

Wouter Van De Pontseele

Postdoctoral Fellow Particle Physics at Harvard University

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English fluent, Dutch native, French intermediate

Research Profile

I gained experience in the field of experimental particle physics during extensive contributions to a variety of neutrino and accelerator experiments. These projects offered unmatched opportunities to become an expert in detector design and technologies. Furthermore, working in large collaborations with extensive data sets and modern machine learning-based algorithms prepared me to thrive in fast-paced innovation-driven environments.

From September 2020 I join the Laboratory for Nuclear Science at MIT as a postdoctoral fellow of the Belgian-American Educational Foundation.

Research Appointments

- 2017–2020 **Postdoctoral Fellow of the Department in Particle Physics** Harvard University, USA
I joined Harvard as a Fellow in 2017 and became a Postdoctoral Fellow in 2020. As a member of Roxanne Guenette's group at Harvard, I advance my doctoral research inside the MicroBooNE neutrino experiment.
- 2019 **Disruption prediction in the JET Tokamak for Nuclear Fusion – 5 weeks** CCFE, UK & PPPL, USA
Supervisors: Robert Akers & William Tang
Studies to quantify systematic variations on plasma disruption predictions with recurrent neural networks.
- 2016 **CERN Summer Student Programme – 9 weeks** CERN Geneva, Switzerland
Supervisors: Matthew Fraser & Francesco Velotti
Investigation of circuit imperfections on the slow extraction process in the SPS. CERN-STUDENTS-Note-2016-249.
- 2015 **IceCube Internship – 6 weeks** University of Wisconsin–Madison, USA
Supervisor: Christopher Wendt
Determination of the absolute sensitivity of the IceCube DOM's. arXiv:1511.02373.

Education

- 2016–2020 **DPhil in Particle Physics – Graduated April 2020** University of Oxford, UK
Supervisors: Roxanne Guenette & Alfons Weber
Thesis: Search for Electron Neutrino Anomalies with the MicroBooNE Detector at the Fermi National Laboratory.
- 2014–2016 **Master of Science: Physics and Astronomy – Greatest Distinction** UGhent & Imperial College London
Supervisors: Dirk Ryckbosch & Antonin Vacheret
Thesis: Characterisation and modelling of correlated noise in SiPMs for the SoLid reactor neutrino experiment.
- 2011–2014 **Bachelor of Science: Physics and Astronomy – Greatest Distinction** University of Ghent, Belgium
Thesis: The construction and calibration of a motorised radiation detection vehicle.

Honors & Awards

- 2016-2020 **Clarendon Scholarship – 4 years** University of Oxford, UK
Scholarship awarded by Oxford University Press in partnership with the UK Science and Technology Facilities Council.
- 2018 **Universities Research Association Scholarship** Fermilab, USA
Scholarship awarded based on academic merit, enabling extensive stays at Fermilab.
- 2011-2016 **Prize for the best student in Physics** University of Ghent, Belgium
Award given to the student with the highest marks over five years of educational training.
- 2013-2016 **Honors Award in Sciences** University of Ghent, Belgium
Three year program awarded to the top student including a research project and additional courses.

- 2011 **42nd International Physics Olympiad** Chulalongkorn University, Thailand
Honorable mention
- 2009-2011 **National Science Olympiads** Belgium
Finals and prizes in: Mathematics (2009, 2011), Physics (2010, 2011), Astronomy (2011) and Technology (2011).

Presentations

- 2016-2020 **MircoBooNE Collaboration meetings**
Talks at collaboration meetings including: charged current electron neutrino measurement, optical-based selection for neutrino searches, and cosmic rate measurement. Presentations at group meetings including: oscillation group, reconstruction group, detector physics and calibration group, astrophysics and exotics group, systematics group.
- 2020 **Invited Plenary MicroBooNE talk International Conference on Neutrinos and Dark Matter** Hurghada, Egypt
- 2019 **Invited Seminar about the Status of the MicroBooNE Experiment** USA
Wisconsin Particle Astrophysics Center, SLAC National Accelerator Laboratory, Columbia University, Berkeley Lab
- 2019 **Joint APP and HEPP Annual Conference** Imperial College, UK
Talk: Electron neutrino selection in the MicroBooNE LArTPC using the Pandora pattern recognition framework.
- 2018 **Invisibles Workshop** Karlsruhe Institute of Technology, Germany
Plenary talk and poster on electron neutrino selection and electromagnetic shower reconstruction in LArTPCs.
- 2017 **International Neutrino Summer School** Fermilab, USA
Poster presentation for the MicroBooNE collaboration on an optical based electron neutrino selection.
- 2016 **SoLid Collaboration Meeting** Imperial College, UK
Plenary and parallel talks to summarise the results of my master thesis.

Outreach & Teaching

- 2019 **Tutor in Particle Physics –3 weeks** University of Oxford, UK
My group of three master students won the Best Critical Engagement and Audience Appreciation Award.
- 2019 **Bench-to-Business Boot Camp** Harvard Office of Technology Development
Selected participant of workshop to recognise and convey the value of technological innovations.
- 2019 **European Conference of 2019** Harvard University, USA
Group leader and presenter during the AI & data privacy policy workshop.
- 2017-2018 **MIT Enterprise Forum of Cambridge** MIT, USA
Active student member of MIT Enterprise Forum, a global organisation of dedicated professionals with local chapters.
- 2018 **Excellence in Detector and Instrumentation Technologies symposium** Fermilab, USA
Two week hands-on school to gain expertise in detector hardware and instrumentation.
- 2013-2016 **Elected Member of the Program Advisory Committee** University of Ghent, Belgium
Institution to control and optimise the quality of the department.

Programming & Data Science

- Machine Learning** Graduate level course at the University of Oxford. Participated in several workshops and lecture series: DS@HEP (2017, Fermilab), 6.S099: Artificial General Intelligence (2018, MIT), CODAS-HEP (2018, Princeton), MLHEP (2018, Oxford). Completed online courses from the University of Toronto and Stanford University.
- Python** Advanced, experience with packages: SciPy, SymPy, NumPy, Pandas, Scikit-learn, Tensorflow, Keras, PyTorch, Seaborn, Plotly, Matplotlib and PyROOT.
- C/C++** Advanced, experience acquired through graduate level courses and theses. Experienced with OpenMP.
- Other** MATLAB, Java, Linux, MC-STAN, LaTeX, Arduino & Raspberry Pi, MAD-X (Methodical Accelerator Design), ROOT, LArSoft, GNU Scientific Library and Labview.

Publications

As part of the MicroBooNE collaboration, outputs are signed by all members in alphabetical order, my personal contribution is highlighted in brackets. Besides publications, all public notes are available at microboone.fnal.gov/public-notes.

Highlighted

1. MicroBooNE Collaboration [Optical selection, muon selection, validation of theoretical models]. First Measurement of Inclusive Muon Neutrino Charged Current Differential Cross Sections on Argon at $E(\nu) \sim 0.8$ GeV with the MicroBooNE Detector. Phys. Rev. Lett. 2019. doi: 10.1103/PhysRevLett.123.131801, arXiv: 1905.09694
2. MicroBooNE Collaboration [Implementation and validation of algorithms]. The Pandora multi-algorithm approach to automated pattern recognition of cosmic-ray muon and neutrino events in the MicroBooNE detector. Eur. Phys. J. C. 2018. doi: 10.1140/epjc/s10052-017-5481-6, arXiv: 1708.03135
3. MicroBooNE Collaboration [Implementation and optimisation of cosmic rejection tools used in many analyses]. Rejecting cosmic background for exclusive charged current quasi elastic neutrino interaction studies with Liquid Argon TPCs; a case study with the MicroBooNE detector. Eur. Phys. J. C. 2019. doi: 10.1140/epjc/s10052-019-7184-7, arXiv: 1812.05679
4. MicroBooNE Collaboration [First validation and implementation of the system in an analysis]. Design and construction of the MicroBooNE Cosmic Ray Tagger system. JINST. 2019. doi: 10.1088/1748-0221/14/04/P04004, arXiv: 1901.02862

Published

- MicroBooNE Collaboration. A Deep Neural Network for Pixel-Level Electromagnetic Particle Identification in the MicroBooNE Liquid Argon Time Projection Chamber. Phys. Rev. D. 2018. doi: 10.1103/PhysRevD.99.092001, arXiv: 1808.07269
- MicroBooNE Collaboration. Measurement of cosmic-ray reconstruction efficiencies in the MicroBooNE LArTPC using a small external cosmic-ray counter. JINST. 2017. doi: 10.1088/1748-0221/12/12/P12030, arXiv: 1707.09903
- MicroBooNE Collaboration. First measurement of muon neutrino charged-current neutral pion production on argon with the MicroBooNE detector. Phys. Rev. D. 2019. doi: 10.1103/PhysRevD.99.091102, arXiv: 1605.07964
- MicroBooNE Collaboration. Noise Characterization and Filtering in the MicroBooNE Liquid Argon TPC. JINST. 2017. doi: 10.1088/1748-0221/12/08/P08003, arXiv: 1705.07341
- MicroBooNE Collaboration. Ionization electron signal processing in single phase LArTPCs. Part I. Algorithm Description and quantitative evaluation with MicroBooNE simulation. JINST. 2018. doi: 10.1088/1748-0221/13/07/P07006, arXiv: 1802.08709
- MicroBooNE Collaboration. Ionization electron signal processing in single phase LArTPCs. Part II. Data/ simulation comparison and performance in MicroBooNE. JINST. 2018. doi: 10.1088/1748-0221/13/07/P07007, arXiv: 1804.02583
- MicroBooNE Collaboration [Wouter Van De Pontseele, alph. order]. Comparison of muon neutrino - Argon multiplicity distributions observed by MicroBooNE to GENIE model predictions. Eur. Phys. J. C. 2019. doi: 10.1140/epjc/s10052-019-6742-3, arXiv: 1805.06887
- MicroBooNE Collaboration. Search for heavy neutral leptons decaying into muon-pion pairs in the MicroBooNE detector. Phys. Rev. D 2020. doi: 10.1103/PhysRevD.101.052001, arXiv: 1911.10545
- MicroBooNE Collaboration. Reconstruction and Measurement of $\mathcal{O}(100)$ MeV Energy Electromagnetic Activity from $\pi^0 \rightarrow \gamma\gamma$ Decays in the MicroBooNE LArTPC. Submitted to JINST. 2020. doi: 10.1103/PhysRevD.101.052001, arXiv: 1910.02166
- MicroBooNE Collaboration. Calibration of the charge and energy response of the MicroBooNE liquid argon time projection chamber using muons and protons. Submitted to JINST. 2020. doi: 10.1088/1748-0221/15/03/P03022, arXiv: 1907.11736

In Press

- MicroBooNE Collaboration. A Method to Determine the Electric Field of Liquid Argon Time Projection Chambers Using a UV Laser System and its Application in MicroBooNE. Submitted to JINST. 2019. arXiv: 1910.01430
- MicroBooNE Collaboration. Vertex-Finding and Reconstruction of Contained Two-track Neutrino Events in the MicroBooNE Detector. Submitted to JINST. 2020. arXiv: 2002.09375