The **PowerOL** dataset was collected from substations of the State Grid Jiangsu Power Company, with assistance of Wiscom System Co. Ltd. (Jiangsu) .

There are 4,364 images in total involving 10 categories of oil leakage from the power facilities, i.e., dmyw (ground oil stains), byq (transformer oil stains), jt (connector oil stains), lqq (cooler oil stains), tg (pipe oil stains), qtjdq (gas-relay oil stains), cyg (tank oil stains), sgz (base oil stains), ylsff (pressure relief valve oil stains) as well as qyb (submersible pump oil stains). For each image, the oil contained areas are annotated using LabelImg, and a separate XML file is generated as the ground-truth of oil leakage events in this image. As there are 7,484 annotations within 4,364 images, some images contain more than one oil leakage annotations (the average number is 1.71). In Table 1, we display the basic statistics of the PowerOL dataset.

Table 1 Statistics of the PowerOL dataset

Category	Label Count	Description
dmyw	3,176	Ground oil stains
byq	1,920	Transformer oil stains
jt	1,282	Connector oil stains
lqq	345	Cooler oil stains
tg	299	Pipe oil stains
qtjdq	149	Gas-relay oil stains
cyg	147	Tank oil stains
sgz	100	Base oil stains
ylsff	34	Pressure relief valve oil stains
qyb	32	Submersible pump oil stains
Total	**7,484**	-
Avg.	**1.71**	

In Fig. 1 and Fig. 2, we show an example of an image containing three different oil leakage annotations and its associated XML file, respectively. In order to improve the utilization of the dataset, we suggest that the brightness, contrast, and saturation of all images be firstly increased, and more data augmentation methods (e.g., random scaling, random flipping, mosaic and so on) can be applied before you train the object detection models. Besides, for the convenience of model training, it is recommended to uniformly adjust the input image size to 640 × 640 pixels.

Fig 1. An image containing byq, dmyw and jt oil leakage categories

```
▼<annotation>
  <folder>VOC2007</folder>
  <filename>game_0b80fe8cc0a2704a612eb2639ccb1024.jpg</filename>
 ▼<source>
    <database>Coco database</database>
  </source>
 ▼<size>
    <width>4000</width>
    <height>3000</height>
    <depth>3</depth>
  </size>
  <segmented>0</segmented>
 ▼<object>
    <name>sly_dmyw</name>
    <pose>Unspecified</pose>
    <truncated>0</truncated>
    <difficult>0</difficult>
   ▼<bndbox>
      <xmin>1660</xmin>
      <ymin>1623</ymin>
      <xmax>3999</xmax>
      <ymax>2992</ymax>
    </bndbox>
  </object>
 ▼<object>
    <name>sly_byq</name>
    <pose>Unspecified</pose>
    <truncated>0</truncated>
    <difficult>0</difficult>
   ▼<bndbox>
      <xmin>299</xmin>
      <ymin>161</ymin>
      <xmax>3778</xmax>
      <ymax>2016</ymax>
    </bndbox>
  </object>
 ▼<object>
    <name>sly_jt</name>
    <pose>Unspecified</pose>
    <truncated>0</truncated>
    <difficult>0</difficult>
   ▼<bndbox>
      <xmin>3205</xmin>
      <ymin>1832</ymin>
      <xmax>3996</xmax>
      <ymax>2680</ymax>
    </bndbox>
  </object>
</annotation>
```

size of the image

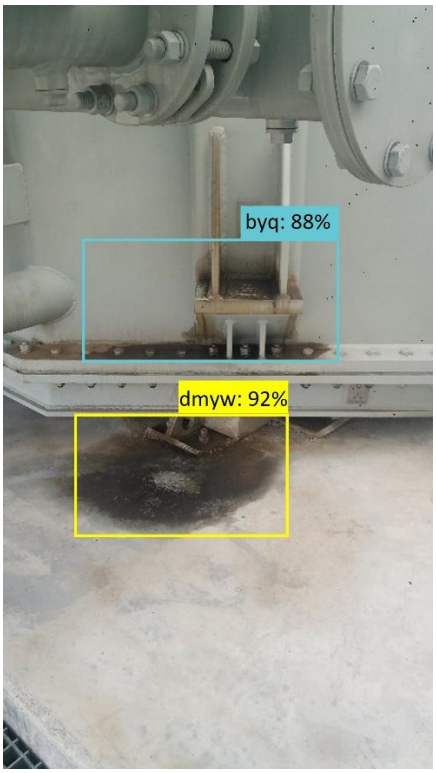
dmyw
rectangular box

byq
rectangular box

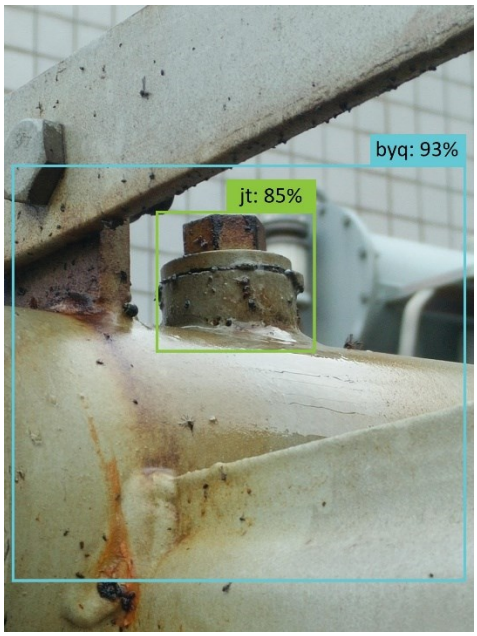
jt
rectangular box

Fig 2. The annotations of the above image in XML format

Fig. 3 shows the detection results on two selected images using YOLOv9 model.



(a)



(b)

Fig 3. Detection results on two selected images delivered by YOLOv9 model