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# Active learning for quality inspecting with synthetic hot-start approach

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In the pharmaceutical industry, there are strict requirements on the presence of contaminants inside single-use syringes (so-called unijects). Quality management systems include various methods such as measuring weight, manual inspection or vision techniques. Automated and accurate techniques for quality inspection are preferred, reducing the costs and increasing the speed of production.

In this paper we analyze defects on unijects. During inspection, the product is spun around to force contaminants to the outside of the bulb and photos are taken. These photos can be manually inspected, however using computer vision techniques this process can be automated.

As such inclusions are exceedingly rare to occur in practice, it is very difficult to collect a first dataset to train a deep-learning network on, which contains actual defects. The approach we will demonstrate in our contribution introduces synthetic defects on top of regular images for kickstarting the defect detection network. Using this initial defect segmentation network, we can then introduce classic uncertainty and diversity sampling algorithms to select relevant images for annotation. Normally, in these 'active learning' strategies the initial dataset is taken at random. However, because of the low probability of selecting each type of defect at random, the model has a very cold start. We will demonstrate how our hot-start approach using synthetic defects solves this initialization problem.

## Type of presentation

Talk

## Classification

Both methodology and application

## Keywords

Active learning, Synthetic data, Quality inspection

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