

Ursula Laa

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PROFESSIONAL EXPERIENCE **Research fellow**, Department of Econometrics and Business Statistics & School of Physics and Astronomy since 2017
Topic: Statistical visualisation methods for theoretical particle physics
(Advisors: Dianne Cook, German Valencia)
Monash University, Australia

EDUCATION **PhD**, Theoretical Particle Physics 2014–2017
Topic: Understanding LHC Searches for new Physics with Simplified Models
(Supervisors: Genevieve Belanger, Sabine Kraml)
LPSC Grenoble, France

Master of Science, Physics 2011–2014
Topic: Interpretation of the CMS and ATLAS Simplified Models Results
University of Vienna and HEPHY, Austria
with distinction

Bachelor of Science, Physics 2007–2011
University of Vienna, Austria
with distinction

RESEARCH VISITS Physics Department and Data Science Centre, New York University, USA Nov 2019
 Statistics Department, University of Pennsylvania, USA Nov 2019
 Theory Group of LPSC Grenoble, France Mar–Jul 2014
 ERASMUS Exchange, Aarhus University, Denmark 2010–2011

AWARDS & SCHOLARSHIPS **ACEMS** Centre of Excellence, associate investigator since 2019
 ENIGMASS Cluster of Excellence, PhD fellowship 2014–2017
 Deans List Faculty of Physics, University of Vienna 2014
 (for outstanding academic performance during the Master’s program)
 Zonta Club Wien I-Postgraduate Award 2013
 FEMtech Scholarship for Master’s thesis internship 2013

PUBLICATIONS

JOURNAL PUBLICATIONS **Note:** authors are sorted alphabetically for particle physics publications (standard in the field), while they are sorted by contribution for publications in statistics journals (marked by highlighting my name in bold font).

Hole or grain? A Section Pursuit Index for Finding Hidden Structure in Multiple Dimensions

 U. Laa, D. Cook, A. Buja, G. Valencia
 under review, arXiv:2004.13327

A slice tour for finding hollowness in high-dimensional data

 U. Laa, D. Cook, G. Valencia
 tentatively accepted for publication in JCGS, arXiv:1910.10854

Fitting in or odd one out? Pulls vs residual responses in $b \rightarrow s\ell^+\ell^-$

B. Capdevila, U. Laa, G. Valencia
under review, arXiv:1908.03338

Using tours to visually investigate properties of new projection pursuit indexes with application to problems in physics

U. Laa, D. Cook

to appear in Computational Statistics, <https://doi.org/10.1007/s00180-020-00954-8>

Connecting R with D3 for dynamic graphics, to explore multivariate data with tours

M. Kipp, U. Laa, D. Cook

The R Journal (2019) 11:1, <https://doi.org/10.32614/RJ-2019-002>

SModelS v1.2: long-lived particles, combination of signal regions, and other novelties

F. Ambrogi, J. Dutta, J. Heisig, S. Kraml, S. Kulkarni, U. Laa, A. Lessa, et al.

to appear in CPC, <https://doi.org/10.1016/j.cpc.2019.07.013>

Anatomy of a six-parameter fit to the $b \rightarrow s\ell^+\ell^-$ anomalies

B. Capdevila, U. Laa, G. Valencia

Eur.Phys.J. C79 (2019) no.6, 462, <https://doi.org/10.1140/epjc/s10052-019-6944-8>

Dynamical projections for the visualisation of PDFSense data

D. Cook, U. Laa, G. Valencia

Eur.Phys.J. C78 (2018) no.9, 742, <https://doi.org/10.1140/epjc/s10052-018-6205-2>

On the coverage of the pMSSM by simplified model results

F. Ambrogi, S. Kraml, S. Kulkarni, U. Laa, A. Lessa, W. Waltenberger

Eur.Phys.J. C78 (2018) no.3, 215, <https://doi.org/10.1140/epjc/s10052-018-5660-0>

Simplified dark matter models with a spin-2 mediator at the LHC

S. Kraml, U. Laa, K. Mawatari, K. Yamashita

Eur.Phys.J. C77 (2017) no.5, 326, <https://doi.org/10.1140/epjc/s10052-017-4871-0>

SModels v1.1 user manual: Improving simplified model constraints with efficiency maps

F. Ambrogi, S. Kraml, S. Kulkarni, U. Laa, A. Lessa, V. Magerl, J. Sonneveld, M. Traub, W. Waltenberger

CPC 227 (2018) 72-98, <https://doi.org/10.1016/j.cpc.2018.02.007>

Collider limits on new physics within micrOMEGAs

D. Barducci, G. Belanger, J. Bernon, F. Boudjema, J. Da Silva, S. Kraml, U. Laa, A. Pukhov

CPC 222 (2018) 327-338, <https://doi.org/10.1016/j.cpc.2017.08.028>

Scalar versus fermionic top partner interpretations of $t\bar{t} + E_T^{\text{miss}}$ searches at the LHC

S. Kraml, U. Laa, L. Panizzi, H. Prager

JHEP 1611 (2016) 107, [https://doi.org/10.1007/JHEP11\(2016\)107](https://doi.org/10.1007/JHEP11(2016)107)

Probing U(1) extensions of the MSSM at the LHC Run I and in dark matter searches

G. Belanger, J. Da Silva, U. Laa, A. Pukhov

JHEP 1509 (2015) 151, [https://doi.org/10.1007/JHEP09\(2015\)151](https://doi.org/10.1007/JHEP09(2015)151)

Constraints on sneutrino dark matter from LHC Run 1

C. Arina, M. E. Cabrera Catalan, S. Kraml, S. Kulkarni, U. Laa

JHEP 1505 (2015) 142, [https://doi.org/10.1007/JHEP05\(2015\)142](https://doi.org/10.1007/JHEP05(2015)142)

SModels: A tool for interpreting simplified-model results from the LHC and its application to supersymmetry

S. Kraml, S. Kulkarni, U. Laa, A. Lessa, W. Magerl, D. Proschofsky-Spindler, W. Waltenberger

Eur.Phys.J. C74 (2014) 2868, <https://doi.org/10.1140/epjc/s10052-014-2868-5>

SOFTWARE

Main developer of the R packages **spinebil** (for evaluating the performance of projection pursuit index functions) and **galahr** (a GUI for the tourr package)

Maintainer of the R packages **binostics** (calculation of graph-theoretic scagnostics) and **tourrGUID3** (D3 based tourr GUI)

Contributor to the R package **tourr** (implementation of tour algorithms in R)

Developer of the Python package **SModels** for re-interpretation of results in particle physics

CONFERENCE PAPERS & PREPRINTS

High-dimensional data visualisation with the grand tour

U. Laa

to appear in the proceedings of CHEP 2019, EPJ Web of Conferences

SModels – new developments and applications

U. Laa

PoS ICHEP2018 (2019) 516

Les Houches 2017: Physics at TeV Colliders New Physics Working Group

arXiv:1803.10379

On the coverage of the pMSSM by simplified model results

U. Laa

PoS EPS-HEP2017 (2017) 300, arXiv:1709.10386

Les Houches 2015: Physics at TeV colliders – new physics working group report

arXiv:1605.02684

Interpreting LHC searches for new physics with SModels

U. Laa

PoS EPS-HEP2015 (2015) 105, arXiv:1510.01999

SModels v1.0: a short user guide

S. Kraml, S. Kulkarni, U. Laa, A. Lessa, V. Magerl, W. Magerl, D. Proschofsky-Spindler, M. Traub, W. Waltenberger

arXiv:1412.1745

TEACHING

TEACHING EXPERIENCE

Tutor at Monash University

from 2020

Statistical Learning

Supervision of computational labs

Practical Exercises at University Grenoble Alpes

2015–2017

Nuclear physics for Radioprotection Master

Nuclear physics for Physics Master

Muon measurements for Physics Bachelor

Tutor at University of Vienna

2011–2013

Weekly seminar for first semester physics students

SUPERVISION Co-advised several PhD, Honours and undergraduate research students
 Main advisor for an Honours project on machine learning and visualisation for particle physics searches and in a summer research project on clustering and visualisation

PRESENTATIONS

COLLOQUIA & WORKSHOPS	Data Visualisation New York Meetup High-dimensional data visualisation with tours	Nov 2019
	Technical Talk ARC Centre of Excellence for Mathematical & Statistical Frontiers An Introduction to the Visualisation Ecosystem in R (with Stuart Lee)	Sep 2019
	Colloquium School of Physics and Astronomy, Monash University, Australia High-dimensional data visualisation for physics applications	Apr 2019
	Workshop Business Analytics Seminar, Monash University, Australia An Introduction to gganimate (with Mitch O'Hara-Wild and Nick Spyrison)	Mar 2019
CONFERENCE TALKS & POSTERS	Conference on Computing in High Energy and Nuclear Physics Adelaide, Australia Talk: High-dimensional data visualisation with the grand tour	Nov 2019
	UseR! Toulouse, France Talk: Visualising high-dimensional data: new developments of the tourr package using Shiny and plotly	July 2019
	Visualisation Matters Canberra, Australia Invited talk: Visualisation in Physics	May 2019
	Australian Meeting on Accelerator-Based Particle Physics Melbourne, Australia Talk: Anatomy of a six-parameter fit to the $b \rightarrow s\ell^+\ell^-$ anomalies	Feb 2019
	International Conference on High Energy Physics Seoul, Korea Talk: SModelS - new developments and applications	Aug 2018
	European Physical Society Conference on High Energy Physics Venice, Italy Talk: On the coverage of the pMSSM by Simplified Model results	July 2017
	Rencontres de Physique des Particules Centre de Physique des Particules de Marseille, France Talk: Simplified dark matter models with a spin-2 mediator at the LHC	April 2017
	Open Questions in Particle Physics and Cosmology Convention Centre by the Observatory, Goettingen, Germany Talk: Simplified dark matter models with a spin-2 mediator at the LHC	April 2017
	(Re)interpreting the results of new physics searches at the LHC CERN, Geneva, Switzerland Talk: Scalar versus fermionic top partner interpretations of $t\bar{t} + E_T^{miss}$ searches at the LHC	Dec 2016

	(Re)interpreting the results of new physics searches at the LHC CERN, Geneva, Switzerland Talk: On the coverage of the pMSSM by Simplified Model results	Jun 2016
	GDR Terascale Subatech, Nantes, France Talk: SModelS & Simplified Model Sensitivity to Spin Structure	May 2016
	Dark Matter at the Large Hadron Collider 2016 Amsterdam, Netherlands Poster: Interpreting LHC searches for new physics with SModelS	Mar-Apr 2016
	SUSY 2015 Lake Tahoe, California, USA Talk: Constraints on sneutrino dark matter from LHC Run 1	Aug 2015
	European Physical Society Conference on High Energy Physics Vienna, Austria Poster: Interpreting LHC searches for new physics with SModelS	Jul 2015
	GDR Terascale Saclay, France Talk: Constraints on sneutrino dark matter from LHC Run 1	Mar-Apr 2015
	GDR Terascale Palaiseau, France Talk: SModelS – Interpreting Simplified Model Results	Jun 2014
	ÖPG/SPS 2013 Annual Meeting Linz, Austria Talk: Application of CMS and ATLAS Simplified Models Results to Theories Beyond the Standard Model	Sept 2013
SEMINARS	IFAE Seminar Barcelona, Spain High-dimensional data visualisation for physics applications	July 2019
	HEPHY Seminar Vienna, Austria High-dimensional data visualisation for physics applications	July 2019
	Particle Physics Pheno Seminar University of Milan, Italy High-dimensional data visualisation for physics applications	June 2019
	LPSC Theory Seminar Grenoble, France High-dimensional data visualisation for physics applications	June 2019
	Feast-of-Facts Seminar RSAA (ANU) Canberra, Australia High-dimensional data visualisation for physics applications	May 2019
	Seminar Ewha Womans University, Seoul, Korea Statistical visualisation of particle physics data: Sensitivity of parton distribution functions	Aug 2018
	Business Analytics Seminar Monash University, Australia Statistical visualisation of particle physics data	June 2018

Particle Physics Seminar March 2018
Monash University, Australia
Understanding LHC searches for new physics with simplified models

PhD Thesis Defence Sept 2017
LPSC Grenoble, France
Understanding LHC searches for new physics with simplified models

Doctoral Seminar Mar 2016
LPSC Grenoble, France
Interpreting LHC searches for new physics with SModels

SERVICE Referee for Physical Review D
Seminar organiser for Monash Business Analytics (from 2020)

COMPUTING Python, R, git, \LaTeX
Author of several open-source software packages

LANGUAGES German (native speaker)
English (fluent)
French (conversant)

NATIONALITY Austrian