Performance Benchmarks for Analysis Grand Challenge

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Abstract

- [Analysis Grand Challenge](#) (AGC) of IRIS-HEP
    - Tests focusing on performing high energy physics analysis at scale
    - Includes all relevant features encountered by analyzers in this context
- Performs using tools and technologies developed within both IRIS-HEP and the broader community
    - Makes use of Python ecosystem and required cyberinfrastructure to run at scale
- Our goal: use pieces of an example physics analysis to study the performance of different system components
   - CMS ttbar analysis based on CMS Opendata

What is Benchmarking?

- "Why care how fast a system goes?"
  - Is it going as fast as it can? Is it going faster than other configurations?
- Comparing the performance between different system configurations and different running conditions
- Purpose: innovate, identify bottlenecks and compare techniques and technologies
- How do we benchmark?
  - Agree on primary metrics
  - Agree on how to vary the system between benchmarks
  - Develop a data collection plan and implement it
  - Collect data
  - Analyze and document results

Introduction - AGC software stack
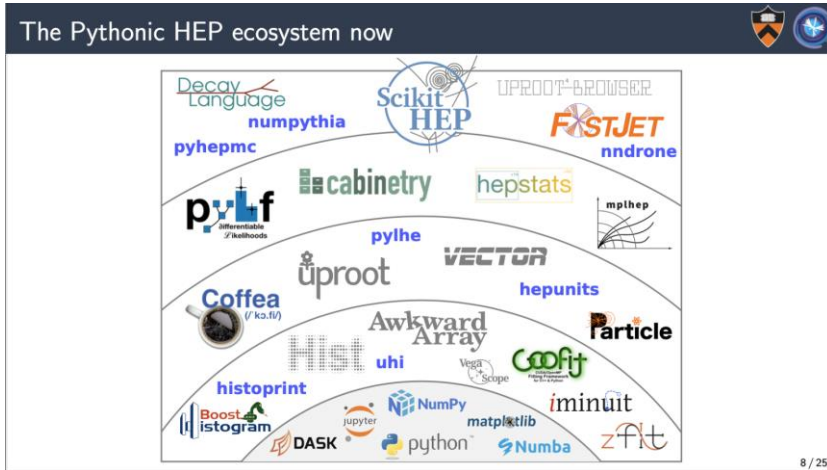

Analysis user experience with the Python HEP ecosystem
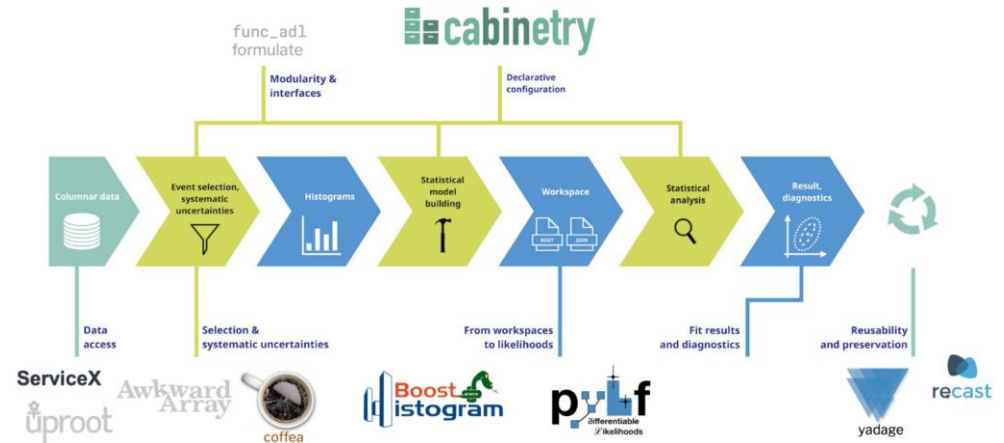
Analysis Grand Challenge analysis pipeline

Introduction - Theory

The goal to start to benchmarking using existing [AGC CMS ttbar coffea analysis](#)

Software packages and components to be tested:

- New user interfaces: *Jupyter*
- Data access: *ServiceX, SkyHook*
- Event selection: *coffea, awkward-array, func_adl,*
- Histogramming: *coffea, hist*
- Statistical model building and fitting: *cabinetry, pyhf*

Analysis user experience with the Python HEP ecosystem
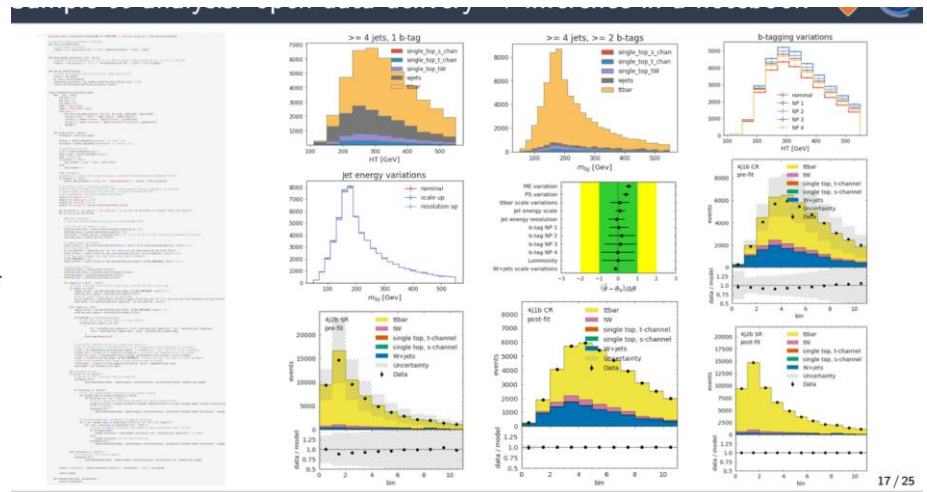
Work to Do

- Select a package for python performance benchmarking
    - https://github.com/airspeed-velocity/asv (https://asv.readthedocs.io/en/stable/writing_benchmarks.html)
    - https://pytest-benchmark.readthedocs.io/en/latest/
- Select performance measurements that will be interesting for AGC
- Adopt code of notebook to be more friendly for performance benchmarking (add more parameters, etc)
- Select how we will store results of benchmarking and how to visualise them
- Run performance benchmarking suite on Coffea-casa Analysis Facility at UNL