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| **Student project at European Spallation Source Data Management and Software Centre** |  |

**Including Nested Mirror Optics (NMO) in the guide optimizer guide\_bot**

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| Supervisor | ? | Code difficulty | | ★★★☆☆ |
| Co supervisor | Mads Bertelsen | Physics difficulty | | ★★★★☆ |

DESCRIPTION

Neutron scattering is an investigative technique that examines matter at the atomic scale, particularly the distances between atoms in crystals. This process involves placing a sample in a neutron beam. By analysing the scattering patterns of these neutrons, researchers can infer the sample's properties. Instruments used in these experiments are highly specialized for various types of samples and scattering methods. The European Spallation Source, nearing completion in Lund, Sweden, houses 15 such instruments. Each of these instruments have a separate guide that transport neutrons from the source to the sample using neutron mirrors. The Python package guide\_bot is available for optimization of guides, and is able to compare alternative guide solutions each optimized for the same instrument. The field of neutron optics is however always advancing, and new ideas for guide elements are suggested, such as the nested mirror optics (NMO) that can focus the beam in one direction.

In this project a NMO element would be added to guide\_bot, as this shows promising focusing abilities and could be combined with other guide elements in interesting ways. The project would also include optimizing guides with and without this element for different instruments which would highlight in what situations this element is useful.

REQUIREMENTS

Experience with the programming language Python (C is a benefit as well)

Some experience with condensed matter physics