

# (Re)interpretation of the LHC results for new physics

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7th workshop of the  
LHC Reinterpretation Forum

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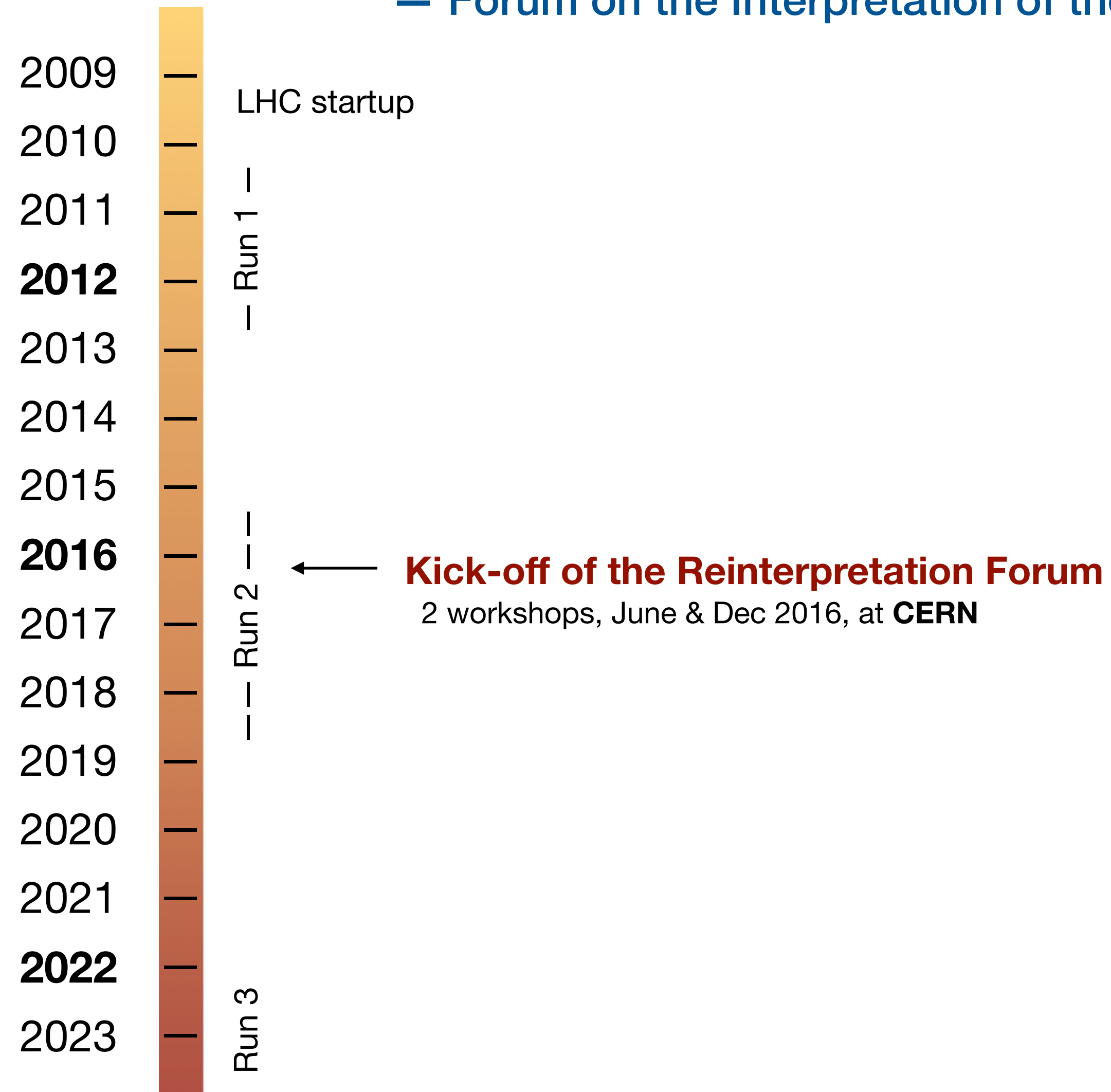
12-15 Dec 2022

**CERN and online**

**Sabine Kraml, Welcome and Introduction**

# LHC Reinterpretation Forum

— Forum on the Interpretation of the LHC Results for BSM studies —



## Motivation

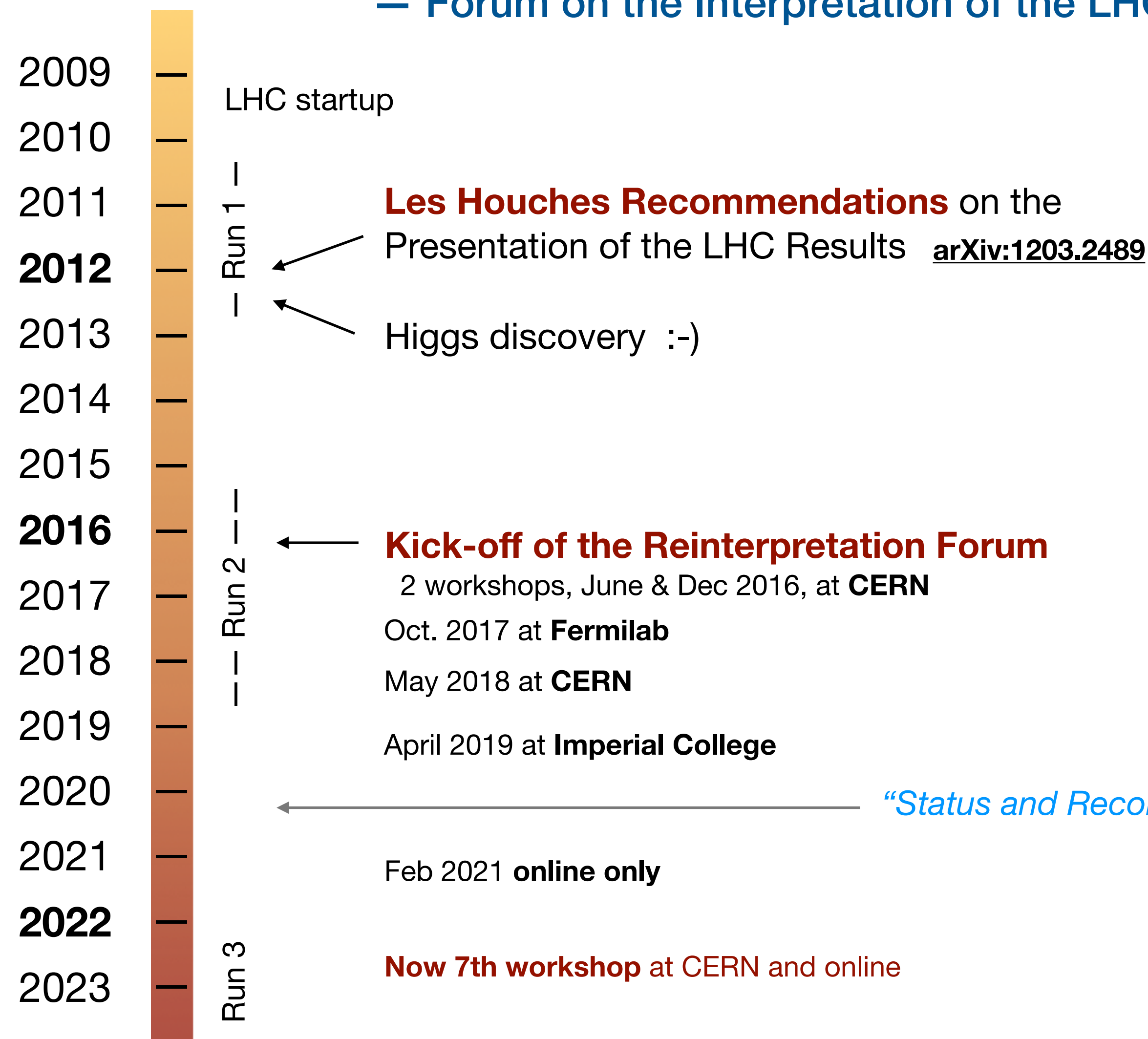
The results of the LHC experimental analyses can constrain much wider sets of physics theories than considered in the original publications.

## Objective

Continued discussion of topics related to the BSM (re)interpretation of LHC data, including the development of the necessary public software tools and related infrastructure.

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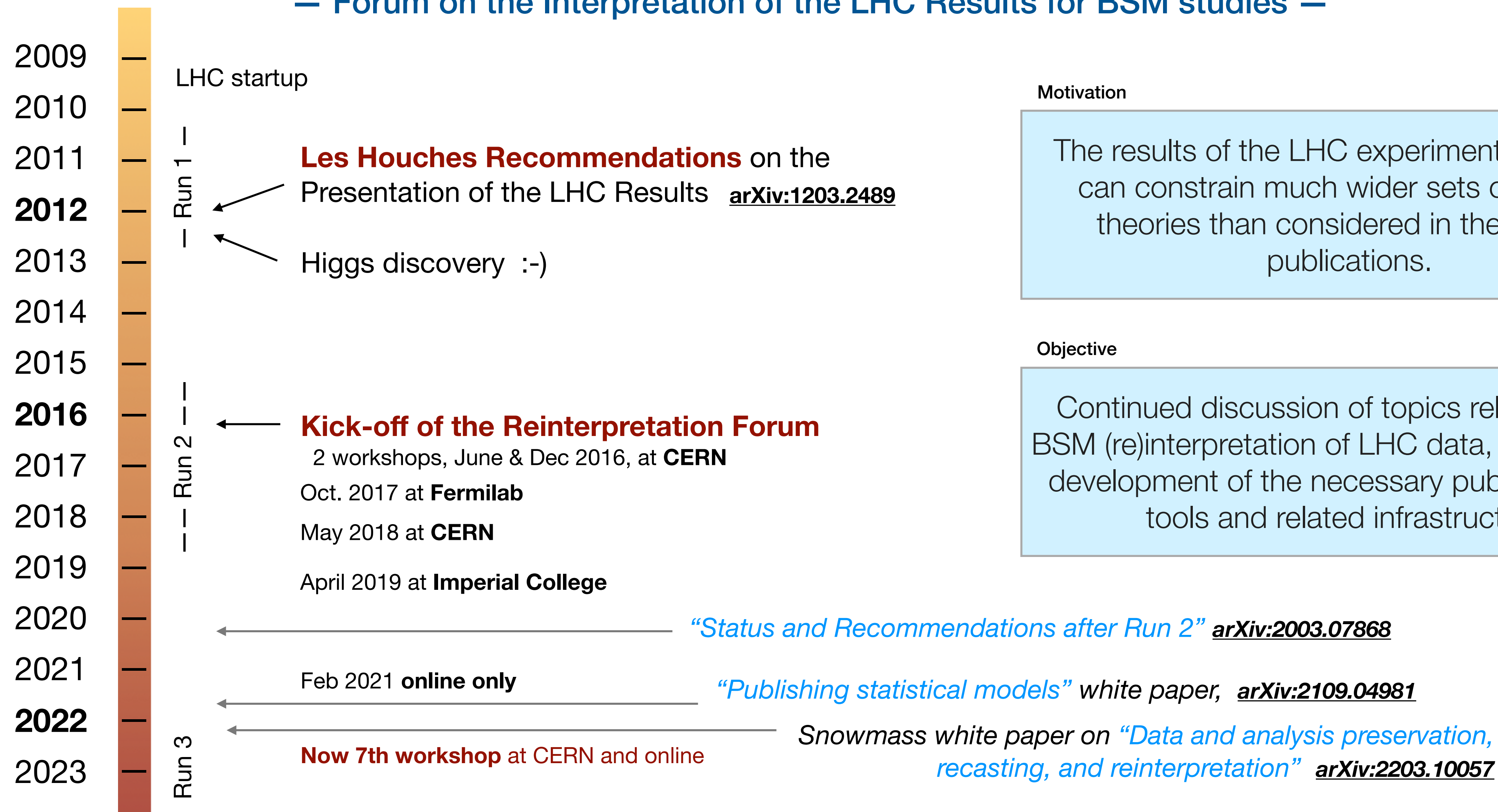
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# Snowmass 2021

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## US Community Study on the Future of Particle Physics

To achieve their full scientific impact, HEP experiments need to integrate **extensive data and analysis preservation efforts** into their publication processes, alongside the communication of results **in reusable form** and preservation of data products, and making event-level data publicly available.

**Without this, the influence** of the hundreds of published analyses from the LHC, HL-LHC, EIC, and other future experiments will be **limited mainly to the physics ideas in vogue** at the time the collaboration collected their data. The public investment in experimental programs underscores the importance of going beyond the original paper publication and **ensuring that analyses continue providing scientific value in perpetuity.**

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Executive summary from “Data and Analysis Preservation, Recasting and Reinterpretation”  
arXiv:2203.10057



# Snowmass white paper on data and analysis preservation and reinterpretation

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S. Bailey et al., [arXiv:2203.10057](https://arxiv.org/abs/2203.10057)

## Analysis Preservation Recommendations

- 3.1:** Ensure use of interoperable systems to maximise the preservability and reusability of experiment simulation and analysis software chains. This includes the use of version control, archival systems, containerisation, common software interfaces and data formats, and commitments from experimental collaborations and their host laboratories to maintain documentation and provide long-term support.
- 3.2:** Ensure that all operational and in-preparation experiments have a planned and resourced programme for capture and long-term reproduction of their complete computational processing chain, including validation regression-tests.
- 3.3:** Ensure that release of [analysis preservation](#) logic via public frameworks for the community to use is integrated with experiment publication and data-release processes, to maximise analysis impact. This also includes providing clear documentation and making all dependent frameworks available and documented for community consumption.
- 3.4:** Support continuing development and uptake of new technologies for increasingly framework-independent analysis specifications, such as via declarative domain-specific analysis description languages.

# Snowmass white paper on data and analysis preservation and reinterpretation

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S. Bailey et al., [arXiv:2203.10057](https://arxiv.org/abs/2203.10057)

## Reinterpretation and Recasting Recommendations

- 5.1:** Encourage that reinterpretability and reuse be kept in mind early on in the analysis design. This concerns, for instance, the choice of input parameters in **ML** models, the full specification of the fiducial phase space of a measurement in terms of the final state, including any vetos applied, and generally the choice of non-overlapping regions and standard naming of shared nuisances to facilitate the combination of analyses.
- 5.2:** Design the format and nature of the public and internally preserved **data products**, such as statistical models, with reinterpretation use-cases in mind.
- 5.3:** Improve the coordination among the different public reinterpretation frameworks with the goal of a centralised database of recast codes, common input/output formats, and a unified statistical treatment.
- 5.4:** Encourage the **FAIR**-ification of codes and **data products** from (theory) reinterpretation studies outside the experimental collaborations at the same level of sophistication as asked for experimental analyses and results. Suitable repositories are, e.g., GitHub and Zenodo; appropriate versioning is essential.



# This workshop

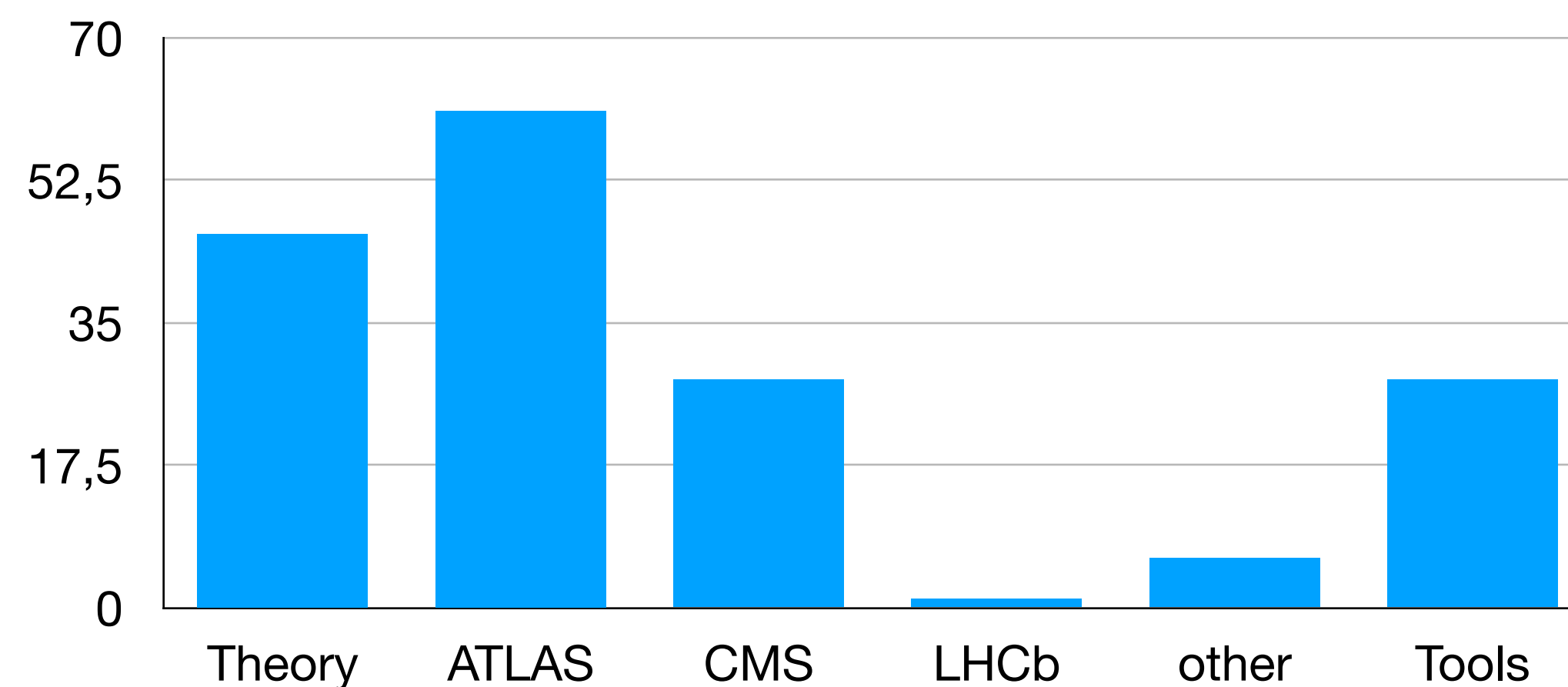
- \* The aim is to **review new developments on the tools, pheno, and the experimental sides**, and to **prepare for the Run 3 results** of the LHC.
- \* In this context, **major topics** of this workshop will be:
  - i) the publication and reuse of **statistical models**,
  - ii) the reinterpretation of analyses that employ **machine learning**, and
  - iii) **global analyses** and global fits.
- \* Continuing the conversation from the last workshop, we would like to include **general best practices** for reinterpretation and reuse of experimental results **beyond the LHC** (w/ contributions from precision, astrophysical and heavy-ion experiments).

**Organisers:** *Andy Buckley, Nishita Desai, Matthew Feickert, Sezen Sekmen and I (Sabine Kraml)*



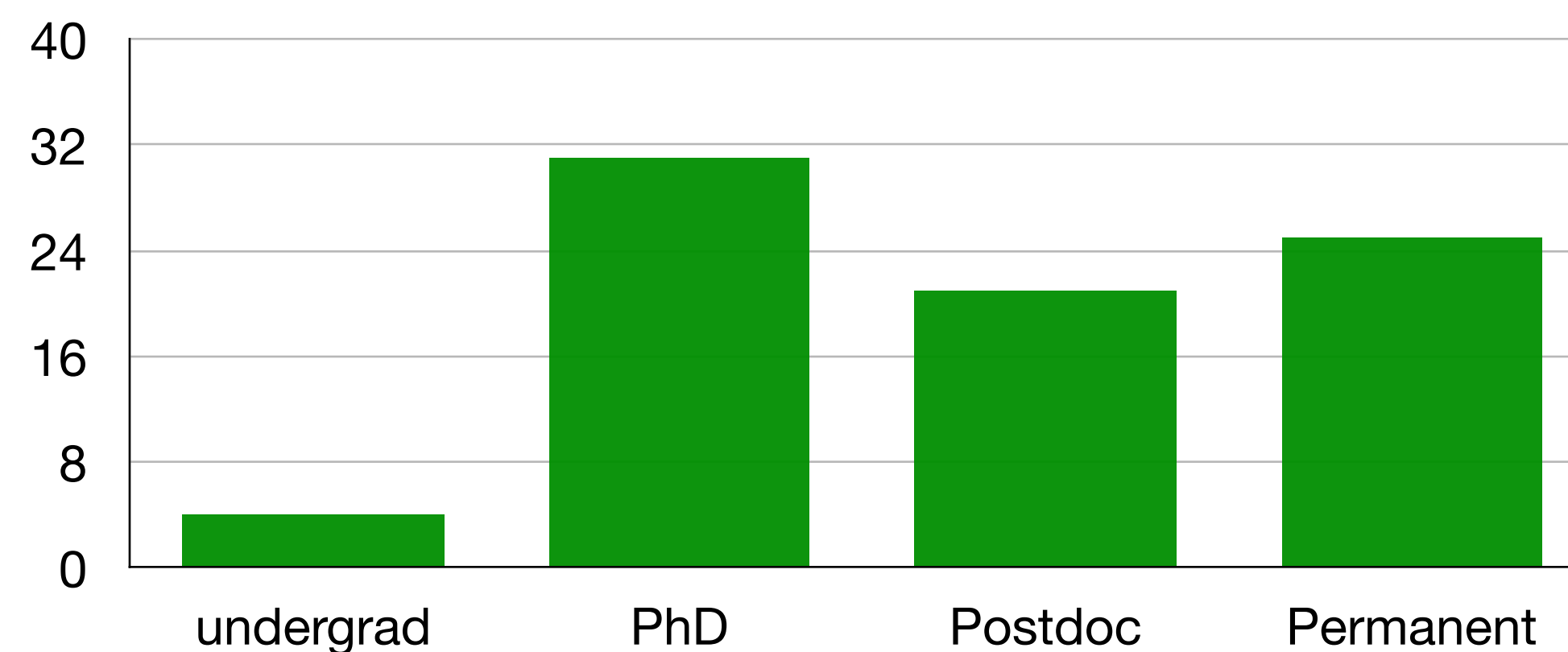


# 131 registrants, ~60 in person (status 11/12/22)



For the first time more experimentalists than theorists

29 countries, from Australia to USA.  
6 continents!



20 didn't say...

# Rough schedule overview

	Monday	Tuesday	Wednesday	Thursday
Morning 10 am	ATLAS and CMS Reviews	LHCb, Belle-II DM, HI exp.	Combinations and global fits	Pheno studies
Afternoon 1	CERN Open Science Policy News from reinterpretation tools	Publishing statistical models	Orthogonal phase space slicing	Renewal of steering group
Afternoon 2	ML reuse	Publishing analysis code	More on tools, ML, SimpleAnalysis	

Please check for details and updates:  
<https://indico.cern.ch/event/1197680/timetable/>

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30/7-018

main gate

Globe of Science

Reception (B33),  
microCosmos

Restaurant 2

open 7:00 to 21:00  
hot meals until 20:00

We are here

6/R-012

Restaurant 1

open 6:30 to 17:00

Hostel

<https://maps.web.cern.ch/>



30/7-018

**B30 "Snacking"** open until 16h30,  
offers a selection of sandwiches,  
panini, salads, desserts, pancakes,  
waffles, sushi, cold and hot drinks.

Restaurant 2

open from 7:00 to 21:00  
hot meals until 20:00

6/R-012

We are here

Restaurant 1

closes 17:00 !!

Hostel

<https://maps.web.cern.ch/>



# (Re)interpretation of the LHC results for new physics

12–15 Dec 2022  
CERN  
Europe/Zurich timezone

Enter your search term

Q

Overview
Timetable
Registration
Call for Abstracts
Participant List
My Conference
My Contributions
Videoconference
Code of Conduct

This is the 7th general workshop of the “[Forum on the interpretation of the LHC results for BSM studies](#)”, or LHC Reinterpretation Forum (RIF) for short. Its aim is to review new developments on the tools, pheno, and the experimental sides, and to prepare for the Run 3 results of the LHC. In this context, major topics of this workshop will be:

- i) the publication and reuse of statistical models,
- ii) the reinterpretation of analyses that employ machine learning, and
- iii) global analyses and global fits.

Continuing the conversation from the last workshop session, we would like to include general best practices for reinterpretation/reuse of experimental results beyond the LHC, and particularly welcome contributions regarding results from precision or astrophysical experiments.

Background: The purpose of the [RIF](#) is discuss topics related to the BSM (re)interpretation of LHC data,



Live Notes

**In case of questions, troubles, etc., turn to the organisers:**

*Andy Buckley, Nishita Desai, Matthew Feickert, Sezen Sekmen and/or me.*  
(online)



Group picture  
in the coffee break

**Enjoy the workshop !**