Sekisui-SPI
Defect Detection Using a Convolutional Neural Network

Overview
Sekisui-SPI is a manufacturer that produces uniform thermoplastic sheets. As a way to find defects and their root cause, the team was tasked with creating a convolutional neural network or CNN. Using machine learning, the team developed an image recognition system to detect and classify defects in the product.

Objectives
The team sought to create a system that detected at least 90% of all defects over 0.5mm in diameter and classify them with at least 70% accuracy. This would be done to spot check at a rate of at least one image per minute.

Approach
- Research machine learning frameworks like Tensorflow, Caffe, Torch, and Keras
- Assess frameworks based on application, CUDA implementation, and documentation quality
- Research different ways of implementing CNN, such as R-CNN
- Find existing models with editable parameters and good documentation
- Develop annotation tool to create training data from provided image set
- Train R-CNN using annotation data
- Perform validation testing on unused images
- Retrain defect groups with poor detection and classification
- Perform final testing on reserved testing images
- Create database logging system to output results to the user
- Diagnose problem areas and provide sponsor with recommendations

Outcomes
- Detected and classified over 90% of defects in four different categories
- Reduced troubleshooting time by providing defect log with defects automatically classified
- Provided additional application for quality control by speeding up defect detection and classification to a rate of 10 frames per second
- Provided annotation tool, R-CNN backbone, and documentation for future image recognition systems