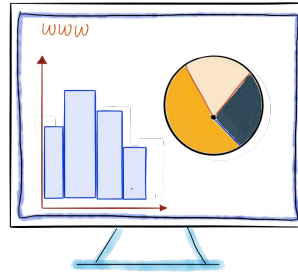


PWF South America Master Thesis Project

Knowledge Transfer that boosts Physics & Computer Skills in the Americas



Arturo Sánchez Pineda

ICTP - PWF meeting, October 22nd, 2020

ATLAS

Open Data

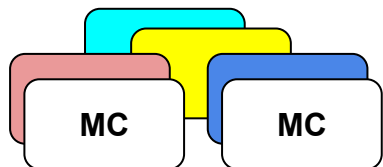
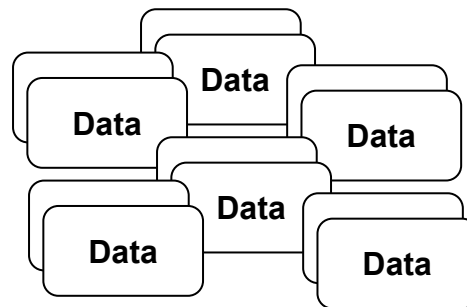
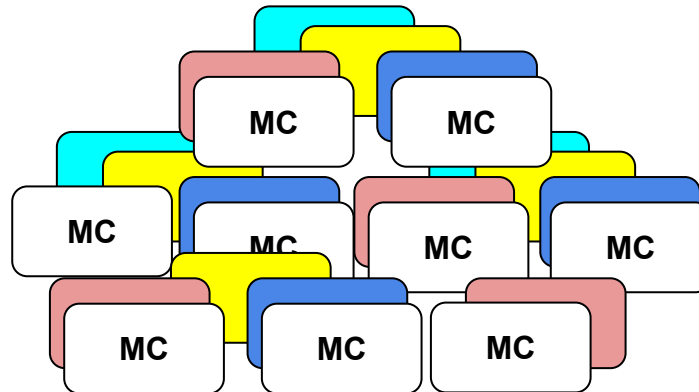
The members of large High Energy Physics (HEP) collaborations come from all over the world. They understand that one significant challenge in teaching experimental HEP is the current location of many potential and valuable students and young researchers. In the case of ATLAS, many of its members come from Latin-American, Middle Eastern and Sub-Saharan countries.

Also, they recognise the massive potential that the always-increasing university student population has regarding expanding this experimental field, not only concerning the fundamental physics but also the computing and Big Data analysis skills.

For that reason, several outreach teams, which include ATLAS, IPPOG, CEVALE2VE members and many other researchers, have been developing and examining costless Open Source technologies to release data and to provide effective web-based and offline environments to run, produce, save and share HEP analysis.

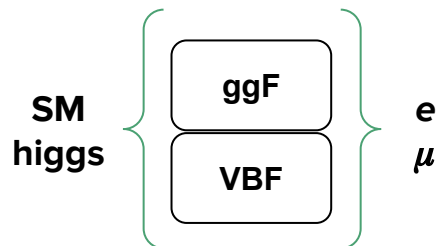
After several years, and with the help of other outreach programs like the Virtual Visits, ATLAS established an active community that is not just releasing knowledge, data and resources but genuinely training new physicists who are pursuing advanced studies in experimental HEP right now. We will present the resources, community, results and ideas that have emerged from these efforts.



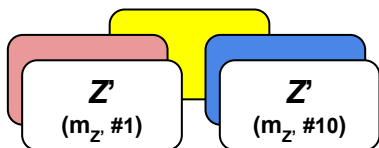
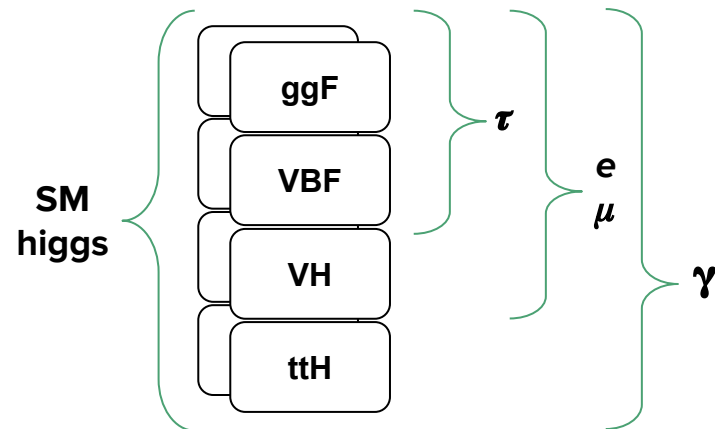
8 TeV release**13 TeV** release 1 fb^{-1}  10 fb^{-1} **44** samples**~120** samples

$\geq X7$
Collections
based in
final states

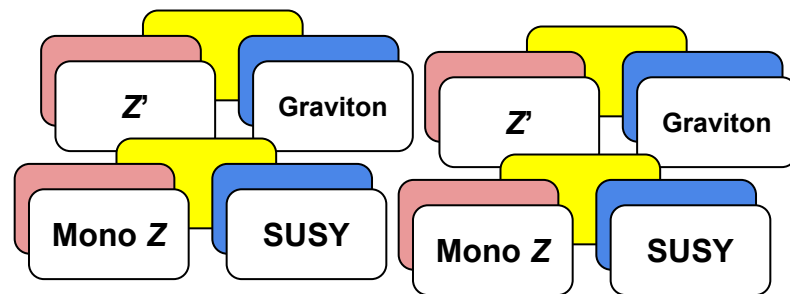
8 TeV MC signals



13 TeV MC signals



14 BSM samples

 ≥ 50 BSM samples

Jupyter Notebooks

```

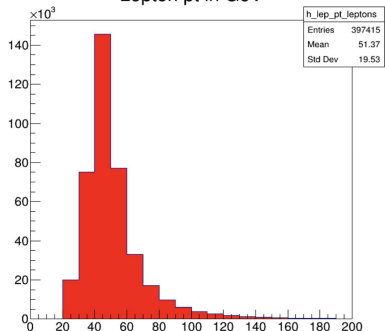
ATLAS_OpenData_06-cpp_simple_cut_and_count_analysis_example (unsaved changes)
File Edit View Insert Cell Kernel Help ROOT Prompt: O
C++
<< % of total events! << endl;endl;
Total # events = 750000. Events to run = 750000 corresponding to 10% of total events

In [10]: for (i=0; i<events_to_run; i++)
{
  nbytes = dataset->GetEntry(i);
  if(lepton_n1) // Number of leptons in the events has to be at least 2
  {
    if(lepton_type[0] == lepton_type[1]) //Leptons of the same family, i.e. 2 electrons or 2 muons (those are the t
    {
      if(lepton_charge[0] != lepton_charge[1]) // The two selected leptons must have opposite charge
      {
        //**
        float lepton_pt_inGeV = lepton_pt[0]/1000.; // The default value in the root file is in MeV, so, we div
        h_lep_pt_leptons->Fill(lepton_pt_inGeV);
      }
    }
  }
}

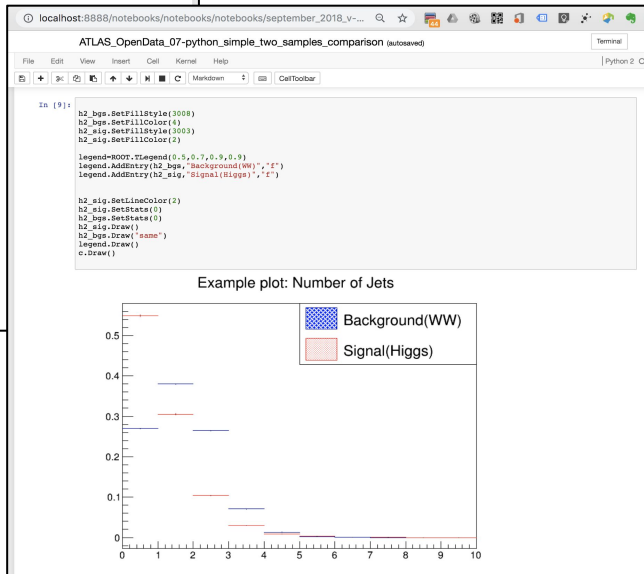
In [11]: TCanvas *cs = new TCanvas("cs","cs",10,10,700,700);
h_lep_pt_leptons->Draw();
cs->Draw();

```

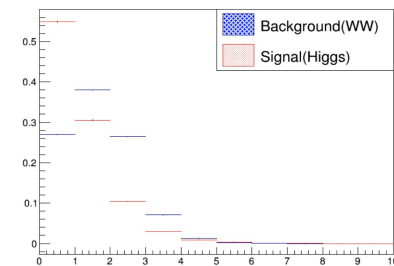
Lepton pt in GeV



Use
ROOTJS

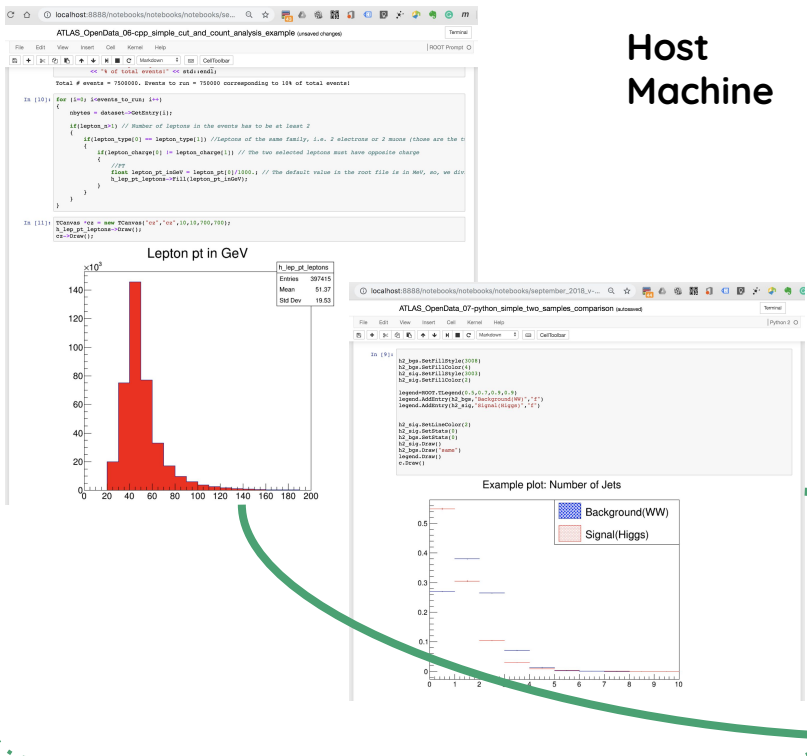


Example plot: Number of Jets



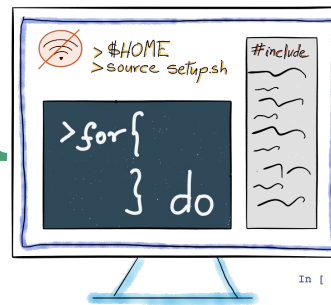
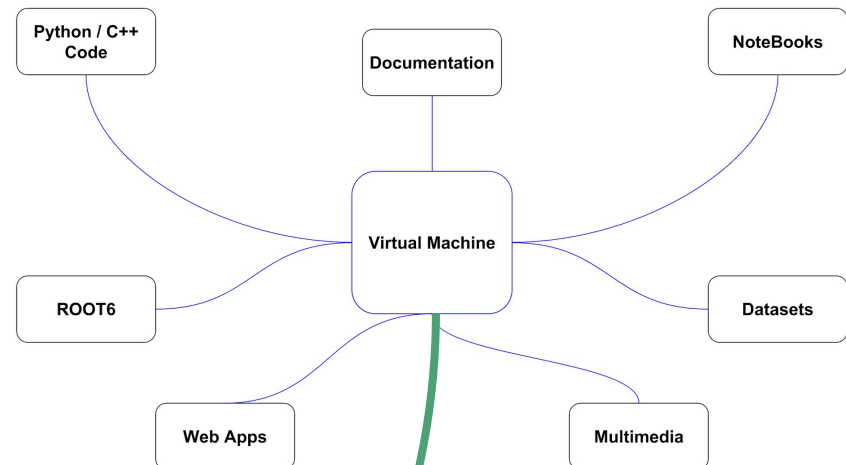
Jupyter notebooks can run ROOT commands

- We produce a series of ~20 examples for basic training on the usage of the notebooks, reading of the samples and plotting simple analysis.
- The notebooks use both the Python and the C++ ROOT kernel to produce results that can be adjusted by teachers and trainers.
- ROOT6 is needed to use this functionality in a local installation but ROOT-free notebooks are also produced
- The notebooks can read the samples directly from the Internet (using http protocol) or run local (if there is limited Internet access)



Jupyter notebooks can run ROOT commands and other Python libraries and tools

- The notebooks use both the Python and the C++ ROOT kernel to produce results using the VM as a server, teaching as well the principles of Cloud and Distributed Computing.



```
In [ ]: import sys
!{sys.executable} -m pip install --upgrade --user pip
!{sys.executable} -m pip install -U numpy pandas uproot matplotlib keras scikit-learn --user
```

```
In [ ]: import os
import csv
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from pandas import read_csv
from matplotlib import pyplot
```

Uses as a Server

ICTP-PWF +
CEVALE2VE



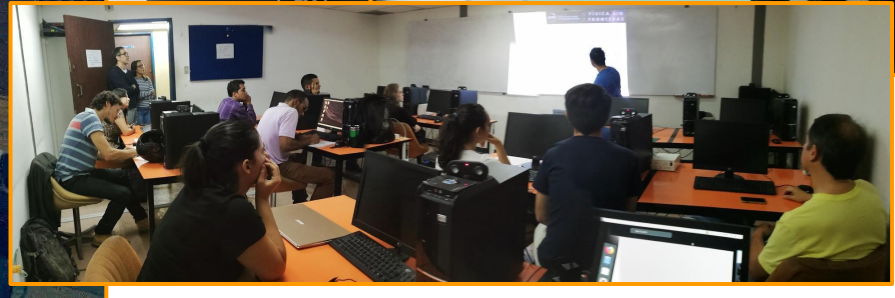
UCV, Caracas



ICTP-FISICA SIN FRONTERAS '16
 MÉRIDA
 Dr. Arturo Sánchez Pineda
 Universidad de Los Andes, ICTP & CERN

Seminario
 "Code in Smart Cities"
 Auditorio A10, Facultad de Ciencias, La Mérida
 Universidad de Los Andes
 Lunes, 14 de Octubre
 10:00 am

ATLAS ATLAS



Thesis program

Today! We have this short workshop where, Latin American students will present themselves and their view of the thesis programs.

(who can, in English, or in Spanish)



Research

Scientific Calendar

Programmes

Europe/Rome

Administration

All of them are using
Open Educational
Resources

Search PWF South America Master Thesis Project

Search in Conferences:

Overview

Programme

Speakers

Practical info

🕒 Starts 22 Oct 2020 13:00
Ends 22 Oct 2020 14:10
Central European Time

📍 ICTP

After many years of successful PWF programmes across South America, six excellent physics students have been identified to work with supervisor Arturo Sanchez (ICTP, PWF Latin America group, CEVALE2VE) on a MSc equivalent thesis in High Energy Physics (HEP) using ATLAS Open Data. The created PWF resources will be created in Spanish and made available online for public use.

Thursday, 22 October 2020

13:00 - 13:10	PWF: Welcome and introduction to ICTP and PWF Conveners: Bobby Samir Acharya (Ictp), Kate Shaw (Ictp)
13:10 - 13:20	PWF: PWF South America Master Thesis Project Convener: Pineda Arturo Rodolfo Sanchez (Ictp)
13:20 - 13:25	PWF: Presentation by Angie Milena Sanchez
13:25 - 13:30	PWF: Presentation by Erick Reategui Rojas
13:30 - 13:35	PWF: Presentation by Mildred Arias
13:35 - 13:40	PWF: Presentation by Oscar Altuve
13:40 - 13:45	PWF: Presentation by Alejandra Angarita
13:45 - 13:50	PWF: Presentation by Ruben Mancilla

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☎ (+39) 040 2240 111
✉ pio@ictp.it

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data privacy and web terms
of use

ICTP is governed by UNESCO, IAEA, and Italy, and is a UNESCO
Category 1 Institute



<http://indico.ictp.it/event/9450>

```
In [8]: for event in tree:
        hist.Fill(tree.lep_n)

        print("Done!")
```

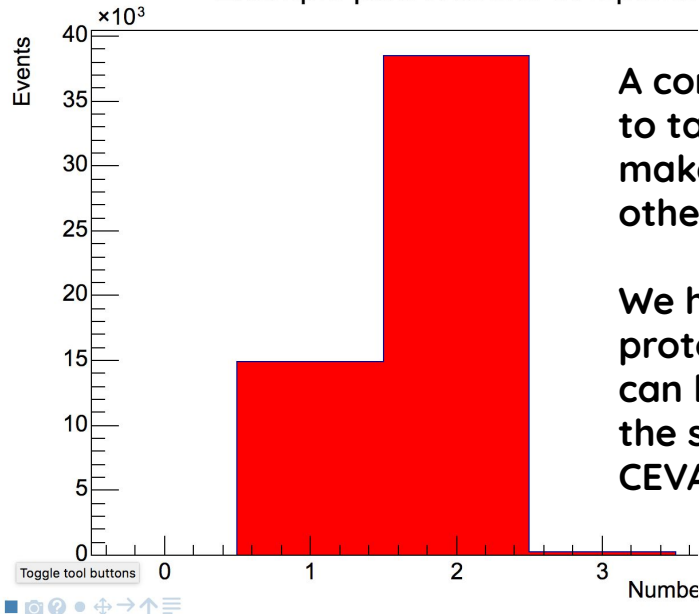
Done!

After filling the histogram we want to see the results of the analysis. First we draw the histogram on the canvas and then the canvas on which the histogram lies.

```
In [9]: hist.SetFillColor(2)
        hist.Draw()
```

```
In [10]: canvas.Draw()
```

Example plot: Number of leptons



A common objective is to take their job and make it available to others.

We have already prototypes of how they can look at, thanks to the similar program into CEVALE2VE :)

Table of contents

Instructor: Homero Martinez

Clase

GitLab repository

Setup

Samples

Analysis Code

Plotting

How to add a new variable and plot it

Módulo 1:

Instructor: Homero Martinez



License in Physics, Universidad de Los Andes, Merida-Venezuela (2008). High Energy Physics LatinAmerican-European Network (HELEN) fellow (2006-2007). Electric engineering degree, Universidad de Los Andes, Merida-Venezuela (2009). PhD in particle physics, University Paris Diderot (Paris 7), France (2013). Post-doc researcher at University of Pavia-INFN, Italy (2013-2016) for the ATLAS experiment. Software Engineer in Alstom, Paris, France (2017-present).

Clase

This is the C++ analysis code that may be used to analyse the data of the ATLAS published dataset.

Introduction to particle physics:
Lecture I: Historical introduction

Personally proud of the positive impact of the resources and the increase on the number of students and professionals that have been using our resources

artfisica / ICTP-2018 Template Unwatch 3 Star 3 Fork 56

Code Issues 0 Pull requests 0 Projects 0 Wiki Security Insights Settings

Repo for exercises and tests for workshops at ICTP + UIS + UCV - 2018 <http://opendata.atlas.cern> Edit

Manage topics

64 commits 1 branch 0 releases 1 contributor

Branch: master New pull request Create new file Upload files Find file Use this template Clone or download

Arturos Sanchez Pineda tmp movement of a file Latest commit f4832d1 on 20 Aug

- .ipynb_checkpoints adding new example notebook last year
- Cali notebook modificado en Cali 11 months ago
- class-material tmp movement of a file 2 months ago
- exercise_climate adding new example notebook last year

artfisica / notebooks forked from atlas-outreach-data-tools/notebooks Unwatch 1 Unstar 2 Fork 33

Code Pull requests 0 Projects 0 Wiki Security Insights Settings

This is the ATLAS outreach data and tools official repository for notebooks under ROOT Edit

Manage topics

49 commits 2 branches 1 release 2 contributors GPL-3.0

Branch: master New pull request Create new file Upload files Find file Clone or download

This branch is 1 commit ahead, 2 commits behind atlas-outreach-data-tools:master. Pull request Compare

artfisica Merge pull request #1 from atlas-outreach-data-tools/master Latest commit bc38626 on 9 Sep 2018

- images images for notebooks last year
- november_2017_y-1.0 updates 2 years ago

artfisica / ICTP-2019 generated from artfisica/ICTP-2018 Unwatch 2 Star 0 Fork 159

Code Issues 0 Pull requests 0 Wiki Security Insights Settings

Educational resources Edit

Manage topics

64 commits 1 branch 0 releases 1 contributor

Branch: master New pull request Upload files Find file Clone or download

artfisica adding details where to find MyBinder link Latest commit c51a800 22 hours ago

- class-material changes for the 2019 first City: Trieste 2 months ago
- notebooks adding a smaller input file 23 hours ago
- peru cleaning 29 days ago
- vm Update of the link for the latest VM last month
- .gitignore ignoring tmp files 2 months ago
- README.md adding details where to find MyBinder link 2 months ago

To April 2020, the forks add ~270

Fork 184

Fork 56

Fork 33

thanks