylvania (Philadelpha, PA), June 2006 - July 2013
  thesis: "A search for new physics in high-mass ditau events in the ATLAS detector"
  advisor: H.H. "Brig" Williams

- **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"
  advisor: Joshua R. Klein, GPA: 3.91/4, physics GPA: 3.94/4

SKILLS

- **General:** problem solving, programming, data visualization, object-oriented design, polymorphic interfaces, petabyte data reduction, statistical analysis, writing technical reports, working independently and in groups, presenting my ideas, graduate level physics and mathematics
- **Programming languages (fluent):** C/C++/STL (16+ years), Python (10+ years)
- **Data science software:** matplotlib, numpy, scipy, scikit-learn, pandas, ipython, keras, tensorflow, BayesDB, ROOT, TMVA, HistFitter
- **General software:** Linux (Redhat/SLC/Ubuntu/Debian), bash, git, svn, SQL, UML, QT, Mathematica, Keynote/PowerPoint/Beamer
- **Markup languages:** LaTeX, Markdown, (X)HTML with CSS, XML

SHOWCASE

- See more about by selected software project here: http://rreece.github.io/sw/
- You can download my thesis and publications here: http://rreece.github.io/publications/

Last updated: November 24, 2017