

PROFESSIONAL EXPERIENCE

- Patents
 - Systems and methods of recurrent convolutional neural network (RCNN) decoding of surface codes for quantum error correction (QEC) (provisional, filed Feb. 13, 2025, USPTO #63/758184)
- Quantitative researcher, SPG RMBS at JPMorgan Chase (Aug. 2024 – present)
 - End-to-end techniques for the prepayment modeling of agency mortgage products.
 - Daily and weekly insights to support RMBS trading and market research.
 - Statistical models for agency mortgage products and ML augmentation.
 - Investigation of current RMBS hedging strategies and their impact on portfolio risk.
- Postdoctoral researcher (HEP-ex/quantum) at UC Santa Barbara (Oct. 2018 – Aug. 2024)
 - Quantum error decoding with a dedicated NN architecture of $\mathcal{O}(100,000)$ parameters, provisional patent filed Feb. 13, 2025, USPTO #63/758184 through Fermilab SQMS.
 - JINST study of pixelated tracking detector prospects for quantum computing
 - Extended C++ math library and STL with built-in GPU acc. and auto-differentiation for particle physics and statistics applications
 - Statistical analyses (w/ and w/o ML) of Higgs boson properties and other standard model measurements, and new physics searches
 - * Lead developer of matrix element and simulation tools in JHUGEN and MELALABS
 - * Contributing developer of CMS statistics tool COMBINE (recent publication; GitHub)
 - * Experience with diverse physics analyses, e.g., observation of four top production, evidence for off-shell Higgs bosons, Higgs couplings combination.
 - Development of CMS MIP Timing Detector GEANT4 software geometry
 - Organizing and convening workshops, e.g. at the LPC, on the Higgs boson, and training for advanced computing (see also Conferences and Talks below)
 - Former convener of the LHC Higgs Off-shell phenomenology subgroup (2019 – 2021)
 - Training of undergraduate (2) and graduate (5 at UCSB, 7 at other institutions) students
 - Lecturer for UCSB course PHYS 5: Modern Physics (April–June 2024)
- Graduate student researcher at Johns Hopkins University (Sep. 2013 – Oct. 2018)
 - Data-driven alignment and calibration of CMS tracker large structures, sensors, and sensor curvatures; incorporation of mass and vertex constraints and automatic data reweighting
 - Major contributor to CMS Higgs boson properties measurements (spin-parity, mass, lifetime, and width) in the four-lepton final state
 - Development and maintenance of JHUGEN event generator and JHUGENMELA matrix element library, expansion of these products for use in final states beyond $H \rightarrow 4\ell$
 - Teaching assistant for introductory physics courses (5) and laboratory sessions (3)
- Undergraduate student researcher at University of Rochester (Sep. 2009 – May 2013)
 - Low- ν method to measure the neutrino beam flux using neutrino scattering data; application to Fermilab NuMI neutrino beam flux studies using data from MINER ν A
 - Studies of the Gibbs free energy of 2×2 RNA tandem mismatches using NMR data
 - Voluntary Society of Physics Students tutor for PHY 122/142: Intro. E&M (Fall 2009)