# DEEP PCB TO COCO CONVERTOR


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# ABSTRACT


- The MS COCO (Microsoft Common Objects in Context) dataset is a large-scale object detection, segmentation, key-point detection, and captioning dataset. It is widely used for various models.
- The dataset consists of 328K images. Coco defines 91 classes but the data only uses 80 classes. So, we are trying to convert the other dataset format into COCO format.
- Deep PCB is a manufacturing defect data set. It has 1500 image pairs. Each has a template image & a test image. The template image has no defects & corresponding test image that has some defects with the annotations in a text file.
- We are trying to convert the deep PCB Manufacturing defect into MS COCO Format and create metadata about the converted dataset COCO format..

# LITERATURE SURVEY

| | Journal Type and year | Authors | Title | Summary |
|---|---|---|---|---|
| 1 | IEEE, 2019 | Weibo Huang, Peng Wei | A PCB Dataset for Defects Detection and Classification | Given the brief introduction about the Deep PCB Manufacturing Defectdataset |
| 2 | IEEE, 2015 | Tsung-Yi Lin Michael Maire Serge Belongie Lubomir Bourdev Ross Girshick, James Hays Pietro Perona Deva Ramanan C. Lawrence Zitnick Piotr Dollar | Microsoft COCO: Common Objects in Context | Gathered images of complex everyday scenes containing common objects in their natural context & made the COCO dataset. Dataset contains photos of 91 objects types that would be easily recognizable by a 4-year-old. With a total of 2.5 million labeled instances in 328k images. |
| 3 | IEEE, 2017 | Lin et al. in Microsoft COCO: Common Objects in Context | COCO (Microsoft Common Objects in Context) | The COCO dataset format was explained in this |

# Existing System

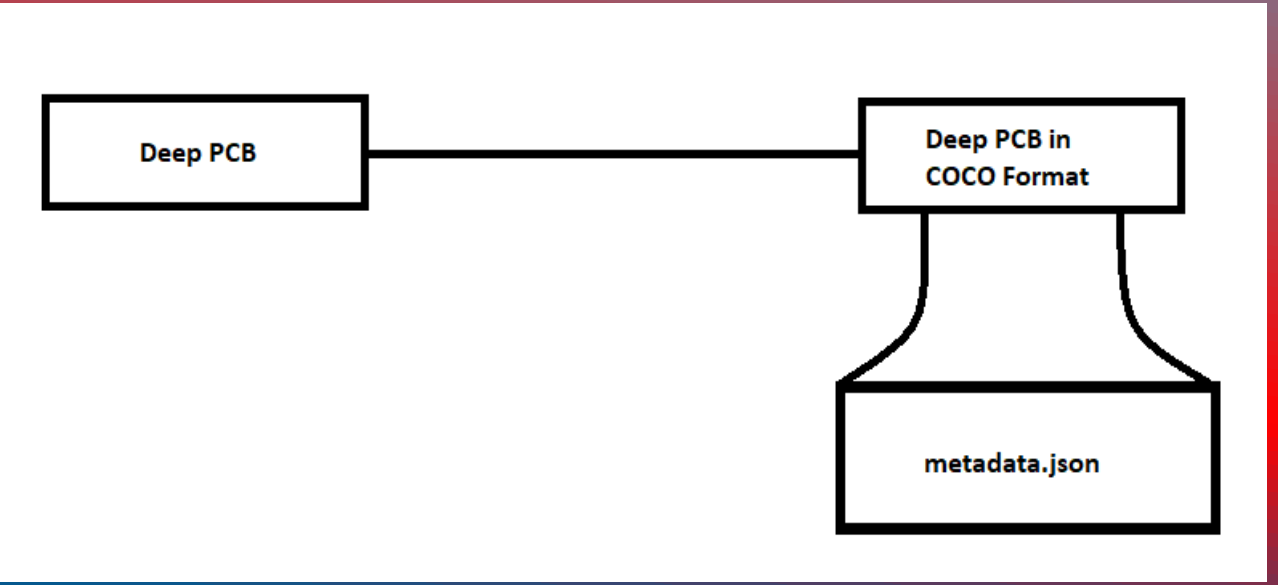
Deep PCB Manufacturing defect dataset is an existing dataset.

MS COCO Format is an existing dataset format.

Reading a text file using python

# Proposed System

Converting the Deep PCB manufacturing defect dataset into MS COCO format



# Problem Definition

**Input:**

Deep PCB Dataset - 1. Image directories , 2. Annotation Text files

**Output:**

MS COCO JSON

# COCO FORMAT

```
{
   "info": info,
   "licenses": [license],
   "categories": [category],
   "images": [image],
   "annotations": [annotation]
}
```

```
"info"
{
"year": int,
 "version": str,
 "description": str,
 "contributor": str,
 "url": str,
 "date_created": datetime,
}
```

```
"info":
    {
        "year": 2019,
        "version": "1.0",
        "description": "Flower and Fruits dataset",
        "contributor": "Flowers Inc.",
        "url": "http://test.org",
        "date_created": "2019/12/04"
    }
```

```
licenses
[{
"id": int,
 "name": str,
 "url": str,
}]
```

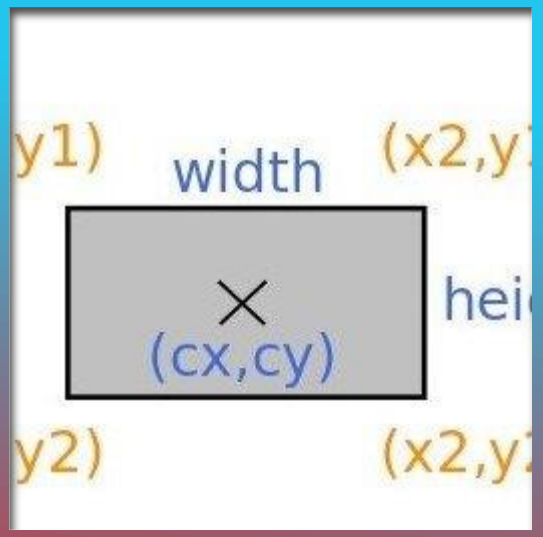
```
"licenses":
[{
        "id": 1,
        "name": "Free License",
        "url": "http://flower.org/",
}]
```

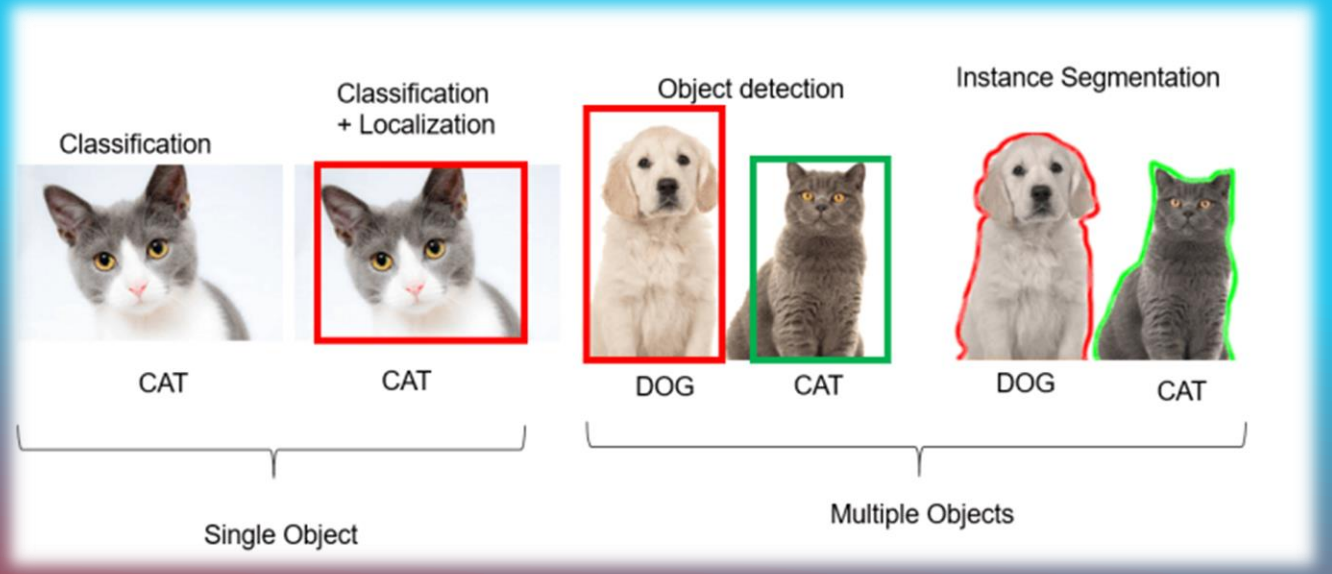
```
Categories
[{
"id": int,
 "name": str,
 "supercategory": str,
}]
```

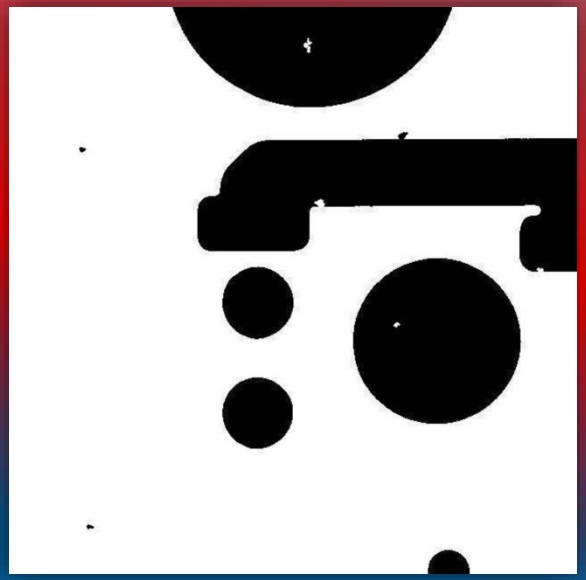
```
"categories":
[
    {"id": 1,"name": "rose", "supercategory": "flower"},
    {"id": 2,"name": "tulip", "supercategory": "flower"},
    {"id": 10,"name": "Apple", "supercategory": "fruit"}
]
```

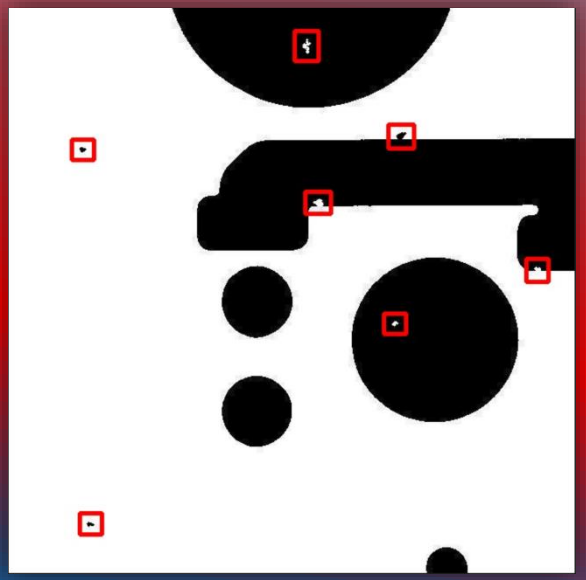
```
image{
"id": int,
"width": int,
"height": int,
"file_name": str,
"license": int,
"flickr_url": str,
"coco_url": str,
"date_captured": datetime,
}
```

```
"images": [
    {
        “id": 397133,
        "width": 640,
        "height": 640,
        "file_name": "101.jpg",
        “license”:1,
         "date_captured": "2019-12-04 17:02:52"
    },
    {
         "id": 397122,
        "height": 640,
        "width": 640,
        "file_name": "102.jpg",
        "license": 1,
        "date_captured": "2019-12-04 17:02:52"
    }
    ]
```





```
335 208 364 233 3
429 132 458 159 4
71 149 96 172 5
323 26 350 60 6
585 284 610 310 3
424 346 449 369 6
80 572 105 596 5
```

```
annotation{
"id": int,
"image_id": int,
"category_id": int,
"segmentation": RLE or [polygon],
"area": float,
"bbox": [x,y,width,height],
"iscrowd": 0 or 1,
}
```

```
"annotations": [
    {
        "segmentation":
[[510.66,423.01,511.72,420.03,...,510.45,423.01]],
        "area": 702.10,
        "iscrowd": 0,
        "image_id":  397133,
        "bbox": [433.07,355.93,138.65,228.67],
        "category_id": 18,
        "id": 1768
    },
    {
        "segmentation":
       {
          “counts”:[12,56,198,10]
          “size”:[120, 240]
       }
        "area": 500.2,
        "iscrowd": 1,
        "image_id": 397122,
        "bbox": [473.07,395.93,38.65,28.67],
        "category_id": 18,
        "id": 1768
    }]
```

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| image | xmin | ymin | xmax | ymax | label |
| 06252020_ | 142.9378703 | 1663.277 | 1783.616 | 3200 | Palme |
| 06252020_ | 2538.41801 | 2061.017 | 3618.644 | 3602.26 | Morn |
| 06252020_ | 350.2824859 | 1537.853 | 2187.006 | 3231.638 | Morn |
| 06252020_ | 2045.762919 | 0 | 5914.689 | 3990.961 | Goose |

EXCEL

```
335 208 364 233 3
429 132 458 159 4
71 149 96 172 5
323 26 350 60 6
585 284 610 310 3
424 346 449 369 6
80 572 105 596 5
```

NOTEPAD

CSV

File Edit View Language

```
ImageID,Source,LabelName,Confidence,XMin,XMax,YMin,YMax,IsOccluded,IsTruncated,IsGroupOf,IsDepiction,IsInside
0001eeaf4aed83f9,freeform,/m/0cmf2,1,0.022464,0.964178,0.070656,0.800164,0,0,0,0,0
000595fe6fee6369,freeform,/m/02wbm,1,0.000000,1.000000,0.000233,1.000000,0,0,1,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.141030,0.180277,0.676262,0.732455,0,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.213781,0.253028,0.298764,0.354956,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.232926,0.288447,0.488954,0.545146,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.245370,0.290361,0.661854,0.716605,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.245370,0.291319,0.548028,0.604220,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.247285,0.283661,0.379450,0.437084,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.247285,0.294190,0.608543,0.673380,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.271216,0.306635,0.597016,0.658972,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.282703,0.341096,0.334784,0.426998,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.316207,0.361198,0.177733,0.246893,0,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.350668,0.384172,0.601339,0.669058,1,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.355455,0.400446,0.648886,0.726691,0,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.375557,0.427249,0.591253,0.661854,0,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.380343,0.591896,0.383773,0.620070,0,0,1,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.406189,0.451180,0.248334,0.304527,0,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.427249,0.467453,0.713724,0.774239,0,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.432992,0.496171,0.595575,0.684907,0,0,0,0,0
000595fe6fee6369,freeform,/m/02xwb,1,0.434907,0.482769,0.736777,0.813141,1,0,0,0,0
```

01_open_circuit_03 - Notepad

File Edit Format View Help

```
<annotation>
        <folder>Open_circuit</folder>
        <filename>01_open_circuit_03.jpg</filename>
        <path>/home/weapon/Desktop/PCB_DATASET/Open_circuit/01_open_circuit_03.jpg</path>
        <source>
                <database>Unknown</database>
        </source>
        <size>
                <width>3034</width>
                <height>1586</height>
                <depth>3</depth>
        </size>
        <segmented>0</segmented>
        <object>
                <name>open_circuit</name>
                <pose>Unspecified</pose>
                <truncated>0</truncated>
                <difficult>0</difficult>
                <bndbox>
                        <xmin>1419</xmin>
                        <ymin>1132</ymin>
                        <xmax>1460</xmax>
                        <ymax>1172</ymax>
                </bndbox>
        </object>
        <object>
                <name>open_circuit</name>
                <pose>Unspecified</pose>
                <truncated>0</truncated>
                <difficult>0</difficult>
                <bndbox>
                        <xmin>599</xmin>
                        <ymin>909</ymin>
                        <xmax>633</xmax>
                        <ymax>942</ymax>
                </bndbox>
        </object>
        <object>
                <name>open_circuit</name>
                <pose>Unspecified</pose>
                <truncated>0</truncated>
                <difficult>0</difficult>
                <bndbox>
                        <xmin>1688</xmin>
                        <ymin>350</ymin>
                        <xmax>1723</xmax>
                        <ymax>390</ymax>
                </bndbox>
        </object>
</annotation>
```

XML

# RESULTS


```
{
    "info": {
        "description": "DeepPCB-2-COCO-Format-2022",
        "url": "",
        "version": "1.0",
        "year": 2022,
        "contributor": "",
        "date_created": "2022/1/10"
    },
    "licenses": [
        {
            "url": "",
            "id": 0,
            "name": ""
        }
    ],
    "images": [
        {
            "id": 1000,
            "license": 0,
            "coco_url": "",
            "flickr_url": "",
            "height": 640,
            "width": 640,
            "file_name": "20085000_test.jpg",
            "date_captured": "2022"
        },
        {
            "id": 1001,
            "license": 0,
            "coco_url": "",
            "flickr_url": "",
            "height": 640,
            "width": 640,
            "file_name": "20085001_test.jpg",
            "date_captured": "2022"
        },
        {
            "id": 1002,
            "license": 0,
            "coco_url": "",
            "flickr_url": "",
            "height": 640
```

```
    ],
    "annotations": [
        {
            "id": 0,
            "category_id": 3,
            "iscrowd": 0,
            "segmentation": [],
            "image_id": 1000,
            "area": 0.0,
            "bbox": [
                409.0,
                394.0,
                26.0,
                28.0
            ]
        },
        {
            "id": 1,
            "category_id": 3,
            "iscrowd": 0,
            "segmentation": [],
            "image_id": 1000,
            "area": 0.0,
            "bbox": [
                275.0,
                383.0,
                44.0,
                34.0
            ]
        },
        {
            "id": 2,
            "category_id": 4,
            "iscrowd": 0,
            "segmentation": [],
            "image_id": 1000,
            "area": 0.0,
            "bbox": [
                8.0,
                163.0,
                28.0,
                28.0
```

```
    "categories": [
        {
            "supercategory": "open",
            "id": 1,
            "name": "open"
        },
        {
            "supercategory": "short",
            "id": 2,
            "name": "short"
        },
        {
            "supercategory": "mousebite",
            "id": 3,
            "name": "mousebite"
        },
        {
            "supercategory": "spur",
            "id": 4,
            "name": "spur"
        },
        {
            "supercategory": "copper",
            "id": 5,
            "name": "copper"
        },
        {
            "supercategory": "pin-hole",
            "id": 6,
            "name": "pin-hole"
        }
    ]
}
```


## DEEP PCB IN COCO FORMAT ANNOTATION JSON

# METADATA

- Information About The Data. It Guides
- Used In Corporate Sector
- It Saves Time And Manpower


```
{
    "@class": "DeepPCB2COCOconvertor.DataSetMetadata",
    "displayName": "DeepPCB to COCO",
    "description": "Manufacturing Defect Dataset to COCO Format.",
    "provider": "Sreeja Genti",
    "creationDateTime": "2022-01-10T11:13:48.343Z",
    "lastUpdateTime": "2022-01-10T11:13:48.343Z",
    "version": 1,
    "studioVersion": 1001,
    "tags": [
        "COCO",
        "DeepPCB"
    ],
    "size": 1500,
    "format": "IMAGES",
    "dataLoader": "COCO",
    "colorSpace": "rgb",
    "purpose": "Detection",
    "labelDistribution": {
        "VALIDATION": {
            "annotationCounts": {
                "1": 659,
                "2": 478,
                "3": 586,
                "4": 483,
                "5": 464,
                "6": 470
            },
            "labelNames": [
                "copper",
                "mousebite",
                "open",
                "pin-hole",
                "short",
                "spur"
            ],
            "imagesCount": 500
        },
        "TRAIN": {
            "annotationCounts": {
                "3": 1379,
                "4": 1142,
                "5": 1010,
                "6": 1031,
                "1": 1283,
                "2": 1028
            },
            "labelNames": [
                "copper",
                "mousebite",
                "open",
                "pin-hole",
                "short",
                "spur"
            ],
            "imagesCount": 1000
        }
    }
}
```

# CONCLUSION

The PCB datasets is converted into COCO format.

Files are shared throughout the corporate in this format structure

1. Images ( which has all the images ).
2. Annotations ( which has the train and test set COCO Json files.
3. Metadata

# References


1. A PCB Dataset for Defects Detection and Classification - Mateusz Buda, Atsuto Maki, Maciej A. Mazurowski ( https://arxiv.org/pdf/1901.08204v1.pdf )

2. Microsoft COCO: Common Objects in Context Lin et al. in Microsoft COCO ( https://arxiv.org/pdf/1405.0312.pdf )

3. COCO (Microsoft Common Objects in Context) Lin et al. in Microsoft COCO ( https://paperswithcode.com/dataset/coco )

4. Sanli Tang, Fan He, Xiaolin Huang, Jie Yang (2019) "Online PCB Defect Detector On A New PCB Defect Dataset" arXiv:1902.06197 [cs.CV] [5] Lv, Teng & Yan, Ping & He, Weimin. (2018). Survey on JSON Data Modelling. Journal of Physics: Conference Series. 1069. 012101. 10.1088/1742-6596/1069/1/012101.

5. Lv, Teng & Yan, Ping & He, Weimin. (2018). Survey on JSON Data Modelling. Journal of Physics: Conference Series. 1069. 012101. 10.1088/1742-6596/1069/1/012101.

6. Allena Venkata Sai Abhishek, Venkateswara Rao Gurrala "AugStatic - A Light-Weight Image Augmentation Library", International Journal of Emerging Technologies and Innovative Research (www.jetir.org), ISSN: 2349-5162, Vol.9, Issue 5, page no.b735-b742, May-2022, Available :http://www.jetir.org/papers/JETIR2205199.pdf

# THANK YOU