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First evidence for the production of four top quarks in events with zero to two leptons with the CMS Run 2 dataset

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The production of four top quarks ($t\bar{t}t\bar{t}$) is studied as a rare standard model process with sensitivity to new physics. The four top quark production cross section also allows investigations of virtual Higgs boson production and the top quark Yukawa coupling, EFT interpretations, and is an essential test of Quantum Chromodynamics. This presentation summarises the recent evidence for four top quark production with LHC Run 2 data samples collected by the CMS experiment at a center-of-mass energy of 13 TeV, corresponding to integrated luminosities of up to 138 fb^{-1} . The results will be presented for the final states with zero, one or two opposite-charged leptons, that all have substantial backgrounds from QCD and top quark pair production. This warrants the use of innovative machine learning techniques that have not yet been previously used in particle physics.

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