News

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PUNCH4NFDI TA5 FPGA Meeting
22.05.2023

News

- FPGA workshop on June 15-16 at DESY
  - https://indico.desy.de/event/39234/
  - TA5-WP2/WP5 and XFEL
  - please, register

- 5 Sessions:
  1) TA5 internal: status and work on "deliverables" documenst (see last meeting and next page) ional archives (other TAs).
  2) Introductory session: overview of FGPAs and ML in particle physics, astrophysics and XFEL
  3) Workshop session 1 - algorithms, tools, hardware

  4) Workshop session 2 - algorithms, tools, hardware
  5) Workshop session 3 - collaborative tools and services

- Your contributions are welcome!

News

- 3 documents are currently being edited related to PUNCH deliverables:
  - D-TA5-WP2-1: Curation & metadata schemes for dynamic filtering
    - see document attached to agenda https://indico.desy.de/event/39151/
  - D-TA5-WP2-2: Strategy concept for identifying highly complex (multi-parametric) signals in huge data streams
    - completion by June
    - see document attached to agenda https://indico.desy.de/event/39151/
  - D-TA5-WP3-1: Specifying the concept of a dynamic archive: Requirements in relationship to other WPs (information loss, dynamic filters, scalable workflows and simulated catalogs) as well as to information in traditional archives (other TAs).

Additional Information - TA5 Deliverables

- Deliverables related to FPGA based PUNCH work in TA5 WP2/WP4/WP5

Deliverables:

- **D-TA5-WP2-1 (31 Mar 2022):** Curation & metadata schemes for dynamic filtering.
- **D-TA5-WP2-2 (31 Mar 2022):** Strategy concept for identifying highly complex (multi-parametric) signals in huge data streams.
- **D-TA5-WP2-3 (30 Sep 2023):** Test environment for identifying highly complex (multi-parametric) signals in huge data streams using MeerKAT data.
- **D-TA5-WP2-4 (30 Sep 2024):** Generic tool to convert trained neural networks into efficient HLS/VHDL FPGA firmware optimised for a real-time, low-latency environment.
- **D-TA5-WP2-5 (30 Sep 2025):** Algorithms for massively parallel real-time sorting, clustering and pattern recognition on specialised hardware.
- **D-TA5-WP2-6 (30 Sep 2025):** Algorithms and Machine Learning methods for filtering and selecting relevant transient/anomalous signals.
- **D-TA5-WP2-7 (30 Sep 2026):** Pipeline for anomalous signal detection with low false-alarm probability for multi-messenger follow-up.

Deliverables:

- **D-TA5-WP3-1 (31 Mar 2023):** Methods by which one or more dynamic archives can be jointly queried and interpreted in the presence of information loss.
- **D-TA5-WP3-2 (30 Sep 2024):** Methods for transforming a dynamic archive query into a dynamic filter (and vice versa).
- **D-TA5-WP3-3 (30 Sep 2026):** Complete dynamic filter / archive feedback loop.

Deliverables:

- **D-TA5-WP4-1 (31 Mar 2022):** Porting common off-line packages (e.g. CASA) to a memory-based computing prototype to prepare analysis of “data monster”.
- **D-TA5-WP4-2 (30 Jun 2024):**Standard software (e.g. CASA) compatible with Gen–Z.
- **D-TA5-WP4-3 (31 Mar 2025):** Caching strategies for processing a set of benchmark files with the evaluated efficiencies and latencies.
- **D-TA5-WP4-4 (30 Jun 2025):** Porting CASA to a HPC platform with appropriate scaling.
- **D-TA5-WP4-5 (30 Jun 2025):** Concepts for the optimisation of the hard/software co-design for CPUs which include GPU or FPGA features.
- **D-TA5-WP4-6 (30 Jun 2026):**Efficient real-time data processing framework.
- **D-TA5-WP4-7 (30 Jun 2026):** Scaled feedback interfaces between off-line software (e.g. CASA) and (selected) real-time processes using MeerKAT data.

Deliverables:

- **D-TA5-WP5-1 (30 Sep 2024):** Development and implementation of machine learning prototypes for anomaly detection, predictive maintenance and process control.
- **D-TA5-WP5-2 (30 Sep 2024):** Interference recognition and mitigation schemes for transient discovery leading to a “robust” triggering system for multi-messenger follow-up.
- **D-TA5-WP5-3 (30 Sep 2026):**Expansion of the concept to a generalized toolkit for predictive maintenance and anomaly detection.
- **D-TA5-WP5-4 (30 Sep 2026):** Evaluation of false-alarm rates and improvements via machine learning, dynamic queries, on-line feedback and modification of archive metadata