ASTERICS-OBELICS PyGamma19 - Python and open data for gamma-ray astronomy

Report of Contributions

Contribution ID: **1** Type: **Talk**

Gammapy - A Python Package for Gamma-Ray Astronomy

Wednesday, March 20, 2019 3:15 PM (45 minutes)

Gammapy is a community-developed, open-source Python package for gamma-ray astronomy and prototype software for the Cherenkov Telescope Array (CTA) science tools. It is built on Numpy, Scipy and Astropy as core dependencies and uses open, FITS based data formats. The development of Gammapy started ˜5 years ago as a loose collection of Python library code, used for the analysis of H.E.S.S. Galactic Plane Survey data. Since this time, the range of features as well as the number of contributors and users has grown considerably. Up to now Gammapy has reached the status of alpha software and has been successfully used for first science publications and analysis of simulated CTA data. However, before Gammapy can be proposed as a complete solution for the future CTA science tools, required features have to be added and a more stable and uniform API has to be developed. In my contribution to PyGamma19 I will present in detail the current status of the package on behalf of the Gammapy team and our proposed roadmap towards a Gammapy 1.0 release. I will also share our past development experiences, present current challenges we are faced with and outline future ideas to continue the collaboration with other astronomical Python based software projects.

Primary author: DONATH, Axel (MPIK)

Presenter: DONATH, Axel (MPIK)

Session Classification: Wednesday

Contribution ID: **2** Type: **Talk**

ctapipe: low-level data processing for CTA

Wednesday, March 20, 2019 10:15 AM (45 minutes)

I will present the history, general design considerations and challenges related to the prototype data processing framework *ctapipe*. The purpose of creating *ctapipe* was to provide an API and standard algorithms for creating low-level (reconstruction level) data processing pipelines for Atmospheric Cherenkov Telescopes—specifically for CTA, but also supporting other existing instruments. The goals were to make it lightweight and user-friendly to support developers of varying skill level, and at the same time to allow the flexibility of design such that it might be adapted to run on anything from a user's Jupyter notebook, to batch-based systems or more complex "big-data" frameworks. The result is a fast-evolving python-based system with optional interfaces with custom high-performance computing libraries.

Primary author: KOSACK, Karl (CEA Saclay)

Presenter: KOSACK, Karl (CEA Saclay)

Session Classification: Wednesday

Contribution ID: **3** Type: **Talk**

3ML: The Multi-Mission Maximum Likelihood Framework

Wednesday, March 20, 2019 4:30 PM (45 minutes)

As the multi-messenger era is now fully active, it is crucial that the community has a framework within which to analyze data from multiple messengers, wavelengths, and instruments in a statistically robust, common way. 3ML (https://threeml.readthedocs.io) provides an abstract, plugin-based data interface for instruments to combine analysis through each instrument's own unique likelihood. As a Python-based tool, users and instrument teams can create or use existing plugins to interface their data to a plethora of Bayesian and optimization packages in a uniform way. Analysis results are reported and stored in portable file formats that allow for the sharing and replication of results in a way that provides observers to produce robust scientific results that the community can interpret. 3ML currently supports via standard plugins many ground and space-based observatories as well as being the primary analysis tool for some collaborations. In my talk, I would like to demonstrate the capabilities and philosophy of 3ML as well as encourage instrument teams to join in the development of new plugins for a variety of instruments.

Primary author: Dr BURGESS, J. Michael (MPE)

Co-author: Dr VIANELLO, Giacomo

Presenter: Dr BURGESS, J. Michael (MPE)

Session Classification: Wednesday

Contribution ID: **4** Type: **Talk**

Towards high-level data analysis with open-source tools in H.E.S.S.

Wednesday, March 20, 2019 11:30 AM (30 minutes)

An overview of past and current efforts to establish high-level data analysis with open-source tools (i.e. *Gammapy* or *ctools*) for the H.E.S.S. experiment will be presented. A focus will be given to ongoing work about the validation of these tools on public H.E.S.S. data (see https://www.mpi-hd.mpg.de/hfm/HESS/pages/dl3-dr1), as well as to the exploration of a 3D likelihood analysis technique. The latter requires a model template for the residual hadronic background; an attempt at the creation of such a model from archival H.E.S.S. data will be outlined.

Primary author: MOHRMANN, Lars (Universität Erlangen-Nürnberg)

Presenter: MOHRMANN, Lars (Universität Erlangen-Nürnberg)

Session Classification: Wednesday

Contribution ID: **5** Type: **Talk**

Fermi all-sky gamma-ray analysis with pointlike

Tuesday, March 19, 2019 3:00 PM (30 minutes)

The Fermi-LAT instrument differs in a fundamental way from its predecessors, particularly EGRET, in having a much larger field of view and energy range. With also having a much larger effective area, the data volume is also substantially larger. The design of pointlike took these factors into account in contrast to the more standard software tools based on the EGRET experience. I will explain this, and discuss the object-oriented design. While the basic parameter optimization is for local patches of sky, an important extension is an iterative all-sky analysis.

Primary author: Prof. BURNETT, Toby (University of Washington)

Presenter: Prof. BURNETT, Toby (University of Washington)

Session Classification: Tuesday

Contribution ID: **6** Type: **Talk**

JetSeT: a C/Python framework for numerical modeling of acceleration/radiation processes in relativistic jets and SED fitting

Thursday, March 21, 2019 11:30 AM (30 minutes)

JetSeT is an open source Python framework with a C numerical engine, to reproduce radiative and accelerative processes acting in relativistic jets, allowing to fit the numerical models to observed data(https://jetset.readthedocs.io/en/latest/ https://github.com/andreatramacere/jetset)

The main features of this framework are:

1. handling observed data (rebinning, definition of data sets, etc...)
2. definition of complex radiative scenario SSC/EC and IC against CMB
3. Constraining of the model in the pre-fitting stage, based on accurate and already published phenomenological trends. In particular, starting from phenomenological parameters, such as spectral indices, peak fluxes and frequencies, and spectral curvatures, that the code evaluates automatically, the pre-fitting algorithm is able to provide a good starting model, following the phenomenological trends that I have implemented.
4. possibility to add template models, such as galaxies, or Big Blu Bumps
5. fitting of multiwavelength SEDs using both frequentist approach (iminuit) and MCMC sampling (emcee)
6. reproduction of the temporal evolution of the plasma under the effect of radiative and accelerative processes, both first order and second order (stochastic acceleration) processes.

I will discuss the design and the status of the project, I will try to through all the items above, in particular item 3), that as far as I know, is missing in similar packages.

Primary author: Dr TRAMACERE, Andrea (Université de Genève)

Presenter: Dr TRAMACERE, Andrea (Université de Genève)

Session Classification: Thursday

Contribution ID: **7** Type: **Talk**

DL3 data conversion in MAGIC

Wednesday, March 20, 2019 12:00 PM (30 minutes)

MAGIC is one of the current Imaging Atmospheric Cherenkov Telescope (IACT) located at the Roque of los Muchachos Observatory on La Palma, one of the Canary Islands. It started to operate in 2003 and is still currently running. Since 2009, MAGIC operates in a stereoscopic mode with two telescopes. A Major hardware upgrade was performed in 2012 for both camera. I will present the status on the conversion of MAGIC data since this upgrade in the high level analysis data format defined for the future very high energy observatory CTA. This open format, named DL3, is based on the FITS format and will contain a list of reconstructed gamma-ray events for each observation as well as the associated instrument response function. The discussion on this format is still open. In order to test it as well as the new open high level analysis tools, it is necessary to convert the current IACT data in this DL3 format.

I will report on the data legacy planed in the DL3 format for MAGIC data and in particular on the production of full enclosure (with no cut applied on the event direction) and offset dependent field of view instrument response function. Both are needed for morphological and 3D analysis that are a crucial point for the high level analysis software developed for CTA. I will show out first spectral results on Crab Nebula observations with Gammapy and finish by explaining our plan to produce a background model.

Primary author: JOUVIN, Lea (IFAE, Barcelona)

Presenter: JOUVIN, Lea (IFAE, Barcelona)

Session Classification: Wednesday

Contribution ID: **8** Type: **Poster**

ASTErIsM: a flexible python framework for detection, morphometry and shape classification of astronomical sources

ASTErIsM is a flexible python open-source framework for detection, morphometry and shape classification of astronomical sources, bases on clustering algorithm and machine learning. ASTErIsM works both on ccd images and photon list (e.g. Fermi). This framework is currently used as deblending algorithm for the Euclid pipeline. I will present the capabilities of the algorithm for:
1) detection and deblending (separation of confused sources) in optical images
2) detection and deblending for gamma-ray sources (Fermi data)
3) galaxy shape identification based on machine-learning
Related publications
https://ui.adsabs.harvard.edu/#abs/2013A%26A...549A.138T/abstract
https://ui.adsabs.harvard.edu/#abs/2016MNRAS.463.2939T/abstract
A preliminary documentation is hosted here:
http://isdc.unige.ch/~tramacer/asterism_doc/html/index.html

Primary author: TRAMACERE, Andrea (Université de Genève)

Presenter: TRAMACERE, Andrea (Université de Genève)

Contribution ID: **9** Type: **Talk**

Jupyter notebooks on steroids

Friday, March 22, 2019 10:15 AM (45 minutes)

Jupyter notebooks have arrived to stay as a means to document the scientific analysis protocol, as well as to provide executable recipes shared seamlessly among the community. This has triggered the rise of a plethora of complementary tools and services associated to them. This talk will cover different possibilities to use Jupyter notebooks and JupyterLab interface. We will start with the description of their basic functionalities, as well as functionality extensions not widely known by the community. We will describe how to take advantage of their cross-language capabilities to enhance collaborative work, and also use them as complementary assets in the paper publication process to provide reproducibility of the results. Other aspects on how to deal with modularity and scalability of long complex notebooks will be covered, and we will see several platforms for rendering and execution others then the browser and the local desktop. We will finish on how they are actually being used together with Docker and Binder as part of the versioned executable documentation of a project like Gammapy.

Primary author: Mr RUIZ, Jose Enrique (IAA - CSIC)

Presenter: Mr RUIZ, Jose Enrique (IAA - CSIC)

Session Classification: Friday

Contribution ID: **11** Type: **Talk**

GammaLib and ctools: A Framework for the Analysis of Astronomical Gamma-ray Datasets

Wednesday, March 20, 2019 2:30 PM (45 minutes)

ctools is an open source data analysis package targeted towards the upcoming Cherenkov Telescope Array. The tools employ both a three-dimensional likelihood analysis similar to that used in the Fermi Science Tools, and a standard On/Off analysis typical of current generation atmospheric Cherenkov telescopes. Built on top of the GammaLib software, *ctools* is designed to be easily adapted for use with data from past, present, and future high energy photon-counting detectors. Already, the tools have been applied to H.E.S.S., Fermi-LAT, and COMPTEL data as well as simulated CTA observations. Data from multiple instruments can also be fit simultaneously, an important feature for understanding astrophysical processes across a broad energy range. In terms of the software, GammaLib exists primarily in C++ to optimize computation speed. Python wrappers are used to provide a user-friendly interface to the GammaLib classes. *ctools* consists of both Python modules and C++ classes that can be accessed via Python wrappers. At a higher level, the individual tools are also designed to be run directly from the command-line. This modular aspect of ctools means it can adapt to suit a range of different analyses workflows. This contribution will focus on the design and development principles behind the *ctools* and GammaLib software. A demonstration of the capabilities of ctools will also be presented using test data recently released by the H.E.S.S. collaboration.

Primary author: CARDENZANA, Josh

Presenter: CARDENZANA, Josh

Session Classification: Wednesday

Contribution ID: **12** Type: **Talk**

Multi Order Coverage maps and Python

Tuesday, March 19, 2019 10:30 AM (30 minutes)

I will present MOC (Multi Order Coverage maps), a Virtual Observatory standard allowing one to describe and compare spatial coverage of astronomical datasets.

After presenting the MOC format (based on HEALPix tessellation), I will show some practical applications of MOC usage, using the MOCPy library developed at CDS.

Primary authors: Mr BOCH, Thomas (CDS - Observatoire de Strasbourg); Mr BAUMANN, Matthieu (CDS - Observatoire de Strasbourg)

Presenter: Mr BOCH, Thomas (CDS - Observatoire de Strasbourg)

Session Classification: Tuesday

Contribution ID: **13** Type: **Talk**

CDS HEALPix libraries

Tuesday, March 19, 2019 9:30 AM (30 minutes)

After a brief presentation of HEALPix, I will discuss the specificities of the CDS implementation. This implementation has been natively coded in both Java and Rust. Wrappers make the Rust library accessible in Javascript/WebAssembly and Python.
Particular emphasis will be placed on the exact solution of cone/polygon coverage queries and on MOCs in which each cell contains a boolean flag.

Primary author: PINEAU, francois-xavier (Université de Strasbourg)

Presenter: PINEAU, francois-xavier (Université de Strasbourg)

Session Classification: Tuesday

Contribution ID: **14** Type: **Talk**

Towards open and reproducible multi-instrument analysis in gamma-ray astronomy

Tuesday, March 19, 2019 11:30 AM (30 minutes)

Analysis and combination of data from different gamma-ray instruments involves the use of collaboration proprietary software and case-by-case methods.
By defining a common open format for high-level gamma-ray data (containing event lists and instrument response functions, using the FITS standard) we allow multi-instrument analysis within the context of open-source software.
This project aims to perform the first fully-reproducible, multi-instrument very-high-energy gamma-ray analysis.
Data of *Fermi*-LAT, MAGIC, VERITAS, H.E.S.S., and FACT, compliant with a preliminary common format (DL3) and analysed with the gammapy science tools, were used to produce a first joint fit of the Crab Nebula spectrum. Aspects of the error evaluation and the release format of a spectral measurement are also included in the discussion.
The talk will illustrate how to realize a fully reproducible publication relying on open access assets as GitHub repositories (https://github.com/open-gamma-ray-astro/joint-crab) and will promote and review current open data format and science tools to allow VHE gamma-ray astronomy to move towards open reproducible science.

Primary author: NIGRO, Cosimo

Presenter: NIGRO, Cosimo

Session Classification: Tuesday

Contribution ID: **15** Type: **Talk**

Rust and its usage as Python extensions

Tuesday, March 19, 2019 10:00 AM (30 minutes)

I will give a brief presentation about the new Rust system programming langage:
- the compiler rules enabling memory safety
- how one can interface Rust code with Python

Then, regarding to what has been currently done in cdshealpix I will talk about the CI pipeline I used for generating and deploying binary wheels for different platforms.

Primary author: Mr BAUMANN, Matthieu (CDS (Centre de Données de Strasbourg))

Presenter: Mr BAUMANN, Matthieu (CDS (Centre de Données de Strasbourg))

Session Classification: Tuesday

Contribution ID: **16** Type: **Talk**

GAMERA toolkit, more than a Kaiju

Thursday, March 21, 2019 12:00 PM (30 minutes)

GAMERA is a toolbox developed at MPIK for the modelling of gamma-ray emission from fundamental processes in relativistic astrophysics. Beside the emission in steady states, it allows the possibility to compute the time evolution of particle distributions in different astrophysical environments and the consequent photon spectrum detectable from an observer.
Written in C++ and wrapped in Python, it makes use of user friendliness and efficiency in the calculation. Here I will introduce the code and its basic functionalities and the development work that is in progress to enhance its capabilities. The package is available here: https://github.com/JoachimHahn/GAMERA

Primary authors: ROMOLI, Carlo (MPI-K); BREUHAUS, Mischa (MPI-K); Dr HAHN, Joachim

Presenter: ROMOLI, Carlo (MPI-K)

Session Classification: Thursday

Contribution ID: **17** Type: **Talk**

Maps in gamma-ray astronomy

Tuesday, March 19, 2019 12:00 PM (30 minutes)

In several branches of astrophysics, high-level data format consists of event lists - containing the reconstructed energy, direction and arrival time (and some other informations, eg: event type) of each event. For analysis and visualisation, maps are made by astronomers with a pixelisation and binning chosen to suit the use case. FITS maps, using either a WCS or a HEALPix format, are commonly used.
An effort has been made over the past few years to define a data model and format for maps in gamma-ray astronomy (GADF; https://gamma-astro-data-formats.readthedocs.io/en/latest/skymaps/) and a prototype implementation in gammapy.maps (https://docs.gammapy.org/0.10/maps) is currently under development. Maps represent pixelized data structures with at least two spatial and an arbitrary number of non-spatial dimensions such as energy, time, event class (or any possible user-defined dimension). This is sufficiently general to act as a container for various objects like sky images and spatially dependent instrument response functions.

In this talk, I will briefly introduce GADF and its implementation within gammapy. The goal is to describe what exists, and to trigger discussion and collaboration both on data format and code aspects to reach a solution that can support many use cases from current and planned telescopes.

Primary author: Dr SINHA, Atreyee (APC, IN2P3/CNRS)

Presenter: Dr SINHA, Atreyee (APC, IN2P3/CNRS)

Session Classification: Tuesday

Contribution ID: **18** Type: **Talk**

The Astropy Project

Monday, March 18, 2019 4:30 PM (45 minutes)

The Astropy Project is a community effort to develop a single core package for Astronomy in Python and foster interoperability between Python astronomy packages. In this talk I will give an introduction to the project, including an overview of progress so far, and I will outline our current plans for the future. I will also describe the Astropy coordinated and affiliated package ecosystem, which is formed by Python packages that are not part of the core package but integrate with Astropy, and are maintained by the Astropy team and the wider community.

Primary author: ROBITAILLE, Thomas (Aperio Software Ltd.)

Presenter: ROBITAILLE, Thomas (Aperio Software Ltd.)

Session Classification: Monday

Contribution ID: **19** Type: **Talk**

A legacy portal of MAGIC published results

Thursday, March 21, 2019 10:15 AM (30 minutes)

Since the begin of its operation in 2003, the MAGIC telescopes collected data from more than 60 TeV emitters. The collaboration distributes public FITS files with high-level data such as spectral energy distributions, light curves and skymaps for every published result. Here we report on the efforts to complement this products with more ample information (data quality, fit models, etc) and with different serialisation formats, in order to make them accessible to a wide community of users and softwares. These high-level products will be offered to the community in a legacy MAGIC data portal, under development. The status of advances will be reported.

Primary authors: DORO, Michele (University of Padua and INFN Padua); Dr PRANDINI, Elisa (Padova University); TRAMACERE, Andréa (Université de Genève)

Presenter: DORO, Michele (University of Padua and INFN Padua)

Session Classification: Thursday

Contribution ID: **20** Type: **Talk**

Python-based Frameworks for KM3NeT

Wednesday, March 20, 2019 9:30 AM (45 minutes)

This talk focuses on three frameworks developed by the KM3NeT collaboration: KM3Pipe, aanet and OrcaNet.
KM3Pipe is a Python-based pipeline framework which is used to modularise different kinds of processes and workflows like data analysis, detector monitoring and ML training in the KM3NeT neutrino telescope experiment. Although it contains many implementations of project specific data formats and API, in its core it provides a generic and lightweight pipeline mechanism which also includes logging and basic profiling. One of its key features is the HDF5 file support which is tightly integrated with a handful of classes.
KM3NeT's offline data format is based on ROOT. The C++ data structures of the aanet framework have been designed with Python in mind from the start. Via the PyROOT binding, seamless interplay between C++ and Python code is possible, using the former for high-performance computation and the latter for high-level data analysis. Facilities also exist to the use the C++ data structures with numpy with minimal overhead.
OrcaNet is a deep learning framework based on Keras in order to simplify the training process of multiple neural networks for astroparticle physics. It incorporates automated logging, plotting and validating during the training as well as saving and continuing the training process.

Primary author: Mr GAL, Tamas (KM3NeT/ECAP)

Presenter: Mr GAL, Tamas (KM3NeT/ECAP)

Session Classification: Wednesday

Contribution ID: **21** Type: **Talk**

Provenance for multi-messenger astronomy

Thursday, March 21, 2019 9:45 AM (30 minutes)

Provenance information in astronomy is important to enable scientists to trace back the origin of a dataset, a document or a device, learn about the people and organizations involved in a project and assess the quality as well as the usefulness of the dataset, document or device for their scientific work. Current efforts to model the Provenance information in Astronomy led to the development of tools, in particular in the context of the development of CTA (Cherenkov Telescope Array) and its python based Pipeline framework.
Astronomical observatory such as CTA are designed to produce data that will be publicly released to a large community of scientists, with strong requirements to ensure data quality, reliability and trustworthiness. Among those requirements, traceability and reproducibility of the data products have to be included early in the development of large projects. In the case of multi-messenger astronomy, the higher complexity of the data acquisition and processing reinforces the need of detailed provenance information.

Primary author: SERVILLAT, Mathieu (LUTH - Observatoire de Paris)

Presenter: SERVILLAT, Mathieu (LUTH - Observatoire de Paris)

Session Classification: Thursday

Contribution ID: **23** Type: **Talk**

Status of VERITAS DL3 production

Wednesday, March 20, 2019 12:30 PM (30 minutes)

Two independent analysis chains have been classically used for the analysis of VERITAS data. These two branches start from independent low-level calibration and reach all the way to high-level science products such as spectra, skymaps, etc. With the objective of joining the effort of producing a joint multi-instrument Crab spectrum, VERITAS started exporting its high-level data products to the open high-level gamma-ray data format (DL3). This format will be ideal for the future legacy products of VERITAS. Here, I will present the current status of both analysis chains to export their data products to this format.

Primary authors: MAIER, Gernot; HASSAN, Tarek (DESY Zeuthen)

Presenter: MAIER, Gernot

Session Classification: Wednesday

Contribution ID: **24** Type: **Talk**

fermitools and fermipy

Tuesday, March 19, 2019 2:30 PM (30 minutes)

I will summarize two software suites used for analysis of Fermi-LAT data: the fermitools (formerly ScienceTools), and the fermipy python-based software package.

Primary author: Dr CHARLES, Eric (SLAC)

Presenter: Dr CHARLES, Eric (SLAC)

Session Classification: Tuesday

Contribution ID: **25** Type: **Talk**

Python in High-Energy Physics

Thursday, March 21, 2019 2:30 PM (30 minutes)

Python is now the dominant language in scientific computing. Especially astroparticle physics and astronomy experiments have embraced Python enthusiastically, for example, the IceCube Neutrino Observatory. CERN experiments are also moving analysis steadily towards Python. ROOT is the foundational library in many HEP experiments, so I will give a brief summary on current developments in ROOT. ROOT-less analysis in Python is now also possible through the work of the Scikit-HEP project, which currently builds a complete Python stack for HEP analyses. The project has already contributed several foundational libraries, notably awkward-array, uproot, and iminuit. uproot allows one to read ROOT files in pure Python and is faster than the native C++ code. I will present these core libraries and their potential. As an outlook, I will speak about our efforts to bring a standardized object-orient fast histogram package to Python based on Boost::Histogram in C++.

Primary author: Dr DEMBINSKI, Hans Peter (Max-Planck-Institute for Nuclear Physics, Heidelberg)

Presenter: Dr DEMBINSKI, Hans Peter (Max-Planck-Institute for Nuclear Physics, Heidelberg)

Session Classification: Thursday

Contribution ID: **26** Type: **Talk**

Porting legacy software packages to the Conda Package Manager

Friday, March 22, 2019 9:30 AM (45 minutes)

The Fermi Science Tools are a software suite provided by the Fermi Science Support Center (FSSC) to facilitate analysis of data gathered by the Fermi Gamma-Ray Space Telescope. In the past the software was distributed via compiled binaries or compile-able source code downloads from the FSSC's website. While this system was effective, it relied on a large amount of developer hours from the FSSC in addition to the original time contributed by the code's authors to compile, debug, test, and package the code on all supported systems. In order to streamline this process and increase ease of use the ScienceTools were ported to the Conda Package Manager and distributed via a channel controlled by the FSSC. This has allowed for the use of Continuous Integration systems, greater ease of installation, and faster turn-around time on software updates. In this talk I will be discussing the problems we encountered making this transition with a legacy software package, detailing the benefits obtained, and presenting lessons learned in the process.

Primary author: ASERCION, Joseph (Fermi Science Support Center)

Presenter: ASERCION, Joseph (Fermi Science Support Center)

Session Classification: Friday

Contribution ID: **27** Type: **Talk**

Welcome

Monday, March 18, 2019 2:00 PM (10 minutes)

Presenter: Prof. HINTON, Jim (Max Planck Institute for Nuclear Physics)

Session Classification: Monday

Contribution ID: **28** Type: **Talk**

Tuesday lightning talks

Tuesday, March 19, 2019 12:30 PM (30 minutes)

- Andrea Tramacere - ASTErIsM (poster)
- Felix Kunzweiler - Rapid Fermi-GBM GRB localization with BALROG (poster)
- Björn Biltzinger - Physically Motivated Background Model for GBM (poster)
- Jeremy Perkins - BurstCube
- Thomas Robitaille - Data visualization with glue

Session Classification: Tuesday

Contribution ID: **29** Type: **Talk**

Introduction

Monday, March 18, 2019 2:10 PM (30 minutes)

Context, goals, overview, logistics for PyGamma19

Presenter: ZANIN, Roberta (MPI for Nuclear Physics, Heidelberg)

Session Classification: Monday

Contribution ID: **30** Type: **Talk**

Fermi-LAT

Monday, March 18, 2019 2:40 PM (40 minutes)

Presenter: PERKINS, Jeremy (NASA/GSFC)

Session Classification: Monday

Contribution ID: **31** Type: **Talk**

Cherenkov Telescope Array

Monday, March 18, 2019 3:20 PM (40 minutes)

Presenter: FÜSSLING, Matthias (CTAO)

Session Classification: Monday

Contribution ID: **32** Type: **Talk**

High performance computing with Python

Thursday, March 21, 2019 3:00 PM (30 minutes)

I will present examples of python code optimization. First we will focus on wrapped C++ code to speed up significantly analysis. Secondly, I will talk about function minimization with PyTorch and how it can be used through two examples: likelihood minimization on GPU for ImPACT optimization and deep learning with the gamma-learn project.

Primary author: Dr GATÉ, Florian (LAPP - CNRS)

Presenter: Dr GATÉ, Florian (LAPP - CNRS)

Session Classification: Thursday

Contribution ID: **33** Type: **Talk**

Python in the CASA project and its pipelines

Monday, March 18, 2019 5:15 PM (45 minutes)

CASA, the Common Astronomy Software Applications, is a package for radio astronomical telescopes that is developed by an international consortium of institutions from America, Asia, Australia and Europe. It is used to manipulate and process both interferometric and single dish data, and is the primary data processing software for the Karl G. Jansky Very Large Array (VLA) as well as the Atacama Large Millimeter/submillimeter Array (ALMA). CASA consists of a suite of libraries and tools written in C++ which provide functionality exposed to Python. I will give an overview of the project, its origins, present and future plans. Topics will include telescopes and data formats supported, and how the software is built and distributed in its current 5.x series and the plans for the upcoming 6.x series. We will also see how the pipelines for automated data processing used by the VLA and ALMA have been developed entirely in Python since their inception.

Primary author: MONTESINO POUZOLS, Federico (European Southern Observatory)

Presenter: MONTESINO POUZOLS, Federico (European Southern Observatory)

Session Classification: Monday

Contribution ID: **34** Type: **Talk**

Thursday lightning talks

Thursday, March 21, 2019 12:30 PM (30 minutes)

- Tamas Gal - Julia - feels like Python, runs like C
- Toby Burnett - A framework to create Web documents from Python code
- Jeremy Perkins - Future Gamma-ray Missions of Various Shapes (mostly square) and Sizes
- Eric Charles - Clever tricks for fast Fermi likelihood
- Francesco Berlato - Improved GBM GRB localizations with BALROG
- Simon Steinmaßl - Fitting a Light Curve in 3ML with Template Models
- Eric Charles - How to build a pyromanic guitar

Session Classification: Thursday

Contribution ID: **35** Type: **Talk**

Summary and Discussion

Friday, March 22, 2019 11:30 AM (1h 30m)

PyGamma19 summary and group discussion

Presenter: DEIL, Christoph (MPI for Nuclear Physics, Heidelberg)

Session Classification: Friday

Contribution ID: **36** Type: **Talk**

Archiving data from a software telescope

Thursday, March 21, 2019 9:30 AM (15 minutes)

In the context of Cherenkov astronomy, the data processing stages imply both assumptions and comparison to dedicated simulation. Those data can be misleading if not documented. This has implications on the format specification for the data that will be exposed to be used in relation with other frequencies for modeling.

Primary author: BOISSON, Catherine (Observatoire de Paris)

Presenter: BOISSON, Catherine (Observatoire de Paris)

Session Classification: Thursday

Contribution ID: **37** Type: **Talk**

Plenary Discussion

Thursday, March 21, 2019 10:45 AM (15 minutes)

Session Classification: Thursday

Contribution ID: **38** Type: **not specified**

Plenary Discussion

Wednesday, March 20, 2019 5:15 PM (45 minutes)

Plenary discussion on gamma-ray data, IRFs and science tools

Session Classification: Wednesday

Contribution ID: **39** Type: **Poster**

Rapid Fermi-GBM GRB localization with BALROG

Through the use of the BALROG code's improved statistical treatment (https://arxiv.org/abs/1610.07385 , https://arxiv.org/abs/1902.01082), it is now possible to achieve superior localization performance for the Gamma-ray Burst Monitor (GBM) on-board the Fermi space telescope. The code is currently being used to rapidly localize gamma-ray bursts (GRBs), which positions are then shared with the rest of the community through our website. The locations can then be used for follow-up observations by other instruments. The code is open source, available at https://github.com/mpe-grb.

Primary authors: BERLATO, Francesco; Mr KUNZWEILER, Felix (MPE); Mr BLITZINGER, Bjoern (MPE); Dr BURGERSS, J. Michael (MPE); Dr GREINER, Jochen (MPE)

Presenters: BERLATO, Francesco; Mr KUNZWEILER, Felix (MPE)

Contribution ID: **40** Type: **Poster**

Physically Motivated Background Model for GBM

We try to build a working physically motivated background model which can be fitted to the data of the Gamma-Ray Burst Monitor. This would yield several interesting applications, like searching for ultra long GRBs and fitting the cosmic gamma ray background spectrum. This poster shows the progress we have made so far.

Primary authors: BILTZINGER, Björn; Mr KUNZWEILER, Felix (MPE); Dr BURGESS, J. Michael (MPE); Dr GREINER, Jochen (MPE)

Presenters: BILTZINGER, Björn; Mr KUNZWEILER, Felix (MPE)

Contribution ID: **41** Type: **Talk**

Numba: Speeding up Python

Thursday, March 21, 2019 3:30 PM (15 minutes)

An introduction to Numba, a Python package which compiles Python code on-the-fly to produce efficient machine code, potentially providing huge improvements in execution time.

Primary author: WATSON, Jason (University of Oxford)

Presenter: WATSON, Jason (University of Oxford)

Session Classification: Thursday

Contribution ID: **42** Type: **not specified**

Plenary Discussion

Thursday, March 21, 2019 3:45 PM (15 minutes)

What are good choices / pros and cons of the various high-performance computing options in Python for our codes?

Session Classification: Thursday

Contribution ID: **43** Type: **Talk**

Sherpa overview

Thursday, March 21, 2019 5:30 PM (15 minutes)

Remote presentation

Presenter: SIEMIGINOWSKA, Aneta (Chandra X-ray Center)

Session Classification: Thursday

Contribution ID: **44** Type: **Talk**

PINT - Pulsar timing with Python

Thursday, March 21, 2019 4:30 PM (30 minutes)

https://github.com/nanograv/PINT

Presenter: LUO, Jing

Session Classification: Thursday

Contribution ID: **45** Type: **Talk**

GSPEC - Gamma-ray Spectroscopy Analysis Package

Tuesday, March 19, 2019 3:30 PM (30 minutes)

The Fermi Gamma-ray Burst Monitor (GBM), with its broad energy range and instantaneous coverage of 2/3 of the sky, observes a wide variety of flaring or transient phenomena. These capabilities make it ideally suited for the search of transient events and to contribute to the new era of multi-messenger astrophysics. The GBM team has recently released the GSPEC analysis package, a modern GUI-based tool written in Python that uses XSPEC under the hood to perform spectral analysis of GBM data. While the initial release of the GSPEC is primary focused on GRB spectroscopy via the interactive GUI, work is underway to develop a full application programming interface (API) to facilitate the analysis, manipulation, and visualization of GBM data. The final GSPEC API will serve as an analog to the Fermipy tools developed for the Fermi Large Area Telescope (LAT).

Primary authors: Dr KOCEVSKI, Daniel (NASA MSFC); Dr GOLDSTEIN, Adam (USRA); Mr CLEVELAND, William

Presenter: Dr KOCEVSKI, Daniel (NASA MSFC)

Session Classification: Tuesday

Contribution ID: **46** Type: **Talk**

JWST Data Analysis Tools: Open Development of Community Software

Thursday, March 21, 2019 5:00 PM (15 minutes)

Presenter: TOLLERUD, Erik (STScI)

Session Classification: Thursday

Contribution ID: **47** Type: **Talk**

The Advanced Scientific Data Format

Thursday, March 21, 2019 5:15 PM (15 minutes)

Presenter: GREENFIELD, Perry (STScI)

Session Classification: Thursday

Contribution ID: **48** Type: **Talk**

Sherpa technical notes

Thursday, March 21, 2019 5:45 PM (15 minutes)

Presenter: LAURINO, Omar (Chandra X-ray Center)

Session Classification: Thursday