MulensModel

https://github.com/rpoleski/MulensModel

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Past

- μSIT recognized that the lack of public and easy-to-use code makes it hard for newcomers to join the microlensing research,
- Aug 2016 – MulensModel is started,
- Mar 2018 – release of v1.0 – first functional and stable version,
- Oct 2018 – code was is used in a data challenge (i.e., is able to fit simulated Roman data) and the team that used it didn't contact the authors,
- Jan 2019 – paper presenting the code in *Astronomy & Computing*, 19 citations currently, e.g.,
  - *Real-time Likelihood-free Inference of Roman Binary Microlensing Events with Amortized Neural Posterior Estimation*, K. Zhang et al. 2021, AJ 161, 262,
  - *Detecting isolated stellar-mass black holes in the absence of microlensing parallax effect*, N. Karolinski and W. Zhu 2020, MNRAS 498L, 25.
- Sep 2021 – release of v2.0.

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Approach

- user perspective: use cases define the code structure and are written before the actual code,
- no build-in fitting routines, but examples provided,
- fully public – developed on github,
- fully documented – every function has a description; there are examples,
- scientific and coding conventions stated and followed,
- different parameterizations of the models possible,
- automated testing,
- object-oriented python3,
- continuously developed.

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Current capabilities

- point-lens finite-source events (including free-floating planets),
- annual and satellite parallax,
- binary-lens events including finite source with limb-darkening and lens orbital motion,
- binary-source events,
- binary-lens binary-source events.

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On-going and future development

On-going efforts:

- xallarap, i.e., orbital motion of the source, which is in a binary system,
- improved example χ^2 gradient based fitting method,
- binary-lens with shear and convergence – by independent contributor Lawrence Peirson.

Most important future development:

- triple lens models,
- astrometric microlensing.

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