Annotation – white paper

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saiwa

simple artificial intelligence web application

Image annotation refers to the process of annotating images from a dataset with labels to train a machine learning model. Labels are pre-determined by experts of the corresponding field of interest from a set of classes. Image annotation normally requires human involvement but there are automatic annotation methods as well. In any case, a machine learning model that is trained using an annotated dataset is called “Supervised learning”. Image annotation is a way to transfer human high-level knowledge of the image content to the model.

For manual image annotation a few well-known steps are defined:

1. Determine the image dataset
2. Define the label classes
3. Annotate the images using a software annotator
4. Export the annotation information to a training format (JSON, YOLO, etc.)

There are three common annotation types in machine vision applications: 1. **Classification**; 2. **Object detection** and 3. **Image segmentation**. saiwa provides three annotation services to support these three annotation types: classification annotation, bounding box annotation and boundary annotation. Below we introduce each type of annotation and features of saiwa corresponding services.

Classification refers to a whole-image annotation that simply identifies properties that exist in the input images. One single label is set to each image (in classification applications this label is usually called *tag*). This type of annotation is used when a machine learning model is trained to find similarity between unlabeled images with known annotated images. Image classification has applications like texture classification, medical detection, defect detection, scene detection and more. Classification annotation is the least-complex and quickest among common annotating types.

saiwa classification annotation service provides a simple interface to define entire-image tags. To employ a set of tags for multiple applications, the user can set multiple tags to one single image. Figure 1 shows a few instances.

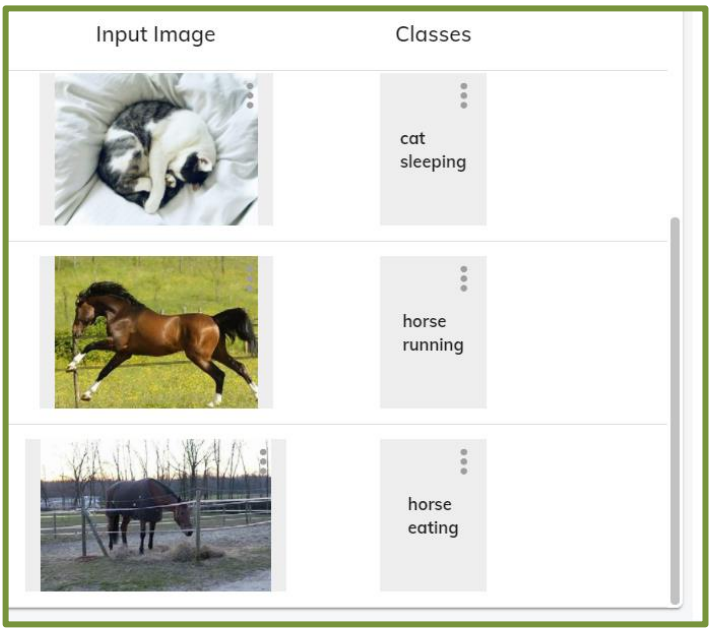

Figure 1. Classification annotation using saiwa interface

Object detection annotation is about finding and localizing objects of interest in the image. Here, in addition to labels, the annotator should provide tools to draw bounding boxes around all instances of objects. Bounding box annotation is the most common annotation out of the other types. Here, the label location is an additional parameter, whereas in image classification, the entire image is tagged as one class. Bounding boxes provide a balance between quick annotation and localizing objects of interest.

saiwa **bounding box annotation** service prepares all that a machine learning expert requires for fast labeling images. With a few clicks multiple bounding boxes within an image are defined. Each bounding box is annotated with one or more labels. Fine granularity and any desired level of overlap between bounding boxes are another features of this service. Figure 2 shows a human detection instance.

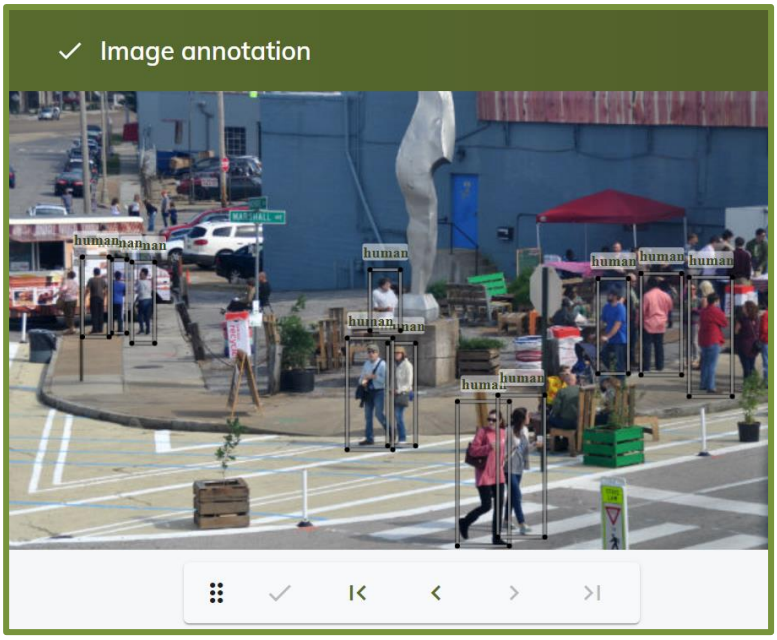

Figure 2. Bounding box annotation using saiwa interface for human tracking application.

Finally, the most advanced annotation type of object targeting is **image segmentation** where objects are recognized at a pixel-level. Here, boundaries of objects within an image are determined and later detected for unannotated images. The objects may have irregular edges. This kind of annotation is slower in nature but more accurate in contrast to other annotation types.

With saiwa **boundary annotation** service this slow task may perform as fast as possible using the interactive facilities for drawing closed boundaries around objects. The boundaries are defined as a set of line segments with different size and shapes. Figure 3 shows an instance of boundary annotation for locating multiple cars in an image.

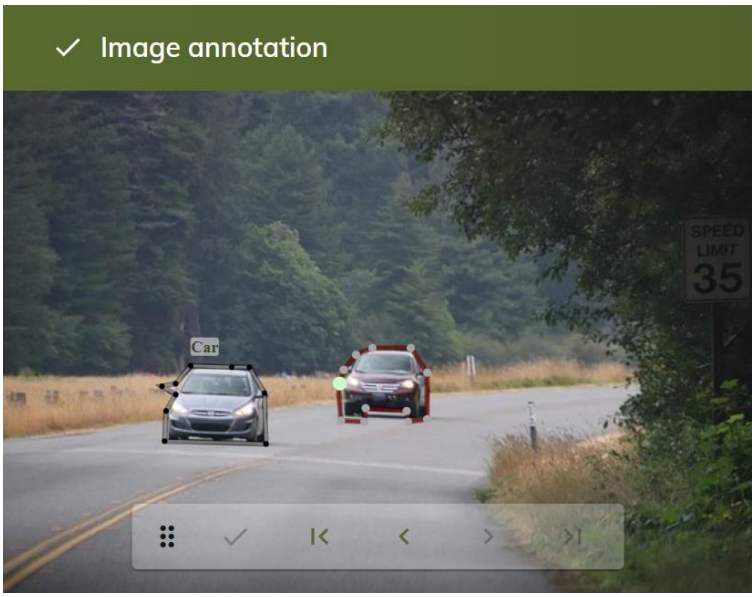

Figure 3. Boundary annotation using saiwa interface for detecting and localizing cars.

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