Amedeo Chiefa

Ph.D. candidate, Theoretical Physics & Machine Learning — University of Edinburgh

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Profile

Theoretical physicist completing a Ph.D. (2027) on the modelling of large, noisy collider datasets with correlated uncertainties. I work on problems where off-the-shelf methods do not exist and theory constrains only part of the structure, with the rest determined empirically: numerical experiment, closure testing, and establishing whether the uncertainties a fitted model reports can be trusted. Six peer-reviewed publications; production Python and C++ in two international collaborations. Looking to bring that pairing of principled modelling and empirical judgement to systematic research in quantitative finance.

Technical Skills

Programming: Python (5+ years), C++ (5+ years), C, Fortran, Bash

Machine learning & numerics: PyTorch, TensorFlow, JAX, NumPy, SciPy, pandas

Statistics & modelling: Bayesian inference, uncertainty quantification, Monte Carlo bootstrap for uncertainty propagation, regression on correlated data, covariance estimation, closure and out-of-sample validation, neural network training dynamics (neural tangent kernel)

Engineering: Git, GitHub Actions (CI/CD), code review in a 20+ person distributed team, Python packaging, pytest, conda, HPC/SLURM

Other: Mathematica, LaTeX

Research & Engineering Experience

Doctoral Researcher, University of Edinburgh 11/2023 – present

Foundational work on the training dynamics of neural networks used for high-dimensional model fitting to noisy experimental data in the context of the NNPDF methodology: a typical fit carries ∼600 free parameters constrained by ∼5,000 correlated measurements, with experimental uncertainties propagated by Monte Carlo bootstrap over ∼100 replicas. Developed a theoretical framework based on the neural tangent kernel that gives a quantitative account of how such fits behave, and that tests whether the uncertainties they report are statistically faithful (*EPJC 86, 722*). Supervised by Prof. Luigi Del Debbio.

Member and Developer, NNPDF Collaboration since 11/2023

NNPDF is an international collaboration that combines experimental data and machine learning to extract the parton distribution functions that encode the internal structure of the proton. I maintain and extend the production Python codebase used collaboration-wide for large-scale model fitting: code review, CI, and release process with a citable DOI. Extended the framework to account for theoretical uncertainties from power corrections through a Bayesian treatment of the data (*EPJC 86, 281*), producing a new tool included in the forthcoming NNPDF4.1 release. Delivered within a distributed team of 20+ international researchers, with regular group meetings, internal presentations, and mentoring of new members. Benchmarked model sets from several independent groups, ours included, against out of sample measurements (*JHEP 07, 067*).

Developer, MAP Collaboration since 03/2023

Co-designed and built Denali, an open-source C++ fitting library (Ceres non-linear least squares, automatic differentiation of network parameters) implementing the same bootstrap procedure with train/validation splitting. Released with a citable DOI; now extending it to higher theoretical accuracy.

Erasmus+ Traineeship, CEA Paris-Saclay, IRFU (France) 03/2023 – 05/2023

Competitively funded by the European Commission. Statistical extraction of model parameters from global datasets at unprecedented theoretical accuracy; development of Denali (PLB 865); supervisor Dr Valerio Bertone.

Education

Ph.D. in Theoretical Physics, The University of Edinburgh (UK) 11/2023 – expected 2027

M.Sc. in Theoretical Physics, University of Turin 2023 — 110/110 cum laude

B.Sc. in Physics, University of Turin 2021 — 109/110

Selected Publications

Six peer-reviewed publications since 2024; two further papers in preparation. Author lists follow the alphabetical convention standard in this field. Full list available on InspireHEP and Google Scholar.

Quantitative Understanding of PDF Fits and their Uncertainties — Published in: *Eur.Phys.J.C 86 (2026) 6, 722* | arXiv:2512.24116

Parton distributions with higher twist and jet power corrections — Published in: *Eur.Phys.J.C 86 (2026) 3, 281* | arXiv:2511.14387

Parton distributions confront LHC Run II data: a quantitative appraisal — Published in: *JHEP 07 (2025) 067* | arXiv:2501.10359

Helicity-dependent parton distribution functions at NNLO accuracy from inclusive and semi-inclusive deep-inelastic scattering data — Published in: *Phys.Lett.B 865 (2025) 139497* | arXiv:2404.04712

Conference Contributions & Invited Talks

Parton Distributions from NTK analysis 10/2025
Invited at Digital Twins for Nuclear and Particle Physics 2025

Parton Distributions from NTK analysis 09/2025
COMETA Workshop on Uncertainty Quantification for Machine Learning

Towards helicity-dependent parton distribution functions at NNLO accuracy 04/2024
31$^{\text{st}}$ International Workshop on Deep Inelastic Scattering (DIS2024)

Additional Training

Iliad Intensive, LISA London (06/2026 – 07/2026) Month-long selective taught course in graduate-level applied mathematics for AI alignment research.

AI for Science European Summer School (07/2026) Applications of AI in scientific research; sponsored by Google DeepMind and the Hellenic Institute of Advanced Studies.

Additional

Teaching: Teaching Assistant in Statistical Physics, Quantum Mechanics and Computer Simulation, University of Edinburgh (2023–2026) — undergraduate students.

Languages: Italian (native); English (full professional proficiency); French (basic).