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1. In this study, the authors analyzed a combined dataset of 1048 Type Ia supernovae to determine the matter density Ω_M and equation of state w of the universe. They fit a distance-modulus model of the universe to the dataset and obtained Ω_M and w from the model that fit the dataset most closely, i.e. minimized the χ^2 value.
2. The study sought to obtain a more precise measurement of the equation of state of the universe in order to resolve inconsistencies in the standard, or ΛCDM, model of cosmology. Currently, the nature of dark energy is ill-understood. With large systematic errors in calculated distance of supernovae with respect to their observed properties, it is uncertain whether ΛCDM is an accurate model for the universe. By reducing the systematic error in supernova measurements and hence distance calculations, this study hopes to more precisely constrain the parameters of the ΛCDM model and help cosmologists evaluate its accuracy.
3. cosmology, supernova, universe, model-fitting, data, calibration
4. This study demonstrates the importance of reducing systematic error in data collection. By combining Type Ia supernova observations from multiple datasets, including their own newly collected dataset PS1 sas well as older datasets from other researchers, the authors of this paper were able to implement a cross-calibration algorithm to reduce systematic error in the measured flux and hence distance moduli of supernovae. With less systematic error in the data points, the researchers were able to obtain a more accurate distance modulus model and could potentially help future researchers evaluate the accuracy of the standard model of cosmology. Indeed, precise data is crucial to testing hypotheses and evaluating the accuracy of models.