

# JAMES BEACHAM

CERN / Duke University

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in linkedin.com/in/james-beacham

## EXPERIENCE

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Research scientist

**Experimental particle physics**

📅 June 2014 - present 📍 CERN, Geneva, Switzerland

- Research physicist and analyst / data scientist at the Large Hadron Collider (LHC), full-time at CERN; affiliated with Duke U. (2018-present), previously Ohio State U. (2014-2018)
- Modeling of complex processes using a variety of tools (Monte Carlo methods, machine learning, etc.) to identify small signals against large backgrounds within very large datasets
- Statistics & statistical modeling, algorithm development, optimization, and data science for analysis of collision data to quantify degree of consistency between data and background-only hypothesis, compatibility with various signal hypotheses

Communications consultant

**Chelonia Applied Science at U. Basel**

📅 January 2021 - Present 📍 Switzerland

- Working on EU Horizon-supported projects

## KEY ACTIVITIES

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- Introduced multiple novel data analyses searching for new discoveries at CERN and acted as main analyzer or coordinator to model processes, develop algorithms, quantitatively distinguish signal from background, and facilitate publication
- Founder of major international working group and workshop/conference series devoted to difficult, rare signals in LHC data; personally organized and convened sessions on machine learning within these events
- Editor (with B. Shuve) of a major white paper about rare signals in LHC data
- Invited to speak at the BBC in Manchester, U.K., about machine learning and artificial intelligence at CERN
- Main organizer of 18 workshops / conferences over ten years at CERN about physics & beyond, including "ExaHealth 2021: Exascale computing & machine learning for public health"

## TECHNICAL SKILLS

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- C, C++, Python, etc.; UNIX/Linux; shell scripting; XML, HTML; Git; ROOT/RooStats; Mathematica; data mining; databases; machine learning techniques (decision trees, neural networks, etc.) and tools (Scikit-learn, TensorFlow, PyTorch, Colab, Jupyter, etc.); familiarity with Qiskit

## PERSONAL SKILLS

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- Founded, led, and managed numerous projects and groups
- Extensive experience leading and facilitating teams
- Instinctively drawn to the edges of any given field or pursuit
- Extensive experience communicating highly technical subjects with simplicity and rigor in both professional and public settings (e.g., my TED talk has been viewed 1.6 million times)

## EDUCATION

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Ph.D., Experimental Particle Physics  
**New York University**

📅 Awarded May 2014

B.S., Physics and Mathematics (double major)

**University of California, Santa Cruz**

📅 Awarded May 2008

## TECHNICAL PROJECTS

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**Statistical tests for compatibility of data and null or signal hypotheses**

- Extensive experience applying and comparing multiple methods (frequentist, likelihood-based, Bayesian) for statistical inference

**Searching for small signal excesses over large backgrounds**

- Extensive experience modeling background and signal distributions with various functions, developing algorithms, and searching for small potential signal excesses, as well as separating signal and background using multivariate machine learning methods

**Monte Carlo methods for modeling particle collision processes**

- Extensive experience simulating particle collision data using various software suites that employ Monte Carlo techniques

**Likelihood matrix method implementation in search for exotic Higgs boson particles**

- Wrote custom software (in C++) to implement something known as the likelihood matrix method to model multi-dimensional background processes in a search for rare signals that could indicate exotic Higgs boson discoveries at the LHC

**Coordinator for processing / reconstruction of ATLAS experiment collision data at the CERN Tier0 data centre**

- Acted, for 1.5 years, as coordinator of the initial processing of LHC collision data in the ATLAS experiment, managing big-data computing jobs using the CERN Tier0 data centre to convert raw collision data into a format analyzable by the 4000 ATLAS physicists

**Code reviewer for ATLAS reconstruction software**

- Acted as reviewer of proposed changes to ATLAS reconstruction software, providing feedback, requests for modifications, and ultimately approval for inclusion into central ATLAS software