Jaco ter Hoeve

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Keywords: Standard Model Effective Field Theory, Deep Learning, Likelihood-Free Inference, Perturbative QCD

Education

- **University of Edinburgh** — Edinburgh, United Kingdom
  Postdoctoral Researcher — *since Oct 2024*
  - Postdoctoral Researcher in Theoretical Particle Physics at the Higgs Centre for Theoretical Physics
- **VU Amsterdam** — Amsterdam, The Netherlands
  PhD candidate — *Oct 2020 - Sep 2024*
  - PhD candidate in Theoretical Particle Physics at VU Amsterdam and Nikhef
    Advisors: Juan Rojo, Wouter Verkerke
- **Utrecht University** — Utrecht, The Netherlands
  M.Sc. Theoretical Physics — *Sep 2018 - Jul 2020*
  - Thesis on 'Matching between EFT and UV Complete Models' at Nikhef
    Graded 8.5/10.0
- **Utrecht University** — Utrecht, The Netherlands
  B.Sc. Physics & Astronomy — *Sep 2015 - Jun 2018*
  - Graduated cum laude, GPA 4.0/4.0 (Dutch grading system: 8.75/10.0)
  - Thesis on 'Renormalization Group Connected to Neural Networks' at the Institute of Theoretical Physics (Utrecht)
  - Participated in the Honours Programme (Descartes College)
- **University of Edinburgh** — Edinburgh, United Kingdom
  Exchange programme — *Sep 2017 - Dec 2017*
  - Obtained an average grade of 80 %, 1st Class Honours

Publications

- **J. ter Hoeve**, *Fingerprinting New Physics with Effective Field Theories*, PhD thesis, [arXiv:2501.08818].
- E. Celada, T. Giani, **J. ter Hoeve**, L. Mantani, J. Rojo, A. N. Rossia, M. O. A. Thomas, and E. Vryonidou, *Mapping the SMEFT at high-energy colliders: from LEP and the (HL-)LHC to the FCC-ee*, *JHEP* **09** (2024) 091, [arXiv:2404.12809].
- **J. ter Hoeve**, G. Magni, J. Rojo, A. N. Rossia, and E. Vryonidou, *The automation of SMEFT-assisted constraints on UV-complete models*, *JHEP* **01** (2024) 179, [arXiv:2309.04523].
- R. Gomez Ambrosio, **J. ter Hoeve**, M. Madigan, J. Rojo, and V. Sanz, *Unbinned multivariate observables for global SMEFT analyses from machine learning*, *JHEP* **03** (2023) 033, [arXiv:2211.02058].

- **J. ter Hoeve**, E. Laenen, C. Marinissen, L. Vernazza, and G. Wang, *Region analysis of QED massive fermion form factor*, *JHEP* **02** (2024) 024, [arXiv:2311.16215].
- H. La, A. Brokkelkamp, S. van der Lippe, **J. ter Hoeve**, J. Rojo, and S. Conesa-Boj, *Edge-induced excitations in Bi2Te3 from spatially-resolved electron energy-gain spectroscopy*, *Ultramicroscopy* **254** (2023) 113841, [arXiv:2305.03752].
- A. Brokkelkamp, **J. ter Hoeve**, I. Postmes, S. E. van Heijst, L. Maduro, A. V. Davydov, S. Krylyuk, J. Rojo, and S. Conesa-Boj, *Spatially Resolved Band Gap and Dielectric Function in Two-Dimensional Materials from Electron Energy Loss Spectroscopy*, *J. Phys. Chem. A* **126** (2022), no. 7 1255–1262, [arXiv:2202.12572].

Seminars and talks at international conferences

- *Single particle extensions at FCC-ee*, 8th FCC Physics Workshop, Jan 2025, (slides)
- *Mapping the SMEFT at future colliders, towards the ESPPU*, Seminar at IPPP, Durham University, Dec 2024
- *Mapping the SMEFT at High-Energy Colliders: from LEP and the (HL-)LHC to the FCC-ee*, ICHEP, Prague, Jul 2024, (slides)
- *Update on global SMEFT fits*, invited talk at Standard Model at the LHC, Rome, May 2024, (slides)
- *Global SMEFT fits from (HL)-LHC to future colliders*, Seminar Radboud University, Nijmegen, March 2024
- *Likelihood-free inference for global SMEFT fits*, invited talk at the 1$^{\text{st}}$ COMETA General Meeting, Izmir, Feb 2024, (slides)
- *Machine Learning opportunities for EFT analyses*, invited talk at the LHC EFT Working Group, CERN (online), Oct 2023, (slides), (recording)
- *Likelihood learning theory in practice*, invited talk at the LHC Precision Program, Benasque (Spain), Oct 2023, (slides)
- *Interpreting HEP data in SMEFiT*, invited talk at the Reinterpretation Forum, Durham, Aug 2023, (slides)
- *Statistically optimal observables for global SMEFT fits*, HEFT, Manchester, Jun 2023, (slides)
- *Unbinned multivariate observables for global SMEFT analyses from machine learning*, invited talk at CERN, Geneva, Dec 2022, (slides)
- *Towards an optimal global SMEFT fit with machine learning*, Machine Learning at GGI, Florence, Sep 2022, (slides)
- *Unbinned measurements in global SMEFT fits from machine learning*, Learning to Discover, Paris-Saclay, May 2022, (slides)
- *Charting Electron Energy Loss Spectra with Machine Learning*, NWO Physics 2021, Jan 2022
- *Optimally sensitive observables for global EFT fits*, Dutch Physics Society (NNV) annual meeting, Nov 2021, (slides)

- *Optimally sensitive observables for global EFT fits*, Higgs 2021, Stony Brook University (online), Oct 2021, (slides)

Software packages

- `ML4EFT`, likelihood-free inference tool based on deep-learning for particle physics data `lhcfitnikhef.github.io/ML4EFT` (open source)
- `EELSFitter`, an Electron-Energy Loss Spectra analyser `lhcfitnikhef.github.io/EELSfitter` (open source)
- `SMEFiT`, a standard model effective field theory fitter `lhcfitnikhef.github.io/smefit_release` (open source)

Activities

- **NNV subatomic physics council member**
  National Physics Society — *Jun 2022 - Sep 2024*
- **Chairman DRSTP PhD council**
  Dutch Research School for Theoretical Physics — *Dec 2020 - Sep 2024*
  - Organise scientific meetings and social/outreach events for theoretical physics PhD students in The Netherlands
- **PhysTev Les Houches workshop** — Les Houches, France
  International workshop aiming to push the frontier of particle physics — *June 2023*
- **CERN Masterclass** — Nikhef
  Particle Physics outreach to high school students — *March 2022*
- **Invited guest lecture** — TU Delft
  Topic: Electron Energy Loss Fitter with Machine Learning — *May 2021*
- **Advanced VBS Traning School** — Milan
  Topics: polarised vector boson scattering and effective field theories — *Aug 29-Sep 03, 2021*
- **DESY Summer School in Gauge and String Theory** — Hamburg
  Topics: scattering amplitudes and loop level technologies — *Jul 22-26, 2019*
- **Summer School Programming** — Amsterdam
  Developed the game Hex in C++ — *Summer 2015*

Teaching and supervisory experience

- **Master thesis supervision** — joint UvA/VU
  P. Herbschleb, MSc Theoretical Physics, optimal observables in SMEFT — *Sep 22- Jun 23*
- **Bachelor thesis supervision** — joint UvA/VU
  W. Gauthier (2023), J. Bakker and D. Pelan (2021), BSc Physics & Astronomy
- **Teaching Assistant** — joint UvA/VU
  Courses: — *since Sep 2020*
  - Effective Field Theories (2023)
  - Quantum Mechanics II (2021, 2022)

- **Teaching Assistant** — Utrecht University
  Courses: — *Nov 2016 - Jun 2020*
  - Black Holes (2019, 2020)
  - Fluid Dynamics (2018, 2020)
  - Data Analysis (2016, 2017)

Computer and natural languages

- Python, PyTorch, C++, Java, Mathematica, Fortran, LaTeX, HTML and CSS
- Dutch (Native), English (Full professional proficiency)