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# Time Delay Estimation in Unresolved Lensed Quasars via Convolutional Neural Networks

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## Abstract

The analysis of the Cosmic Microwave Background anisotropies and the measurements obtained via cosmic distance ladder have resulted in a tension on the estimated value of the Hubble parameter  $H_0$ . This has triggered the need for new methods for its determination. To this extent, the gravitational lensing of quasars provides an alternative probe for  $H_0$  via the measurement of the time-delay between multiple images of the lensed quasar. Such a method requires a regular and long-term monitoring of the lensed source, of the order of years. This cannot be achieved with big telescopes, due to the huge amount of observational requests they have to fulfill. On the other hand, small/medium-sized telescopes are present in a much larger number and are often characterized by more versatile observational programs. However, the limited resolution capabilities of such instruments and their often not privileged geographical location prevent them from providing well-separated images of the same lensed source. In this work, we present a new method based on Convolutional Neural Networks to estimate the time-delay in non fully-resolved lensed images. Extensive experiments on realistic quasar mock curves demonstrate the effectiveness of the proposed approach.

Slides: in PDF

Video: <https://youtu.be/rx2kKyw9zzM>

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