FAQs for AIoT

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Why we need AIoT?

What are functions of AIoT?

What is APC?

How to do the retrain?

How to do the transfer learning?

How much data is required?

What is soft sensor?

What are sensor resolutions?

How do deploy the model?

What is PdM?

Why we need AI?

What kind of sensors?

How to monitor the model?

What are the key features?

How to decide the NN?

How to build the system?

Why we need IoT?

How many models build?

What

What kind of sensors?
What are sensor resolutions?
What is APC?
What are functions of AIoT?
What is soft sensor?
What is PdM?
What are the key features?

How

How much data is required?
How to build the system?
How many models build?
How to monitor the model?
How do deploy the model?
How to do the retrain?
How to decide the NN?
How to do transfer learning?

Why

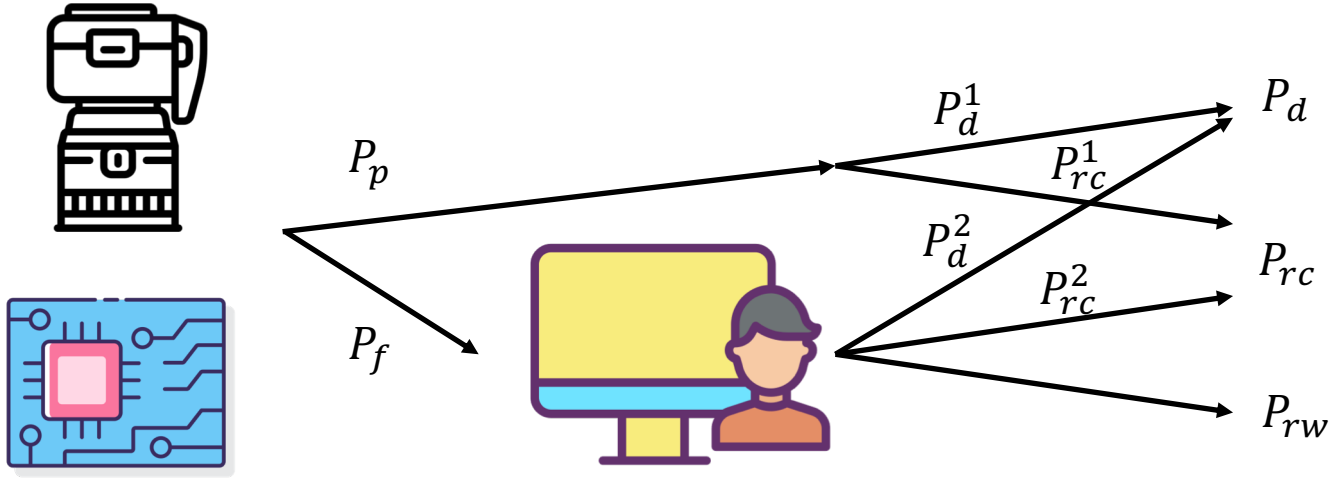
Why we need AI?
Why we need IoT?
Why we need AIoT?

Why We need AIoT?

- Top Down View
  - Corporate strategy, infrastructure, …
- Bottom
  - Solve specific problems, improve specific KPIs
- How much time we save/target?
- How much quality/yields we can increase/target?
- How much productivities we can improve/target?
- How much expense we have to spend/target?

Multi-objective optimization problem

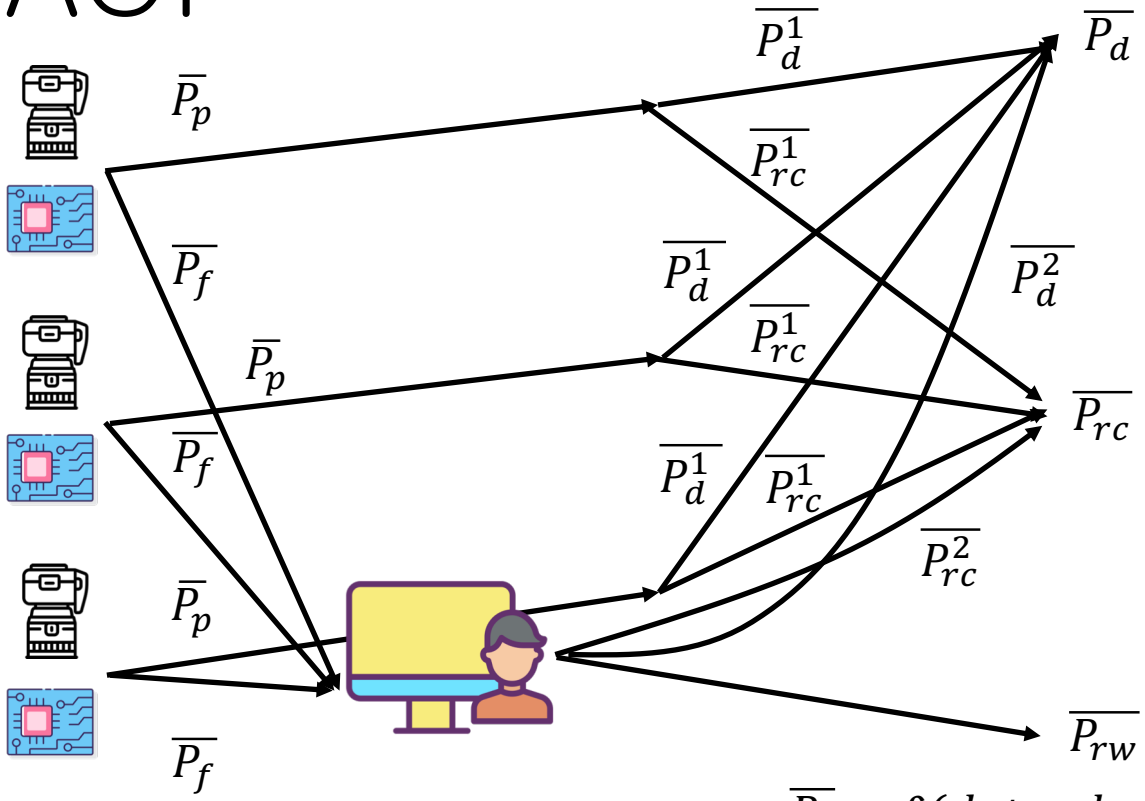
Conventional AOI



$$C_T = C_{HR} + C_E + C_{RC} + C_{RW}$$

$$D_T = P_d \cdot D_d + P_{rw} \cdot D_{rw}$$

AI-based AOI



$$\overline{C_T} = \frac{C_{HR}}{N(\overline{P_f})} + \overline{C_E}(class, algo, camera) + C_{RC}(\overline{P_{rc}}) + C_{RW}$$

$$\overline{D_T} = \overline{P_d} \cdot D_d + \overline{P_{rw}} \cdot D_{rw}$$

$$\overline{P_f} = \mathcal{L}(data, class, algo, camera)$$

$$\overline{P_{rc}} = \mathcal{H}(data, class, algo, camera)$$

$$\overline{P_d} = \mathcal{R}(data, class, algo, camera)$$

Try to formulate your AIoT multi-objective optimization problem

Next Question, How?

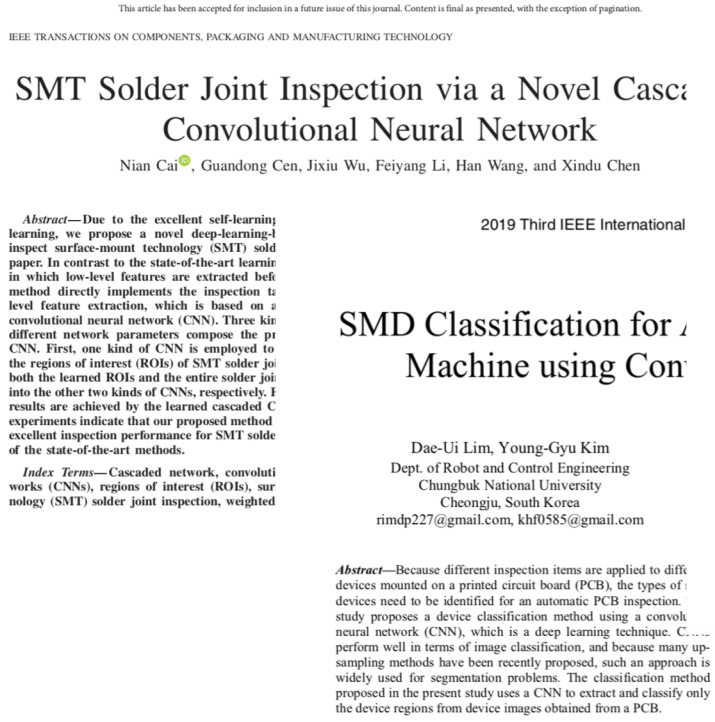
$$\overline{P_f} = \mathcal{L}(data, class, algo, camera)$$

$$\overline{P_{rc}} = \mathcal{H}(data, class, algo, camera)$$

$$\overline{P_d} = \mathcal{R}(data, class, algo, camera)$$

$$\overline{C_E}(class, algo, camera)$$

- Launch a POC/prototype project
  - Not for demo, to figure out these missing parameters
  - Sometimes, google can help you to pin down the ranges of parameters


This article has been accepted for inclusion in a future issue of this journal. Content is final as presented, with the exception of pagination.

IEEE TRANSACTIONS ON COMPONENTS, PACKAGING AND MANUFACTURING TECHNOLOGY

SMT Solder Joint Inspection via a Novel Casca
Convolutional Neural Network

Nian Cai, Guandong Cen, Jixiu Wu, Feiyang Li, Han Wang, and Xindu Chen

Abstract—Due to the excellent self-learning learning, we propose a novel deep-learning-l inspect surface-mount technology (SMT) sold paper. In contrast to the state-of-the-art learnin in which low-level features are extracted befo method directly implements the inspection ta level feature extraction, which is based on a convolutional neural network (CNN). Three kin different network parameters compose the pr CNN. First, one kind of CNN is employed to the regions of interest (ROIs) of SMT solder joi both the learned ROIs and the entire solder joi into the other two kinds of CNNs, respectively. I results are achieved by the learned cascaded C experiments indicate that our proposed method excellent inspection performance for SMT solde of the state-of-the-art methods.

Index Terms—Cascaded network, convoluti works (CNNs), regions of interest (ROIs), sur nology (SMT) solder joint inspection, weighted

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SMD Classification for
Machine using Con

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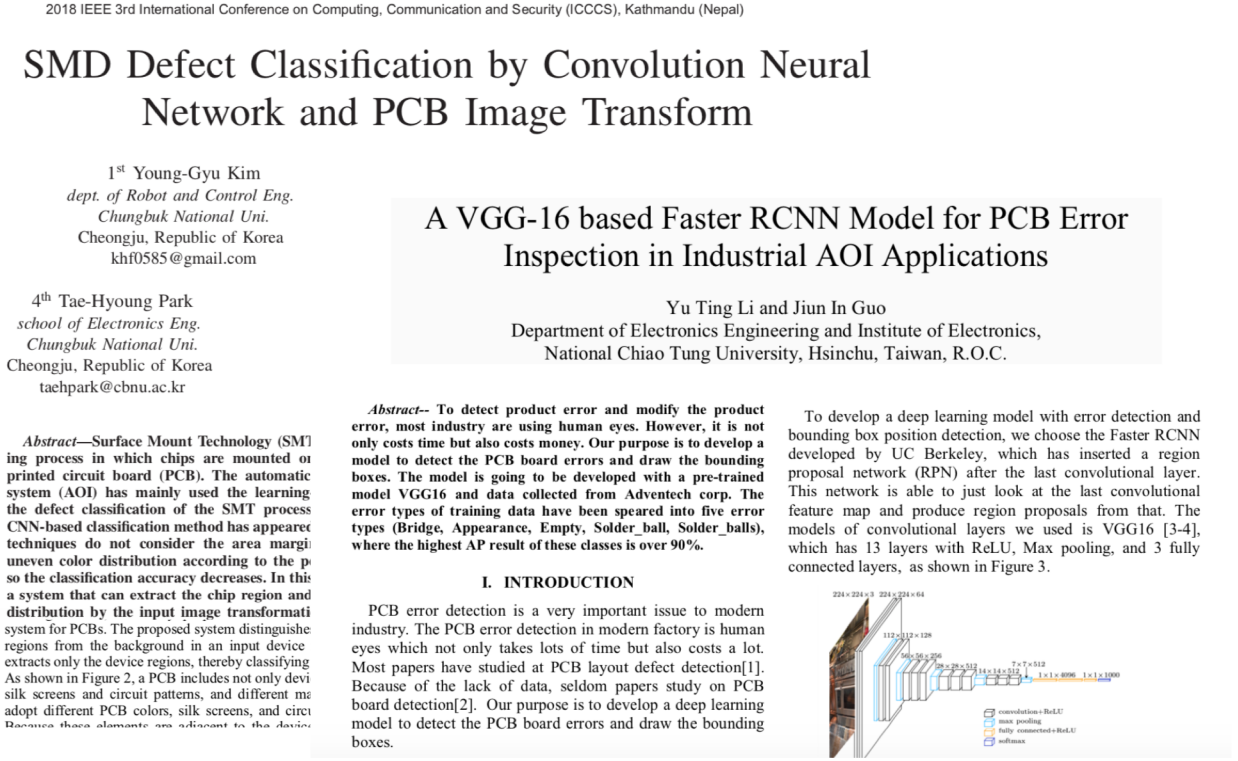
Abstract—Because different inspection items are applied to diffe devices mounted on a printed circuit board (PCB), the types of devices need to be identified for an automatic PCB inspection. study proposes a device classification method using a convolu neural network (CNN), which is a deep learning technique. C perform well in terms of image classification, and because many up-sampling methods have been recently proposed, such an approach is widely used for segmentation problems. The classification method proposed in the present study uses a CNN to extract and classify only the device regions from device images obtained from a PCB.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SMD Defect Classification by Convolution Neural
Network and PCB Image Transform

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Abstract—Surface Mount Technology (SMT ing process in which chips are mounted o printed circuit board (PCB). The automatic system (AOI) has mainly used the learning the defect classification of the SMT process CNN-based classification method has appeared techniques do not consider the area margi uneven color distribution according to the p so the classification accuracy decreases. In this a system that can extract the chip region and distribution by the input image transformati system for PCBs. The proposed system distinguishe regions from the background in an input device extracts only the device regions, thereby classifying As shown in Figure 2, a PCB includes not only devi silk screens and circuit patterns, and different ma adopt different PCB colors, silk screens, and circu

A VGG-16 based Faster RCNN Model for PCB Error
Inspection in Industrial AOI Applications

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Abstract-- To detect product error and modify the product error, most industry are using human eyes. However, it is not only costs time but also costs money. Our purpose is to develop a model to detect the PCB board errors and draw the bounding boxes. The model is going to be developed with a pre-trained model VGG16 and data collected from Adventech corp. The error types of training data have been speared into five error types (Bridge, Appearance, Empty, Solder_ball, Solder_balls), where the highest AP result of these classes is over 90%.

I. INTRODUCTION

PCB error detection is a very important issue to modern industry. The PCB error detection in modern factory is human eyes which not only takes lots of time but also costs a lot. Most papers have studied at PCB layout defect detection[1]. Because of the lack of data, seldom papers study on PCB board detection[2]. Our purpose is to develop a deep learning model to detect the PCB board errors and draw the bounding boxes.

To develop a deep learning model with error detection and bounding box position detection, we choose the Faster RCNN developed by UC Berkeley, which has inserted a region proposal network (RPN) after the last convolutional layer. This network is able to just look at the last convolutional feature map and produce region proposals from that. The models of convolutional layers we used is VGG16 [3-4], which has 13 layers with ReLU, Max pooling, and 3 fully connected layers, as shown in Figure 3.

How to Get Started?

Around 20% of AIoT services have well-structured formula and well-known parameters

Determine these critical problems

Internalization

Yell for help

Is that easy or difficult?

Easy because

AIoT =

An Integration of old Technologies

KISS principle works well in AIoT area

Difficult because

AIoT =

An Innovation of Thinking

We not merely replace human intelligences by machine intelligences
We further redefine the manufacturing by machine intelligences

Summary

- Review FAQs for AIoT from a different perspective, i.e. Why, ~~How~~ and ~~What~~ for your AIoT investment
- Why: formulate multi-objective optimization problem for your AIoT project
- How: POCs to figure out the critical parameters rather a fancy demo
- How to get started
  - DIY: determine, leverage, internalized
  - An Integration of old Technologies: KISS principles
  - An Innovation of Thinking: not only replace but also redefine