2025 Fink Collaboration Meeting

mercredi 16 juillet 2025 - vendredi 18 juillet 2025

Hotel Littéraire Alexandre Vialatte

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Science / **1**

Early identification of optical tidal disruption events with the Fink broker

Auteur: Sergey Karpov[1]

Co-auteurs: Emille Ishida [2]; Erwan Quintin [3]; Etienne Russeil ; Julien Peloton [4]; Maria Pruzhinskaya [5]; Miguel Llamas Lanza [6]

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Detecting Tidal Disruption Events (TDEs) candidates early is essential for follow-up observations at peak brightness, enabling confirmation of their nature and a deeper understanding of their complex multi-wavelength behavior. TDEs are rare events, and their detection is one of the key goals of large ground optical facilities, such as the Zwicky Transient Facility (ZTF) and the upcoming Vera C. Rubin Observatory. However, managing their vast alert streams requires automated pipelines that identify the nature of the detected events. We introduce a module developed within the Fink alert broker, designed to enable the early identification of TDEs observed by ZTF.
A first step consists in the automatic selection of light curves compatible with a rising transient scenario. It is followed by a tailored feature extraction based on a multi-band fit of the rising part of the light curves. It enables the computation of physically-motivated features, such as temperature and rise time, which are essential to distinguish TDEs from other long-lasting transients. Finally, a machine learning classifiers trained on a sample of high quality TDEs to distinguish similar events, with and without additional features related to the distance to host galaxy. Despite the challenge offered by the sparse and highly imbalanced training dataset, the classifiers provides reasonably completeness and purity metrics.

The talk describes the training of the classifier on archival data, implementation of the module inside Fink broker that reports the candidates in nearly real time, and presents several promising candidates identified during the development, as well as the perspectives of adaptation of this approach for the upcoming Rubin Observatory' Legacy Survey of Space and Time data stream.

Technology / **2**

Enhancing Real-Time Astronomical Alert Processing with Scalable Kubernetes-Driven Infrastructure and Observability

Auteur: Fabrice Jammes[1]

Co-auteur: Julien Peloton [2]

[1] *CNRS*

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Fink is a real-time astronomical alert broker designed to process high-throughput data streams from surveys such as ZTF and the forthcoming LSST. To meet the demands of low-latency, high-reliability

data classification at scale, we have developed a production-grade Kubernetes-based deployment architecture that integrates continuous delivery (CI/CD), fine-grained observability, and resource-aware scheduling.

This contribution presents recent work on operationalizing Fink's Spark-based alert pipeline using Kubernetes-native tooling, focusing on standardizing performance monitoring and pipeline introspection. We leverage Prometheus and JMX exporters for service-level metrics, integrate sparkmeasure to capture stage-level execution details, and develop automated profiling strategies to detect bottlenecks and regressions. Our goal is to elevate Spark observability to first-class status within real-time scientific data infrastructures.

We also report on collaborations with CERN (Luca Canali), Kubeflow, and Stackable.tech to prototype next-generation workflows for distributed data science, bridging operational excellence with scientific reproducibility. These efforts aim to position Fink as a model for scalable, maintainable, and transparent alert processing in the upcoming data-intensive era of time-domain astronomy.

Science / **3**

Search for hidden baryons through interstellar scintillation

Auteur: marc moniez[1]

[1] *LAL-IN2P3*

Auteur correspondant moniez@lal.in2p3.fr

Cool molecular hydrogen H2 may be the ultimate possible constituent to the Milky-Way baryonic hidden matter. I will describe a new way to search for such transparent matter in the Galactic discs and halo, through its diffractive and refractive effects on the light of background stars. The light of a background star can be subject to stochastic fluctuations on the order of a few percent at a characteristic time scale of a few minutes. Results from simulations and from a feasibility test performed with the ESO-NTT telescope will be presented.
I will show that a mini-survey of a few hours with the telescope of the Vera Rubin Observatory, consisting in filming a single field (in the LMC or the SMC) at the rate of a few images per minute has the unique potential to discover (or exclude) interstellar scintillation due to transparent turbulent clouds in the halo.
Complementary observations triggered by the fink broker will then enable us to monitor the sources that undergo scintillation over a long period of time and determine their size, distance and spectrum.

Science / **4**

Finding magnetic cataclysmic variable stars with Fink

Auteur: Clement MUR[None]

Auteur correspondant clement.mur@etu.uca.fr

Magnetic cataclysmic variable stars are rare close binary systems in which matter from a main sequence star accretes on a strongly magnetized white dwarf. This presentation will introduce the characteristics of these objects and show the development of a module within Fink designed to find magnetic cataclysmic variable stars in the Zwicky Transient Facility alert stream, in collaboration with the Fink Cataclysmic Variable team from Brazil. The module is based on a nearest neighbors algorithm using lightcurve statistical features which characterize luminosity variability of celestial bodies. Accuracy tests and first results show promising performances for future detections. Difficulties encountered in real-time implementation, as well as changes and thoughts on future LSST implementation will also be discussed.

Science / 5

Hostless transients detection in Fink

Auteur: Rupesh Durgesh[1]

[1] *COIN*

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Hostless transients refer to transients for which we cannot find an associated host galaxy. This could happen for the following possible reasons: 1. Mostly due to the limitations of telescopes, we are unable to detect the associated host; 2. In very rare cases, supernovae have escaped their hosts due to dynamical ejection, tidal stripping or other astrophysical phenomena. Such candidates are interesting for many reasons such as: to understand why some transients occur in very faint galaxies or to find new low surface brightness galaxies. We developed and integrated a statistical pipeline for ZTF alerts in Fink broker that detects potential hostless transients. By applying image processing and frequency domain analysis to ZTF science and template alert stamps, our pipeline (ELEPHANT) is discovering interesting potential hostless transients. ~19% of the reported transients on our Fink Telegram bot from April 2024 to March 2025 have spectroscopic classification on the Transient Name Server portal.

Moving forward, we aim to update and integrate the methodology for the Vera C. Rubin Observatory data in Fink broker. Since the LSST can produce up to 10 million alerts each night, it would be beneficial to have a real-time pipeline that can flag potential hostless transients. Our pipeline is independent of other catalogues, operates solely on stamp images and can process alerts at a faster rate. Therefore, it would be an ideal tool for the LSST to create a potential hostless transients catalogue.

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Introduction: Fink from 2019 to 2025

Auteur: Emille Ishida[1]

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Roundtable

Introduction from participants and their goal in this workshop

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Overview of the infrastructure and usage report

Auteur: Julien Peloton[1]

[1] *CNRS-IJCLab*

Auteur correspondant peloton@ijclab.in2p3.fr

Technology / **9**

Science portal session

Auteur correspondant peloton@ijclab.in2p3.fr

New functionalities and discussion on evolution (aka what worked and did not work for ZTF, and what is missing for Rubin)

Technology / **10**

LSST simulations: what to expect for alerts and data

Auteur: Anais Moller[1]

[1] *Swinburne University*

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Science / **11**

Discussion: Extra-galactic science

Technology / **12**

Manipulating Rubin 1st alerts

Auteur correspondant peloton@ijclab.in2p3.fr

Science / **13**

Discussion: Galactic science

Science / **14**

What will you do and what do you need for 1st alerts?

What will you do and what do you need for 1st alerts?

Science / **15**

Brainstorming on classification

Defining what classification means in Fink, and its impact

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Sightseeing & conference dinner

Technology / **17**

Hands on: From ZTF to LSST

Auteurs: Julien Peloton[1]; Anais Moller[2]; Emille Ishida[3]

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Hands-on examples!

Adapting your current science module and filter to LSST:
- change in schema
- difference of cutouts
- retraining ML models
- scaling for LSST

Technology / **18**

Graph?

Auteur correspondant julius.hrivnac@ijclab.in2p3.fr

Technology / **19**

Contest: Science portal visualisation

How to visualise LSST light-curves efficiently?

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Wrap-up