

## Ursula Laa

---

Mail: [ursula.laa@boku.ac.at](mailto:ursula.laa@boku.ac.at)  
Web: <https://uschilaa.github.io>  
ORCID: 0000-0002-0249-6439  
Last update: 29.09.2022

PROFESSIONAL EXPERIENCE	<b>Assistant professor (tenure track)</b> , Institute of Statistics University of Natural Resources and Life Sciences (BOKU) Vienna, Austria	since 2022
	<b>University assistant (tenure track)</b> , Institute of Statistics University of Natural Resources and Life Sciences (BOKU) Vienna, Austria	2020–2022
	<b>Research fellow</b> , 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	<b>PhD</b> , Theoretical Particle Physics Topic: Understanding LHC Searches for new Physics with Simplified Models (Supervisors: Genevieve Belanger, Sabine Kraml) LPSC Grenoble, France	2014–2017
	<b>Master of Science</b> , Physics Topic: Interpretation of the CMS and ATLAS Simplified Models Results University of Vienna and HEPHY, Austria with distinction	2011–2014
	<b>Bachelor of Science</b> , 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	<b>ACEMS</b> Centre of Excellence, associate investigator	2019–2021
	<b>ENIGMASS</b> Cluster of Excellence, PhD fellowship	2014–2017
	<b>Deans List</b> Faculty of Physics, University of Vienna (for outstanding academic performance during the Master’s program)	2014
	<b>Zonta</b> Club Wien I-Postgraduate Award	2013
	<b>FEMtech</b> Scholarship for Master’s thesis internship	2013
CONSULTING	<b>Roche Diagnostics</b> Training on exploratory data analysis and automated reporting with R (2 days)	2023

## OUTREACH

**faculti interview** A Slice Tour for Finding Hollowness in High Dimensional Data

2023

## 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. Asterix marks publications for which I was first and/or corresponding author.

**\* New and simplified manual controls for projection and slice tours, with application to exploring classification boundaries in high dimensions**

U. Laa, A. Aumann, D. Cook, G. Valencia

Journal of Computational and Graphical Statistics, 32:3, 1229-1236

<https://doi.org/10.1080/10618600.2023.2206459>

**cubble: An R Package for Organizing and Wrangling Multivariate Spatio-temporal Data**

H. S. Zhang, D. Cook, U. Laa, N. Langrene, P. Menendez

under review

<https://doi.org/10.48550/arXiv.2205.00259>

**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, 14(4), e1573,

<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

Journal of Data Science, Statistics, and Visualisation, <https://doi.org/10.52933/jdssv.v2i3>

**\* 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.

CPC 251 (2020), <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>

**BOOK  
CONTRIBUTIONS**

Book chapter **Klassisches maschinelles Lernen** (in German)

**U. Laa**, F. Leisch

in Moderne Verfahren der Angewandten Statistik. Springer Spektrum

[https://doi.org/10.1007/978-3-662-63496-7\\_6-1](https://doi.org/10.1007/978-3-662-63496-7_6-1)

**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). All three packages are available through my GitHub account [github.com/uschiLaa](https://github.com/uschiLaa).

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

Major contributor to the R package **tourr** (implementation of tour algorithms in R), in particular the new display methods for the slice and sage tour, and methods for section pursuit. Contributor to the packages **ferri** (diagnostics for optimization), **cassowary** (re-implementation of scagnostics) and **cubbe** (for multivariate spatio-temporal data).

Previously a developer of the Python package **SModelS** for re-interpretation of results in particle physics.

**CONFERENCE  
PAPERS &  
PREPRINTS**

**New tour methods for visualizing high-dimensional data**

U. Laa, D. Cook

Pearson, Italy, Cladag 2023 Book of Abstracts and Short Papers

ISBN: 978-88-9193-563-2

**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  $b \rightarrow s\ell^+\ell^-$**

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 analysis

**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**

**R Ladies Vienna** May 2022

Introduction to shiny – Workshop

**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** Apr 2019

School of Physics and Astronomy, Monash University, Australia

High-dimensional data visualisation for physics applications

**Workshop** Mar 2019

Business Analytics Seminar, Monash University, Australia

An Introduction to gganimate (with Mitch O'Hara-Wild and Nick Spyrisson)

CONFERENCE TALKS & POSTERS	<b>Cladag</b> Salerno, Italy Talk: New tour methods for visualizing high-dimensional data	Sept 2023
	<b>DSSV-ECDA</b> Antwerp, Belgium Talk: New tour methods for visualizing high-dimensional data	July 2023
	<b>CompStat</b> Bologna, Italy (Hybrid) Invited talk: Different flavors of publishing computational work	Aug 2022
	<b>JSM</b> Washington DC, USA Invited panel contribution: Tours for the dynamic visualization of high-dimensional data	Aug 2022
	<b>DSSV</b> Tainan, Taiwan (Hybrid) Invited talk: Multivariate visualization for the interpretation of clustering results	June 2022
	<b>Austrian and Slovenian Statistical Days</b> Graz, Austria Talk: Scagnostics with the cassowaryR package	Apr 2022
	<b>CMStatistics</b> London, UK (Hybrid) Talk: Section pursuit	Dec 2021
	<b>Rencontres R</b> Paris, France Talk: Tours for the dynamic visualization of high-dimensional data	July 2021
	<b>UseR!</b> virtual Talk: New displays for the visualization of multivariate data in the tourr package	July 2021
	<b>ACEMS Retreat</b> 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
	<b>Conference on Computing in High Energy and Nuclear Physics</b> Adelaide, Australia Talk: High-dimensional data visualisation with the grand tour	Nov 2019
	<b>UseR!</b> Toulouse, France Talk: Visualising high-dimensional data: new developments of the tourr package using Shiny and plotly	July 2019
	<b>Visualisation Matters</b> Canberra, Australia Invited talk: Visualisation in Physics	May 2019
	<b>Australian Meeting on Accelerator-Based Particle Physics</b> Melbourne, Australia Talk: Anatomy of a six-parameter fit to the $b \rightarrow s\ell^+\ell^-$ anomalies	Feb 2019

	<b>International Conference on High Energy Physics</b> Seoul, Korea Talk: SModelS - new developments and applications	Aug 2018
	<b>European Physical Society Conference on High Energy Physics</b> Venice, Italy Talk: On the coverage of the pMSSM by Simplified Model results	July 2017
	<b>Rencontres de Physique des Particules</b> Centre de Physique des Particules de Marseille, France Talk: Simplified dark matter models with a spin-2 mediator at the LHC	April 2017
	<b>Open Questions in Particle Physics and Cosmology</b> Convention Centre by the Observatory, Goettingen, Germany Talk: Simplified dark matter models with a spin-2 mediator at the LHC	April 2017
	<b>(Re)interpreting the results of new physics searches at the LHC</b> CERN, Geneva, Switzerland Talk: Scalar versus fermionic top partner interpretations of $t\bar{t} + E_T^{miss}$ searches at the LHC	Dec 2016
	<b>(Re)interpreting the results of new physics searches at the LHC</b> CERN, Geneva, Switzerland Talk: On the coverage of the pMSSM by Simplified Model results	Jun 2016
	<b>GDR Terascale</b> Subatech, Nantes, France Talk: SModelS & Simplified Model Sensitivity to Spin Structure	May 2016
	<b>Dark Matter at the Large Hadron Collider 2016</b> Amsterdam, Netherlands Poster: Interpreting LHC searches for new physics with SModelS	Mar-Apr 2016
	<b>SUSY 2015</b> Lake Tahoe, California, USA Talk: Constraints on sneutrino dark matter from LHC Run 1	Aug 2015
	<b>European Physical Society Conference on High Energy Physics</b> Vienna, Austria Poster: Interpreting LHC searches for new physics with SModelS	Jul 2015
	<b>GDR Terascale</b> Saclay, France Talk: Constraints on sneutrino dark matter from LHC Run 1	Mar-Apr 2015
	<b>GDR Terascale</b> Palaiseau, France Talk: SModelS – Interpreting Simplified Model Results	Jun 2014
	<b>ÖPG/SPS 2013 Annual Meeting</b> Linz, Austria Talk: Application of CMS and ATLAS Simplified Models Results to Theories Beyond the Standard Model	Sept 2013
SEMINARS	<b>WU Statistics and Mathematics Research Seminar</b> Vienna University of Economics and Business, Austria (Hybrid) Section pursuit	Jan 2022

<b>Particle Physics Group Meeting</b> Monash University, Australia (virtual) Hole or grain? Exploring for hidden structure in multiple dimensions with the slice tour	Nov 2020
<b>ICRAR/UWA Seminar</b> University of Western Australia, Australia (virtual) Visualisation beyond 3 dimensions	June 2020
<b>Business Analytics Seminar</b> Monash University, Australia (virtual) Hole or grain? Exploring for hidden structure in multiple dimensions with the slice tour	June 2020
<b>IFAE Seminar</b> Barcelona, Spain High-dimensional data visualisation for physics applications	July 2019
<b>HEPHY Seminar</b> Vienna, Austria High-dimensional data visualisation for physics applications	July 2019
<b>Particle Physics Pheno Seminar</b> University of Milan, Italy High-dimensional data visualisation for physics applications	June 2019
<b>LPSC Theory Seminar</b> Grenoble, France High-dimensional data visualisation for physics applications	June 2019
<b>Feast-of-Facts Seminar</b> RSAA (ANU) Canberra, Australia High-dimensional data visualisation for physics applications	May 2019
<b>Seminar</b> Ewha Womans University, Seoul, Korea Statistical visualisation of particle physics data: Sensitivity of parton distribution functions	Aug 2018
<b>Business Analytics Seminar</b> Monash University, Australia Statistical visualisation of particle physics data	June 2018
<b>Particle Physics Seminar</b> Monash University, Australia Understanding LHC searches for new physics with simplified models	March 2018
<b>PhD Thesis Defence</b> LPSC Grenoble, France Understanding LHC searches for new physics with simplified models	Sept 2017
<b>Doctoral Seminar</b> LPSC Grenoble, France Interpreting LHC searches for new physics with SModels	Mar 2016

## SERVICE

Co-organizer of the **Data Science @ BOKU initiative** and associated events and of **R Ladies Vienna**

Program Committee member for UseR! 2024



Referee for the R Journal; the Journal of Computational and Graphical Statistics; the Journal of Data Science, Statistics and Visualisation; the International Journal of Data Science and Analytics; and the Journal of Outdoor Recreation and Tourism

Previously referee for Physical Review D

Seminar organiser for Monash Business Analytics (2020)

Session chair: rstudio::global(2021) conference (co-host), JSM 2022, Cladag 2023

**COMPUTING**

Python, R, git,  $\LaTeX$

Author of several open-source software packages

**LANGUAGES**

German (native speaker)

English (fluent)

French (conversant)

**NATIONALITY**

Austrian