

Ursula Laa

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PROFESSIONAL EXPERIENCE	University assistant (tenure track) , Institute of Statistics University of Natural Resources and Life Sciences (BOKU) Vienna, Austria	since 2020
	Research fellow , Department of Econometrics and Business Statistics & School of Physics and Astronomy Topic: Statistical visualisation methods for theoretical particle physics (Advisors: Dianne Cook, German Valencia) Monash University, Australia	2017–2020
EDUCATION	PhD , Theoretical Particle Physics Topic: Understanding LHC Searches for new Physics with Simplified Models (Supervisors: Genevieve Belanger, Sabine Kraml) LPSC Grenoble, France	2014–2017
	Master of Science , Physics Topic: Interpretation of the CMS and ATLAS Simplified Models Results University of Vienna and HEPHY, Austria with distinction	2011–2014
	Bachelor of Science , Physics University of Vienna, Austria with distinction	2007–2011
RESEARCH VISITS	Research group SOLsTIS, AgroParisTech, France	July 2021
	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	2019–2021
	ENIGMASS Cluster of Excellence, PhD fellowship	2014–2017
	Deans List Faculty of Physics, University of Vienna (for outstanding academic performance during the Master’s program)	2014
	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).

The state-of-the-art on tours for dynamic visualization of high-dimensional data
S. Lee, D. Cook, N. Da Silva, **U. Laa**, E. Wang, N. Spyrisson, H. S. Zhang
WIREs Computational Statistics, online access,
<https://doi.org/10.1002/wics.1573>

Visual Diagnostics for Constrained Optimisation with Application to Guided Tours

H. S. Zhang, D. Cook, U. Laa, N. Langrene, P. Menendez
The R Journal (2021) 13:2,
<https://doi.org/10.32614/RJ-2021-105>

Pandemonium: a clustering tool to partition parameter space – application to the B anomalies

U. Laa, G. Valencia
European Physical Journal Plus, 137:145,
<https://doi.org/10.1140/epjp/s13360-021-02310-1>

Casting Multiple Shadows: High-Dimensional Interactive Data Visualisation with Tours and Embeddings

S. Lee, U. Laa, D. Cook
to appear in Journal of Data Science, Statistics, and Visualisation, arXiv:2012.06077

Burning sage: Reversing the curse of dimensionality in the visualization of high-dimensional data

U. Laa, D. Cook, S. Lee
Journal of Computational and Graphical Statistics, 31:1, 40-49,
<https://doi.org/10.1080/10618600.2021.1963264>

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

U. Laa, D. Cook, A. Buja, G. Valencia
Journal of Computational and Graphical Statistics, online access,
<https://doi.org/10.1080/10618600.2022.2035230>

A slice tour for finding hollowness in high-dimensional data

U. Laa, D. Cook, G. Valencia
Journal of Computational and Graphical Statistics, 29:3, 681-687,
<https://doi.org/10.1080/10618600.2020.1777140>

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

U. Laa, D. Cook
Computational Statistics 35, 1171-1205(2020), <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. Ambrogio, 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. Ambrogio, 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. Ambrogio, 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), **galahr** (a GUI for the tourr package) and **pandemonium** (a Shiny app for the interactive exploration of hierarchical clustering results)

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), in particular the new display methods for the slice and sage tour. Contributor to the packages **ferrn** (diagnostics for optimization) and **cassowaryr** (re-implementation of scagnostics).

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

EPJ Web of Conferences 245, 06018 (2020)

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

B. Capdevila, U. Laa, G. Valencia

arXiv:1908.03338

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

Lecturer at BOKU University from 2021

4 hours of teaching per semester, in German and English
Different formats: lecture, exercise classes, seminar
Topics: Statistics introduction, Statistics with R, Introduction to statistical learning,
Exploratory data analysis
Development of new teaching material, and fully new course Exploratory data anal-
ysis

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 parti-
cle physics searches and in a summer research project on clustering and visualisation

PRESENTATIONS

COLLOQUIA & WORKSHOPS

R Ladies Vienna May 2021

Introduction to ggplot2 – Workshop

Data Visualisation New York Meetup Nov 2019

High-dimensional data visualisation with tours

Technical Talk Sep 2019

ARC Centre of Excellence for Mathematical & Statistical Frontiers

	An Introduction to the Visualisation Ecosystem in R (with Stuart Lee)	
	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	CMStatistics London, UK (Hybrid) Talk: Section pursuit	Dec 2021
	Rencontres R Paris, France Talk: Tours for the dynamic visualization of high-dimensional data	July 2021
	UseR! virtual Talk: New displays for the visualization of multivariate data in the tourr package	July 2021
	ACEMS Retreat ARC Centre of Excellence for Mathematical & Statistical Frontiers virtual retreat Talk: Reversing the curses of dimensionality in the visualization of high-dimensional data	Nov 2020
	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	Dec 2016

	CERN, Geneva, Switzerland	
	Talk: Scalar versus fermionic top partner interpretations of $t\bar{t} + E_T^{miss}$ searches at the LHC	
	(Re)interpreting the results of new physics searches at the LHC	Jun 2016
	CERN, Geneva, Switzerland	
	Talk: On the coverage of the pMSSM by Simplified Model results	
	GDR Terascale	May 2016
	Subatech, Nantes, France	
	Talk: SModelS & Simplified Model Sensitivity to Spin Structure	
	Dark Matter at the Large Hadron Collider 2016	Mar-Apr 2016
	Amsterdam, Netherlands	
	Poster: Interpreting LHC searches for new physics with SModelS	
	SUSY 2015	Aug 2015
	Lake Tahoe, California, USA	
	Talk: Constraints on sneutrino dark matter from LHC Run 1	
	European Physical Society Conference on High Energy Physics	Jul 2015
	Vienna, Austria	
	Poster: Interpreting LHC searches for new physics with SModelS	
	GDR Terascale	Mar-Apr 2015
	Saclay, France	
	Talk: Constraints on sneutrino dark matter from LHC Run 1	
	GDR Terascale	Jun 2014
	Palaiseau, France	
	Talk: SModelS – Interpreting Simplified Model Results	
	ÖPG/SPS 2013 Annual Meeting	Sept 2013
	Linz, Austria	
	Talk: Application of CMS and ATLAS Simplified Models Results to Theories Beyond the Standard Model	
SEMINARS	WU Statistics and Mathematics Research Seminar	Jan 2022
	Vienna University of Economics and Business, Austria (Hybrid)	
	Section pursuit	
	Particle Physics Group Meeting	Nov 2020
	Monash University, Australia (virtual)	
	Hole or grain? Exploring for hidden structure in multiple dimensions with the slice tour	
	ICRAR/UWA Seminar	June 2020
	University of Western Australia, Australia (virtual)	
	Visualisation beyond 3 dimensions	
	Business Analytics Seminar	June 2020
	Monash University, Australia (virtual)	
	Hole or grain? Exploring for hidden structure in multiple dimensions with the slice tour	
	IFAE Seminar	July 2019
	Barcelona, Spain	
	High-dimensional data visualisation for physics applications	
	HEPHY Seminar	July 2019
	Vienna, Austria	

High-dimensional data visualisation for physics applications	
Particle Physics Pheno Seminar	June 2019
University of Milan, Italy	
High-dimensional data visualisation for physics applications	
LPSC Theory Seminar	June 2019
Grenoble, France	
High-dimensional data visualisation for physics applications	
Feast-of-Facts Seminar	May 2019
RSAA (ANU) Canberra, Australia	
High-dimensional data visualisation for physics applications	
Seminar	Aug 2018
Ewha Womans University, Seoul, Korea	
Statistical visualisation of particle physics data: Sensitivity of parton distribution functions	
Business Analytics Seminar	June 2018
Monash University, Australia	
Statistical visualisation of particle physics data	
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	Co-organizer of R Ladies Vienna
	Referee for the R Journal, Journal of Computational and Graphical Statistics and the Journal of Outdoor Recreation and Tourism
	Previously referee for Physical Review D
	Seminar organiser for Monash Business Analytics (2020)
	Session co-host rstudio::global(2021) conference
COMPUTING	Python, R, git, \LaTeX
	Author of several open-source software packages
LANGUAGES	German (native speaker)
	English (fluent)
	French (conversant)
NATIONALITY	Austrian