## Datasets and Simulation (PPD/GEN)



The exercise includes material from the PPD and GEN groups.

Primary objectives: things we want the students to be able to do

- ▶ Find datasets using Grasp and DAS
- Compute luminosity with brilcalc
- ▶ Find normalization cross sections for SM and BSM processes
- Figure out relevant citations for Monte Carlo samples
- Secondary objectives: things we want the students to be aware of
  - Data and Monte Carlo processing steps, data tiers
  - Meaning of a Global Tag
  - Role of cmsDriver and McM

The exercise is divided in two parts. In the first part, students gather information about existing samples. In the second part, they generate a few Monte Carlo events from scratch and all the way to NanoAOD.

## Anomalies



The exercise is about leveraging machine learning to detect anomalies in a data-driven way.

The session would be based on an existing **anomaly exercise**. The existing content is meant to follow a theoretical introduction and is calibrated for about 90 min. It is based on Google Colab but could be moved to SWAN.

## **Prerequisites:** Some Python, experience with ML is preferred. **Content:**

- A general overview of anomaly detection
- First exercise: implementing "overdensity-based" anomaly detection using the CWoLa approach, including an important failure mode
- First exercise: implementing "outlier-based" anomaly detection with an autoencoder

## SMP: $Z \rightarrow \mu \mu \gamma$



**Physics case:** Photon FSR modifies the apparent (di-)lepton  $p_{\rm T}$  distributions.

- Need very good control for  $m_W$  measurements
- Dramatic effect on the  $m_{\mu\mu}$  spectrum between 50 and 91 GeV
- ▶ This decay mode is missing from the PDG<sup>1</sup>!

Expectating at least 10 000 events in full Run 2 (very rough, to be refined)

**Primary objective:** Measure  $\mathcal{B}(Z \to \mu \mu \gamma) / \mathcal{B}(Z \to \mu \mu)$ 

- ▶ Lepton selection and systematics, main backgrounds for Drell-Yan
- Efficiency and acceptance corrections
- Correlated and uncorreated uncertainties in the ratio
- ▶ If stats and time allow, maybe also a differential measurement

Status: Extending the inclusive jet framework with leptons and photons

<sup>&</sup>lt;sup>1</sup>There *is* information in the PDG, but it's just wrong.