

CV

Personal information

Dr. Philipp Eller
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Married, 1 Child

Education

- SINCE 2023 **Habilitation Candidate in Physics**
TU Munich, "Experimental Neutrino Physics"
- 2011 - 2015 **Doctor of Sciences**
ETH Zurich, thesis advisors Prof. R. Wallny & Prof. C. Grab
Thesis title: Associated Z+Higgs Boson Production in the Leptonic+Beauty Final State and the Upgrade of the Pixel Detector at CMS
- 2008 - 2010 **Master of Science in Physics**
ETH Zurich, thesis advisors Prof. G. Dissertori & Prof. C. Gerber (UIC)
(with exchanges at ENS Paris and University of Illinois at Chicago / Fermilab)
- 2005 - 2009 **Bachelor of Science in Physics**
ETH Zurich

Employment history

- SINCE 2021 **Research Group Leader**
TU Munich (Prof. E. Resconi)
- 2019-2021 **Postdoctoral Researcher / Member of the Origins Data Science Lab**
TU Munich / Excellence Cluster "Origins" (Prof. A. Caldwell)
- 2016-2019 **Postdoctoral Researcher**
Penn State University (Prof. D. Cowen)
- 2011-2015 **Research Assistant**
ETH Zurich (Prof. R. Wallny & Prof. C. Grab)
- 2010-2011 **Project Scientist**
FHNW Basel (Prof. A. Binz)

Scientific responsibilities

- SINCE 2022 Convener of IceCube oscillation physics
- SINCE 2021 Principal Investigator in the **SFB 1258** "Neutrinos and Dark Matter in Astro- and Particle Physics"
- SINCE 2021 Participant in the consortium "**PUNCH4NFDI** — Particles, Universe, Nuclei & Hadrons for the NFDI"
- SINCE 2021 Munich Data Science Institute (MDSI) seed funding project "**Netrium: Precise and fast model prediction with machine learning**"
- SINCE 2020 Frequent reviewer for the European Physics Journal C
- 2018 - 2022 Technical coordinator of the IceCube oscillation working group
- 2018 - 2022 Member of the IceCube Coordination Committee (ICC)

Scientific service work

- 2018 USAP Antarctic deployment for IceCube on-site maintenance
- SINCE 2016 Maintainer of various IceCube software packages, and the **PISA** open-source software
- 2013-2014 Detector on-call expert for the CMS pixel detector
- 2010 Detector on-site operations of the DØ tracking detector

Languages

- GERMAN native
- ENGLISH fluent / proficient
- FRENCH advanced (C1)

Funding & Fellowships

- 2022 **Kaggle Research Grant & MDSI Outreach Grant**
For the execution of the "IceCube - Neutrinos in Deep Ice" project (undisclosed amount)
- 2022 **ORIGINS Seed Money**
Co-PI of project "One for All" (Eur 60k)
- 2022 **PhD position**
for Rasmus Ørsøe (PUNCH4NFDI / NFDI)
- 2021 **PhD position**
for Alan Zander (SFB1258 / DFG)
- 2021 **ODSL Fellowship**
Origins Excellence Cluster
- 2017 **Early Postdoc Mobility Fellowship**
Swiss National Science Foundation (~\$77k)
- 2016 **IGC Fellowship**
PSU Institute for Gravitation & the Cosmos (\$10k)

Prizes & Awards

- 2022 **Supervisory Award**
For the outstanding supervision of his graduate students, Department of Physics, TU Munich
- 2021 **US Antarctica Service Medal**
In recognition of valuable contributions to exploration and scientific achievement under the United States Antarctic program
- 2020 **IceCube Impact Award**
For key contributions to the development of and support for event reconstruction and detector systematics, in particular relevant to the collaboration's low-energy analyses
- 2019 **Seal of Excellence**
Marie Skłodowska-Curie Actions, European Commission
- 2017 **Prize for best poster at the Advanced Computing and Analysis Techniques conference**
2x P100 GPUs sponsored by Nvidia (~\$12k retail value)

International Conferences

- 2023 **38th International Cosmic Ray Conference (ICRC2023)**
Talk: Public Kaggle Competition "IceCube – Neutrinos in Deep Ice" + 2 Posters
- 2022 **The 27th European Cosmic Ray Symposium, Nijmegen**
Highlight Talk: Particle Physics with Neutrino Telescopes
- 2022 **ML4Astro, Catania**
Talk: ML Event Reconstructions for Neutrino Telescopes
- 2019 **PAHEN 2019, Berlin**
Talk: Neutrino oscillations and tau appearance at IceCube
- 2019 **EPS-HEP 2019, Ghent**
Talk: Neutrino Oscillations in IceCube
- 2018 **Neutrino 2018, Heidelberg**
Poster 1: Tau Neutrino Appearance in IceCube, Poster 2: IceCube Event Reconstruction using Photon Backpropagation
- 2017 **NuPhys, London**
Talk: Recent results from IceCube
- 2017 **NuFact, Uppsala**
Talk: Tau Neutrino Appearance in IceCube
- 2017 **Advanced Computing and Analysis Techniques in Physics, Seattle**
Poster + Talk: High Statistics & GPU Accelerated Data Analysis in IceCube
- 2016 **NuFact, 12th Rencontres du Vietnam, Quy Nhon**
Talk: Recent IceCube/DeepCore results and the PINGU upgrade
- 2016 **Neutrino 2016, London**
Poster: Constraining Neutrino Oscillation Parameters with IceCube/DeepCore
- 2014 **10th International Conference on Position Sensitive Detectors, Surrey**
Talk: CMS Pixel Phase I Upgrade
- 2014 **37th International Conference on High Energy Physics, Valencia**
Talk: Measurement of VZ production cross sections in $VZ \rightarrow Vb\bar{b}$ decay channels in pp collisions at 8 TeV from CMS
- 2014 **Large Hadron Collider Physics, New York**
Poster: Measurement of VZ production cross sections in $VZ \rightarrow Vb\bar{b}$ decay channels in pp collisions at 8 TeV from CMS
- 2013 **Higgs Hunting, Orsay**
Talk: Search for a Higgs Boson produced in association with W or Z Bosons, and decaying into bottom quarks at CMS
- 2013 **Large Hadron Collider Physics, Barcelona**
Poster: Search for a Higgs-like boson decaying into bottom quarks in the ZH channel

International Schools

- 2013 **International School Excellence in Detectors and Instrumentation Technologies (EDIT)**
KEK Tsukuba & J-PARC Tokai, Japan
- 2012 **European School of High-Energy Physics**
Anjou, France

Colloquia, Seminars & Workshops

- 2023 **Kaggle webinar**
- 2022 SFB Colloquium, Munich
- 2022 2nd GraphNeT workshop (co-organization), TU Munich
- 2022 1st GraphNeT workshop, Niels-Bohr Institute, Copenhagen
- 2022 **Astroparticle Seminar**, Niels-Bohr Institute, Copenhagen
- 2021 Galaxies and Lensing Seminar, Universitäts-Sternwarte München
- 2020 Workshop on State of the Art in Sampling and Clustering, Munich
- 2019 Bayes Forum, Munich
- 2019 Physics Colloquium, CERN, Geneva
- 2019 IPA Colloquium, ETH Zurich
- 2018 Seminar, Nikhef, Amsterdam
- 2018 Particle Physics Seminar, University of Geneva
- 2018 High Energy Physics Seminar, Penn State University
- 2017 APS April Meeting, Washington DC
- 2015 Particle Physics Seminar, University of Manchester
- 2014 Advanced Scientific Computing Workshop, Zurich
- 2013 Joint Annual Meeting of APS and SPS, Linz
- 2013 PhD Seminar, Zurich
- 2012 Annual Meeting of the Swiss Physical Society, Zurich

Teaching

- 2023 "Data Science Basics", TU Munich
- 2023 "Physics for Future Presidents", Munich School of Politics (TUM)
- 2022 "Introduction to Machine Learning", Excellence Cluster Origins
- 2022 "Applied Multi-Messenger Astronomy 2", TU Munich
- 2022 "Applied Multi-Messenger Astronomy 1", TU Munich
- 2021 "Applied Multi-Messenger Astronomy 2", TU Munich
- 2021 "Introduction to Machine Learning", BiD4BEST Astrostatistics school
- 2020 "Introduction to Machine Learning", Excellence Cluster Origins
- 2020 "Numerical Methods for Data Analysis", TU Munich
- 2019 "Introduction to Data Analysis", TU Munich
- 2008 – 2015 Teaching Assistant at ETH Zurich for numerous courses (physics, calculus, statistics)

Outreach

- 2023 Organizer of the kaggle competition "**IceCube - Neutrinos in Deep Ice**"
- 2020 CERN early career scientist event "A conversation over ice cream: future detectors for particle physics"
- 2014 ETH Unterwegs, talk to high school students, High school Wil
- 2013 ETH Day, talk of three young scientists, Zurich

Scientific Publications

Complete list of publications can be found under: <http://inspirehep.net/author/profile/P.Eller.1> The following lists only publications with substantial personal contributions. (Please note that in our field authors are often listed alphabetically by name or institution and not by their contribution, especially collaboration papers.)

2024

- Manuel Ettengruber, Alan Zander, and Philipp Eller. Testing the Number of Neutrino Species with a Global Fit of Neutrino Data. 2 2024. [arXiv:2402.00490](https://arxiv.org/abs/2402.00490)
- Martina Karl and Philipp Eller. Fitting neutrino flares: Applying expectation maximization on neutrino data. 12 2023. [arXiv:2312.15196](https://arxiv.org/abs/2312.15196)

2023

- Habib Bukhari, Dipam Chakraborty, Philipp Eller, Takuya Ito, Maxim V. Shugaev, and Rasmus Ørsøe. IceCube – Neutrinos in Deep Ice: The Top 3 Solutions from the Public Kaggle Competition, 2023. [arXiv:2310.15674](https://arxiv.org/abs/2310.15674)
- Alan Zander, Manuel Ettengruber, and Philipp Eller. How Many Dark Neutrino Sectors Does Cosmology Allow? 8 2023. [arXiv:2308.00798](https://arxiv.org/abs/2308.00798)
- Philipp Eller, Kayla Leonard DeHolton, Jan Weldert, and Rasmus Orsoe. Sensitivity of the IceCube Upgrade to Atmospheric Neutrino Oscillations. *PoS, ICRC2023:1036*, 2023. [doi:10.22323/1.444.1036](https://doi.org/10.22323/1.444.1036)
- Philipp Eller and Martin Rongen. A model independent parametrization of the optical properties of the refrozen IceCube drill holes. *PoS, ICRC2023:1034*, 2023. [doi:10.22323/1.444.1034](https://doi.org/10.22323/1.444.1034)
- Philipp Eller. Public Kaggle Competition “IceCube - Neutrinos in Deep ice”. *PoS, ICRC2023:1609*, 2023. [doi:10.22323/1.444.1609](https://doi.org/10.22323/1.444.1609)
- IceCube Collaboration (Abbasi et al.). Measurement of atmospheric neutrino mixing with improved IceCube DeepCore calibration and data processing. *Phys. Rev. D*, 108(1):012014, 2023. [arXiv:2304.12236](https://arxiv.org/abs/2304.12236), [doi:10.1103/PhysRevD.108.012014](https://doi.org/10.1103/PhysRevD.108.012014)
- Andreas Søgaard, Rasmus F. Ørsøe, Morten Holm, Leon Bozianu, Aske Rosted, Troels C. Petersen, Kaare Endrup Iversen, Andreas Hermansen, Tim Guggenmos, Peter Andresen, Martin Ha Minh, Ludwig Neste, Moust Holmes, Axel Pontén, Kayla Leonard DeHolton, and Philipp Eller. Graphnet: Graph neural networks for neutrino telescope event reconstruction. *Journal of Open Source Software*, 8(85):4971, 2023. URL: <https://doi.org/10.21105/joss.04971>, [doi:10.21105/joss.04971](https://doi.org/10.21105/joss.04971)

2022

- Philipp Eller. Event Reconstruction for Neutrino Telescopes. *Accepted for publication in Astrophysics and Space Science Proceedings*, 11 2022
- IceCube Collaboration (Abbasi et al.). Graph Neural Networks for low-energy event classification & reconstruction in IceCube. *JINST*, 17(11):P11003, 2022. [arXiv:2209.03042](https://arxiv.org/abs/2209.03042), [doi:10.1088/1748-0221/17/11/P11003](https://doi.org/10.1088/1748-0221/17/11/P11003)
- Manuel Ettengruber, Matteo Agostini, Allen Caldwell, Philipp Eller, and Oliver Schulz. Discovering neutrinoless double-beta decay in the era of precision neutrino cosmology. *Phys. Rev. D*, 106(7):073004, 2022. [arXiv:2208.09954](https://arxiv.org/abs/2208.09954), [doi:10.1103/PhysRevD.106.073004](https://doi.org/10.1103/PhysRevD.106.073004)
- Philipp Eller, Aaron Fienberg, Jan Weldert, Garrett Wendel, Sebastian Böser, and D. F. Cowen. A flexible event reconstruction based on machine learning and likelihood principles. *Nucl. Instrum. Meth. A*, 1048:168011, 2023. [arXiv:2208.10166](https://arxiv.org/abs/2208.10166), [doi:10.1016/j.nima.2023.168011](https://doi.org/10.1016/j.nima.2023.168011)
- Philipp Eller, Nahuel Iachellini Ferreiro, Luca Pattavina, and Lolian Shtembari. Online triggers for supernova and pre-supernova neutrino detection with cryogenic detectors. *JCAP*, 10:024, 2022. [arXiv:2205.03350](https://arxiv.org/abs/2205.03350), [doi:10.1088/1475-7516/2022/10/024](https://doi.org/10.1088/1475-7516/2022/10/024)
- IceCube Collaboration (Abbasi et al.). Low energy event reconstruction in IceCube DeepCore. *Eur. Phys. J. C*, 82(9):807, 2022. [arXiv:2203.02303](https://arxiv.org/abs/2203.02303), [doi:10.1140/epjc/s10052-022-10721-2](https://doi.org/10.1140/epjc/s10052-022-10721-2)
- Vasyl Hafych, Philipp Eller, Oliver Schulz, and Allen Caldwell. Parallelizing MCMC Sampling via Space Partitioning. *Statistics and Computing*, 35(56), 2022. [doi:https://doi.org/10.1007/s11222-022-10116-z](https://doi.org/10.1007/s11222-022-10116-z)

- Christian Karl, Philipp Eller, and Susanne Mertens. Fast and precise model calculation for KATRIN using a neural network. *Eur. Phys. J. C*, 82(5):439, 2022. [arXiv:2201.04523](#), [doi:10.1140/epjc/s10052-022-10384-z](#)

2021

- Philipp Eller and Lolian Shtembari. A goodness-of-fit test based on a recursive product of spacings. *Journal of Instrumentation*, 18(03):P03048, 2023
- Martina Karl, Philipp Eller, and Anna Schubert. Search for high-energy neutrino sources from the direction of IceCube alert events. In *37th International Cosmic Ray Conference*, 7 2021. [arXiv:2107.08853](#)
- F. Henningsen, M. Boehmer, P. Eller, C. Fruck, A. Gärtner, L. Geilen, R. Gernhäuser, H. Heggen, K. Holzapfel, N. Khera, L. Papp, T. Pertl, I.C. Rea, E. Resconi, F. Schmuckermaier, C. Spannfellner, and M. Traxler. A self-monitoring precision calibration light source for the IceCube upgrade. *Journal of Instrumentation*, 16(09):C09033, 2021. [doi:10.1088/1748-0221/16/09/c09033](#)
- CMS Tracker Group (Adam et al.). The CMS Phase-1 Pixel Detector Upgrade. *JINST*, 16(02):P02027, 2021. [arXiv:2012.14304](#), [doi:10.1088/1748-0221/16/02/P02027](#)

2020

- Allen Caldwell, Philipp Eller, Vasyly Hafych, Rafael Schick, Oliver Schulz, and Marco Szalay. Integration with an adaptive harmonic mean algorithm. *Int. J. Mod. Phys. A*, 35(24):1950142, 2020. [arXiv:1808.08051](#), [doi:10.1142/S0217751X20501420](#)
- IceCube Collaboration (Aartsen et al.). Development of an analysis to probe the neutrino mass ordering with atmospheric neutrinos using three years of IceCube DeepCore data. *Eur. Phys. J. C*, 80(1):9, 2020. [arXiv:1902.07771](#), [doi:10.1140/epjc/s10052-019-7555-0](#)
- IceCube Collaboration (Aartsen et al.). Computational Techniques for the Analysis of Small Signals in High-Statistics Neutrino Oscillation Experiments. *Nuclear Instruments and Methods in Physics Research A*, page 164332, 2020. [arXiv:1803.05390](#), [doi:https://doi.org/10.1016/j..2020.164332](#)

2019

- IceCube Collaboration (Aartsen et al.). Measurement of Atmospheric Tau Neutrino Appearance with IceCube DeepCore. *Phys. Rev.*, D99(3):032007, 2019. [arXiv:1901.05366](#), [doi:10.1103/PhysRevD.99.032007](#)

2018

- Philipp Eller. High-statistics and GPU Accelerated Data Analysis. *J. Phys. Conf. Ser.*, 1085(4):042033, 2018. [doi:10.1088/1742-6596/1085/4/042033](#)
- Philipp Eller and Justin Lanfranchi. A reverse icecube event reconstruction, June 2018. URL: <https://doi.org/10.5281/zenodo.1304918>, [doi:10.5281/zenodo.1304918](#)
- Philipp Eller, Feifei Huang, and Michael Larson. Measurement of Atmospheric Tau Neutrino Appearance with IceCube/DeepCore, June 2018. URL: <https://doi.org/10.5281/zenodo.1304920>, [doi:10.5281/zenodo.1304920](#)
- IceCube Collaboration (Aartsen et al.). Measurement of Atmospheric Neutrino Oscillations at 6–56 GeV with IceCube DeepCore. *Phys. Rev. Lett.*, 120(7):071801, 2018. [arXiv:1707.07081](#), [doi:10.1103/PhysRevLett.120.071801](#)
- IceCube Collaboration (Aartsen et al.). Search for Nonstandard Neutrino Interactions with IceCube DeepCore. *Phys. Rev.*, D97(7):072009, 2018. [arXiv:1709.07079](#), [doi:10.1103/PhysRevD.97.072009](#)

2017

- IceCube Collaboration (Aartsen et al.). PINGU: A Vision for Neutrino and Particle Physics at the South Pole. *J. Phys.*, G44(5):054006, 2017. [arXiv:1607.02671](#), [doi:10.1088/1361-6471/44/5/054006](#)
- IceCube Collaboration (Aartsen et al.). Letter of Intent: The Precision IceCube Next Generation Upgrade (PINGU). 2017. [arXiv:1401.2046](#)

2015

- Philipp Eller. *Associated Z+Higgs Boson Production in the Leptonic+Beauty Final State and the Upgrade of the Pixel Detector at CMS*. PhD thesis, ETH, Zurich (main), 2015. URL: <https://e-collection.library.ethz.ch/view/eth:47775>

2014

- CMS Collaboration (Chatrchyan et al.). Evidence for the direct decay of the 125 GeV Higgs boson to fermions. *Nature Phys.*, 10:557–560, 2014. [arXiv:1401.6527](https://arxiv.org/abs/1401.6527), [doi:10.1038/nphys3005](https://doi.org/10.1038/nphys3005)
- CMS Collaboration (Chatrchyan et al.). Search for the standard model Higgs boson produced in association with a W or a Z boson and decaying to bottom quarks. *Phys. Rev.*, D89(1):012003, 2014. [arXiv:1310.3687](https://arxiv.org/abs/1310.3687), [doi:10.1103/PhysRevD.89.012003](https://doi.org/10.1103/PhysRevD.89.012003)
- CMS Collaboration (Chatrchyan et al.). Measurement of WZ and ZZ production in pp collisions at $\sqrt{s} = 8$ TeV in final states with b-tagged jets. *Eur. Phys. J.*, C74(8):2973, 2014. [arXiv:1403.3047](https://arxiv.org/abs/1403.3047), [doi:10.1140/epjc/s10052-014-2973-5](https://doi.org/10.1140/epjc/s10052-014-2973-5)
- Philipp Eller. Measurement of VZ production cross sections in Z \rightarrow bb decay channels in pp collisions at 8 TeV. In *Proceedings, 2nd Conference on Large Hadron Collider Physics Conference (LHCP 2014): New York, USA, June 2-7, 2014*, 2014. URL: <http://www.slac.stanford.edu/econf/C140602.2/papers/1408.5044v1.pdf>, [arXiv:1408.5044](https://arxiv.org/abs/1408.5044)

2013

- CMS Collaboration (Chatrchyan et al.). Observation of a new boson with mass near 125 GeV in pp collisions at $\sqrt{s} = 7$ and 8 TeV. *JHEP*, 06:081, 2013. [arXiv:1303.4571](https://arxiv.org/abs/1303.4571), [doi:10.1007/JHEP06\(2013\)081](https://doi.org/10.1007/JHEP06(2013)081)
- Philipp Eller. Search for a Higgs-like boson decaying into bottom quarks in the Z(H)H channel. *EPJ Web Conf.*, 60:20029, 2013. [doi:10.1051/epjconf/20136020029](https://doi.org/10.1051/epjconf/20136020029)

2011

- DØ Collaboration (Abazov et al.). Measurements of single top quark production cross sections and $|V_{tb}|$ in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV. *Phys. Rev.*, D84:112001, 2011. [arXiv:1108.3091](https://arxiv.org/abs/1108.3091), [doi:10.1103/PhysRevD.84.112001](https://doi.org/10.1103/PhysRevD.84.112001)
- DØ Collaboration (Abazov et al.). Model-independent measurement of t -channel single top quark production in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV. *Phys. Lett.*, B705:313–319, 2011. [arXiv:1105.2788](https://arxiv.org/abs/1105.2788), [doi:10.1016/j.physletb.2011.10.035](https://doi.org/10.1016/j.physletb.2011.10.035)