SEMICON® EUROPA

NOV 14–17, 2023 | MUNICH, GERMANY

semi

SMART Manufacturing

Data Driven Optimization in Semiconductor Fabrication: How Business Efficiency Helps Environment as Well

T. Heller
Director for Yield Engineering Responsible for Development & Production
GLOBALFOUNDRIES, Yield Engineering, Dresden, Germany

Abstract

The complexity of modern Semiconductor Fabrication requires a combination of the real- and the digital world.

Data driven optimization and digital manufacturing enable a new area to harvest savings related to energy consumption, material spending and efficiency regarding human capital.

These points equally improve cost efficiency of the supply and production chain, which also helps to spare the environment.

One example is an application that helps to detect consumption differences between semiconductor fabrication tools, another solution monitors the transport system.

A very different approach are our Physics-informed Digital Twins of semiconductor devices, which reduce computation times from hours per simulation to seconds for thousands samples.

The presented examples will show that there are opportunities in every area within semiconductor fabrication in which digital manufacturing can be used to harvest/enable savings that also protect our environment.

Biography

Dr. Thomas Heller started his professional career as a technician in a brown coal power plant, pretty much the opposite of a semiconductor clean room. After studying physics at BTU Cottbus, he earned his doctorate in Cottbus (Germany) and St. Andrews (Scotland).

Thomas joined AMD's Fab30/GF Fab1 Yield Engineering department in 2000. After bringing seven key technology nodes and several differentiated offerings to best-in-class yield levels, he has been responsible for all technologies in development and production since 2017. In 2020, Thomas also took over responsibility for Advanced Analytics & Machine Learning at GF Fab1 Dresden.

Thomas believes that yield engineering is one of the most interesting areas in the semiconductor industry because it provides comprehensive insight into customer, manufacturing and technology issues. By using advanced data analytics techniques, one can reach the next level of improving yield, quality and production efficiency.

AI Engineering (B. Sc.) - Rethinking Applied AI Education

B. Rolf
Researcher
Otto-von-Guericke-Universität Magdeburg,
Institute of Logistics and Material Handling
Systems, Magdeburg, Germany

Abstract

In the era of Industry 4.0, where advanced manufacturing processes are shaping industries like never before, the potential of AI cannot be ignored. To address this paradigm shift, the "AI Engineering" project, run at Institute of Logistics and Material Handling Systems at Otto-von-Guericke-University in Magdeburg, Germany, is a new way of teaching engineering. This fresh Bachelor's degree program, started in October 2023, mixes the study of Artificial Intelligence and engineering sciences together. The main goal is to teach students how to create advanced AI solutions that can be used in many different kinds of industries.

Thie AI Engineering program, which is supported by the German Federal Ministry of Education and Research, is part of a collaboration between Otto-von-Guericke-University Magdeburg and Anhalt, Harz, Magdeburg-Stendal, and Merseburg universities of applied sciences. Each university adds its own special knowledge to one of five important areas: Manufacturing, Production and Logistics; Green Engineering; Biomechanics and Smart Health Technologies; Mobile Systems and Telematics; and Agricultural Economy and Technology. By offering in-depth training in these domains, we ensure our graduates possess a deep understanding of both AI principles and domain-specific expertise.

At the core of AI Engineering is a hands-on, project-based learning approach that commences from the very first semester. We firmly believe that the best way to comprehend theory is by applying it to real-world challenges. Through close collaboration with regional and international companies, our students gain invaluable experience working on real use cases, utilizing actual datasets, and benefitting from industry mentorship.

Biography

Benjamin Rolf is a researcher specializing in supply chain management and logistics. He is currently pursuing a Ph.D. in Mechanical Engineering at Otto-von-Guericke-University Magdeburg, focusing on inventory management and reconfiguration in large-scale supply networks. He holds a Master's degree in Industrial Engineering Logistics and gained practical experiences when working for different manufacturing companies. His research interests lie at the intersection of supply chain management, simulation, network science, and machine learning. His contributions have been published in reputable journals and presented at international conferences. In 2024, he will continue his research as an expatriate at the RIKEN Center for Computational Science in Kobe, Japan.

Education
- 10/2019-06/2021 M. Sc. Industrial Engineering Logistics (with distinction) at Otto-von-Guericke-University Magdeburg, Germany
- 10/2020-06/2021 Special auditing student at Niigata University, Japan

Professional Experience
- 07/2021-Now: Researcher at Institute of Logistics and Material Handling Systems, Otto-von-Guericke-University Magdeburg
- 01/2024-06/2024: Expatriate at RIKEN Center for Computational Science, Kobe, Japan
- Internships/projects at BMW AG, LivingSolids GmbH, 4Flow AG, ...

Academic Publications
- International Journal of Production Research, Procedia Manufacturing, Hawaii International Conference on System Sciences, ...

Easy Integration of Machine Interface

F. Wagner
Consultant and Developer
ZEISS Digital Innovation, Dresden, Germany

Abstract

The OPC-UA standard is ideally suited for establishing machine-oriented communication with a software system. By using node-set files, it is possible to define the static structure of the OPC-UA interface to all communication partners in a uniform way. However, the standard does not allow the definition of the behavior; a separate documentation must be created for this. The interpretation of the documentation can lead to different interpretations, which results in a high risk of integration problems, especially if client and server are developed independently.

In our project, we minimize this risk by providing a generic configurable simulation of the interfaces for client and server. This enables us to provide communication partners with different behaviors with minimal effort, which are used as counterparts before a real implementation.

The configuration of a simulator essentially consists of a collection of states of certain tokens. This allows us to derive and generate all possible combinations of the configurations of the tokens, which allows us to define a test oracle for the behavior of the simulator.

By integrating the simulator into our QA processes, we have the chance to test all possible failure cases without the need of having a real machine available. This way, many errors are caught before the actual integration in the development process.

This procedure has proven itself in our project and makes the integration with the real machine easier and more efficient for us and creates fewer errors on both sides.

Biography

Frank Wagner is a consultant and developer at ZEISS Digital Innovation. He is particularly involved in production technology and automation with a focus on the integration of machines based on Microsoft technologies in the semiconductor industry. Clean code, clean architecture and test automation characterize his area of expertise.