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Deep learning for small angle scattering under grazing incidence

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Grazing-incidence small-angle scattering (GISAS) is a well established technique to analyze thin multilayered films containing nano-sized objects. It offers a lot of benefits, however the data analysis is challenging and time-consuming.

Nowadays deep learning is widely applied in various areas of our all-day life. In many image analysis applications it achieves already a human-level performance.

We investigate an opportunity to apply deep learning for GISAS data analysis. The aim is to provide users with a fast and accurate feedback on the sample parameters. Trained deep neural network delivers result in about 200 ms, while manual fitting of a single GISAS pattern takes at least hours.

The focus of the present contribution is an overview of our activities in the field of deep learning for GISAS data analysis: the challenges we meet and the results we have achieved. The following topics will be highlighted as well:

could we benefit from the transfer learning?

which features of the GISAS pattern contribute to the output result?

how do we evaluate the result delivered by the deep neural network?

The achieved results include successful prediction of the rotational distributions of hexagonally arranged nanoparticles from the GISAS pattern.

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