Positivity Bounds in Effective Field Theories

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Locality, unitarity and analyticity are some of the most fundamental properties of quantum field theory. I will show how requiring a local, analytic, unitary UV completion for a low energy effective theory (EFT) can impose positivity bounds on the Wilson coefficients in the EFT. These positivity bounds take the form of constraints on combinations of the pole subtracted scattering amplitude and its derivatives. I will first demonstrate the main idea with the simple case of a massive scalar field, and then discuss the technical subtleties that arise when generalising to cases with nonzero spins. These positivity pounds can be applied to any EFTs. As an illustration, I will apply these positivity bounds to a few well-konwn EFTs, including galileon, standard model effective field theory and massive gravity.