Optimization proposal to computational analysis of the Higgs boson in the decay channel H→ZZ*→4l at √s = 13 TeV using ATLAS Open Data

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Introduction

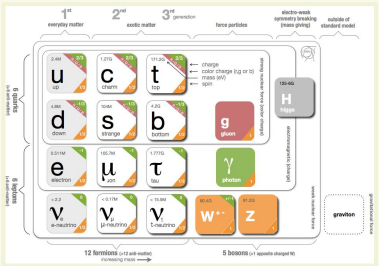
Since 2019, ATLAS Open Data has been releasing a new proton-proton collision dataset to the public to promote its use for educational purposes, which they call "13 TeV ATLAS Open Data", this is also accompanied by a set of educational tools associated with each other: Analysis framework where protocols for reading, analysis selection, histogram writing and plotting data results are implemented. ROOTBooks, which displays notebooks in Jupyter with decay analysis examples. Virtual machine, Ubuntu operating system where tools such as ROOT and Jupyter are provided to perform various data analyzes. The online documentation refers to introductory and divulgative information about the ATLAS experiment.
A set of samples from the Monte Carlo simulation is also added to model the expected distributions of different signals and background events.
For the purposes of this project, the following is proposed: an optimization to the computational analysis of the Higgs boson in the decay channel of two Z bosons to four leptons with center of mass energies of 13 TeV, using ATLAS Open Data in Jupyter Notebook with ROOT C ++ kernel.

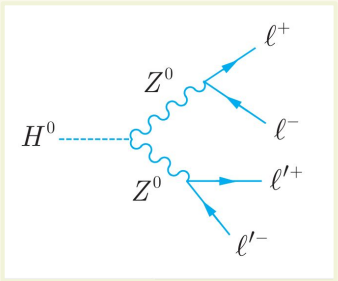
Material and methods

Theoretical framework

Summarize and characterize

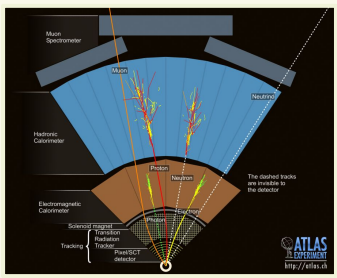
Standard model [1]. >



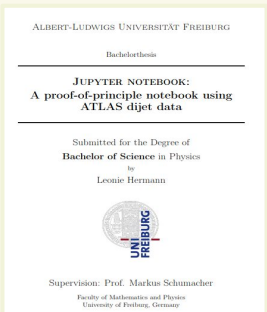


< Dominant mechanism for the decay H→l^+ l^- l'^+ l'^- (l= e,μ; l'=e,μ) [2].

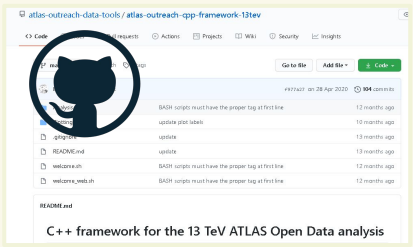
ATLAS experiment [3]. >



Previous investigations [4] and [5].



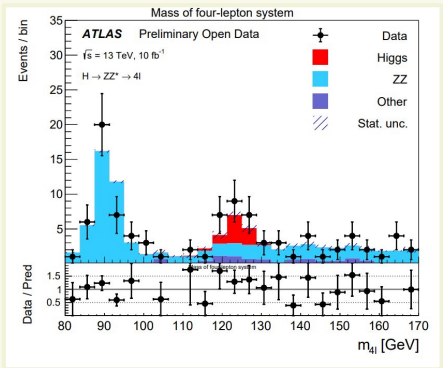
Methods



The reproduction adapts computational analysis in the ROOT C ++ kernel Jupyter Notebooks environment by modeling "TSelector" object functions from the 13 TeV ATLAS Open Data analysis framework.

Compare (Discuss)

Propose an optimization



Scope

In accordance with: ATLAS Open Data's overall goal for the published dataset and tools.

Via: The "Jupyter Notebooks" software tool.

With: "ROOT C++" analysis framework.

References

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[6] ATLAS Collaboration, "Review of the 13 TeV ATLAS Open Data release," CERN, January 2020. [Online]. Available: https://cds.cern.ch/record/2707171. [Accessed 13 October 2020].
[7] ATLAS Outreach data and tools, "C++ framework for the 13 TeV ATLAS Open Data analysis," atlas-outreach-data-tools, 28 April 2020. [Online]. Available: https://github.com/atlas-outreach-data-tools/atlas-outreach-cpp-framework-13tev. [Accessed 13 October 2020].

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