

# Stefano Castro Tognini

## Curriculum Vitæ

Oak Ridge National Laboratory

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stognini

### Professional experience

2019

**Postdoctoral Research Associate, Oak Ridge National Laboratory.**

HPC Methods for Nuclear Applications Group | Nuclear Energy and Fuel Cycle Division

### Education

2012

2018

**Ph.D. in Physics, Federal University of Goias.**

High Energy Physics, focused on cosmic ray data analysis in the NO $\nu$ A Experiment

Funding: CAPES, CNPq, ANL

INSPIRE  
HEP

[inspirehep.net/record/1692030](https://inspirehep.net/record/1692030)

DOE OSTI

[www.osti.gov/biblio/1468447-observation-multiple-muon-seasonal-variations-noa-near-detector](https://www.osti.gov/biblio/1468447-observation-multiple-muon-seasonal-variations-noa-near-detector)

2010

2012

**M.Sc. in Physics, Federal University of Goias.**

High Energy Physics, focused on cosmic ray Monte Carlo simulation

Funding: CAPES, Fermilab

2005

2009

**B.Sc. in Physics, Federal University of Goias.**

### Collaborations

2020

**Celeritas Project, Oak Ridge National Laboratory.**

**A GPU-based HEP Monte Carlo particle transport software**

- Core member of the Celeritas development team.

 celeritas-project

2020

**URL Muon Detector Project, Oak Ridge National Laboratory.**

**A compact muon detector apparatus developed to test and validate new non-destructive techniques for geological disposal safety assessments (GDSA).**

- Core team member involved with all stages of the project: Detector design, simulation, commissioning, deployment, and analysis.

2013

2018

**NO $\nu$ A Experiment, Fermilab.**

**NuMI Off-axis  $\nu_e$  Appearance Experiment**

- **Ph.D. Thesis** [[Phys. Rev. D 99, 122004 \(2019\)](#)]

- **The NO $\nu$ A Remote Operation Center at Federal University of Goias**

- Commissioned, certified, and maintained the NO $\nu$ A ROC @ UFG between 2016 and 2018.

- **Integration of CORSIKA in the NO $\nu$ A ART Framework**

- Developed an integration layer software for between CORSIKA and Fermilab's ART Framework.

- Used by the MicroBooNE Collaboration to integrate CORSIKA in LArSoft. The package also became the standard MC of ProtoDUNE.

- **APD quality assessment task force**

- NO $\nu$ A detector channels consist of wavelength-shifting fibers submersed in liquid scintillator and connected to Avalanche Photo Diodes (APDs). The work consisted in testing the quality of these APDs before being installed in the NO $\nu$ A Near Detector.

- Trained new people to keep the APD testings running at the end of the Near Detector commissioning period.

- **On call emergency contact for Near Detector related issues (8 months)**

 novaexperiment.fnal.gov

2011

## **MINOS/MINOS+ Experiment, Fermilab.**

### **Main Injector Neutrino Oscillation Search Experiment**

(Data taking period ended in June 29, 2016. Data analyses are still ongoing.)

 [www.numi.fnal.gov](http://www.numi.fnal.gov)

- **MINOS/MINOS+ Remote Operation Centers**

- Worked to produce a centralized package and documentation for commissioning and maintaining Remote Operation Centers (ROCs) for the MINOS/MINOS+ Experiment.
- Participated in writing a certification process for Remote Operation Centers. Current certification processes used by all neutrino experiments at Fermilab are based on it.
- Built and maintained the MINOS ROC at UFG. This was the first certified MINOS ROC outside Fermilab. This was the first certified ROC of any Fermilab neutrino experiment.
- Provided technical support and keep documentation up to date for all MINOS(+) ROCs.
- Deployed and maintained the MINOS+ Control Room at FNAL's ROC-West until the end of the experiment.

- **Data analyses**

- Produced Monte Carlo, helped writing, and participated in two data analyses:
  - Observation of seasonal variation of atmospheric multiple-muon events in the MINOS Near and Far Detectors [[Phys. Rev. D \*\*91\*\*, 112006 \(2015\)](#)]
  - Measurement of the multiple-muon charge ratio in the MINOS Far Detector [[Phys. Rev. D \*\*93\*\*, 052017 \(2016\)](#)]

## **Scholarships**

2012

### **Ph.D., Federal University of Goias.**

Funding: CAPES.

2016

2014

### **Argonne National Laboratory & Fermi National Accelerator Laboratory, Ph.D. candidate.**

Funding: Argonne National Laboratory and Science Without Borders Fellowship (CAPES & CNPq).

2015

2010

### **MSc., Federal University of Goias.**

Funding: CAPES.

2012

2011

### **Fermi National Accelerator Laboratory, Master's student.**

Funding: Fermilab.

Period: 3 months.

## **Skills**

### **Spoken languages**

Portuguese (native), English (fluent), Italian (fluent), French (conversational)

### **Programming & scripting languages**

C/C++, Python, SQL, FORTRAN, UNIX Shell scripting,  $\text{\LaTeX}$

### **Frameworks**

ROOT, Fermilab ART Framework (NOvASoft and LArSoft)

### **Monte Carlo**

CORSIKA, Geant4

### **Other**

GIT, SVN, Redmine, PBS TORQUE

## Teaching and mentoring

2012  
2018

**Advising assistant, Ph.D. student/candidate**, Federal University of Goias.

- **2015:** Co-advised the senior thesis of Matheus Norberto Jacome, entitled "**Stratospheric temperature effects on cosmic ray muon flux**" [in Portuguese], from State University of Goias, Brazil.
- Helped advising most younger students from our UFG HEP Group on different projects over the years.

2012  
2013

**Teaching assistant, Ph.D. student**, Federal University of Goias.

- Physics I.
- Physics III.
- Introduction to Elementary Particle Physics.

2011  
2012

**Teaching assistant, Master's student**, Federal University of Goias.

- Physics I.
- Laboratory of Physics II.
- Introduction to Elementary Particle Physics.

## Administrative experience

2013  
2014

**Member of the Administrative Council of the Physics Ph.D. Program**, *Institute of Physics*, Federal University of Goias.

- Elected representative of MSc. and Ph.D. students with the purpose to suggest, discuss, and vote on administrative resolutions, including the graduate program guidelines and funding approvals for graduate students, such as work-related field trips for Ph.D. students.

## Talks and seminars

- 2019 Particle Physics. XI Physics School.** Institute of Physics, Federal University of Goias. Presented as a part of a series of lectures at undergraduate level. [In Portuguese]  
<https://if.ufg.br/e/23682-xi-escola-de-fisica-do-if-ufg>
- 2018 Observation of cosmic ray multiple-muon seasonal variations in the NO $\nu$ A Near Detector.** *High Energy Physics Seminar*. Syracuse University, NY.  
<http://physics.syr.edu/event-items/2018/2018-04-11-stefano-tognini-hep-seminar.html>
- 2013 The loop of habit.** *Perturbative Theories* – a series of seminars organized and presented by the graduate students of the Physics Institute at UFG. [In Portuguese]  
<http://teoriasperturbativas.wikidot.com/blog:22>
- 2012 The problem with the speed of neutrinos.** *Perturbative Theories* – a series of seminars organized and presented by the graduate students of the Physics Institute at UFG. [In Portuguese]  
<http://teoriasperturbativas.wikidot.com/blog:4>

## Scientific outreach

- 2020 Being a scientist outside the University.** Invited speaker at PUC – Goias. [In Portuguese]  
<https://www.pucgoias.edu.br/noticias/eventos/a-vida-de-cientista-fora-da-universidade/>
- 2018 How particle accelerators revolutionized our World.** Invited speaker at Campus Party Brasilia, Brazil. [In Portuguese]  
<https://campuse.ro/events/Campus-Party-Brasilia-2018-CPBSB2/talk/internet-tratamentos-de-cancer-producao-de-eletronicos-pneus-de-carro-como-aceleradores-de-particulas-revolucionaram-nosso-mundo-cpbsb2/>
- 2016** Interviewed by the TV show **Connect to UFG – Inovation and Technology**. *TV UFG*, aired on October 26, 2016. [In Portuguese]  
Available on Youtube: <https://www.youtube.com/watch?v=TeTco24vgY4>






- 2015 Volunteer scientist to interact with adults and children at the **Fermilab's Family Open House**. Briefly interviewed at: <https://www.dailyherald.com/article/20150208/news/150208893/>
- 2014 Invited scientist to answer questions from community decision leaders and VIPs at the **Future of Fermilab Address and Reception**.

## Selected conference presentations

- 2014 S. C. Tognini and R. A. Gomes. **Simulation of cosmic ray shower using CORSIKA and CRY in the NO $\nu$ A Far Detector**. [Poster] XXXV National Meeting of Particles and Fields, Passa Quatro (MG), Brazil.  
S. C. Tognini and R. A. Gomes. **Neutrino oscillation physics at the NO $\nu$ A experiment**. [Poster] XXXV National Meeting of Particles and Fields, Passa Quatro (MG), Brazil.
- 2012 S. C. Tognini and R. A. Gomes. **Simulation of atmospheric temperature effects on cosmic ray muon flux**. [Poster] NuInt12: Eight International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, Rio de Janeiro (RJ), Brazil.
- 2011 S. C. Tognini and R. A. Gomes. **Remote MINOS Shift Station at IF-UFG**. [Poster] I Physics Meeting, Foz do Iguaçu (PA), Brazil.
- 2010 S. C. Tognini and R. A. Gomes. **Monte Carlo simulation of the cosmic ray muons at the MINOS Far Detector**. [Poster] XXXI National Meeting of Particles and Fields, Passa Quatro (MG), Brazil.
- 2009 S. C. Tognini and R. A. Gomes. **Status and results in neutral hyperon physics at KTeV (Fermilab) and NA48/1 (CERN)**. [Poster] XXX National Meeting of Particles and Fields, Passa Quatro (MG), Brazil.

## Publications

### Research profiles

-  [orcid.org/0000-0001-9741-6608](https://orcid.org/0000-0001-9741-6608)
-  [inspirehep.net/authors/1074966](https://inspirehep.net/authors/1074966)
-  [publons.com/researcher/1798369/stefano-castro-tognini/](https://publons.com/researcher/1798369/stefano-castro-tognini/)
-  [scholar.google.com/citations?user=M4To0NcAAAAJ](https://scholar.google.com/citations?user=M4To0NcAAAAJ)
-  [www.researchgate.net/profile/Stefano-C-Tognini](https://www.researchgate.net/profile/Stefano-C-Tognini)

### Journal articles

- 2021 M. A. Acero, *et al.* (NO $\nu$ A Collab.) **Seasonal Variation of Multiple-Muon Cosmic Ray Air Showers Observed in the NO $\nu$ A Detector on the Surface**. Accepted in PRD [PLACEHOLDER]. <https://arxiv.org/abs/2105.03848>
- 2020 P. Adamson, *et al.* (MINOS+ Collab.) **Precision Constraints for Three-Flavor Neutrino Oscillations from the Full MINOS+ and MINOS Dataset**. Phys. Rev. Lett. **125**, 131802. DOI: [10.1103/PhysRevLett.125.131802](https://doi.org/10.1103/PhysRevLett.125.131802)  
P. Adamson, *et al.* (MINOS+ Collab.) **Improved Constraints on Sterile Neutrino Mixing from Disappearance Searches in the MINOS, MINOS+, Daya Bay, and Bugey-3 Experiments**. Phys. Rev. Lett. **125**, 071801. DOI: [10.1103/PhysRevLett.125.071801](https://doi.org/10.1103/PhysRevLett.125.071801)
- 2019 M. A. Acero, *et al.* (NO $\nu$ A Collab.) **Observation of seasonal variation of atmospheric multiple-muon events in the NO $\nu$ A Near Detector**. Phys. Rev. D **99**, 122004. DOI: [10.1103/PhysRevD.99.122004](https://doi.org/10.1103/PhysRevD.99.122004)

- P. Adamson, *et al.* (MINOS+ Collab.) **Search for Sterile Neutrinos in MINOS and MINOS+ Using a Two-Detector Fit.** Phys. Rev. Lett. **122**, 091803. DOI: [10.1103/PhysRevLett.122.091803](https://doi.org/10.1103/PhysRevLett.122.091803)
- 2018 M. A. Acero, *et al.* (NO $\nu$ A Collab.) **New constraints on oscillation parameters from  $\nu_e$  appearance and  $\nu_\mu$  disappearance in the NO $\nu$ A experiment.** Phys. Rev. D **98**, 032012. DOI: [10.1103/PhysRevD.98.032012](https://doi.org/10.1103/PhysRevD.98.032012)
- 2017 P. Adamson, *et al.* (NO $\nu$ A Collab.) **Search for active-sterile neutrino mixing using neutral-current interactions in NO $\nu$ A.** Phys. Rev. D **96**, 072006. DOI: [10.1103/PhysRevD.96.072006](https://doi.org/10.1103/PhysRevD.96.072006)
- P. Adamson, *et al.* (MINOS+ Collab.) **Search for flavor-changing nonstandard neutrino interactions using  $\nu_e$  appearance in MINOS.** Phys. Rev. D **95**, 012005. DOI: [10.1103/PhysRevD.95.012005](https://doi.org/10.1103/PhysRevD.95.012005)
- P. Adamson, *et al.* (NO $\nu$ A Collab.) **Measurement of the Neutrino Mixing Angle  $\theta_{23}$  in NO $\nu$ A.** Phys. Rev. Lett. **118**, 151802. DOI: [10.1103/PhysRevLett.118.151802](https://doi.org/10.1103/PhysRevLett.118.151802)
- P. Adamson, *et al.* (NO $\nu$ A Collab.) **Constraints on Oscillation Parameters from  $\nu_e$  Appearance and  $\nu_\mu$  Disappearance in NO $\nu$ A.** Phys. Rev. Lett. **118**, 231801. DOI: [10.1103/PhysRevLett.118.231801](https://doi.org/10.1103/PhysRevLett.118.231801)
- 2016 P. Adamson, *et al.* (MINOS Collab.) **The NuMI neutrino beam.** Nucl. Instr. Meth. A **806**, 279-306. DOI: [10.1016/j.nima.2015.08.063](https://doi.org/10.1016/j.nima.2015.08.063)
- P. Adamson, *et al.* (NO $\nu$ A Collab.) **First measurement of muon-neutrino disappearance in NO $\nu$ A.** Phys. Rev. D **93**, 051104(R). DOI: [10.1103/PhysRevD.93.051104](https://doi.org/10.1103/PhysRevD.93.051104)
- P. Adamson, *et al.* (MINOS Collab.) **Measurement of the multiple-muon charge ratio in the MINOS Far Detector.** Phys. Rev. D **93**, 052017. DOI: [10.1103/PhysRevD.93.052017](https://doi.org/10.1103/PhysRevD.93.052017)
- P. Adamson, *et al.* (NO $\nu$ A Collab.) **First Measurement of Electron Neutrino Appearance in NO $\nu$ A.** Phys. Rev. Lett. **116**, 151806. DOI: [10.1103/PhysRevLett.116.151806](https://doi.org/10.1103/PhysRevLett.116.151806)
- P. Adamson, *et al.* (Daya Bay Collab., MINOS Collab.) **Limits on Active to Sterile Neutrino Oscillations from Disappearance Searches in the MINOS, Daya Bay, and Bugey-3 Experiments.** Phys. Rev. Lett. **117**, 151801. DOI: [10.1103/PhysRevLett.117.151801](https://doi.org/10.1103/PhysRevLett.117.151801)
- P. Adamson, *et al.* (MINOS Collab.) **Search for Sterile Neutrinos Mixing with Muon Neutrinos in MINOS.** Phys. Rev. Lett. **117**, 151803. DOI: [10.1103/PhysRevLett.117.151803](https://doi.org/10.1103/PhysRevLett.117.151803)
- P. Adamson, *et al.* (MINOS Collab.) **Measurement of single  $\pi^0$  production by coherent neutral-current  $\nu$ Fe interactions in the MINOS Near Detector.** Phys. Rev. D **94**, 072006. DOI: [10.1103/PhysRevD.94.072006](https://doi.org/10.1103/PhysRevD.94.072006)
- P. Adamson, *et al.* (MINOS Collab.) **Constraints on large extra dimensions from the MINOS experiment.** Phys. Rev. D **94**, 111101(R). DOI: [10.1103/PhysRevD.94.111101](https://doi.org/10.1103/PhysRevD.94.111101)
- 2015 P. Adamson, *et al.* (MINOS Collab.) **Observation of seasonal variation of atmospheric multiple-muon events in the MINOS Near and Far Detectors.** Phys. Rev. D **91**, 112006. DOI: [10.1103/PhysRevD.91.112006](https://doi.org/10.1103/PhysRevD.91.112006)
- P. Adamson, *et al.* (MINOS Collab.) **Study of quasielastic scattering using charged-current  $\nu_\mu$ -iron interactions in the MINOS near detector.** Phys. Rev. D **91**, 012005. DOI: [10.1103/PhysRevD.91.012005](https://doi.org/10.1103/PhysRevD.91.012005)
- P. Adamson, *et al.* (MINOS Collab.) **Precision measurement of the speed of propagation of neutrinos using the MINOS detectors.** Phys. Rev. D **92**, 052005. DOI: [10.1103/PhysRevD.92.052005](https://doi.org/10.1103/PhysRevD.92.052005)
- 2014 P. Adamson, *et al.* (MINOS Collab.) **Combined Analysis of  $\nu_\mu$  Disappearance and  $\nu_\mu \rightarrow \nu_e$  Appearance in MINOS Using Accelerator and Atmospheric Neutrinos.** Phys. Rev. Lett. **112**, 191801. DOI: [10.1103/PhysRevLett.112.191801](https://doi.org/10.1103/PhysRevLett.112.191801)
- P. Adamson, *et al.* (MINOS Collab.) **Observation of muon intensity variations by season with the MINOS near detector.** Phys. Rev. D **90**, 012010. DOI: [10.1103/PhysRevD.90.012010](https://doi.org/10.1103/PhysRevD.90.012010)

- 2013** P. Adamson, *et al.* (MINOS Collab.) **Measurement of Neutrino and Antineutrino Oscillations Using Beam and Atmospheric Data in MINOS**. Phys. Rev. Lett. **110**, 251801. DOI: [10.1103/PhysRevLett.110.251801](https://doi.org/10.1103/PhysRevLett.110.251801)

#### [Proceedings](#)

- 2021** S. R. Johnson, S. C. Tognini, *et al.* **Novel features and GPU performance analysis for EM particle transport in the Celeritas code**. vCHEP2021: 25<sup>th</sup> International Conference on Computing in High-Energy and Nuclear Physics. [REF. PLACEHOLDER].
- 2020** T. M. Evans, S. R. Johnson, *et al.* **Celeritas—a nascent GPU detector simulation code**. Letter of Interest for Snowmass 2021.
- 2017** A. Habig, M. Goodman, P. Schreiner, S. C. Tognini, and R. A. Gomes. (On behalf of the NO $\nu$ A Collaboration) **Seasonal Variation of Multiple-Muon Events in MINOS and NOvA**. 35<sup>th</sup> International Cosmic Ray Conference (ICRC), Bexco, Busan, Korea. DOI: [10.22323/1.301.0200](https://doi.org/10.22323/1.301.0200)
- 2012** S. C. Tognini and R. A. Gomes. **Simulation of atmospheric temperature effects on cosmic ray muon flux**. NuInt12: Eight International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, Rio de Janeiro (RJ), Brazil. AIP Conf. Proc. **1663**, 120015. DOI: [10.1063/1.4919521](https://doi.org/10.1063/1.4919521)