



Interdisciplinary Workshop for Undergraduate Students
May 14-19, 2017

Project: *Time Delay Estimation for Gravitationally Lensed Light Curves*
[Time Delay]

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Abstract:

The gravitational field of a galaxy can act as a lens and deflect the light emitted by a more distant object such as a quasar. Strong gravitational lensing causes multiple images of the same quasar to appear in the sky. Since the light in each gravitationally lensed image traverses a different path length from the quasar to the Earth, fluctuations in the source brightness are observed in the several images at different times. The time delay between these fluctuations can be used to constrain cosmological parameters, e.g., Hubble constant (the current expansion rate of the Universe), and can be inferred from the time series of brightness data or lightlight curves of each image. We will overview and discuss pros and cons of the existent time delay estimation methods and then each student (or team) is supposed to choose one of the methods or develop a new idea to estimate the blinded time delays and their estimation uncertainties from 50 simulated data sets. Support on coding and test data sets with known time delays (for calibration) will be given. We will discuss the performance of each method to understand why some methods work well and why others do not work well. This discussion will be summarized and reported on the final day.