

ULAŞCAN SARICA

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Quantitative researcher at JPMorgan Chase, associate

Formerly

Postdoctoral researcher at UC Santa Barbara – Fermilab LPC Junior Distinguished Researcher
CMS collaboration member at the CERN Large Hadron Collider

“I appreciate Ulascan’s willingness to make himself readily available to help others, demonstrating a genuine commitment to supporting students and colleagues alike... my colleague possesses a deep and comprehensive understanding of several subjects, particularly in the field of physics.” – Francesco Setti (TransMarket Group, former graduate student at UCSB)

Personal page |  ORCID  INSPIRE  Scopus  GitHub
 USARICA |  ML4QEC  IvyFramework |  MELALABS

(last update: July 8, 2025)

EDUCATION

- Johns Hopkins University (Sep. 2013 – Oct. 2018; Baltimore, MD, USA)
Ph.D. in Physics and Astronomy (Dec. 28, 2018); Springer Theses book publication award
- University of Rochester (Sep. 2009 – May 2013; *magna cum laude*, $\Phi B K$; Rochester, NY, USA)
B.S. in Physics and in Molecular Genetics; minor in Mathematics; certificate in Biophysics

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)

AWARDS, HONORS, AND SCHOLARSHIPS

- 2025 Breakthrough Prize in Fundamental Physics (as a member of the CMS Collaboration)
- Fermilab LHC Physics Center Junior Distinguished Researcher (2024)
- Springer Theses Award (2019)
- JHU William Gardner Fellowship (Spring, Summer 2015)
- JHU Owen Scholars Award (2013-2016)
- Phi Beta Kappa Honor Society membership (May 2013)
- *Magna cum laude* from the University of Rochester (May 2013)
- Stoddard Thesis Prize Honorary Mention (May 2013)
- University of Rochester Rush Rhees Scholarship (2009-2013)
- University of Rochester Dean's Scholarship (2009-2013)
- Phi Beta Kappa Iota Chapter 2010 Iota Book Award (Nov. 2010)
- CRC Press 2010 Freshman Chemistry Achievement Award (Sep. 2010)

SKILLS AND COMPETENCIES

Toolkit:

- *Programming:* C/C++, DPC++; CUDA; Alpaka; Intel oneAPI; Python; SQL; Fortran; Julia; Perl; UNIX/shell scripting; HTML
- *Machine learning:* PyTorch; Keras/QKeras, TensorFlow; XGBoost; scikit-learn
- *Quantum circuits:* Stim, Cirq, Qiskit; quantum error decoding algorithms
- *Scientific/statistical software:* NumPy, pandas, scipy, Minuit/iMinuit, Jupyter notebooks, Mathematica, R
- *High-performance computing:* HTCondor, SLURM grid computing; CVMFS, HDFS, and Ceph
- *Software development platforms:* GitHub, GitLab, CI/CD usage, debugging tools
- *Documentation:* LaTeX, Microsoft Office products, Adobe products
- Various other statistical analysis and simulation tools

Other competencies:

- *Languages:* Turkish (native), English (expert), German (intermediate), Spanish (beginner)

SCIENCE OUTREACH AND COMMUNITY INVOLVEMENT

- Outspoken supporter for a 10–TeV wakefield collider in the US
- Given various seminars on Higgs physics at the LHC and prospects in the past
- Fondly interacted with the youth in regional US science fairs
- Advising Turkish physics undergraduate or graduate student on particle physics
- Have been interviewed about perspectives on brain drain in Turkey
- Ballroom and Latin dance enthusiast outside of professional work

PUBLICATION RECORD ([link to full list](#))

Summary:

h-index: 156
Citations: > 95,000
in author list: > 950
of significant contrs. (list link):
 25 articles, 3 reports, 1 book,
 1 conference proc., 10 pre-prints,
 3 acknowledgments
Most cited articles w/ sig. contrs.:
 Higgs boson spin-parity
 (>950; published in `15)
 LHC Run 2 $H \rightarrow 4\ell$ properties
 (>750; published in `17)

Notable papers:

CMS statistics tool COMBINE:
 CMS collaboration, sub. to Comp. & Soft. for Big Science (2024).
 Conceptual study of tracking detectors for QPUs:
 U. Sarica, JINST 18 P12005 (2023). **(single author)**
 CMS silicon tracker alignment:
 CMS collaboration, Nucl. Instrum. Meth. A 1037 166795 (2022).
 First evidence at the LHC for off-shell Higgs boson production:
 CMS collaboration, Nature Phys. 18 (2022). **(editor)**
 Combination measurement of Higgs boson couplings:
 CMS collaboration, Nature 607 60 (2022).
 Handbook of LHC Higgs Cross Sections (>**1750 citations**):
 CERN Report CERN-2017-002-M (2017). **(subsection editor)**

PAST NOTABLE CONFERENCES AND TALKS ([link to full list](#))

CMS Topical Workshop on Off-shell Higgs Boson Production, Fermilab LPC (25–29 March, 2024):
Main organizer of the workshop, and of its advanced computing tutorials
 Multi-Boson Interactions, UC San Diego, San Diego, CA (29 Aug. – 1 Sep. 2023):
Multiboson final states with Higgs bosons in ATLAS and CMS
 SLAC LCWS 2023, Menlo Park, CA (15–19 May 2023):
Highlights and prospects of Higgs measurements at CMS
 Fermilab Wine and Cheese seminar (invited seminar, 3 Feb. 2023):
Higgs boson width and off-shell contributions to ZZ production
 Higgs 2022, Pisa, Italy (7–11 Nov. 2022): Co-convener of the Precision track

SCIENTIFIC REVIEW EXPERIENCE

• CMS Analysis Review Committee Activities

- **BPH-23-001**: *Measurement of $R(J/\psi)$ in the hadronic τ decay channel*, Aug. 2023–present (target journal: *Physical Review Letters*)
- **BPH-22-012**: *Test of lepton flavor universality in semileptonic B_c^+ meson decays in proton-proton collisions at $\sqrt{s} = 13$ TeV*, Mar. 2023–present (published: *Physical Review Letters*)
- **HIG-20-007**: *Constraints on anomalous Higgs boson couplings to vector bosons and fermions from the production of Higgs bosons using the $\tau\tau$ final state*, Mar. 2021–May 2022 (published: *Physical Review D*)

• CMS Collaboration-wide Reviews

- **BPH-21-005**: *Search for lepton flavor violating $\tau \rightarrow 3\mu$ decays in proton-proton collisions at $\sqrt{s} = 13$ TeV*, Sep.–Oct. 2023 (published: *Physics Letters B*)
- **TOP-21-013**: *Search for flavor-changing neutral current interactions of the top quark in final states with a photon and additional jets in proton-proton collisions at $\sqrt{s} = 13$ TeV*, Jul.–Aug. 2023 (published: *Physical Review D*)
- **HIG-23-002**: *Evidence for the Higgs boson decay to a Z boson and a photon at the LHC*, Jul. 2023 (published: *Physical Review Letters*)
- **SUS-21-006**: *Search for supersymmetry in final states with disappearing tracks in proton-proton collisions at 13 TeV*, Jun.–Sep. 2023 (published: *Physical Review D*)
- **TOP-22-008**: *Evidence for tWZ production in proton-proton collisions at $\sqrt{s} = 13$ TeV in multilepton final states*, Jun.–Jul. 2023 (published: *Physical Review Letters*)
- **HIG-22-007**: *Search for exotic Higgs boson decays to a pair of pseudoscalars in the $\mu\mu b\bar{b}$ and $\tau\tau b\bar{b}$ final states in proton-proton collisions with the CMS experiment*, May–Nov. 2023 (published: *European Physical Journal C*)

- **HIG-19-010:** *Measurements of Higgs boson production in the decay channel with a pair of τ leptons in proton-proton collisions at $\sqrt{s} = 13$ TeV*, Nov. 2021–Feb. 2022 (published: *European Physical Journal C*)
- **Conference Reviews**
 - **Higgs 2022, Pisa, Italy**, 7–11 Nov. 2022: Co-coordinator of Precision parallel sessions; reviewed 44 abstracts; facilitated communication between presenters and session/program coordinators

HIGHLIGHTS FROM THE MEDIA

- I. Fadelli, *Evidence of Higgs boson contributions to the production of Z boson pairs at high energies*, Phys.Org (25 Nov. 2022).
- T. Junk, *Higgs bosons off the shell*, Nature Physics News and Views (20 Oct. 2022).
- E. Gibney, *Happy birthday, Higgs boson! What we do and don't know about the particle*, Nature Briefing newsletter (4 Jul. 2022).
- J. Pivarski, *Half-life of the Higgs boson*, Fermilab at Work (27 May 2014).

FUNDING DURING FORMER RESEARCH ACTIVITIES

My work has helped my groups obtain grants from the DOE (UCSB; \$4.273 M during employment) and NSF (JHU; \$3.6 M during employment). I have also obtained the following scholarships and awards directly while working as a postdoc or graduate student:

- Fermilab LHC Physics Center Junior Distinguished Researcher award (2024, \$55,662)
- William Gardner Fellowship (Full funding of salary for Spring, Summer 2015)
- Owen Scholars Award (2013–2016, \$18,000)