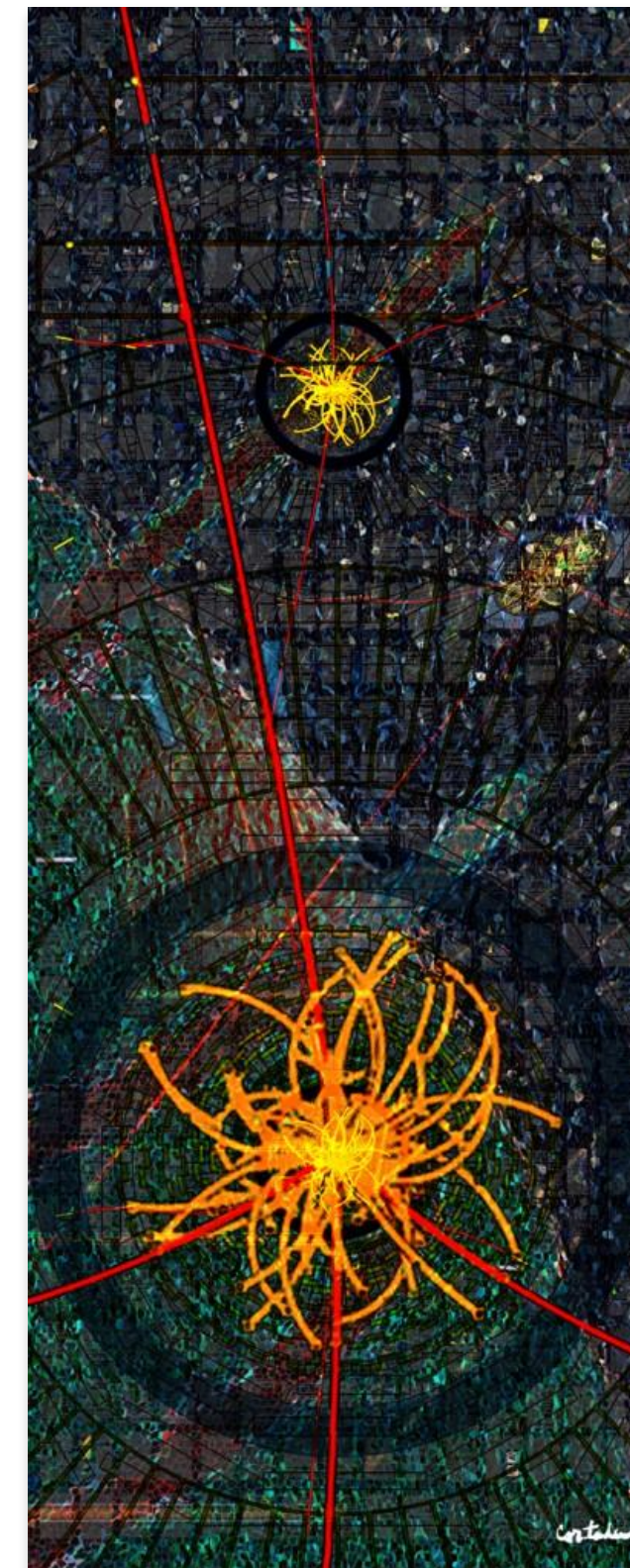# U.S. CMS Feedback to IRIS-HEP
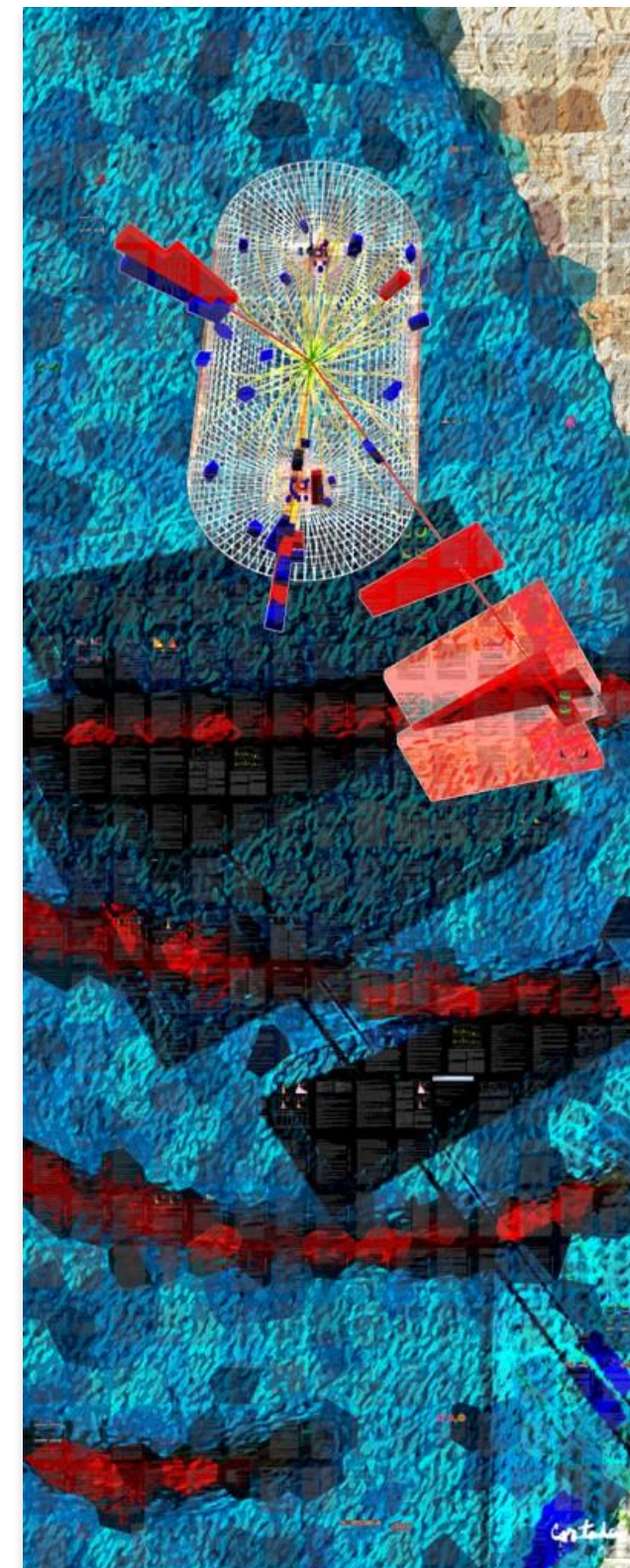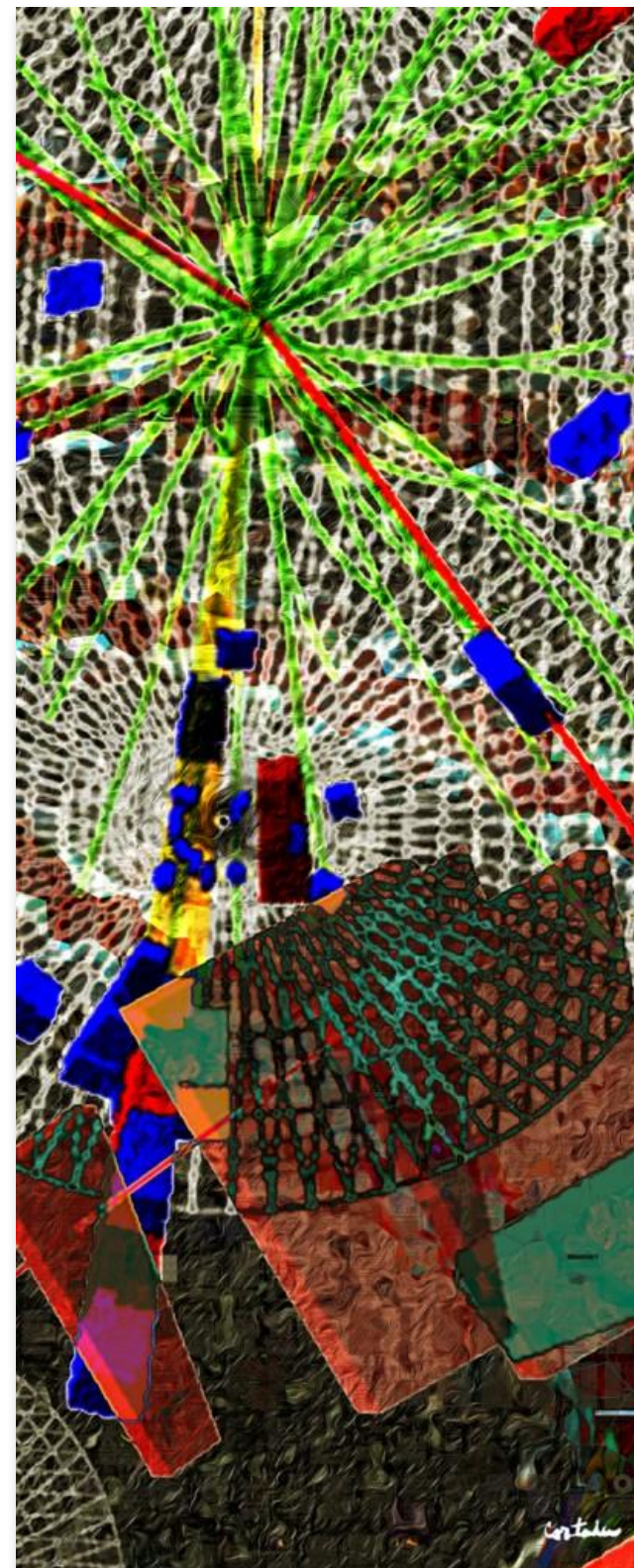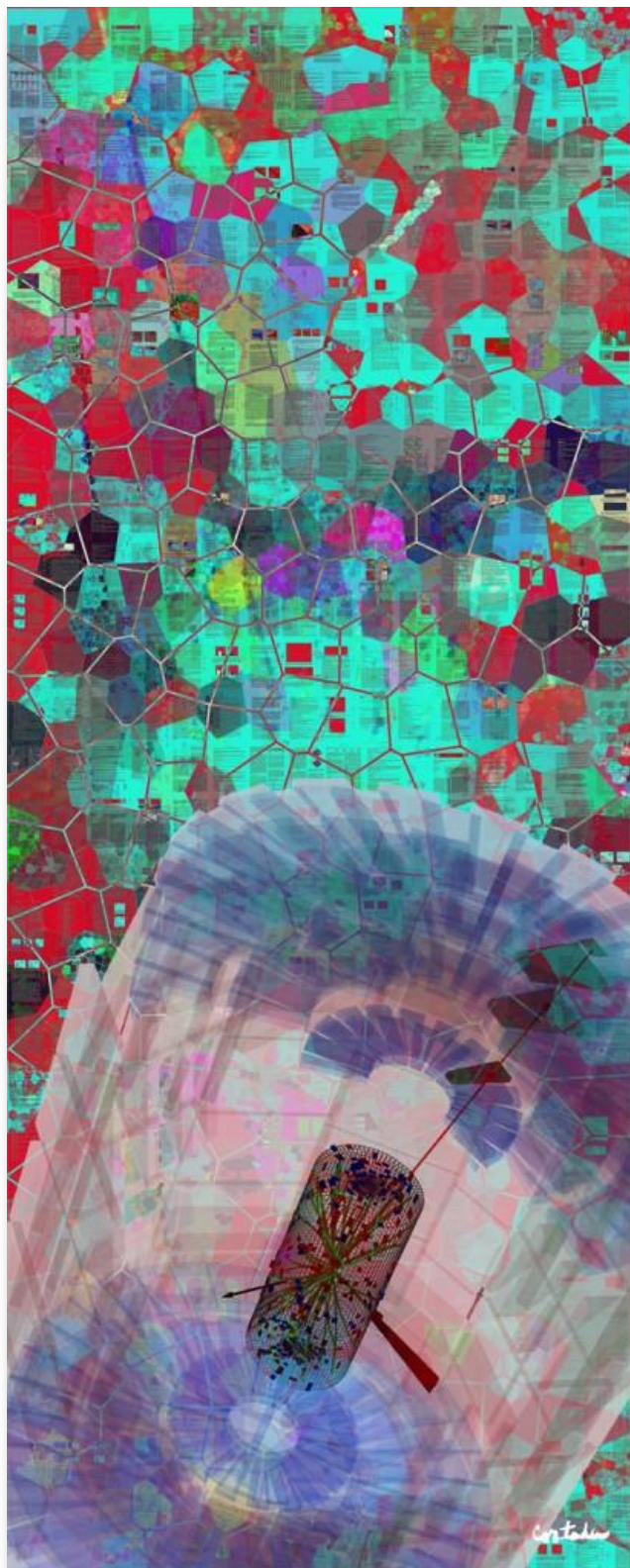
Tulika Bose (University of Wisconsin-Madison)
for the U.S. CMS Software & Computing Operations Program

- Disclaimer: This is not a summary of the U.S. CMS HL-LHC Software & Computing (S&C) R&D program
- Presenting today:
  - Updates to U.S. CMS Software & Computing Operations Program Organization
  - Feedback from U.S. CMS S&C Operations Program related to IRIS-HEP focus areas/activities
- Reminder: U.S. CMS HL-LHC R&D work is organized within a dedicated WBS and based on a strategic plan that covers 4 grand challenges:
  - Modernize physics software and improve algorithms
  - Build infrastructure for exabyte-scale datasets
  - Transform the scientific data analysis process
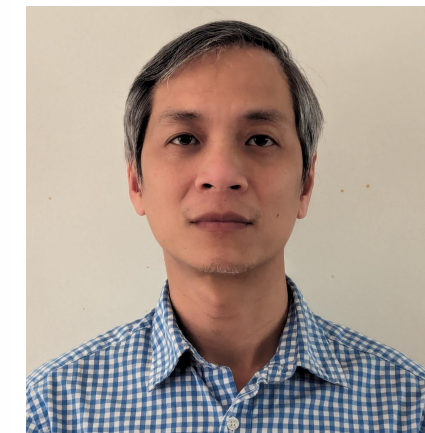 - Transition from R&D to operations

Thank you Oli!

Software & Computing
Tulika Bose (Wisconsin)
Dirk Hufnagel (Fermilab), deputy
Robert Tuck (Princeton), project support

Facilities
David Mason (Fermilab)
Andrew Melo (Vanderbilt)

Operations
Duong Hai Nguyen (Buffalo)
Scarlet Norberg (Fermilab)

Software
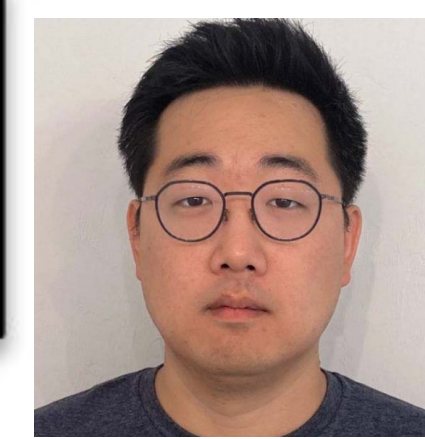Saba Sehrish (Fermilab)
Kevin Lannon (Notre Dame)

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David Sperka (Boston)

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James Letts (UC San Diego),
University Facilities

Algorithms
Philip Chang (Florida)

Analysis
Matteo Cremonesi (Carnegie Mellon)

U.S. CMS
Operations
Program

- We are happy with our strong collaboration w/ **IRIS-HEP**:
  - ○ co-fund effort on certain projects
  - ○ several U.S. CMS S&C members integrated in IRIS-HEP projects and in leadership roles
  - ○ Appreciate communication via regular executive board and steering board meetings, participation in IRIS-HEP retreat…
  - ○ Perhaps a high-level management meeting (once a year ?) to discuss goals and plans for the year (relevant to us both) to coordinate ?

Feedback: Analysis Systems

- ● What's working well:
  - ○ development and stabilization of columnar analysis tools, support and finalization of awkward-array, uproot, dask-awkward.
  - ○ Overall, the IRIS-HEP contribution to AF R&D is excellent

- ● What we could work on together:
  - ○ Preparation for long-term support (aka transition from R&D to operations)
    - ■ E.g. what are the plans for setting up a stake-holder process for awkward-array ?
  - ○ Planning of future analysis challenges that include multiple users, multiple sites, realistic analyses
    - ■ U.S. CMS has 4 AF efforts with growing user bases::Nebraska Coffea-Casa , FNAL Elastic AF, Purdue AF, MIT subMIT
    - ■ Our work plan includes aiming for wider adoption via exercises at CMS Data Analysis School

Feedback: Innovative Algorithms

- ● What's working well:
  - ○ Good progress related to track reconstruction projects (funded by both IRIS-HEP and U.S. CMS S&C Ops)
    - ■ mkfit : Deployed for Run 3 and in production
    - ■ GPU compatible algorithm (Line Segment Tracking) being developed

- ● What we could work on together:
  - ○ Additional opportunities for synergy/collaboration (across experiments ?) ?
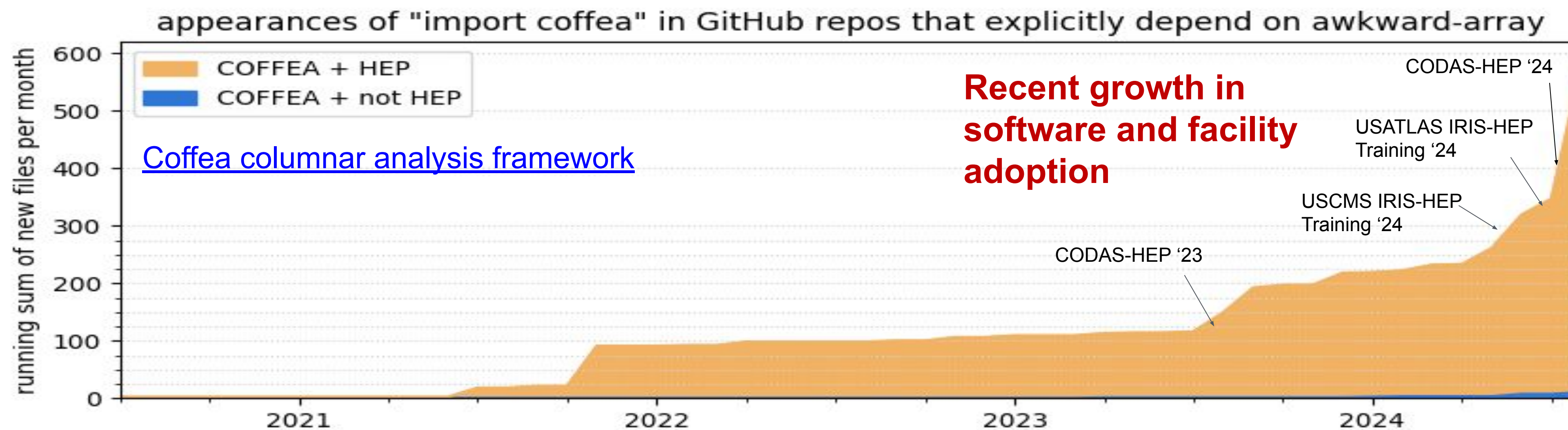
- **What's working well:**
  - Good collaboration with Ops Program through ServiceX join work
  - Excellent interactions with OSG

- **What we could work on together:**
  - Still need to work together to determine the way to fully utilize ServiceX within CMS and build workflows that CMS analysts find useful.
  - XRootD: identify HL-LHC needs for XRootD. Are there any scaling issues ? Work together towards a stakeholder setup ?

Feedback: SSL

- ● What's working well:
  - ○ The 200 Gbps challenge was a very useful experience

- ● What we could work on together:
  - ○ Plan ahead for analysis grand challenges and how to involve multiple users, more realistic analyses, Coffea2024…

- **What's working well:**
  - IRIS-HEP software stack tutorials are well organized and students really seem to like them / get something out of them.
  - Collaboration via DOE computational HEP traineeship programs

- **What we could work on together:**
  - Additional avenues of collaboration ? Are there IRIS-HEP mentors who wish to connect with undergraduate/graduate students looking for projects ?

appearances of "import coffea" in GitHub repos that explicitly depend on awkward-array

Coffea columnar analysis framework

Recent growth in software and facility adoption

CODAS-HEP '24

USATLAS IRIS-HEP Training '24

USCMS IRIS-HEP Training '24

CODAS-HEP '23

Found the "Coordinated Ecosystem" like meetings to be very useful in bringing some of the community together to discuss topics important to us all.

Are there any plans for having another such meeting in the near future ?

Topical blueprints (e.g. "Future of Analysis in the HL-LHC era" ?) also welcome