



Reinterpretation of LHC results for new physics

9th general workshop of the BSM Reinterpretation Forum

25–28 Feb 2025, CERN

closing remarks

Chairs: [Jon Butterworth](#) • [Martin Habedank](#) • [Sezen Sekmen](#) • [Sabine Kraml](#)

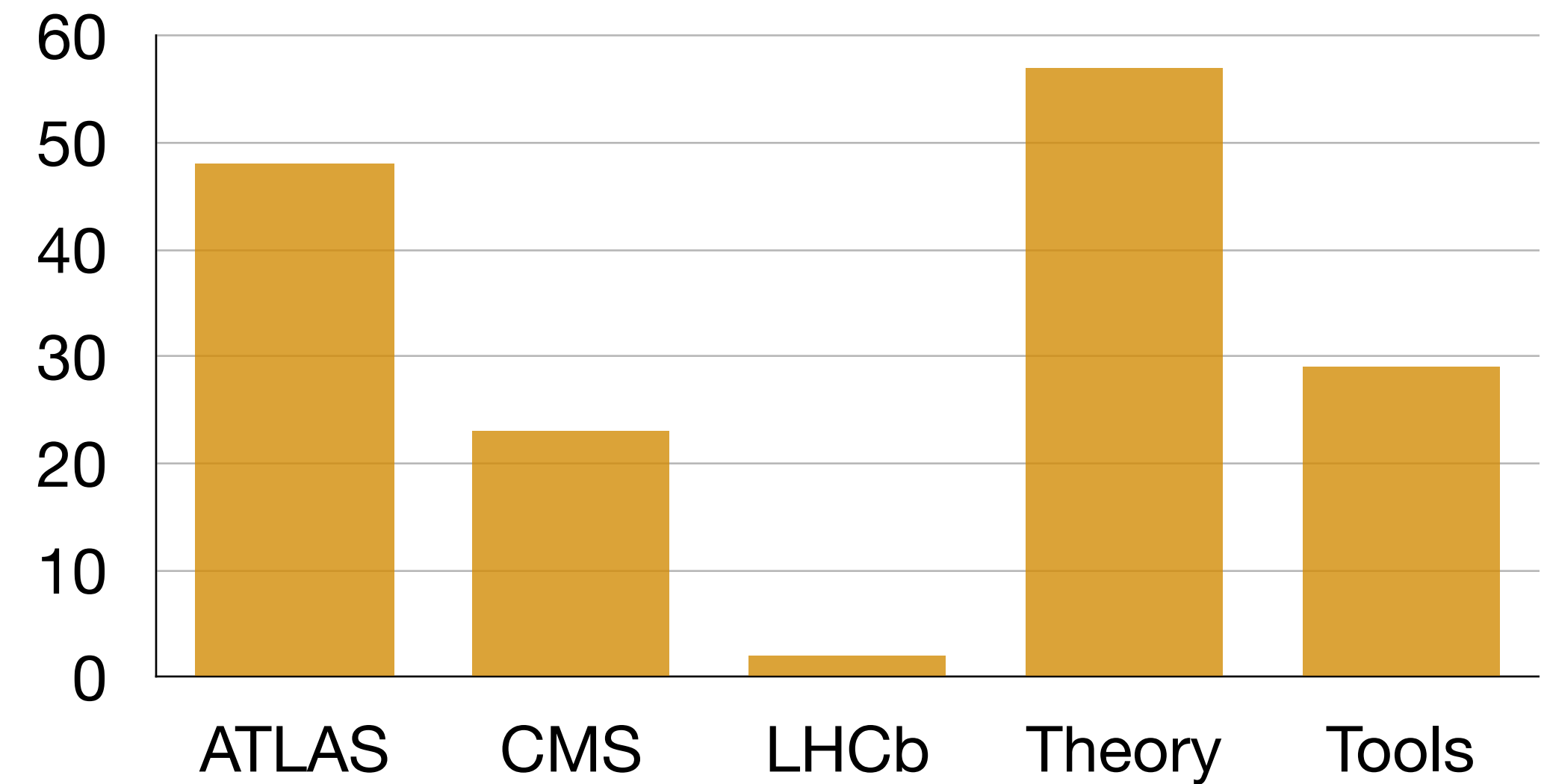
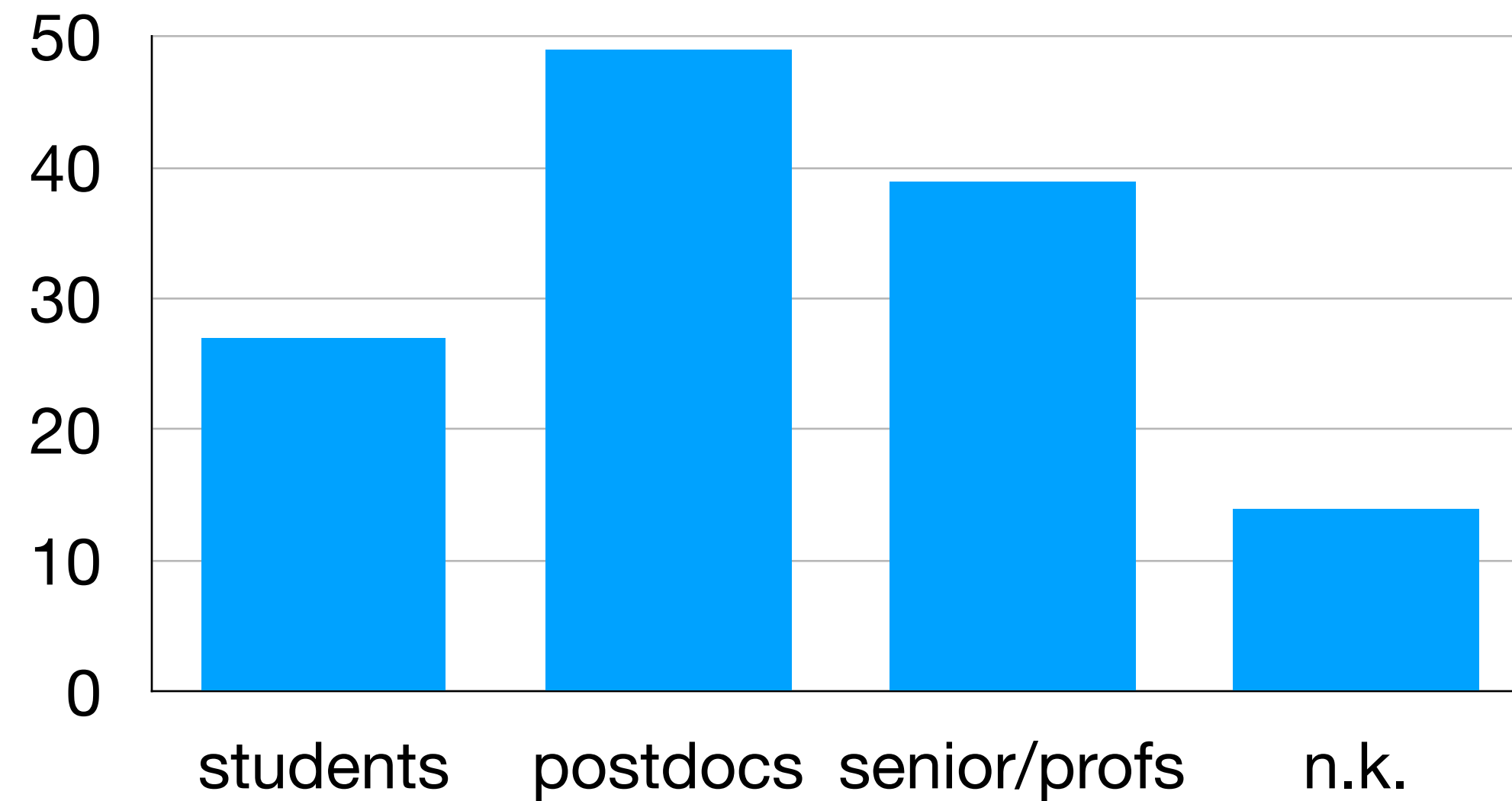
<https://indico.cern.ch/event/1466101/>

An intensive week

	Monday	Tuesday	Wednesday	Thursday	Friday
Morning		BSM WG kickoff meeting	Open Data, Analysis Preserv.	(ML) Likelihoods	Pheno studies
			HEPData, HS3, BDT surrogates	Tools and related developments	<u>Final discussion:</u> from RiF to REI, next steps & action items.
Afternoon	BSM WG kickoff meeting	Pheno studies	project discussions (or TH seminar)	More on public reinterp. tools	<i>> 40 talks ! nice balance btw pheno studies, experiment-related and tools contributions</i>
		CMS stat. models	ATLAS & CMS perspectives	ESPPU white paper discussion	

Attendance stats

Reinterpretation workshop 25-28 Feb 2025



129 registered participants, ~ 60 to attend in person

status 25/02/25, 11 am

BSM Reinterpretation Forum (RiF)

2016
till now

*Purpose: provide a platform for **continued discussion** of topics related to the BSM (re)interpretation of LHC data, including the development of the necessary **public recasting tools** and **related infrastructure**.*

- ❖ **Community-driven effort**, >200 subscribers, ~100 active participants
- ❖ **Large steering group**: individual physicists, both TH and EXP, who are driving the reinterpretation efforts; a representative of each of the major public reinterpretation tools.

Current: Jack Araz, Jon Butterworth, Andy Buckley, Carsten Burgard, Christopher Jackson Chang, Louie Dartmoor Corpe, Matthew Feickert, Lukas Heinrich, Sabine Kraml, Clemens Lange, (Michelangelo Mangano), Federico Redi, Krzysztof Rolbiecki, Sezen Sekmen, Markus Seidel, Nick Wardle.

Previous members: Kyle Cranmer, Matthias Danninger, Nishita Desai, Matthew Dolan, Benjamin Fuks, Marie-Helene Genest, Tomas Gonzalo, Ahmed Ismail, Frank Krauss, Michael Krämer, Suchita Kulkarni, Nazila Mahmoudi, Stefano Moretti, Pat Scott, Jamie Tattersall, Wolfgang Waltenberger, Andreas Weiler.

- ❖ Supported by the LPCC, but **no official mandate**

Promote standards & good practice

long journey — big thanks to everybody who served in the S.G. and helped make it a success story

RiF workshops

- ▶ Reports on recent [reinterpretation studies](#); feedback to experiments
- ▶ Status and progress of [public tools](#) development
- ▶ Reviews from [ATLAS/CMS/LHCb](#) (new approaches, policies for providing auxiliary material, etc)
- ▶ [Joint sessions](#) with other groups: LLP, DM, EFT, ...
- ▶ [Open Data](#)
- ▶ [General best practices](#) for reinterpretation/reuse of experimental results beyond the LHC: cross-talks w/ e.g. Astrophysics, Direct DM det., B-factories

- 15-17 June 2016 at **CERN** (kick-off)
- 12-14 Dec 2016 at **CERN**
- 16-18 Oct 2017 at **Fermilab**
- 14-16 May 2018 at **CERN**
- 2-4 April 2019 at **Imperial College**
- 15-19 Feb 2021 on **Zoom** (online only)
 - Apr-Sep 2021: mini-workshop series on open likelihoods (online)
- 12-15 Dec 2022 at **CERN**
- 29 Aug - 1 Sep 2023 at **IPPP Durham**
 - 17-20 June 2024 at LPSC Grenoble (mini-workshop)
- 25-28 Feb 2025 at **CERN**

↪ **transition from RiF to REI WG !**

LHC Beyond the Standard Model WG

Mandate: The LHC beyond the Standard Model (BSM) physics working group (LHC BSM WG) [brings together theorists and experimentalists to define guidelines and recommendations](#) for the benchmark models, interpretation, and characterisation of BSM searches at the LHC. As examples, the group develops and promotes well-defined signal models, specifying the assumptions behind them and describing the conditions under which they should be used. This would include both simplified models for specific signatures (experiment driven) and full models (theory driven). It works to improve the set of tools available to the experiments, such as higher-precision calculations of the backgrounds, where applicable working together with the other working groups. [It also includes support to theorists for the reinterpretation of published LHC experimental results and discussions amongst experiments on common reconstruction developments.](#)

<https://lpcc.web.cern.ch/content/lhc-bsm-wg>



BSM WG

- › Dark Matter
- › Long-lived particles
- › Prompt BSM signatures
- › Reinterpretation

EFT WG

Electroweak WG

Forward Physics WG

Heavy Flavour WG

Heavy Ions WG

Machine Learning WG

LHC REI WG: BSM re-interpretation of LHC results



This subgroup of the BSM WG builds on the experience of the long-established LHC re-interpretation forum (RiF), which will continue working under the umbrella of the BSM WG in continuity with its original scientific goals.

The REI WG provides a platform for continued discussion of topics related to the BSM (re)interpretation of LHC data, including the development of the necessary public Recasting Tools and related infrastructure.

Conveners:

- ATLAS: Martin Habedank
 - CMS: Sezen Sekmen
 - LHCb: Carlos Vazquez Sierra
 - Theory: Sabine Kraml
 - LPCC: Michelangelo Mangano
- Contact us: lhc-reiadmin@cern.ch

<https://lpcc.web.cern.ch/content/lhc-rei-wg>

BSM WG

- › Dark Matter
- › Long-lived particles
- › Prompt BSM signatures
- › Reinterpretation

EFT WG

Electroweak WG

Forward Physics WG

Heavy Flavour WG

Heavy Ions WG

Machine Learning WG

LHC REI WG: BSM re-interpretation of LHC results



- E-group: lhc-reiwg@cern.ch ← replaces info-lhc-reinterpretation@cern.ch
- Indico: <https://indico.cern.ch/category/13649/>
- Webpage: <https://lpcc.web.cern.ch/content/lhc-rei-wg>
- Twiki: <https://twiki.cern.ch/twiki/bin/view/LHCPhysics/InterpretingLHCresults>
- Documents: <https://lpcc.web.cern.ch/content/reinterpretation-wg-documents>

<https://lpcc.web.cern.ch/content/lhc-rei-wg>

BSM WG

- › Dark Matter
- › Long-lived particles
- › Prompt BSM signatures
- › Reinterpretation

EFT WG

Electroweak WG

Forward Physics WG

Heavy Flavour WG

Heavy Ions WG

Machine Learning WG

REI WG – plans and action items

- * Raise **more awareness** on why reinterpretability is crucial
- * Highlight the specific information (aka **auxiliary material**) required
- * Build a **more coordinated effort within** and **across the collaborations** in providing this information
- * Highlight reinterpretations/**usage** of reinterpretation materials *in practise*
- * Propagate **new ideas/new developments** that the community can benefit from
- * Pinpoint possible and needed **task forces** for the REI WG



A white paper for the European Strategy Update

- ▶ **Draft** here on Overleaf (view only)
- ▶ **Jon will restructure and revise it** according to discussion on Thu afternoon.
- ▶ New draft to be circulated (end of) next week to collect input from larger editorial team.
- ▶ **If you want to be involved in the editorial process**, subscribe to the e-group info-rif-esppu25@cern.ch
- ▶ **Once finalised, everybody will be invited to co-sign to show support**

Reinterpretation and preservation of data and analyses in HEP

Sabine Kraml¹, Andy Buckley², Jon Butterworth³, Kati Lassila-Perini⁴, another author⁵

(add your name and institute; to be re-ordered alphabetically at the end)

¹ LPSC Grenoble, Université Grenoble-Alpes, CNRS/IN2P3

² University of Glasgow, UK

³ University College London, UK

⁴ Helsinki Institute of Physics, Finland

⁵ another institute

Abstract

We call for a dedicated effort towards data and analysis preservation in high energy physics (HEP) in order to enable community-wide reuse. We argue that this is vital for fully exploiting the physics potential of current and future experiments.

1 Executive summary

Experimental results in particle physics are unique and of immense scientific value. They are obtained at enormous cost in terms of both financial and human resources, and their implications reach far beyond the set of (often simplified) theories or parameter combinations tested in the original experimental publications. Indeed, their implications may reach well beyond any theory brought forth so far, and thus beyond anything that may directly be tested by the experimental collaborations themselves. For fully exploiting the physics potential of the current and future experiments, it is thus crucial that their results can be used and interpreted by the whole physics community — now and for decades to come.

The products of scientific research are multiple and far beyond the traditional publication in a journal. We call for act

Analysis-specific data produced at the time of activity make them available is c the experimental collabor

Event-level data a community ensures that a while the expertise is still these data are allocated. exploitation cost. The cu decades to come, and the community for future ge

In summary, there exists a significant opportunity to maximize the return on investment through long-term preservation of data and analyses, enabling their reuse by the whole HEP community. This can lead to significant new scientific results. Services such as the CERN Open Data Portal, Zenodo, and HEPData (all European funded) are a good starting point, but a concentrated and coordinated effort across the field is needed to make preservation — with reuse in mind! — a standard scientific practice. We therefore argue that it is mandatory [4]

to ensure that all current and future programs (both experimental and theoretical) have a *strategy and resources* for the long term preservation of data and analysis capabilities, beyond the lifetime of the individual projects. This includes supporting career development and recognition mechanisms for those who contribute to analysis and data preservation. The “I” and “R” of FAIR practices need to become an integral part of the particle-physics experimental publication procedure.

The journey continues

- ✓ official mandate
- ✓ more experiment involvement

let's make it a success

