

# Internship: Pattern discovery to improve overlay control loop by using Bayesian inference tooling



## Background information

Dept.: BL-Apps MPC D&E PWC Overlay  
Group: Overlay Integration.

Before delivering our machines to customers, ASML conducts a thorough system setup. This is crucial to ensure that the machine can meet certain Key Performance Indicators (KPI). Overlay is one of the KPIs in ASML's system setup. Overlay is layer-to-layer mis-alignment on a multi-layer device structure. Once a customer begins using an ASML lithography machine in their production line, the machine may drift from its calibrated state, leading to overlay errors.

BaseLiner Overlay is a product to monitor and maintain overlay performance of ASML machines over time. It uses mathematical models to describe machine drift and to correct the drift in order to improve overlay.

## Your assignment

This internship assignment aims to detect and quantify persistent overlay improvements by investigating a larger data set systematically.

This internship will provide you with insights into the overlay performance of ASML lithography machines. You will also learn how ASML maintains machine performance via drift control strategy. As for hands-on experience, you will deploy your MATLAB skills to analyze mathematical models and statistical toolbox, to interpret real machine population data and to link them to a physical mechanism by talking to experts.

Your tasks will include writing a test plan, collecting and preprocessing appropriate data sets, applying advanced machine learning and statistical tools to the processed data sets with various model settings, performing proof book analysis, and presenting and writing reports.

The goal is to help the overlay integration group in choosing the path to follow with respect to potential future overlay control product improvements: do we expect benefit in changing the current overlay control model; if so, which part of the current model can be improved, and what will the impact be?

- **Your profile**  
Physics/mathematics background with Machine Learning and Data Science skills
- Affinity with all or some of the following: statistical analysis, Bayesian inference, Gaussian Processes, machine learning, data science
- Programming in MATLAB, GIT

This is an graduation internship for 5 days a week with duration of a minimum 6 months.

*Please keep in mind that we can only consider students*

## Diversity and inclusion

ASML is an Equal Opportunity Employer that values and respects the importance of a diverse and inclusive workforce. It is the policy of the company to recruit, hire, train and promote persons in all job titles without regard to race, color, religion, sex, age, national origin, veteran status, disability, sexual orientation, or gender identity. We recognize that diversity and inclusion is a driving force in the success of our company.

## Other information

### Change the world – one nanometer at a time

Become an intern at a Dutch company that's a global industry leader. You'll gain valuable experience in a highly innovative environment – one that sparks your imagination and creativity. In addition to a monthly internship allowance of maximum €600 (plus a possible housing allowance and free public transport), you'll get practical guidance from experts in the field and the chance to work in and experience a dynamic team environment.

### ASML: Be part of progress

ASML is a high-tech company headquartered in the Netherlands. 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.

### Students: Getting ready for real-world R&D

We're a global team of about 28,000 people of 120 different nationalities and counting. Headquartered in Europe's top tech hub, the Brainport Eindhoven region in the Netherlands, our operations are spread across Europe, Asia and the US.

In such an environment, your colleagues may be sitting next door, or they could be thousands of kilometers away in a different country – or even working for a different company.

An internship at ASML is the opportunity to get to know not only the world of industrial-strength R&D, but yourself – you'll discover just what excites you most. Will you design a part of the machine, or make sure it gets built to the tightest possible specifications? Will you write software that drives the system to its best performance, or work side-by-side with the engineers of our customers in a fab, optimizing a system to the requirements of the customer?

### *How will you be part of progress?*

**Field: Data Science**

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