



TO MAGNIFICO RETTORE OF UNIVERSITÀ DEGLI STUDI DI MILANO

ID CODE 6604

I, the undersigned, ask to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di fisica**

Scientist- in - charge: **Prof. Stefano Forte**

Ramon Peter Winterhalder

CURRICULUM VITAE

PERSONAL INFORMATION

Surname	Winterhalder
Name	Ramon Peter

PRESENT OCCUPATION

Appointment	Structure
Post-doc researcher	UCLouvain

EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
Degree	Master's Degree in Physics	University of Freiburg	2017
Specialization			
PhD	PhD in Physics	Heidelberg University	2020
Master			
Degree of medical specialization			
Degree of European specialization			
Other	Imperial College International Diploma in Physics	Imperial College London	2016
Other	Bachelor's Degree in Physics	University of Freiburg	2014



FOREIGN LANGUAGES

Languages	level of knowledge
German	Native
English	C1
Swedish	A2
French	A1
Italian	A1

AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award
01-08/2021	HEiKA Fellow - Joint PostDoc fellowship with Heidelberg University and KIT Karlsruhe
10/2017 - 09/2020	IMPRS-PTFS Fellow - PhD fellowship of the International Max Planck Research School in Heidelberg
10/2015 - 07/2016	Erasmus Scholar - Erasmus scholarship for one-year studies at Imperial College London
10/2014 - 09/2017	Deutschlandstipendium - Scholarship awarded annually to high-achieving students

TRAINING OR RESEARCH ACTIVITY

<p>POSTDOCTORAL RESEARCHER Sep. 2021 - Present UCLouvain Louvain-la-Neuve, Belgium</p> <ul style="list-style-type: none">• Development of the ML-based MADNIS framework for improved phase-space integration and event generation within MG5AMC and as a standalone package• Advisors: Fabio Maltoni & Olivier Mattelaer <p>POSTDOCTORAL RESEARCHER Nov. 2020 - Aug. 2021 Karlsruhe Institute of Technology Karlsruhe, Germany</p> <ul style="list-style-type: none">• Development of ML methods for fast numerical evaluations of multi-loop integrals• Advisor: Gudrun Heinrich <p>TEACHING EXPERIENCE - Lectures ErUM-Data-Hub - Active Training Course Meinerzhagen, Germany Sep. 2023</p> <ul style="list-style-type: none">• Lecture on Diffusion and Transformer models (1.5h)• Tutorial and hands-on sessions (3h)



MCnet Summer School 2023 Durham, UK

Jul. 2023

- Lecture on Machine learning for event generation (1h)
- Tutorial and hands-on session on MadGraph5 (3h)

KIAS QUC Summer School on A.I. in High Energy Physics Seoul, South Korea

Jul. 2023

- Lectures on Modern machine learning for particle physics (4h)
- Hands-on projects presentation and supervision (3h)

MCnet Summer School 2022 Zakopane, Poland

Jun. 2022

- Lecture on Machine Learning in HEP (1h)
- Hands-on session for Tensorflow and ML4HEP examples (3h)

UCLouvain Louvain-la-Neuve, Belgium

Nov. 2021

- Lecture and hands-on session on An Introduction to Neural Networks (3h)

TEACHING EXPERIENCE - Tutorials

Heidelberg University, Heidelberg, Germany

Oct. 2017 - Sep. 2021

- Advanced Quantum Field Theory - Tutor (2021)
- Theoretical Physics I - Head tutor and replacement lecturer (2018)
- Theoretical Physics I - Tutor (2017)

University of Freiburg, Freiburg, Germany

Oct. 2013 - Jul. 2017

- Experimental Physics II - Tutor (2015, 2017)
- Experimental Physics I - Tutor (2013, 2016)

TEACHING EXPERIENCE - Co-Supervision

Sophia Vent, Bologna, Italy

MSC IN PHYSICS Dec. 2023 - Present

Project: Symbolic regression and explainable AI for HEP applications



Luca Beccatini, Louvain-la-Neuve, Belgium

PHD AND MSC IN PHYSICS Sep. 2022 - Present

- Shared PhD between Bologna and UCLouvain

PhD Project: ML surrogates for fast event generation

- Master thesis: Improving MadGraph importance sampling efficiency by using neural network

Theo Heimel, Heidelberg, Germany

PHD IN PHYSICS Apr. 2021 - Present

Project: Generative models for event generation and simulation-based inference

Mathias Backes Heidelberg, Germany

BSC IN PHYSICS Mar. 2020 - Jun. 2020

Thesis: How to unweight with GANs

PROFESSIONAL SERVICE

HEP ML Living Review (Online)

Active moderator of A Living Review of Machine Learning for Particle Physics

May 2023 - Present

Journal Referee (Online)

Revision of articles for SciPost and European Physical Journal C (EPJ C)

Jun. 2022 - Present

ITP Directors Advisory Board, Heidelberg, Germany

Elected PhD representative

May 2019 - Oct. 2020

CONGRESSES AND SEMINARS

CONFERENCES AND WORKSHOPS

COMETA WG2 Meeting (Online)

The MadNIS Reloaded – Enhancing MadGraph with Neural Importance Sampling, invited talk

Mar. 2024

LHC EW WG Meeting (Online)

Like-sign VBS at the LHC – Approximations and full NLO predictions

Jan. 2024



Generator and N(n)LO Workshop (Geneva, Switzerland)

The MadNIS Reloaded – Boosting MG5 with Neural Networks, invited talk
Nov. 2023

ML4Jets 2023 (Hamburg, Germany)

Modern Machine Learning for the LHC Simulation Chain, invited talk
Nov. 2023

Hammers & Nails 2023 (Locarno, Switzerland)

Modern Machine Learning for the LHC Simulation Chain, invited talk
Nov. 2023

3rd MODE Workshop (Princeton, USA)

MadNIS and ELSA – Multi-modal event generation, invited talk
July 2023

LHCP 2023 (Belgrade, Serbia)

Modern Machine Learning for LHC Physics, invited talk
May 2023

Pheno 2023 (Pittsburgh, USA)

Machine Learning for Particle Physics, invited talk
May 2023

CRC TRR 257 Meeting (Aachen, Germany)

Machine Learning for HEP Theory, invited talk
Mar. 2023

ML Workshop (Heidelberg, Germany)

MadNIS – Neural multi-channel importance sampling in MadGraph, invited talk
Dec. 2022

IML Meeting (Geneva, Switzerland)

MadNIS – Neural networks for multi-channel integration in MadGraph (online)
Dec. 2022

ML4Jets 2022 (Piscataway, USA)

MadNIS – Neural networks for multi-channel integration in MadGraph
Nov. 2022

MCnet Meeting (Graz, Austria)

MadNIS – Neural networks for multi-channel integration in MadGraph, invited talk
Sep. 2022

IML Meeting (Geneva, Switzerland)

Targeting Multi-Loop Integrals with Neural Networks (online)
May 2022



IRN Meeting (Bonn, Germany)

Targeting Multi-Loop Integrals with Neural Networks, invited talk
Mar. 2022

DPG Spring Meeting (Heidelberg, Germany)

Targeting Multi-Loop Integrals with Neural Networks (online)
Mar. 2022

MadGraph Meeting (Bonn, Germany)

Machine Learning for Event Generation, invited talk
Nov. 2021

ML4Jets 2021 (Heidelberg, Germany)

Latent Space Refinement for Deep Generative Models
Jul. 2021

CRC TRR 257 Meeting (Heidelberg, Germany)

New LHC Simulation Methods (online)
Jun. 2020

IMPRS-PTFS Meeting (Heidelberg, Germany)

New LHC Simulation Methods, invited talk
May 2020

ML4Jets 2020 (New York, USA)

How to GAN LHC Events
Jan. 2020

IMPRS-PTFS Meeting (Neunkirchen, Germany)

How to GAN LHC Events
Sep. 2019

Higgs Couplings 2017 (Heidelberg, Germany)

The Effective-Vector-Boson Approximation at the LHC
Nov. 2017

IMPRS-PTFS Meeting (Karlsruhe, Germany)

Approximations for Vector Boson Scattering at the LHC
Oct. 2017

SEMINARS

CERN QCD Seminar (Geneva, Switzerland)

Generative Machine Learning – Towards a paradigm shift in physics research?
Jan. 2024

IPA Colloquium (Zurich, Switzerland)

Generative Machine Learning – Towards a paradigm shift in particle physics research?
Dec. 2023



Joint INFN-UNIMI-UNIMIB Seminar (Milan, Italy)

The MadNIS Reloaded

Dec. 2023

IFT Seminar (Madrid, Spain)

The MadNIS Reloaded

Oct. 2023

KIAS QUC-AIHEP Seminar (Seoul, South Korea)

MadNIS – Neural Importance Sampling

Jun. 2023

ODSL Seminar (Munich, Germany)

MadNIS – Neural Importance Sampling (online)

May 2023

IPPP Seminar (Durham, UK)

Targeting Multi-Loop Integrals with Neural Networks (online)

Jun. 2022

TTK Theory Seminar (Aachen, Germany)

Targeting Multi-Loop Integrals with Neural Networks

May 2022

ODSL Seminar (Munich, Germany)

Targeting Multi-Loop Integrals with Neural Networks (online)

Apr. 2023

CP3 Seminar (Louvain-la-Neuve, Belgium)

Unbinned Measurements & Predictions

Oct. 2021

NERSC Data Seminar (Berkeley, USA)

Generative Neural Networks (online)

Oct. 2020

Seminar Fundamentale Wechselwirkungen (Freiburg, Germany)

How to GAN LHC Events

Dec. 2019

ITP Pheno Seminar (Heidelberg, Germany)

Approximations for Vector-Boson Scattering at the LHC

Nov. 2017



PUBLICATIONS

Articles in reviews

Like-Sign W-Boson Scattering at the LHC - Approximations and Full Next-to-Leading-Order Predictions (2023)

S. Dittmaier, P. Maierhöfer, C. Schwan, R. Winterhalder

JHEP 11 (2023) 022, arXiv:2308.16716 [hep-ph]

ELSA - Enhanced latent spaces for improved collider simulations (2023)

B. Nachman and R. Winterhalder

Eur. Phys. J. C 83, 843 (2023), arXiv:2305.07696 [hep-ph]

MadNIS - Neural Multi-Channel Importance Sampling (2022)

T. Heimel, R. Winterhalder, A. Butter, J. Isaacson, C. Krause, F. Maltoni, O. Mattelaer, T. Plehn

SciPost Phys. 15, 141 (2023), arXiv:2212.06172 [hep-ph]

Ephemeral Learning - Augmenting Triggers with Online-Trained Normalizing Flows (2022)

A. Butter, S. Diefenbacher, G. Kasieczka, B. Nachman, T. Plehn, D. Shih, R. Winterhalder

SciPost Phys. 13, 087 (2022), arXiv:2202.09375 [hep-ph]

Targeting Multi-Loop Integrals with Neural Networks (2021)

R. Winterhalder, V. Magerya, E. Villa, S. P. Jones, M. Kerner, A. Butter, G. Heinrich, T. Plehn

SciPost Phys. 12, 129 (2022), arXiv:2112.09145 [hep-ph]

Publishing Unbinned Differential Cross Section Results (2021)

M. Arratia, A. Butter, M. Campanelli, V. Croft, A. Ghosh, D. Gillberg, K. Lohwasser, B. Malaescu, V. Mikuni, B. Nachman, J. Rojo, J. Thaler, R. Winterhalder

JINST 17, P01024 (2022), arXiv:2109.13243 [hep-ph]

How to GAN Event Unweighting (2020)

M. Backes, A. Butter, T. Plehn, R. Winterhalder

SciPost Phys. 10, 089 (2021), arXiv:2012.07873 [hep-ph]

Invertible Networks or Partons to Detector and Back Again (2020)

M. Bellagente, A. Butter, G. Kasieczka, T. Plehn, A. Rousselot, R. Winterhalder, L. Ardizzone, U. Köthe

SciPost Phys. 9, 074 (2020), arXiv:2006.06685 [hep-ph]



How to GAN Event Subtraction (2019)

with A. Butter, T. Plehn

SciPost Phys. Core 3, 009 (2020), arXiv:1912.08824 [hep-ph]

How to GAN away Detector Effects (2019)

M. Bellagente, A. Butter, G. Kasieczka, T. Plehn, R. Winterhalder

SciPost Phys. 8, 070 (2020), arXiv:1912.00477 [hep-ph]

How to GAN LHC Events (2019)

A. Butter, T. Plehn, R. Winterhalder

SciPost Phys. 7, 075 (2019), arXiv:1907.03764 [hep-ph]

PRE-PRINT PUBLICATIONS

The MadNIS Reloaded (2023)

T. Heimel, N. Huetsch, F. Maltoni, O. Mattelaer, T. Plehn, R. Winterhalder

arXiv:2311.01548 [hep-ph], submitted to SciPost

Precision-Machine Learning for the Matrix Element Method (2023)

T. Heimel, N. Huetsch, R. Winterhalder, T. Plehn, A. Butter

arXiv:2310.07752 [hep-ph], submitted to SciPost

Latent Space Refinement for Deep Generative Models 2021

R. Winterhalder, M. Bellagente, B. Nachman

NeurIPS DGMs and Applications Workshop (2021), arXiv:2106.00792 [stat.ML]

LECTURE NOTES

Modern Machine Learning for LHC Physicists (2022)

T. Plehn, A. Butter, B. Dillon, C. Krause, T. Heimel, R. Winterhalder

arXiv:2211.01421 [hep-ph]

Congress proceedings

Machine Learning and LHC Event Generation (2022)

A. Butter, T. Plehn, S. Schumann (editors) et al.

Contribution to Snowmass 2021, SciPost Phys. 14, 079 (2023), arXiv:2203.07460 [hep-ph]



Event Generators for High-Energy Physics Experiments (2022)

J. M. Campbell et al.

Contribution to Snowmass 2021, arXiv:2203.11110 [hep-ph], submitted to SciPost

OTHER INFORMATION

SKILLS

Programming: Python, C/C++, Fortran

Frameworks: PyTorch, TensorFlow, Keras, MadGraph, Mathematica, ROOT

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

Please note that CV WILL BE PUBLISHED on the University website and It is recommended that personal and sensitive data should not be included. This template is realized to satisfy the need of publication without personal and sensitive data.

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Place and date: Ixelles, 29/04/2024