Implementation of a genetic algorithm concept in an open source software for the ellipsometric data evaluation

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Ellipsometry has traditionally relied on a limited range of applications developed by a select few companies. However, during work at the university the necessity of a more inclusive approach crystallized. The tool would assist researchers in expanding the capabilities of their ellipsometry studies without additional cash contribution. In this regard, we present open-source software written in Python, a programming language well-known among scientists.

Our software offers the capability to simulate data such as psi, delta on thickness/wavelength spectra, reflectance plots, determination of Brewster's angle and more. Additionally, it provides the means to analyze experimental data, whether or not prior knowledge of sample properties is available.

One of the major benefits of our solution is an easy-to-use graphical interface, designed to streamline the user experience and facilitate intuitive navigation. The interface allows researchers to interact with the software seamlessly, providing a visual representation of the simulated or analyzed data. Through this graphical interface, users can easily manipulate input parameters, visualize results, and explore various analysis options.

A notable feature of our software is its reliance on Dr Eng Krzysztof Dorywalski's concept of utilizing a genetic algorithm (GA) to identify an optimal starting point for the gradient-based Levenberg-Marquardt algorithm (LMA). This concept has been further developed into a multilayer GA, where each iteration progressively narrows down the search range, resulting in accurate and rapid determination of essential parameters such as thickness, refractive index (plot), extinction coefficient (plot), or layer roughness.

By offering an open-source solution with an intuitive graphical interface, our software aims to empower researchers and practitioners in the field of ellipsometry. It ensures a user-friendly experience, making the software accessible to a broader community which provides possibility of rapid development.

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