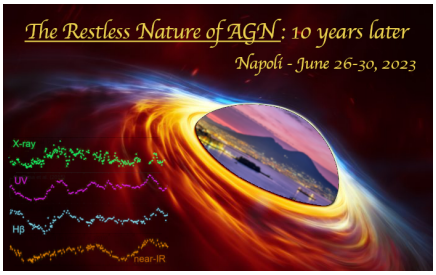

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Open-source X-ray reverberation modelling

X-ray reverberation models provide an unprecedented view of accretion processes in active galactic nuclei (AGN), allowing us to probe deep into the innermost regions close to the singularity. To date, spectral and variability models have been successful in studying certain coronal structures and disc geometries, mandating increasingly specialized codes to simulate complex reverberating systems. These codes are time consuming to develop, and often require compromising assumptions and approximations in order to be performant. We present Gradus.jl, a new extensible, reproducible and fast open-source Julia library for general relativistic ray-tracing and reverberation modelling. Our code expedites the process of studying new coronal models and disc geometries for X-ray reverberation. We overcome current modelling limitations through automatic differentiation and state-of-the-art optimizers, with little impact on performance. We invite anyone to use our code to accelerate developing novel reverberation models for AGN and beyond.

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