# A statistical overview of DES SN Ia light curves application to study the Hubble tension

With recent results coming from DES, pointing to a reduction in the significance of the Hubble tension, the focus is now shifting to study the shape of the dark energy (DE) equation of state (EOS). The Hubble tension is the discrepancy between the values of \(H_0\) determined from the magnitude-redshift relation and those derived from the Cosmic Microwave Background (CMB). In this work, we analyze Type Ia supernovae (SNe) data to constrain the dark energy EOS, given by \(w = P/\rho\). Previous studies on dynamic DE models (Torres et al., 2024) suggest that while DE alone cannot completely resolve the tension, it remains a viable candidate and may contribute to its alleviation. In addition to the role of DE dynamic models in helping solve the tension, these models can shade light on the processes causing the acceleration, specifically it is of interest to show whether the deviations of the EOS (from constant $w = -1$) are smooth, orif they exhibit a rapid change at a specific redshift (such as expected from a phase transition of an underlying scalar field). We propose a physics-agnostic approach to constrain DE using both supernovae and CMB data. Our approach involves fixing pre-recombination physics, firmly established based on CMB observations (where CMB results jointly constrain the six parameters defining the $\Lambda$CDM cosmology), and examination of SNe data for late-time effects that could alleviate the tension. In order to achieve this, we introduce a simple parametrization of the EOS, employing a sigmoid function that explicitly encodes a transition redshift where \(w\) transitions from -1 (consistent with CMB observations) to its present value, \(w_0\) (a model parameter). This parametrization enables DE to influence late-time expansion without disturbing early CMB physics. The primary dataset utilized in our analysis comprises Type Ia supernovae sourced from the Pantheon+ compilation, with a focus on selecting SNe within the Hubble flow sector (\(z > 0.15\)), where late-time physics effects would take place. Driven by the approach of fixing pre-recombination physics, we incorporate cosmological probes (CMB) not by merging the data, but rather as constraints. In this talk we are going to present the same analysis but now by using the data coming from the Dark Energy Survey (DES) last results. We present fits of cosmological parameters to the data, conduct analysis of parameter degeneracy, and incorporation of CMB constraints. The collective findings serve as a valuable resource for formulating theoretical models pertaining to the EOS.

## Nivel de formación

Maestría

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