

Michela Paganini

Lawrence Berkeley National Lab
NERSC - 059-4016N
✉ michela.paganini@yale.edu
☎ +1 (510) 423-2136

CERN CH - Bâtiment 15-S-007
Genève, Switzerland
🌐 <http://mickypaganini.github.io/>
👤 mickypaganini

Education

Yale University

Ph.D., Physics, in progress (expected 2018)
M.Phil., Physics, 2016
M.S., Physics, 2014 - student marshal

University of California, Berkeley

B.A., Astrophysics, 2013
B.A., Physics, 2013

University of Cambridge

Pembroke-King's Programme, 2012

Dissertation

Tentative title: *Machine Learning Solutions for High Energy Physics – applications to Monte Carlo tuning and to the search for Higgs boson pairs in the $\gamma\gamma b\bar{b}$ final state using pp collision data at $\sqrt{s} = 13$ TeV with the ATLAS detector* (in progress)

Research

CERN (European Organization for Nuclear Research)

Ph.D. Student, ATLAS Experiment
2013 - present

- Designing and implementing location-aware auxiliary-classifier Generative Adversarial Networks for fast detector-level physics simulation. Managing task force to deploy results in ATLAS simulation production code, and leading cross-talks with GEANT collaboration for integration into GEANT-V product release.
- Prototyping object permutation selection with pointer network-inspired neural net architectures.
- Pushing multi-stream LSTMs for event-level classification into production for the $hh \rightarrow \gamma\gamma b\bar{b}$ analysis. Coordinated a team of students on this project.
- Designed Recurrent Neural Networks for impact parameter based flavor tagging. Led effort to integrate into live analysis deployment by contributing to LWTNN code development.
- Using Dark Knowledge to replace the Matrix Element Method (MEM) — a Physics driven, computationally intensive routine — in order to streamline the $t\bar{t}H$ with $H \rightarrow b\bar{b}$ analysis pipeline.
- Refined boosted top-tagging technique using Deep Learning discrimination versus QCD background. Performed in-depth studies of pile-up and p_T dependence. Compared efficiency with substructure taggers.
- Contribution to code testing, maintainability, and documentation.

NERSC (National Energy Research Scientific Computing Center)

High Energy Physics Center for Computational Excellence Graduate Student Intern

May 2017 - present

- Researching, developing, and deploying customized Generative Adversarial Networks to accelerate computationally intensive Physics simulation of particles interacting with matter in heterogeneously segmented 3D detectors.
- Exploring and benchmarking deep neural networks training and evaluation in HPC environment on Cori (#6 TOP500) with TensorFlow optimizations for modern Intel architectures.
- Applying Computer Vision solutions for the identification of new Physics events from data in multi-channel, high-resolution sparse image format, using the search for R-parity violating supersymmetry as a case study.

Cambridge Institute of Astronomy

Summer Exchange Student

July-August 2012

- Galactic dynamics, mass-velocity profiles, and anisotropy variation.

Università degli Studi di Milano

Summer Research Assistant

June 2012

- Neutrino Physics at the Borexino experiment, Gran Sasso National Lab.
- Positronium formation studies for anti-hydrogen production at the AEGIS experiment at CERN.

SETI Institute, University of California, Berkeley

Undergraduate Research Assistant

2011

- Remote observing for Optical SETI.

Space Sciences Lab, University of California, Berkeley

Undergraduate Research Assistant

2010-2011

- Data collection and analysis for MAVEN, STEREO and VEX missions.
- Catalogs of coronal mass ejections, live monitoring of solar activity.

Teaching Department of Physics, Yale University

Teaching Fellow, Physics 440 (Quantum Mechanics and Natural Phenomena I), Spring 2015

Teaching Fellow, Physics 180 (University Physics - Mechanics), Fall 2014

Teaching Fellow, Physics 166L (General Physics Laboratory - E&M), Spring 2014

Teaching Fellow, Physics 165L (General Physics Laboratory - Mechanics), Fall 2013

College of Letters and Science, University of California, Berkeley

Undergraduate Student Instructor (UGSI), Sense and Sensibility and Science, 2012-2013

Reader, Physics H7A (Physics for Scientists and Engineers), 2012

Publications

W. Bhimji, S. Farrell, T. Kurth, M. Paganini, Prabhat, E. Racah, *Neural Networks for Physics Analysis on low-level whole-detector data at the LHC*, in proceedings of ACAT 2017.

M. Paganini, L. de Oliveira, B. Nachman, *CaloGAN: Simulating 3D High Energy Particle Showers in Multi-Layer Electromagnetic Calorimeters with Generative Adversarial Networks*, [arXiv:1705.02355].

L. de Oliveira, M. Paganini, B. Nachman, *Learning Particle Physics by Example: Location-Aware Generative Adversarial Networks for Physics Synthesis*, [arXiv:1701.05927].

The ATLAS Collaboration, *Measurements of Higgs Boson Properties in the Diphoton Decay Channel with 36.1 fb^{-1} pp Collision Data at the Center-of-Mass Energy of 13 TeV with the ATLAS Detector*, [ATLAS-CONF-2017-045].

The ATLAS Collaboration, *Optimisation and Performance Studies of the ATLAS b -Tagging Algorithms for the 2017-18 LHC Run*, [ATL-PHYS-PUB-2017-013].

The ATLAS Collaboration, *Identification of Jets Containing b -Hadrons with Recurrent Neural Networks at the ATLAS Experiment*, [ATL-PHYS-PUB-2017-003].

The ATLAS Collaboration, *Search for Higgs boson pair production in the $b\bar{b}\gamma\gamma$ final state using pp collision data at $\sqrt{s} = 13 \text{ TeV}$ with the ATLAS detector*, [ATLAS-CONF-2016-004].

Invited Talks, Posters, and Panels

Machine Learning for Jet Physics, LBNL, December 2017

Mitchell Institute for Fundamental Physics and Astronomy, TAMU, October 2017

NERSC Data Day, LBNL, September 2017

18th International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT 2017), University of Washington, August 2017

Women in Computer Vision Workshop (WiCV) at the 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Hawaii Convention Center, July 2017

Machine Learning and b -Tagging in ATLAS, SLAC, May 2017

Fermilab Machine Learning Group Kick-Off, FNAL, May 2017

Data Science @ HEP Workshop, FNAL, May 2017

Berkeley Institute for Data Science Faire, UC Berkeley, May 2017

AI at SLAC Seminar, SLAC, March 2017

Inter-Experimental Machine Learning Workshop, CERN, March 2017

2nd Developers@CERN Forum, CERN, May 2016

3rd HEP Software Foundation Workshop, LAL Orsay, May 2016

Languages and Skills

Languages: Italian, English (bilingual), French (intermediate), Spanish (elementary), Latin

Computing: Python, C, C++, Docker, Git

Libraries: TensorFlow, Keras, scikit-learn, NumPy, SciPy, Matplotlib, pandas, ROOT

Interpersonal Skills: project management, leadership, effective communication, knowledge sharing, mentoring, active listening, flexibility

Awards and Fellowships

High Energy Physics Center for Computational Excellence Summer Fellowship,

NERSC and Lawrence Berkeley National Laboratory, 2017

Leigh Paige Prize, Yale Physics Department, 2013

UC Summer Grant, UC Berkeley, 2012

University of California Undergraduate Grant, UC Berkeley, 2011-2012

UC Freshman Scholarship, UC Berkeley, 2010

Summer Schools Scaling to Petascale Institute 2017
Thematic CERN School of Computing 2017
SLAC Summer Institute 2016

Outreach and Leadership

CERN

S’Cool Lab Tutor
Open Geneva Hackathon, *Preventing Suicide with Social Media Data*
DiploHack, *Extracting Sensitive Human Rights Data from Inaccessible Countries*
TEDxCERN Volunteer
THEPort CERN Hackathon, *Integrating Humanitarian Data*
POP Science, Nuit des Chercheurs
CERN Guide

Yale University

Graduate Student Assembly - Representative for Department of Physics
Graduate School of Arts and Science Executive Committee
Academics and Professional Development Committee Secretary
McDougal Graduate Student Life Fellow
Yale Minority Advisory Council - Graduate Representative
Board Member of Italian Society of Yale Students and Affiliates
Graduate Affiliate at Pierson Residential College
Co-Founder of iUSA (Italian University Societies in America)

University of California, Berkeley

Society of Physics Students (SPS) Officer
SWPS Physics Undergraduate Coordinator
Member of Order of Omega Leadership Honor Society
Academic Tutor at Athletic Study Center
Founder of Italian Society at Berkeley
Team Manager - Div I Women’s Tennis Team
Emerging Leaders Institute at Butler University

References

Prof. Paul Tipton
Department of Physics
Yale University
paul.tipton@yale.edu

Prof. Tobias Golling
Department of Particle and Nuclear Physics
University of Geneva
tobias.golling@unige.ch

Prof. Amir Farbin
Department of Physics
University of Texas, Arlington
afarbin@uta.edu

Dr. Wahid Bhimji
NERSC
Lawrence Berkeley National Laboratory
wbhimji@lbl.gov