

# Articles for Review

## Lensing Software:

*A SYSTEMATIC REVIEW OF STRONG GRAVITATIONAL LENS MODELING SOFTWARE,*  
<https://arxiv.org/abs/1206.4382>

*lenstronomy: multi-purpose gravitational lens modelling software package,*  
<https://arxiv.org/abs/1803.09746>

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## Time Delay & $H_0$ :

*COSMOGRAIL:* <https://cosmograil.epfl.ch/page-95701-en.html>

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## Substructure:

*Gravitational Lensing and the Power Spectrum of Dark Matter Substructure: Insights from the ETHOS N-body Simulations,* <https://arxiv.org/abs/1809.00004>

*Strong lensing signatures of luminous structure and substructure in early-type galaxies,* <https://arxiv.org/abs/1610.08525>

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## Image Reconstruction:

*An unbiased estimator for the ellipticity from image moments,*  
<https://arxiv.org/abs/1705.01109v1>

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## Cosmological Voids:

*Measuring the mass distribution of voids with stacked weak lensing,*  
<https://arxiv.org/abs/1211.5966v2>

*...or whatever you find interesting!*

## Hands-On Lensing

Write your own (ray-tracing) code that lenses a background source via a point mass, i.e. use

$$\begin{pmatrix} \theta_{1,\pm} \\ \theta_{2,\pm} \end{pmatrix} = \frac{1}{2} \left( \beta \pm \sqrt{\beta^2 + 4\theta_E^2} \right) \begin{pmatrix} \frac{\beta_1}{\beta} \\ \dots \\ \frac{\beta_2}{\beta} \\ \beta \end{pmatrix}$$

$$\theta_E = \sqrt{\frac{D_{LS}}{D_S D_L} \frac{4GM}{c^2}} \quad \theta_E: \text{Einstein radius}$$

$$\beta = \sqrt{\beta_1^2 + \beta_2^2}$$

to map  $(\beta_1, \beta_2)$  onto  $(\theta_1, \theta_2)$ .

# Presentation

Your end-of-course presentation should be 10 to max. 15 minutes long and cover the following aspects

- general introduction into the field
- objectives of the actual work: what are the aims?
- description of the methodology used to reach those objectives
- results
- discussion of results: why is this interesting?
- possible future follow-up investigations

As a general remark: prepare your presentation in such a way that your fellow students are able to understand it. That means, someone who is not an expert should clearly apprehend the relevance of the results. Therefore, you should give a clear (yet brief) introduction into the field and motivate the results well.

In case you have chosen a literature research project, please note that it is not always important to present and discuss every single plot of the paper. You should focus on the most relevant result(s) and explain those well.