INTERNSHIP / M.SC. PROJECT, WITHIN TUE SPS - ASML COLLABORATION

ASML D&E YieldStar Algorithms and Physical Modeling group

ASML is the world-leading provider of lithography systems for the semiconductor industry, which are critical for the production of integrated circuits (ICs). In this, Moore's law dictates a biannual doubling in the number of transistors per unit area. The current state-of-the-art microprocessors utilize billions of transistors that are densely packed within a couple of square centimeters, and that extend over hundreds of layers in terms of height. To achieve this integration density and geometrical detailing, device features need to be printed extremely accurately in terms of height and width, as well as with minimum alignment errors for devices extending across multiple layers. As a result, feature error monitoring and correction is essential for high-volume manufacturing (HVM) in the semiconductor industry, enabled by high-speed and high-accuracy metrology tools.

ASML's YieldStar is a state-of-the-art optical metrology tool that enables real-time HVM measurement of stack geometry features, like line-width and line-height as well as alignment errors. Using angle-resolved scatterometric metrology, such parameters are estimated, e.g., with an iterative reconstruction process as shown in the figure.

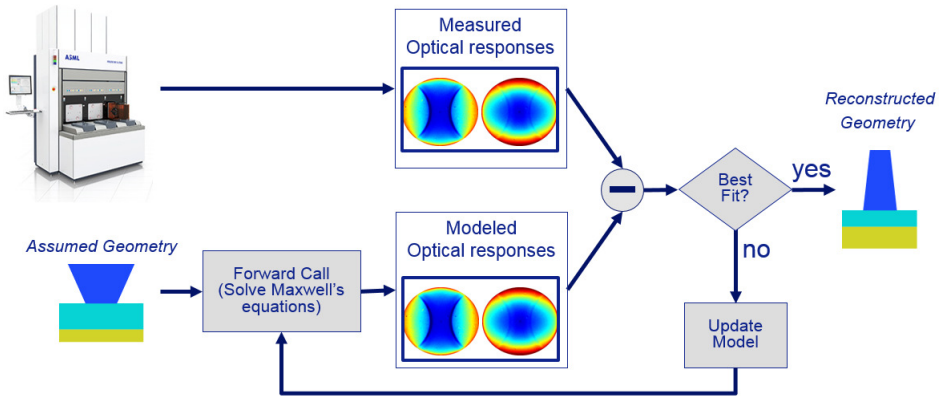

FIG. Example optical metrology, here using an iterative geometry reconstruction method.

In the context of optical metrology, the YieldStar Algorithms and Physical Modeling group is looking for candidates with excellent mathematics, machine learning or algorithms background, and understanding of physical processes governing a system's response. Additionally, good coding ability is a pré. Topics of interest are in the area of signal processing, information theory and machine learning:

- Fundamental performance limits in parameter estimation using scatterometric techniques
- Statistical and physical model selection
- Multi-level feature extraction (e.g. pixel, image, sequence of images) algorithm architectures
- Interpolation techniques
- Probabilistic inference methods
- Learning methods for "small"-data, and incomplete dataset applications
- Combining information from different sensors and metrology sources
- Optimal-Design-of-Experiments: maximal information extraction from limited measurements

Preference goes out to ≥ 7-months internships. The ASML algo-group consists of 25 talented employees - mostly Ph.D.'s- with backgrounds in electrical engineering, computer science, mathematics and physics.

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