Dr. Claudius G. Krause

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Research Experience

10/2020 – present **Postdoctoral Associate**, Rutgers, The State University of New Jersey, USA
Research focus: Machine Learning for Particle Physics

03/2018 – 09/2020 **Feodor Lynen Research Fellow of the Alexander von Humboldt Foundation**, hosted by Prof. Dr. M. Carena in the Theory Department, Fermi National Accelerator Laboratory (Fermilab), USA
Research focus: Higgs Phenomenology beyond the Standard Model, Machine Learning for Particle Physics

11/2016 – 02/2018 **Postdoctoral Researcher,** LHC-Pheno group of Prof. Dr. A. Pich, Instituto de Física Corpuscular (IFIC), Valencia, Spain
Research focus: Effective Field Theories and Higgs Phenomenology

10/2016 **Scientific Assistant**, group of Prof. Dr. G. Buchalla, Ludwig Maximilian University, Munich, Germany
Transition period for 1 month between the doctorate and the start of the position in Valencia, Spain
Research focus: Higgs Effective Field Theories

10/2013-09/2016 **Scientific Assistant**, group of Prof. Dr. G. Buchalla, Ludwig Maximilian University, Munich, Germany
Contract as doctoral student

Studies and education

Winter term 13/14 – Summer term 16 **Dr. rer. nat. (in Physics), Ludwig Maximilian University Munich**
Final grade 1.0 (magna cum laude)
Doctoral Thesis: "Higgs Effective Field Theories – Systematics & Applications", Supervisor: Prof. Dr. G. Buchalla
Date of graduation: 15. September 2016

Wt 10/11 – St 13 **M.Sc. in Physics, Ludwig Maximilian University Munich,**
Final grade 1.0 (very good, A+)
Master's Thesis: "An effective field theory for electroweak symmetry breaking including a light Higgs", Supervisor: Prof. Dr. G. Buchalla

Wt 11/12 **École Polytechnique Fédérale de Lausanne**
Semester abroad via the Erasmus program

Wt 07/08 – St 10 **B.Sc. in Physics, Brandenburg University of Technology (BTU) Cottbus**
Final grade 1.1 (very good, A+)
Bachelor's Thesis at the "Deutsches Elektronen Synchroton" (DESY) in Zeuthen: "The Impact of Different Monte Carlo Models on the Cross

Section Measurement of Top-Pair Production at 7 TeV Proton-Proton Collisions", Supervisor: Prof. Dr. W. Lohmann

Summer 2006 **Abitur, Christian-Weise-Gymnasium, Zittau**
Abitur (final school exam) with result 1.2 (very good, A+)
Advanced courses in mathematics and physics

Awards and scholarships

03/2018 – 09/2020 Feodor Lynen Research Fellowship of the Alexander von Humboldt Foundation, carried out at the Fermi National Accelerator Laboratory (Fermilab), USA
hosted by Prof. Dr. M. Carena in the Theory Department

01/2018 "Universe PhD Award 2017" of the "Cluster of Excellence Universe" in Munich, category Theory, award for the best theoretical doctoral thesis in 2016/2017

10/2013 – 09/2016 Associated with the "International Max Planck Research School (IMPRS)" on Elementary Particle Physics in Munich

09/2013 Award for being among the best 10% of all graduating students in Physics: Refund of the tuition fees of the LMU Munich

04/2012 – 03/2013 Scholarship holder of the Deutschland-Stipendium (Germany-Scholarship)

08/2011 – 02/2012 Erasmus Scholarship for a semester at the École Polytechnique Fédérale de Lausanne in Switzerland

01/2011 Award for the best Bachelor's Thesis of the Faculty 1 of the Brandenburg University of Technology Cottbus in the year 2010

02/2009 – 06/2013 Scholarship holder of the Roland-Berger-Stiftung

since 07/2006 Member of the German Physical Society
The first year of the membership was an award for the best exam in physics in my school in the Abitur (final school exam).

Service and Outreach

03/2021 Referee for the SIGGRAPH2021 conference

12/2020 – present Organizer of the Phenomenology Seminar at the Rutgers Physics Department

since 2020 Referee for the Journal "Machine Learning: Science & Technology"
Referee for the Journal "European Physical Journal C" (EPJ C)

01/2020 Participating scientist in the monthly Fermilab event "ask-a-scientist"

10/2019-09/2020	Organizer of the Fermilab HEP Journal Club
07/2019	Co-organizer of the workshop “Multibosons At The Energy Frontier” at Fermilab
since 2018	Referee for the Journal of High Energy Physics (JHEP)
10/2017	Participated in a two day workshop on outreach, organized by the Klaus Tschira Stiftung, as reward for my participation in the “KlarText” competition.
05/2017	Participated in the “Expociencia”, open house day of IFIC, Valencia, Spain
02/2017	Participated in the “KlarText” competition of the Klaus Tschira Stiftung, writing an outreach essay about my doctoral thesis

Teaching experience

Lecturing:

High School level	2-day block course with lectures in “Physics for becoming medical students”
undergraduate level/ Bachelor classes	1 stand-in lecture in “Quantum mechanics for teachers” (theoretical)
graduate level/ Master classes	1 stand-in lecture in “Quantum electrodynamics” (theoretical)
	1 stand-in lecture in “Machine Learning for High-Energy Physics”

Teaching assistant (8 terms in total at LMU Munich):

undergraduate level/ Bachelor classes	Atomic and molecular physics (experimental) Electrodynamics (theoretical) Nuclear and particle physics (experimental) Quantum mechanics for teachers (theoretical)
graduate level/ Master classes	Quantum electrodynamics (theoretical) Nuclear and particle physics (experimental) QCD and Standard Model (theoretical)

Development of problem sheets:

graduate level/ Master classes	QCD and Standard Model (theoretical)

Supervising physics lab courses (3 terms in total at BTU Cottbus):

undergraduate level/ Bachelor classes	physics lab course for physicists physics lab course for engineers

Internships

09/2011 – 02/2012 **École Polytechnique Fédérale de Lausanne**
Traveaux Pratiques – Laboratory work
Final report: "Applications of Dirac-Theory" (8ECTS)
Supervisor: Prof. Dr. R. Rattazzi

02/2010 – 03/2010 **Deutsches Elektronen Synchroton (DESY), Zeuthen**
Final report: "Improvement of the continuum limit for Wilson twisted mass fermions at maximal twist" (8ECTS)
Supervisor: Prof. Dr. K. Jansen

Selected conference talks (full list available at https://claudius-krause.gitlab.io/cv)

01/2020	"i-flow: High-Dimensional Integration and Sampling with Normalizing Flows", invited talk at the "CMS Machine Learning Forum on Event Generation", virtual for CERN, Switzerland
12/2019	"Event Generation with Normalizing Flows", invited talk at "Particle Physics in Computing Frontier", IBS, Daejeon, South Korea
04/2019	"Master formula for one-loop renormalization of bosonic SMEFT operators", invited talk at "Higgs Effective Field Theories", UC Louvain, Belgium
09/2018	"Complete One-Loop Renormalization of the Higgs-Electroweak Chiral Lagrangian", invited talk at "Chiral Dynamics 2018", Durham, NC, USA
06/2018	"Current and Future Constraints on Higgs Couplings", talk at "PASCOS - PArticles, Strings, & COSmology", Cleveland, OH, USA
04/2018	"Complete One-Loop Renormalization of the Higgs-Electroweak Chiral Lagrangian", invited talk at Higgs Effective Field Theories", Mainz, Germany
12/2017	Signals of electroweak baryogenesis and the role of Higgs self-couplings" talk at "LHC Pheno", IFIC Valencia, Spain

Publications

Peer-reviewed:

1. "i-flow: High-dimensional Integration and Sampling with Normalizing Flows", C. Gao, J. Isaacson, C. Krause, arXiv:2001.05486, Mach.Learn.Sci.Tech. 1 (2020) 4, 045023

2. "Event Generation with Normalizing Flows", C. Gao, S. Hoeche, J. Isaacson, C. Krause, H. Schulz, arXiv:2001.10028, Phys.Rev.D 101 (2020) 7, 076002

3. "Colorful Imprints of Heavy States in the Electroweak Effective Theory", C. Krause, A. Pich, I. Rosell, J. Santos, J.-J. Sanz-Cillero, arXiv:1810.10544, JHEP 1905 (2019) 092

4. "Current and Future Constraints on Higgs Couplings in the Nonlinear Effective Theory", J. de Blas, O. Eberhardt, C. Krause, arXiv:1803.00939, JHEP 1807 (2018) 048

5. "Signals of the electroweak phase transition at colliders and gravitational wave observatories", M. Chala, C. Krause, G. Nardini, arXiv:1802.02168, JHEP 1807 (2018) 062

6. "Complete One-Loop Renormalization of the Higgs-Electroweak Chiral Lagrangian", G. Buchalla, O. Cata, A. Celis, M. Knecht, C. Krause, arXiv:1710.06412, Nucl.Phys. B928 (2018) 93-106

7. "Standard Model Extended by a Heavy Singlet: Linear vs. Nonlinear EFT", G. Buchalla, O. Cata, A. Celis, C. Krause, arXiv:1608.03564, Nucl.Phys. B917 (2017) 209-233

8. "Fitting Higgs Data with Nonlinear Effective Theory", G. Buchalla, O. Cata, A. Celis, C. Krause, arXiv:1511.00988, Eur.Phys.J. C76 (2016) no.5, 233

9. "Note on Anomalous Higgs-Boson Couplings in Effective Field Theory", G. Buchalla, O. Cata, A. Celis, C. Krause, arXiv:1504.01707, Phys.Lett. B750 (2015) 298-301

10. "A Systematic Approach to the SILH Lagrangian", G. Buchalla, O. Cata, C. Krause, arXiv:1412.6356, Nucl.Phys. B894 (2015) 602-620

11. "On the Power Counting in Effective Field Theories", G. Buchalla, O. Catá, C. Krause, arXiv:1312.5624, Phys.Lett. B731 (2014) 80-86

12. "Complete Electroweak Chiral Lagrangian with a Light Higgs at NLO", G. Buchalla, O. Catà, C. Krause, arXiv:1307.5017, Nucl.Phys. B880 (2014) 552-573, Erratum: Nucl.Phys. B913 (2016) 475-478

Preprints:

1. "A New Approach to Electroweak Symmetry Non-Restoration", M. Carena, C. Krause, Z. Liu, Y. Wang, arXiv:2104.00638

2. "Higgs-Electroweak Chiral Lagrangian: One-Loop Renormalization Group Equations", G. Buchalla, O. Catà, A. Celis, M. Knecht, C. Krause, arXiv:2004.11348

3. "Master Formula for One-Loop Renormalization of Bosonic SMEFT Operators", G. Buchalla, A. Celis, C. Krause, J.-N. Toelstede, arXiv:1904.07840

4. "Comment on "Analysis of General Power Counting Rules in Effective Field Theory"", G. Buchalla, O. Cata, A. Celis, C. Krause, arXiv:1603.03062

Doctoral Thesis:

1. "Higgs Effective Field Theories — Systematics & Applications", Claudius Krause, arXiv:1610.08537, University Library LMU Munich

Community projects:

1. "Higgs Physics at the HL-LHC and HE-LHC", HL/HE WG2 group (M. Cepeda et al.), arXiv:1902.00134

2. "Handbook of LHC Higgs Cross Sections: 4. Deciphering the Nature of the Higgs Sector", LHC Higgs Cross Section Working Group (D. de Florian et al.), arXiv:1610.07922

Conference proceedings:

1. "Effective theories and resonances in strongly-coupled electroweak symmetry breaking scenarios", I. Rosell, C. Krause, A. Pich, J.-J. Sanz-Cillero, arXiv:1910.01839, PoS EPS-HEP2019

2. "Complete One-Loop Renormalization of the Higgs-Electroweak Chiral Lagrangian", C. Krause, G. Buchalla, O. Cata, A. Celis, M. Knecht, arXiv:1907.07605, PoS CD2018 (2018) 072

3. "Heavy resonances and the electroweak effective theory", I. Rosell, C. Krause, A. Pich, J. Santos, J.-J. Sanz-Cillero, arXiv:1811.10233, PoS ICHEP2018 (2019)

4. "Tracks of resonances in electroweak effective Lagrangians", I. Rosell, C. Krause, A. Pich, J. Santos, J.J. Sanz-Cillero, arXiv:1710.06622, PoS EPS-HEP2017 (2018) 334