

Master's Thesis: Dynamic Cycle Time Prediction for Semiconductor Manufacturing



Are you passionate about AI, manufacturing and optimization? In this master's thesis, you'll delve into the dynamic prediction of product cycle times for manufacturing process steps within a semiconductor manufacturing facility. This involves aggregating data of key input features and developing sophisticated prediction models using classical statistical methods and cutting-edge machine learning approaches. Leveraging both theoretical knowledge and practical skills, you'll evaluate these models and assess their integration with innovative reinforcement learning and classical optimization approaches for the dynamic job shop scheduling task. You'll collaborate closely with experts in the field, gain valuable hands-on experience in data analysis and model development, and contribute to innovative solutions in the semiconductor industry. The thesis will be conducted in collaboration with Infineon Technologies AG.

Job Description

- **Aggregate Data:** Identify key input features for the prediction task and collect required data from both a real manufacturing line and its digital twin.
- **Explore and Visualize Data:** Use data visualization and statistical techniques to identify patterns, relationships, and anomalies within the datasets, providing insights that inform model development.
- **Develop Prediction Models:** Develop and implement classical statistical and/or machine learning models to accurately predict cycle times under various conditions.
- **Evaluate and Optimize Models:** Validate model performance in different testing scenarios and system conditions in simulation and for real data.
- **Integrate with Scheduling Models:** Integrate the prediction model with innovative reinforcement learning and classical optimization methods for dynamic complex job shop scheduling.

Your Profile

- **Study Field:** You are currently enrolled in a master's program at TUM School of Management.
- **Experience:** You have strong programming skills in Python and experience with data analysis libraries like Pandas and NumPy. Ideally, you have first experience with production science or scheduling problems.
- **Focus:** You possess a solid understanding of classical statistical methods and machine learning concepts, with practical experience using libraries such as Scikit-learn and Pytorch.
- **Personality:** You exhibit strong problem-solving abilities, attention to detail, and the capacity for innovative thinking.
- **Way of Work:** You have the ability to work independently and as part of a larger project team. You can dive into complex problems while still maintaining a holistic overview of the problem scope.
- **Language Skills:** You are fluent in English; proficiency in German is a plus.

Begin: As soon as possible

Advisor: Niels Hayen