Trigger exercise @ PODAS23

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with help from Sanu Varghese (NISER)

Status Meeting 7.9.2023

Trigger exercise: overview

The target of the exercise is to get participants familiarised with basic concepts of Trigger operations/usage and do efficiency measurements.

Exercise largely based on the last DAS@CERN in June 23: link

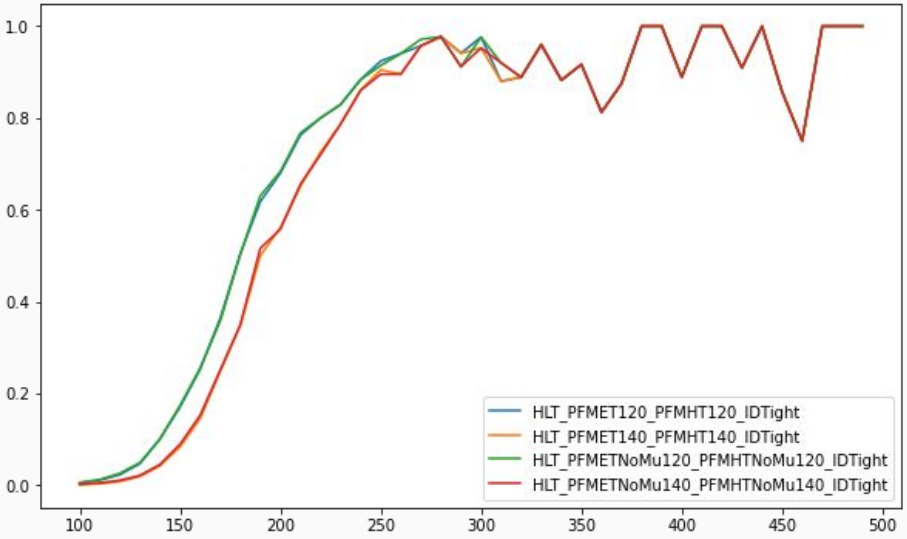
Facilitators:

- Juliette Alimena (DESY, staff)
- Artur Lobanov (UHH, postdoc)
- + might ask more to help -> **need to know # of participants/session!**

Trigger exercise goals

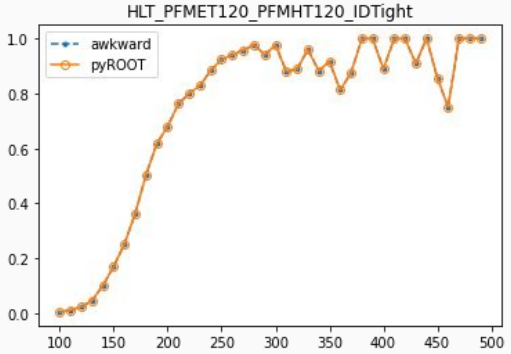
The exercise goals are:

- Learn how to use/inspect Nano
- Measure the trigger efficiency of an HLT MET path in data using *the orthogonal trigger methods*
- Measure the trigger efficiency of an Single Muon path in data *using the Tag-and-Probe method*
- Advanced:
  - Compare MET efficiency with TnP and orthogonal methods
  - Compare to performance in MC (need Jet-lepton cleaning, use unprescaled L1 etc)



Tools / technical info

- NanoAOD (will copy some files to EOS/NFS ~10GB)
- Uproot + Awkward array + matplotlib (no ROOT or CMSSW)
- Pure Jupyter-notebook based
  - For CERN account holders:
    using SWAN with latest LCG release (can install extra libs via pip)
  - For DESY account holders:
    Can use https://naf-jhub.desy.de/ -> will provide conda env.yml and instructions (made, but not documented yet)



Perfect agreement between our implementation and the CERN DAS one (pyROOT)

One concern for NAF:

RAM allocation on NAF Jhub is not very reliable

-> to be tested, but better to provision some dedicated nodes?

(SWAN is safe to be used)

Answers to your questions

1. **Do have special computing requirements?** (default: standard NAF account with NFS and HTCondor)

   -> NAF is ok as long as the RAM is enough :)

2. **Are you looking for more facilitators?** (we want at least 2, ideally one of them being based in Hamburg)

   -> Will have 2 (Artur and Juliette) in Hamburg. might ask for 2 more students depending on # of participants (Finn, Manuel, Tobias, Mathis (UHH) ?

3. **Are you planning any pre-exercises?** (recommended to set up environment)

   -> We might want them to try logging into swan/jhub once

4. **Does your exercise depend on another exercise?** (e.g. PAG inclusive jet depends on POG jets)

   -> Not really, but the columnar one or nano would be useful

5. **Anything else?**

   -> RAM

Plans

Until end of September

- Finish notebooks / documentation
- Organise gitlab repo: https://gitlab.cern.ch/cms-podas23/dpg/trigger-exercise
- Add env/requirements
- Make README as instructions
  - Do we need a twiki!?
    E.g. Past ones had one
- TEST on other users/students :)

… profit?!

Backup

(slides from last time)

Trigger Exercise - PO&DAS 2023

- **People:**
  - Confirmed: Artur Lobanov, Juliette Alimena, Sanu Varghese
- **Ideas for talk on the first day(s):**
  - Introduce basic concepts of L1 and HLT
  - Highlight new Run 3 triggers
  - Questions we have for organizers:
    - Part of a larger talk?
    - Should we provide slides?
    - How long? When will it be given?
    - Who gives it?
- **2 hour exercise**, repeated 3 or 4 times → every student will see our exercise
- Will adapt the CERN DAS trigger exercise from this year to only use nanoAOD and SWAN
  - Need to move it from nanoAOD-tools to columnar analysis? Or what are other people using? (We should sync among ourselves)
- **Focus on 2 HLT efficiency short exercises:**
  - Calculate MET trigger efficiency using orthogonal datasets
  - Calculate single muon trigger efficiency using tag and probe
- Provide bonus material (list of references):
  - L1 trigger efficiency study
  - How to calculate lumi for a trigger
  - Find trigger rates on OMS
  - Most recent trigger tutorials

Additional slide

- If needed, we could ask: Tobias Quadfasel (he developed all the timing tools for Run 3), Manuel Sommerhalder (he developed the new multi run harvesting tool for Run 3). Other UHH students involved with trigger are finishing thesis… (Finn Labe did a B2G trigger tutorial for HLT-level efficiency measurements)
- The intro presentation should cover:
  - **What does everyone need to know?** (L1 and HLT)
    - What is L1 and HLT? What is an HLT path? Which objects do we trigger on? What are prescales (and columns), trigger menus, trigger paths? Who uses which triggers and why? How do you use a trigger in your analysis? How do you get your data? How are primary datasets defined? How do you know when your trigger was active, and how much lumi it took? What are different kinds of trigger paths (signal, backup, control)? What is the L1T (DPG,…) and the TSG? How do I apply my trigger to MC? What is a L1 seed? How do you find your trigger efficiency and turnon curve?
    - (Artur): how to find whether the trigger of interests was prescaled or not (I think Sam Harper has some tool for that - via OMS API?)
- **We will provide bonus material to answer:**
  - **What do you need to know if you're developing a new trigger?** (L1 and HLT)
    - L1
      - terminology: trigger primitive, EMTF, BMTF, OMTF, …..
    - HLT
      - Rates (pure rates, PU dependency), efficiencies, CPU/GPU timing, monitoring and validation
      - Tools: confDB, etc
      - Mention skims