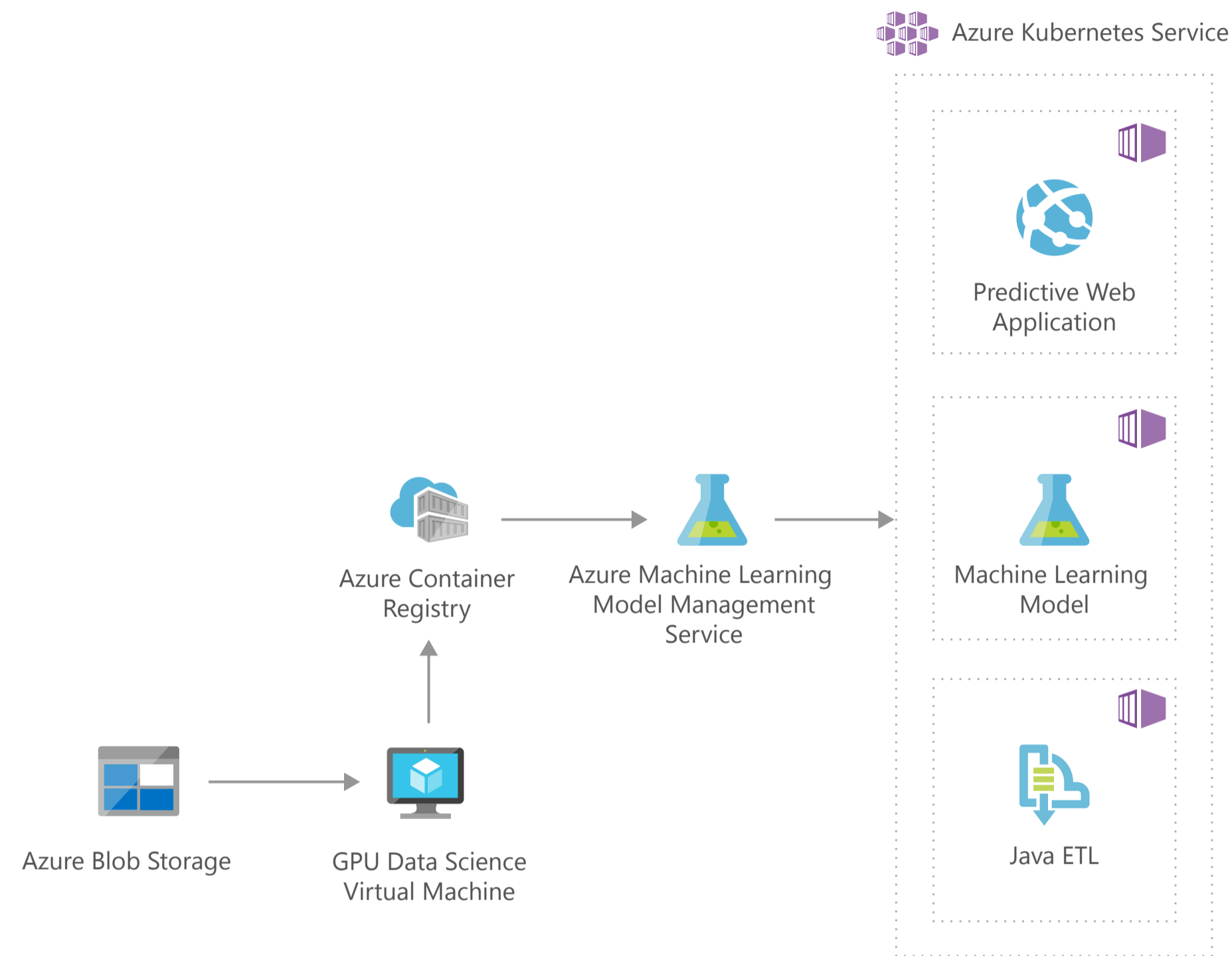


Image classification with convolutional neural networks










Architecture overview

Lean manufacturing, cost control, and waste reduction are imperative for manufacturing to remain competitive. In circuit-board manufacturing, faulty boards can cost manufacturers money and productivity. Assembly lines rely on human operators to quickly review and validate boards flagged as potentially faulty by assembly-line test machines.

This solution analyzes electronic component images generated by assembly-line cameras in a circuit-board manufacturing plant and detects their error status. The goal is to minimize or remove the need for human intervention. The solution builds an image classification system using a convolutional neural network with 50 hidden layers, pretrained on 350,000 images in an ImageNet dataset to generate visual features of the images by removing the last network layer. These features are then used to train a boosted decision tree to classify the image as "pass" or "fail" and final scoring conducted on edge machines at the plant. The classification performance results are good (time-based cross-validation AUC>.90) which indicates the solution is suitable to drastically minimize human intervention for electronic-components failure detection in assembled circuit boards.

Using this solution to automate failure detection instead of relying solely on human operators helps improve the identification of faulty electronic components and boost productivity.

Azure products used in this solution

- | | |
|--|---|
|  Azure Blob Storage |  Virtual Machines |
|  Azure Container Registry |  Machine Learning |
|  Web Apps |  Azure Kubernetes Services |
|  Java ETL | |