[ITI41120 Applied Computer Science Project](https://www.hiof.no/english/studies/courses/iio/itk/2022/spring/iti41120.html" \t "_blank)

Spring 2023

**Topic**: Smart Instruments and Smart Monitoring of Chemical Production at Unger Fabrikker

**Research areas involved:** Cyber-Physical systems and Machine Learning

**Skills needed:** Investigation curiosity, interest in production, basic machine learning, basic cyber-physical competence

**Number of students needed:** 2

**Contact:** Øystein Haugen ( oystein.haugen@hiof.no )

Unger contact will be Per Olav Hansen [per.olav.hansen@unger.no](mailto:per.olav.hansen@unger.no)

**Content:** This project will work with Unger Fabrikker in Fredrikstad. The task is related to monitoring and tuning chemical processes. The task will focus on the “Neutralization Loop” and see whether smart use of new instruments may help monitor the loop to make the production more predictable and productive.

The task will consist of 3 subtasks. First, there is a need for a literature search to establish corresponding experiments. Secondly, the most promising instruments must be purchased. We have already thought that vibration sensor and natural light sensor would be candidates. Thirdly, an evaluation must be performed where machine-learning is applied to estimate critical parameters of the neutralization loop. If promising, you should investigate the potential of other improvements to the production based on the instrumentation.

Some references:

1. Garcia Ceja, Enrique Alejandro; Hugo, Åsmund Pedersen; Morin, Brice; Hansen, Per Olav; Martinsen, Espen; Lam, An Ngoc & Haugen, Øystein (2020). A Feature Importance Analysis for Soft-Sensing-Based Predictions in a Chemical Sulphonation Process, Proceedings of 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS). IEEE (Institute of Electrical and Electronics Engineers). ISSN 978-1-7281-6389-5. s. 62–66. doi: 10.1109/ICPS48405.2020.9274769.
2. <https://ercim-news.ercim.eu/en122/special/optimization-of-a-chemical-process-with-soft-sensing-technologies>
3. Productive4.0 where HIOF and Unger worked together towards production improvements <https://productive40.eu>