# Nina **Elmer**

THEORETICAL PHYSICS · MACHINE LEARNING

*Department of Applied Mathematics and Theoretical Physics, Cambridge, UK*
*Infosys - Cambridge AI Center, London, UK*

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## Research Interest

**Physics and AI**  Trustworthyness of AI models, Uncertainty estimation, BNNs, Ensembles, NTKs and GPs
**Particle Physics**  Global analyses for SMEFT, PDF fitting, Amplitude surrogates

## Experience

**Research Associate**  *Cambridge, UK*

DAMTP, UNIVERSITY OF CAMBRIDGE  *Oct. 2025 - PRESENT*

- Inaugural Physics–AI Fellow (independent postdoc), member of the Infosys–Cambridge AI Center

**Postdoctoral Researcher**  *Heidelberg, Germany*

INSTITUTE FOE THEORETICAL PHYSICS, HEIDELBERG UNIVERSITY  *Aug. 2025 - Sep. 2025*

- Continued research on the topic of amplification and uncertainty quantification for scattering amplitudes to finalise ongoing projects
- Advisor: Tilman Plehn

## Education

**PhD in Theoretical Particle Physics**  *Heidelberg, Germany*

HEIDELBERG UNIVERSITY  *Nov. 2022 - July 2025*

- Fellow of the IMPRS–PTFS at the Max-Planck-Institut for nucelar physics
- Dissertation: "Bridging Theory and Data — Uncertainty-Aware Analyses for the LHC and Beyond"
- Supervisor: Tilman Plehn

**M.Sc in Physics**  *Heidelberg, Germany*

HEIDELBERG UNIVERSITY  *Oct. 2020 - Sep. 2022*

- Thesis: "SMEFT Russian Roulette - Is including high kinematic distributions in SMEFT global analyses worth the effort?"
- Supervisor: Tilman Plehn

**B.Sc in Physics**  *Bielefeld, Germany*

BIELEFELD UNIVERSITY  *Oct. 2017 - Sep. 2020*

- Thesis: "Zusammenhang zwischen den Majorana-Phasen und der Massenordnung von Neutrinos"
- Supervisor: Dietrich Bödeker

## Teaching

TUTORIALS

**Heidelberg University**  *Heidelberg, Germany*

TEACHING ASSISTANT  *Nov. 2020 - Mar. 2024*

- Classical Mechanics – Tutor (2022, 2023)
- Analytical Mechanics and Thermodynamics – Tutor (2023)
- Physics for Scientists – Tutor (2021, 2022)
- General Lab course – Tutor (2021)

**Bielefeld University**  *Bielefeld, Germany*

TEACHING ASSISTANT  *Oct. 2019 - Sep. 2020*

- General Lab course – Tutor (2019, 2020)

## (Co-) Supervision

**Siqi Zheng**                                                                                     *Cambridge, UK*
MPhil in Data Intensive Science (DIS)                                                              *Nov. 2025 - July 2026*
- Project: Disentangling Uncertainties for LHC Amplitudes using Cooperative Bayesian and Variance Networks

**Giovanni De Cresecenzo**                                                                         *Heidelberg, Germany*
PhD in Physics                                                                                     *Apr. 2025 - Present*
- Project: Amplitude Surrogates for MADNIS

## Professional Service

**SciPost Physics**                                                                                *Online*
Reviewer/ Referee for SciPost Physics                                                              *Oct. 2025 - Present*

**Modern Numerics for Theoretical Physics**                                                        *Heidelberg, Germany*
Co-organizer of the *Modern Numerics for Theoretical Physics* Seminar at ITP Heidelberg            *Oct. 2024 - Aug. 2025*

## Fellowships

**IMPRS-PFS Fellow**                                                                               *Heidelberg, Germany*
PhD fellowship of the *International Max Planck Research School* in Heidelberg                      *Nov. 2022 - July 2025*

## Skills

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| **Programming** | Python, C, C++, Fortran, Java, Basic SQL |
| **Software and Tools** | PyTorch, TensorFlow, Mathematica, Git, scikit-learn, JAX |
| **Languages** | German (native), English (fluent) |

## Talks

18 talks | 4 invited conference & workshop talks | 4 seminars

### Conferences & Workshops

**General MadGraph Meeting**                                                                        *Heidelberg*
Reliable uncertainty estimation for amplitude surrogates                                            *Feb. 2026*

**Zurich Phenomenology Workshop**                                                                   *Zurich*
Invited - Learning reliable amplitude surrogates                                                    *Jan. 2026*

**ACAT 2025 conference**                                                                            *Hamburg*
Learning Reliable Uncertainties – The Return of the Ensemble                                        *Sep. 2025*

**KISS BMBF Annual Meeting**                                                                        *Munich*
Invited — Accuracy and uncertainty control for ML-Amplitudes                                        *Mar. 2025*

**MadGraph5_aMC@NLO Meeting**                                                                       *CERN*
Learned Uncertainties for LHC-Networks                                                              *Feb. 2025*

**ML4Jets Conference**                                                                             *Paris*
The good, the bad, and the Bayesian                                                                 *Nov. 2024*

**PHYSTAT – Statistics meet AI**                                                                    *London*
Poster — Uncertainty-aware machine learning for the LHC                                             *Sep. 2024*

**IRN Terascale Meeting**                                                                           *Frascati*
The Impact of Theory Uncertainties in Global EDM Analyses                                           *Apr. 2024*

**Annual Meeting of the CRC TRR 257**                                                               *Karlsruhe*
Invited — A global interpretation of EDMs                                                           *Mar. 2024*

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| **EDM Workshop** | *Trento* |
| INVITED — A GLOBAL EDM ANALYSIS WITH THEORY UNCERTAINTIES | *Mar. 2024* |
| **IRN Terascale Meeting** | *Marseille* |
| GLOBAL ANALYSIS: THE TRUE CONSTRAINING POWER OF DIFFERENT EDM MEASUREMENTS | *Oct. 2023* |
| **Pheno Conference** | *Pittsburgh* |
| FROM HIGGS TO TOP: A GLOBAL SMEFT ANALYSIS | *May 2023* |
| **ALPS Conference** | *Obergurgl* |
| PROFILING AND MARGINALIZATION IN A GLOBAL SMEFT ANALYSIS | *Mar. 2023* |
| **Higgs Conference** | *Pisa* |
| TO PROFILE OR TO MARGINALIZE: A SMEFT CASE STUDY | *Nov. 2022* |
| **DESY Theory Workshop** | *Hamburg* |
| TO PROFILE OR TO MARGINALIZE: A SMEFT CASE STUDY | *Sep. 2022* |

## SEMINARS

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| **COMETA Working Group Meeting** | *Online* |
| INVITED — USING AMPLITUDES FOR ACCURACY AND UNCERTAINTY ESTIMATION IN ML | *Jan. 2025* |
| **Nikhef Theory Seminar** | *Amsterdam* |
| INVITED — ACCURACY AND UNCERTAINTIES FOR ML-AMPLITUDES | *Dec. 2024* |
| **Particle Theory Seminar** | *Würzburg* |
| INVITED — THE IMPACT OF LIKELIHOODS ON SMEFT GLOBAL ANALYSES | *Oct. 2024* |
| **BNL Lunch Seminar** | *Brookhaven* |
| INVITED — FROM HIGGS TO TOP: A GLOBAL SMEFT ANALYSIS | *May 2023* |

# Publications ─────────────────────────────

Automatically updated list on Google Scholar

6 publications – 4 peer reviewed | 2 submitted

## PEER-REVIEWED PUBLICATIONS

**∗Amplitude Uncertainties Everywhere All at Once**

WITH H. BAHL, T. PLEHN, R. WINTERHALDER                                   *2025*

accepted in SciPost Physics, arXiv:2509.00155 [hep-ph]

**∗Accurate Surrogate Amplitudes with Calibrated Uncertainties**

WITH H. BAHL, L. FAVARO, M. HAUßMANN, T. PLEHN, R. WINTERHALDER          *2024*

SciPost Phys. Core 8 (2025) 073, arXiv:2412.12069 [hep-ph]

**∗Staying on Top of SMEFT-Likelihood Analyses**

WITH M. MADIGAN, T. PLEHN, N. SCHMAL                                      *2023*

SciPost Phys. 18 (2025) 108, arXiv:2312.12502 [hep-ph]

**∗To profile or to marginalize — A SMEFT case study**

WITH I. BRIVIO, S. BRUGGISSER, E. GEOFFRAY, M. LUCHMANN, T. PLEHN        *2022*

SciPost Phys. 16 (2024) 035, arXiv:2208.08454 [hep-ph]

## PREPRINT PUBLICATIONS

**∗Forecasting Generative Amplification**

WITH H. BAHL, S. DIEFENBACHER, T. PLEHN, J. SPINNER                      *2025*

submitted to SciPost, arXiv:2509.08048 [hep-ph]

**∗A Global View of the EDM Landscape**

WITH S. DEGENKOLB, T. MODAK, M. M"UHLLEITNER, T. PLEHN                   *2024*

submitted to SciPost, arXiv:2403.02052 [hep-ph]