MACHINE LEARNING FOR X-RAY DETECTORS

Malvern Panalytical technologies are used by scientists and engineers in a wide range of industries and organizations to measure, among other things, particle size, shape and concentration of materials. One of the measurement devices Malvern Panalytical produce is an X-ray diffractometer, in which so-called PIXcel X-ray detectors are applied. In the production process of the X-ray diffractometer, tests are taken to evaluate its quality during the successive process phases. An open challenge is to predict in early test stages whether the tests at later stages might fail.

To attain this goal, Malvern Panalytical and the 'lectoraat' Ambient Intelligence have joined forces. Ambient Intelligence is a research group at Saxion which focuses on making environments smart, especially in the domains of safety, sport and smart industry.

Test data is available from the four stages of production (a-d) of the *Digital-to-Analog Convertors* (DACs). The blue lines in within the green bar are measurements of working DACs, but some blue lines still lead to failures. Manual inspection is performed to detect these outliers. The student assignment focuses on optimizing the optical, manual inspection by automating this using a predictive (machine learned) model.

Wafer: W1060, DAC: V_Gnd

(a) Chips in wafer

(b) Chip on sensor module

(c) Sensor module in Detector
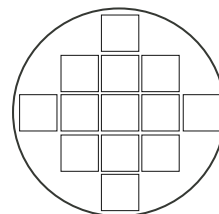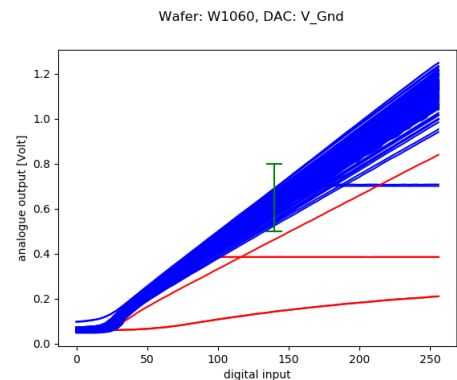

(d) Detector in Empyrean diffractometer

TASK DESCRIPTION

A group of Saxion students has worked on making the data available in a data warehouse, carrying out preliminary analysis. Your role will be inspecting (more) data in detail, to assist Malvern Panalytical in working towards recognition and prediction of failures. The task is to:
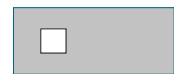
- Analyze the 200,000 available DAC curves to find correlations in the 3-step manufacturing process;
- Apply machine learning on the data to train a model which can classify the DAC curves;
- Create a software pipeline which retrieves data and classifies it using the model;
- Develop a way to automate labelling of data for inspectors;
- Visualize the results to communicate the gathered information, for example, by generating a report or providing a dashboard.

PRACTICAL INFORMATION

- **Student profile:** HBO-ICT SE, intern or graduate student; knowledge of Python is a plus.
- **Duration:** February 2020 – July 2020.
- **Compensation:** 230 euro per month (before taxes) when carrying out this assignment at Ambient Intelligence.
- **Contact person:** for more information, contact Jeroen Linssen (**j.m.linssen@saxion.nl**).
- **More information: saxion.nl/ami**