

FEDERICO BATTISTI

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Particle Physics DPhil student at the University of Oxford. Specializing in accelerator neutrino physics and particle tracking, with experience at the ANTARES, SBN, ALICE and DUNE experiments in academic and research environments both in the EU, UK and the US.

EDUCATION AND RESEARCH

10/2020 – PRESENT

PARTICLE PHYSICS PHD STUDENT, UNIVERSITY OF OXFORD

Thesis title: “Neutrino Interactions with a High-Pressure Gas Time Projection Chamber”

Description: The Deep Underground neutrino experiment (DUNE) is a next generation long baseline neutrino oscillation experiment. The DUNE Near Detector, closely situated next to the neutrino source, will act as the experiment’s control. One of the main components in the Near Detector complex is ND-GAr, a high-pressure Argon gas Time Projection Chamber detector (HPgTPC). ND-GAr’s unique features make it an ideal laboratory for the study of neutrino interactions on Argon. Transverse kinematic imbalance (TKI) techniques, could be used to effectively probe the impact of nuclear effects and distinguish between different nuclear targets in the gas, including hydrogen. The main goal of my thesis is to precisely evaluate the detector’s capabilities in the application of this technique. The current, not fully mature status of ND-GAr’s track reconstruction pipeline, however, impedes a full characterization of the capabilities of the detector. A state-of-the-art tracking algorithm based on the Kalman Filter technique, has been developed in tandem with experts from the ALICE collaboration, to be used by both experiments.

Supervisor: Xianguo Lu (xianguo.lu@warwick.ac.uk) ·

Co- Supervisor: Farrukh Azfar (farrukh.azfar@physics.ox.ac.uk)

10/2017 – 04/2020

PARTICLE PHYSICS MASTER’S DEGREE, ALMA MATER STUDIORUM BOLOGNA

Thesis Title: “Monitoring of the DUNE Long Baseline Neutrino Beam with the SAND Detector”

Full text available at: <https://amslaurea.unibo.it/20447/1/TesiFB.pdf>

Grade: 110/110 cum laude · Supervisor: Sergio Bertolucci (sergio.bertolucci@unibo.it)

09/2014 - 09/2017

PHYSICS BACHELOR’S DEGREE, ALMA MATER STUDIORUM BOLOGNA

Thesis Title: “Study of neutrinos from the galactic plane with ANTARES telescope”

Grade: 110/110 cum laude · Supervisor: Maurizio Spurio (Maurizio.Spurio@bo.infn.it)

09/2009 - 09/2014

HIGH SCHOOL DIPLOMA, LICEO SCIENTIFICO FULCERI PAOLUCCI DI CALBOLI

Grade: 100/100 cum laude

INTERNSHIPS AND EXPERIENCE

2022 - PRESENT

EXTERNAL COLLABORATOR, ALICE EXPERIMENT

External Project Collaborator · Supervisor: Marian Ivanov (marian.ivanov@cern.ch) · Optimization of fast simulation and reconstruction for the DUNE ND-GAr detector with potential applications for ALICE3 and ALICE Run3. Standalone publication currently being produced. Summary Talk: <https://indico.cern.ch/event/1312544>

09/2019 – 04/2020

INTERN STUDENT, INFN BOLOGNA

Master Thesis internship · Supervisor: Matteo Tenti (matteo.tenti@bo.infn.it) · Simulation and analysis for the KLOE near detector at the DUNE experiment. Additional experience at the Frascati National Laboratories building and testing CRT Modules for the ICARUS experiments.

10/2018 – 04/2019

ERASMUS+ STUDENT, ALMA MATER STUDIORUM BOLOGNA

Erasmus+ project - iTHEPHY · Supervisor: Matteo Negrini (matteo.negrini@bo.infn.it) · Study on top-quark measurements at the LHC and beyond in the SMEFT framework, and presentation of the results at the Cargese annual summer-school on high energy physics

08/2018 – 09/2018

INTERN STUDENT, FERMILAB

University of Pisa- Summer Student Program at Fermilab and other US facilities · Supervisor: Minerba Betancourt (betan009@fnal.gov) · Cosmic background studies for the SBN collaboration using machine learning techniques in the TMVA framework

07/2018 – 08/2018

SUMMER STUDENT, UNIVERSITY OF OXFORD

Oxford Summer Student Program – Moving Knowledge 2018

TALKS AND CONFERENCES

07/07/2022

ICHEP 2022 BOLOGNA

Talk Title: The DUNE Near Detector

Talk: <https://agenda.infn.it/event/28874/contributions/169662/>

17/04/2021

APS APRIL MEETING 2021

Talk Title: Potential of studying neutrino interactions in the DUNE high-pressure gas time projection chamber via transverse kinematic imbalance

<https://meetings.aps.org/Meeting/APR21/Session/L14.3>

26/02/2021

XIX INTERNATIONAL WORKSHOP ON NEUTRINO TELESCOPES

Talk Title: Physics potential with the DUNE ND-GAr detector

<https://agenda.infn.it/event/24250/contributions/130002/>

PUBLICATIONS

07/07/2022

ICHEP 2022 BOLOGNA

Publication: The DUNE Near Detector

Proceedings: <https://inspirehep.net/literature/2619507>

SKILLS

- **TEACHING:** Nuclear physics laboratory demonstrator for 3rd year Oxford University physics bachelor students.
- **CODING:** Experienced in C++, Python; ROOT, PyROOT, matplotlib and ROOTInteractive libraries; Jupyter Notebooks.
- **PROJECT MANAGING:** Experienced in github both with forking and branching workflows
- **MACHINE LEARNING:** Experienced in the use of ROOT TMVA and python scikit-learn
- **LANGUAGES:** Proficient in Italian and English, limited skills in French