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CMS Made Simple: A ROOT-less workflow for educating undergraduates about CMS data analysis JESSICA MUENKEL, MATTHEW BELLIS, Siena College, CMS COLLABORATION — Involving students in research is an important part of the undergraduate experience. By working on a problem where the answer is unknown, students apply what they learn in the classroom to a real-world challenge, which reinforce the more theoretical aspects of their courses. Many undergraduates are drawn to the idea of working on big particle physics experiments like CMS (Compact Muon Solenoid) at the Large Hadron Collider (LHC), but the threshold is high for them to contribute to an analysis. Those of us who perform research spend much of our time debugging scripts and C++ code, usually specific to that one experiment. If an undergraduate is not going on to grad school in particle physics, much of that work can be wasted on them. However, there are many general skills that students can learn by working on parts of a particle physics analysis (relativistic kinematics, statistics, coding, etc.), and so it is worth trying to lower the threshold to engage students. In this poster, we present a suite of datasets and tools, built around the Python programming language that simplify the workflow and allow a student to interact with CMS data immediately. While it is a staple of the particle physics community, we avoid using the ROOT toolkit, so as to stick to more broadly used tools that the students can take with them. These tools are being used to supplement the educational examples for the CERN Open Data Portal, a project to make LHC datasets available to the general public. The successes and limitations of CMS Made Simple will be discussed and links are provided to these tools.

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