## Defect Pattern Clustering and New Pattern Classification of Wafer Bin Maps by Subset Learning with Convolutional

## **Neural Networks**

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## Abstract

A wafer bin map (WBM) is the result of a circuit probe test (CP test) on a wafer after the completion of the manufacturing process in semiconductor industry. The specific defect patterns on WBMs provide crucial information for engineers to trace the failure causes in the complicated manufacturing process. Many research for WBM image recognition were done using statistical and deep learning methods. The statistical methods are often followed by additional image transformation processes. As for the deep learning method, they often focus on dealing the classification task with many labelled data. Their approach is difficult to apply for the real applications because usually only few labeled data are available.

In this study, a small subset of data with labels is used to train convolutional neural networks (CNN) models and extract features from the models without additional transformations on WBMs. We then take the features to cluster the WBMs. We also use the CNN models to separate the new pattern from the typical defect patterns by utilizing the help of untypical defect patterns from other WBM products. The evaluation of our procedure is conducted with simulation data.

Keyword: Wafer Bin Map, Clustering, Classification, Image Recognition, Convolution Neural Network