Internship / Master Thesis Project:

Machine Learning Approaches for Semiconductor Metrology

ASML

Background information

ASML's metrology solutions aim at inspecting the quality of the semiconductor devices such as memory or logic chips. This is done by measuring certain physical parameters, for example the misalignment between different layers in the semiconductor stack or feature sizes. The measurements are obtained by inferring the parameters from optical signals acquired with the YieldStar system. Inference is done using data-driven mathematical models that relate the physical parameter to the optical signals. The quality of such models is critical to ensure accuracy of the measured parameters.

Your assignment

This project aims at exploring new machine learning techniques which can improve accuracy of the measured parameters. A key to achieve such goal is to enhance the models' capability of using the signal and their robustness against variations in the manufacturing process window.

Topics related to the project include (but are not limited to):

- Developing a general approach to determining optimal sensor placements. Concrete examples include image reconstruction from coarse-grained images or using an optimal subset of all available measurements while retaining accuracy.
- Combining generative machine learning approaches with physical and mathematical modelling. A concrete example would be to utilize relevant mathematical and physical constraints during the model training phase.
- Identifying suitable models by discovering subsets of relevant parameters and identifying error bounds on parameters. As an example, consider identifying missing parameters in the description of semiconductor chips produced by ASML's customers.

Educational level:

- Close to graduation of a MSc program

Required skills:

- Solid understanding in linear algebra, calculus and statistics
- Good understanding in machine learning and mathematical modeling
- Good working knowledge of Python or Matlab

Change the world – one nanometer at a time

This assignment will be carried out in the Modeling & Inference Group at ASML in Eindhoven. This is a graduation internship for 5 days a week with a duration of 6-12 months.

In addition to a monthly internship allowance of maximum €600 (plus a possible housing or travel allowance), you'll get practical guidance from experts at ASML D&E and experience the difference between industry D&E and academia research. Working in a stimulating team environment at the cutting edge of technology, you'll gain valuable experience in a highly innovative environment – one that sparks your imagination and creativity

In addition, you will have the chance to enhance your skills in:

- Collaborative code development with Python
- Cutting-edge classical and modern (generative) AI based approaches
- Development of mathematical concepts/bounds with concrete applications for cutting-edge products
- Solving PDEs using state-of-the-art numerical approaches

ASML: be part of progress

Headquartered in the Netherland, we manufacture the complex lithography machines that chipmakers use to produce integrated circuits, or computer chips. What we do is at the heart of all the electronic devices that keep us informed, entertained and connected. Every day, you use electronics that simply wouldn't exist without our machines.

Behind ASML's innovations are engineers who think ahead. The people who work at our company include some of the most creative minds in physics, electrical engineering, mathematics, chemistry, mechatronics, optics, mechanical engineering, and computer science and software engineering.

We believe we can always do better. We believe the winning idea can come from anyone. We love what we do – not because it's easy, but because it's hard.

How will you be part of progress?

Contacts

ASML

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