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## 1 Waldo Extractor

This auxiliary notebook has been used to briefly expand our dataset by adding some images. It serves as a supplementary step in the overall data preparation process.

### 1.1 1. Extraction function

Below is the implementation of a function designed to save specific crops into our dataset. In this case, we manually calculate the coordinates of the 64×64 bounding box where Waldo appears in the images, and then use this function to extract and save those crops.

The extraction process follows the same methodology originally employed to generate the dataset we are working with. For reference and reproducibility, the original code used for dataset creation is included in the repository.

```
[2]: from PIL import Image
import io
import os
import matplotlib.pyplot as plt

def save_crop_from_box(image_path_or_pil, box, save_path):
    if len(box) != 4 or any(not isinstance(x, int) for x in box):
        raise ValueError("Box must be a tuple of 4 integers (x0, y0, x1, y1).")

    if isinstance(image_path_or_pil, str):
        image = Image.open(image_path_or_pil).convert("RGB")
    else:
        image = image_path_or_pil.convert("RGB")

    crop_img = image.crop(box)

    buffer = io.BytesIO()
    crop_img.save(buffer, format="JPEG", optimize=True, quality=85)
    buffer.seek(0)

    img_to_save = Image.open(buffer).convert("RGB")

    os.makedirs(os.path.dirname(save_path), exist_ok=True)
```

```
img_to_save.save(save_path)
print(f"Image saved in {save_path}")
```

```
[3]: import matplotlib.pyplot as plt
def print_box(image_path, box):
    if len(box) != 4 or any(not isinstance(x, int) for x in box):
        raise ValueError("Box must be a tuple of 4 integers (x0, y0, x1, y1).")
    image = Image.open(image_path).convert("RGB")
    crop_img = image.crop(box)
    plt.imshow(crop_img)
```

Example of usage: “python save\_crop\_from\_box( image\_path\_or\_pil=“full\_images/waldo\_original.jpg”, box=(50, 100, 114, 164), # 64x64 box save\_path=“patches\_64x64/waldo\_042.jpg” )

We will save all the image crops in the folder **augmented\_data/waldo**

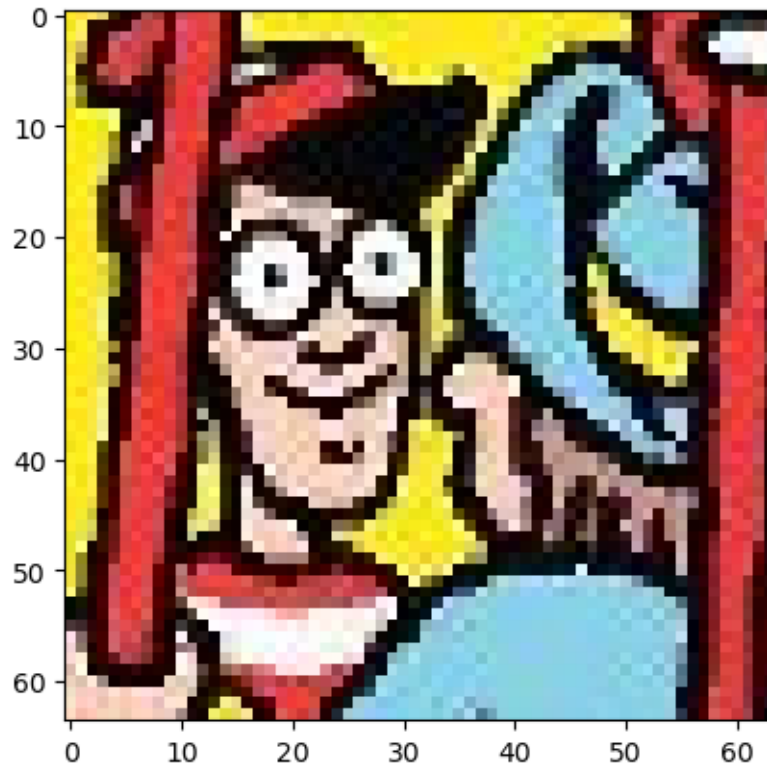
The code used to crop Waldo is shown below.

---

```
[10]: output_path = "../data/expanded_data/waldo"
```

## 2 Waldo from image 1

```
[11]: import matplotlib.pyplot as plt
path_1 = "../data/original-images/1.jpg"
box_1 = (705, 515, 769, 579)
print_box(path_1, box_1)
```

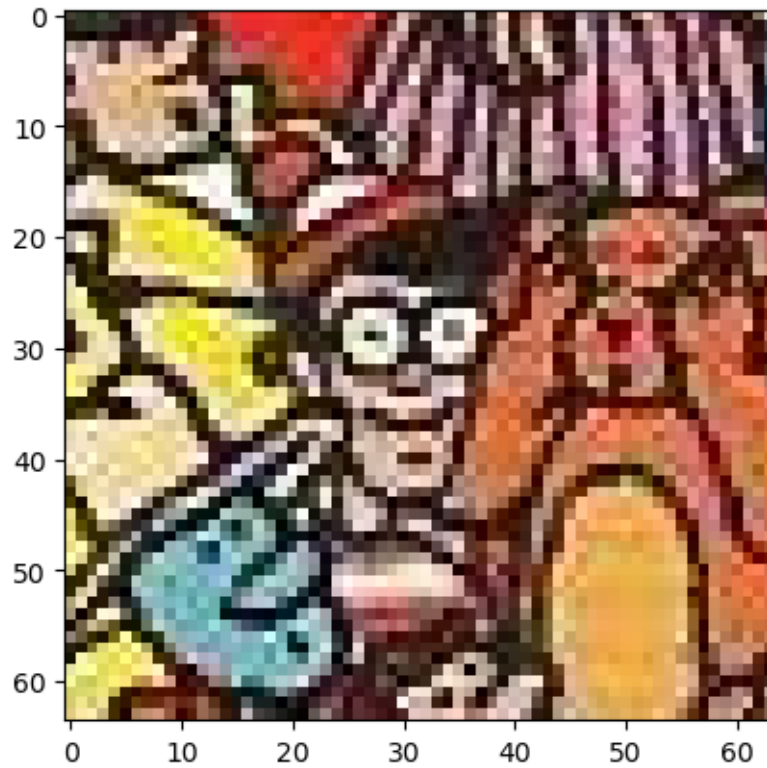


```
[12]: output_path_1 = os.path.join(output_path, "waldo1.jpg")  
      save_crop_from_box(path_1, box_1, output_path_1)
```

Image saved in ../data/expanded\_data/waldo/waldo1.jpg

### 3 Waldo from image 2

```
[14]: import matplotlib.pyplot as plt  
      path_2 = "../data/original-images/2.jpg"  
      box_2 = (65, 510, 129, 574)  
      print_box(path_2, box_2)
```

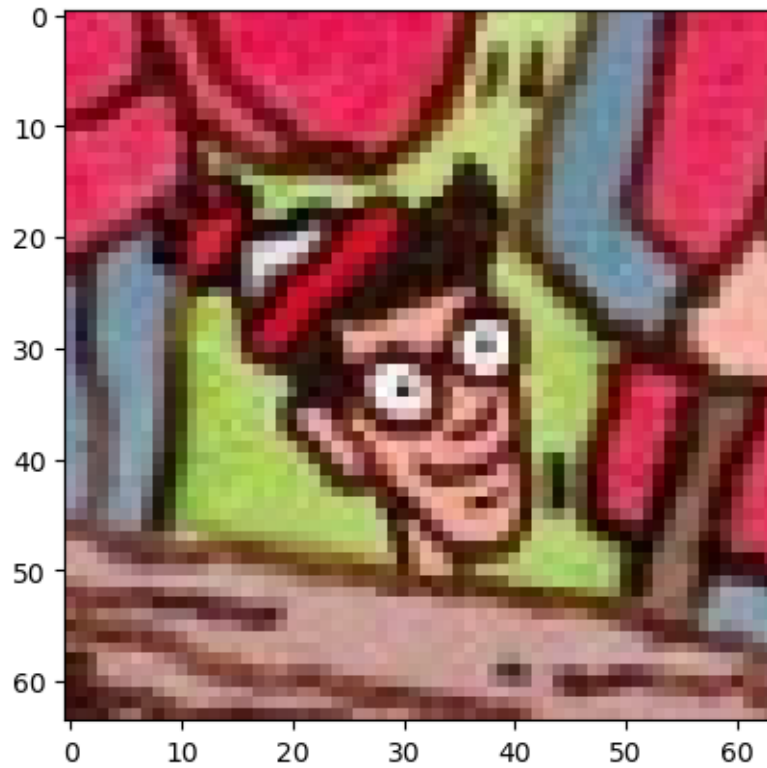


```
[16]: output_path_2 = os.path.join(output_path, "waldo2.jpg")  
      save_crop_from_box(path_2, box_2, output_path_2)
```

Image saved in ../data/expanded\_data/waldo/waldo2.jpg

#### 4 Waldo from image 3

```
[18]: import matplotlib.pyplot as plt  
      path_3 = "../data/original-images/3.jpg"  
      box_3 = (1380, 450, 1444, 514)  
      print_box(path_3, box_3)
```

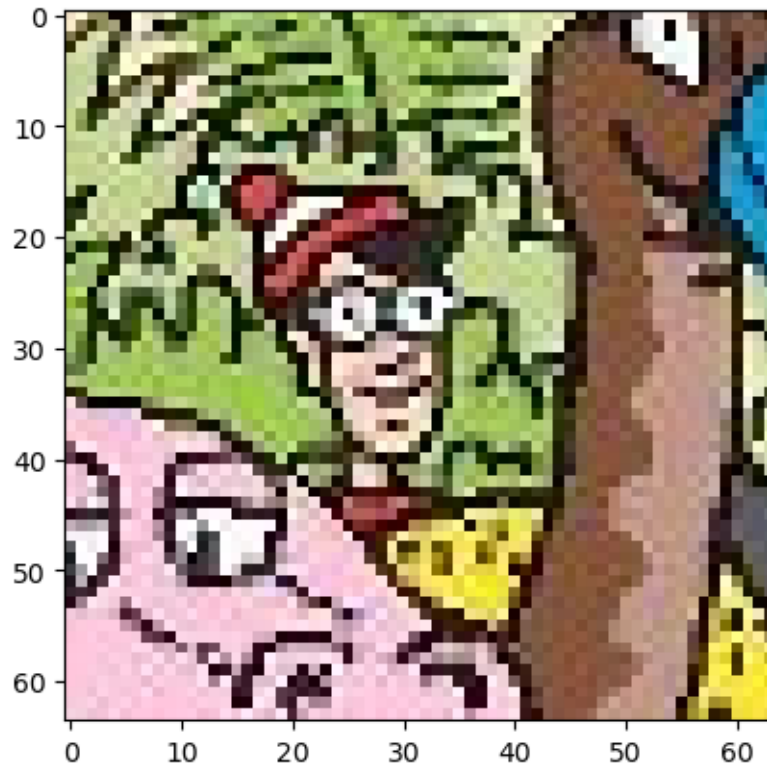


```
[19]: output_path_3 = os.path.join(output_path, "waldo3.jpg")  
      save_crop_from_box(path_3, box_3, output_path_3)
```

Image saved in ../data/expanded\_data/waldo/waldo3.jpg

## 5 Waldo from image 4

```
[23]: import matplotlib.pyplot as plt  
      path_4 = "../data/original-images/4.jpg"  
      box_4 = (1470, 265, 1534, 329)  
      print_box(path_4, box_4)
```

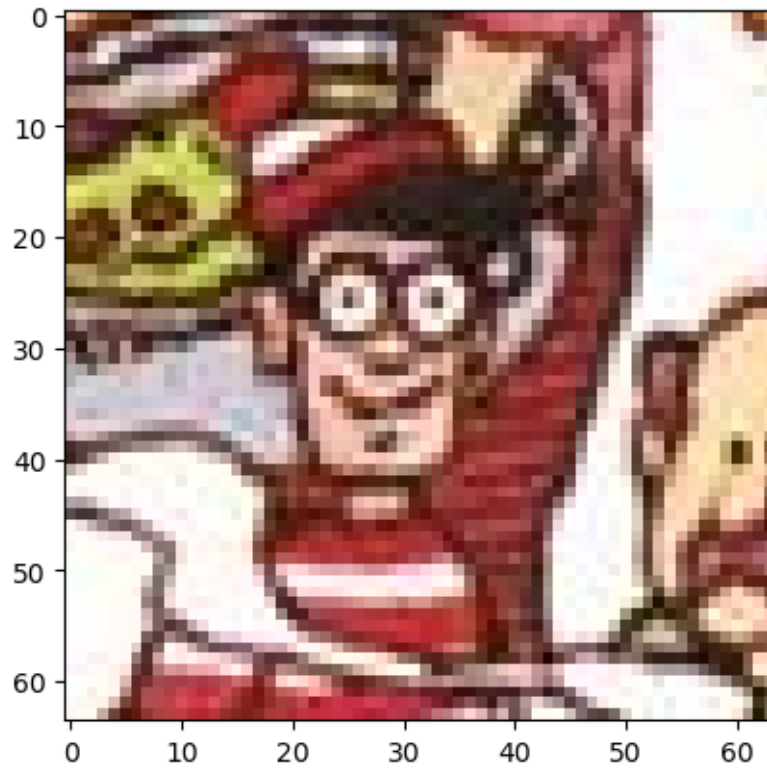


```
[24]: output_path_4 = os.path.join(output_path, "waldo4.jpg")
      save_crop_from_box(path_4, box_4, output_path_4)
```

Image saved in ../data/expanded\_data/waldo/waldo4.jpg

## 6 Waldo from image 5

```
[75]: import matplotlib.pyplot as plt
      path_5 = "../data/original-images/5.jpg"
      box_5 = (1570, 590, 1634, 654)
      print_box(path_5, box_5)
```

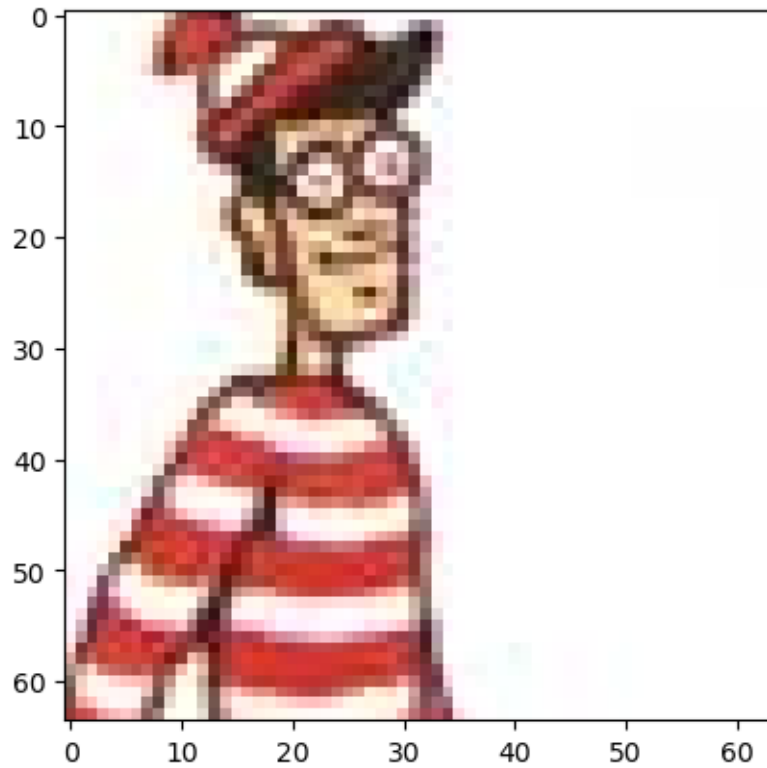


```
[26]: output_path_5 = os.path.join(output_path, "waldo5.jpg")  
      save_crop_from_box(path_5, box_5, output_path_5)
```

Image saved in ../data/expanded\_data/waldo/waldo5.jpg

## 7 Second crop from image 5

```
[76]: import matplotlib.pyplot as plt  
      path_52 = "../data/original-images/5.jpg"  
      box_52 = (605, 1335, 669, 1399)  
      print_box(path_52, box_52)
```



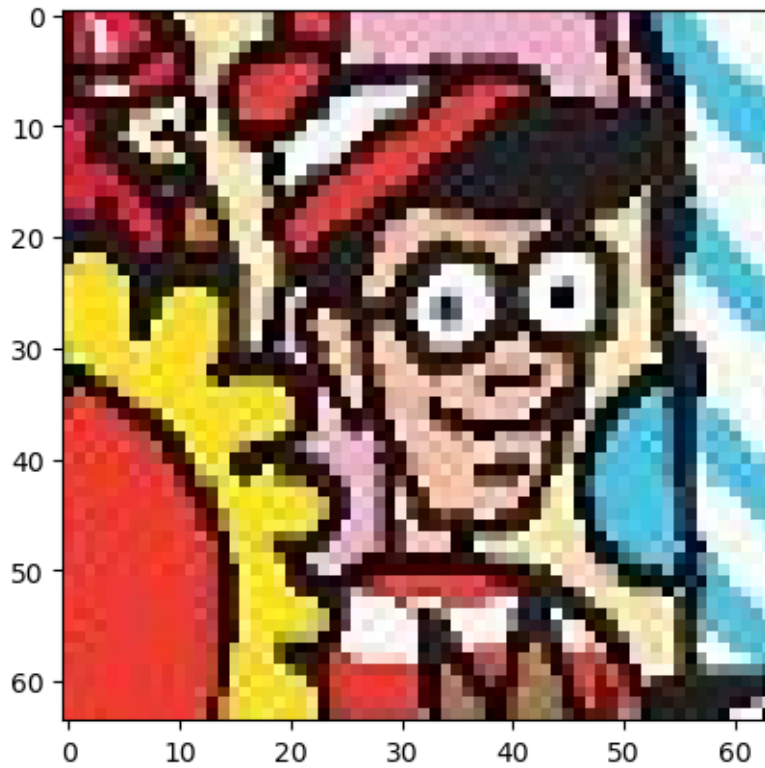
```
[77]: output_path_52 = os.path.join(output_path, "waldo52.jpg")  
      save_crop_from_box(path_52, box_52, output_path_52)
```

Image saved in ../data/expanded\_data/waldo/waldo52.jpg

## 8 Waldo from image 6

```
[29]: import matplotlib.pyplot as plt  
      path_6 = "../data/original-images/6.jpg"  
      box_6 = (1700, 405, 1764, 469)  
      print_box(path_6, box_6)
```



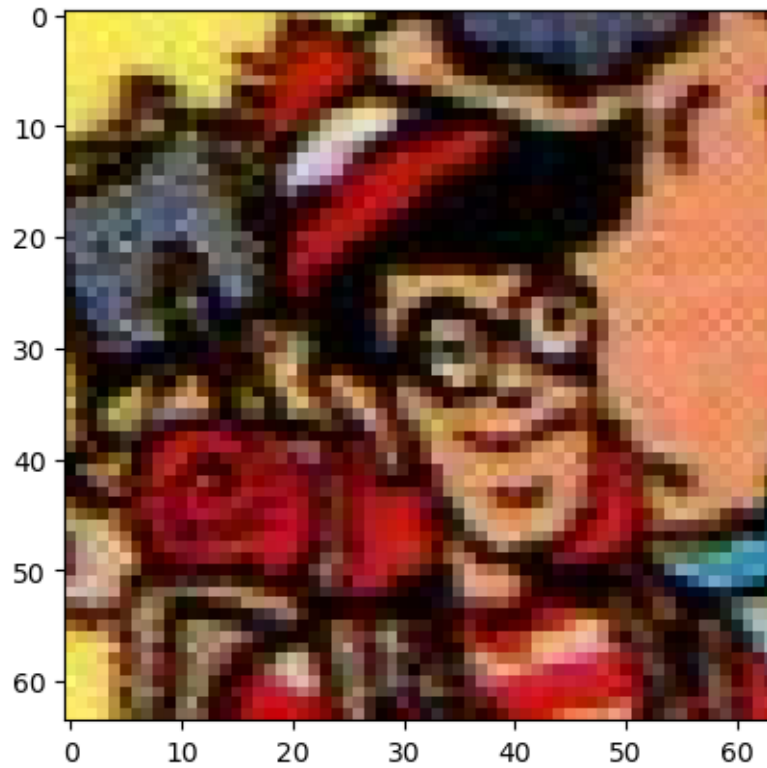


```
[30]: output_path_6 = os.path.join(output_path, "waldo6.jpg")  
      save_crop_from_box(path_6, box_6, output_path_6)
```

Image saved in ../data/expanded\_data/waldo/waldo6.jpg

## 9 Waldo from image 7

```
[31]: import matplotlib.pyplot as plt  
      path_7 = "../data/original-images/7.jpg"  
      box_7 = (800, 950, 864, 1014)  
      print_box(path_7, box_7)
```

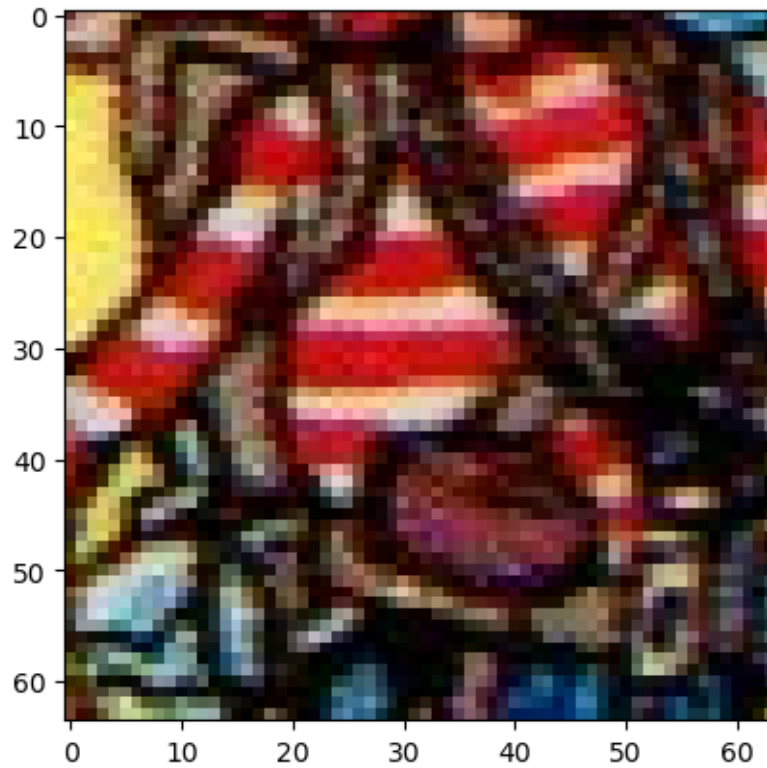


```
[32]: output_path_7 = os.path.join(output_path, "waldo7.jpg")  
      save_crop_from_box(path_7, box_7, output_path_7)
```

Image saved in ../data/expanded\_data/waldo/waldo7.jpg

## 10 Waldo from image 7, second crop

```
[34]: import matplotlib.pyplot as plt  
      path_72 = "../data/original-images/7.jpg"  
      box_72 = (800,1000,864,1064)  
      print_box(path_72, box_72)
```

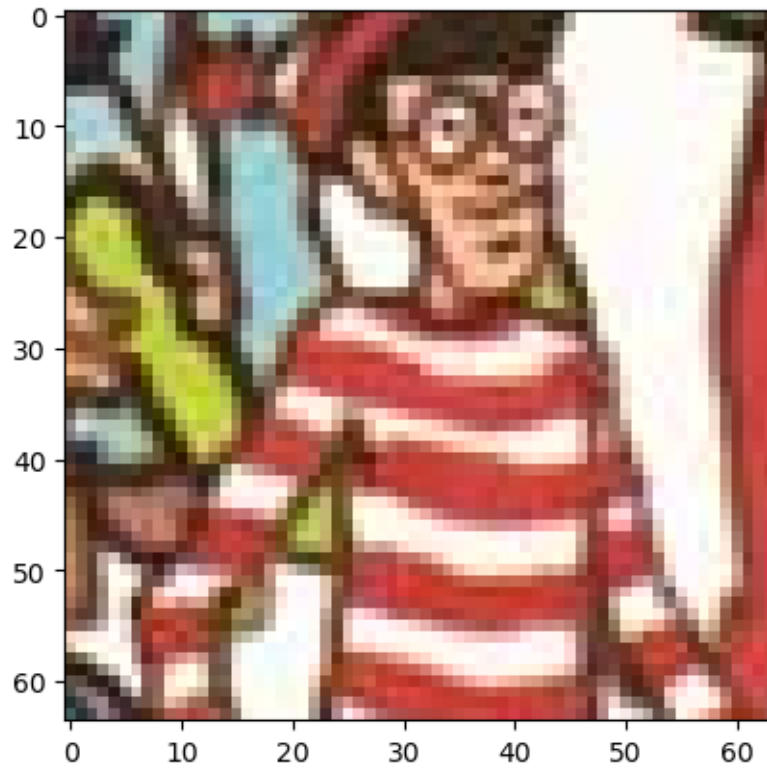


```
[35]: output_path_72 = os.path.join(output_path, "waldo72.jpg")  
      save_crop_from_box(path_7, box_72, output_path_72)
```

Image saved in ../data/expanded\_data/waldo/waldo72.jpg

## 11 Waldo from image 8

```
[37]: import matplotlib.pyplot as plt  
      path_8 = "../data/original-images/8.jpg"  
      box_8 = (1145, 295, 1209, 359)  
      print_box(path_8, box_8)
```

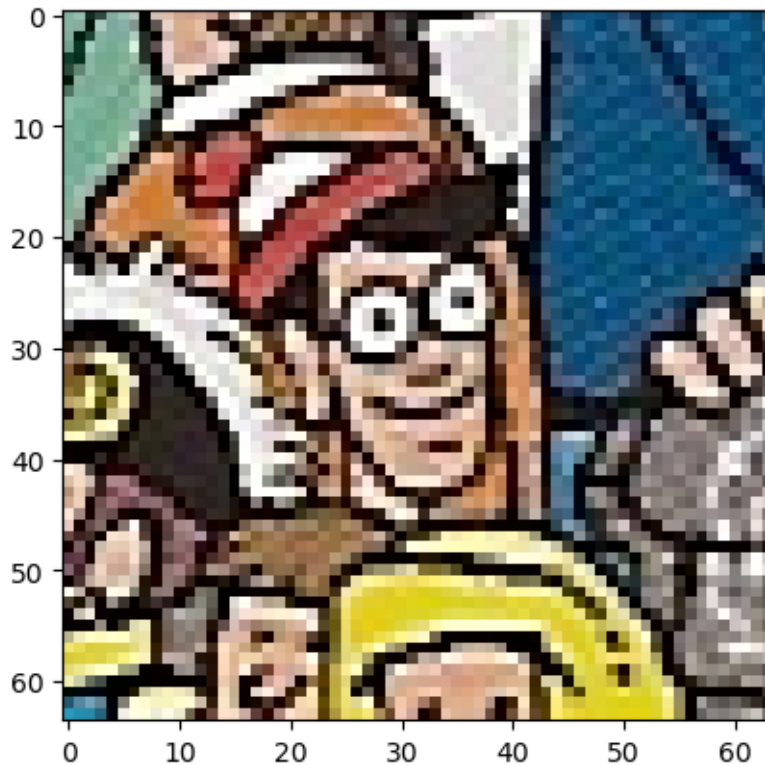


```
[38]: output_path_8 = os.path.join(output_path, "waldo8.jpg")  
      save_crop_from_box(path_8, box_8, output_path_8)
```

Image saved in ../data/expanded\_data/waldo/waldo8.jpg

## 12 Waldo from image 9

```
[40]: import matplotlib.pyplot as plt  
      path_9 = "../data/original-images/9.jpg"  
      box_9 = (220, 725, 284, 789)  
      print_box(path_9, box_9)
```



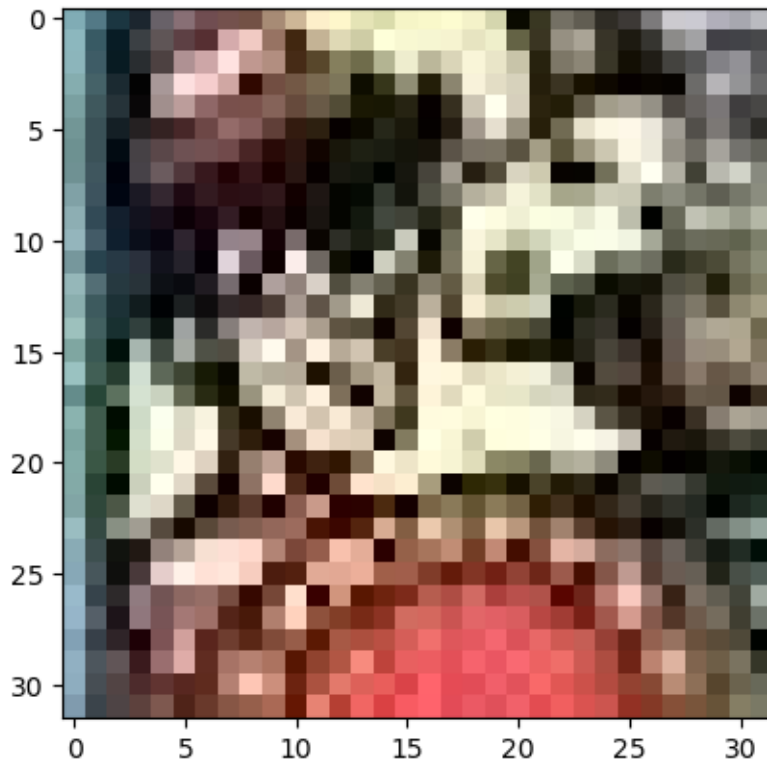
```
[41]: output_path_9 = os.path.join(output_path, "waldo9.jpg")
      save_crop_from_box(path_9, box_9, output_path_9)
```

Image saved in ../data/expanded\_data/waldo/waldo9.jpg

### 13 Waldo from image 10

For this image, we crop a 32×32 patch and resize it to 64×64 because Waldo appears very small in the original photo.

```
[46]: import matplotlib.pyplot as plt
      path_10 = "../data/original-images/10.jpg"
      box_10 = (715,160,747,192)
      print_box(path_10, box_10)
```

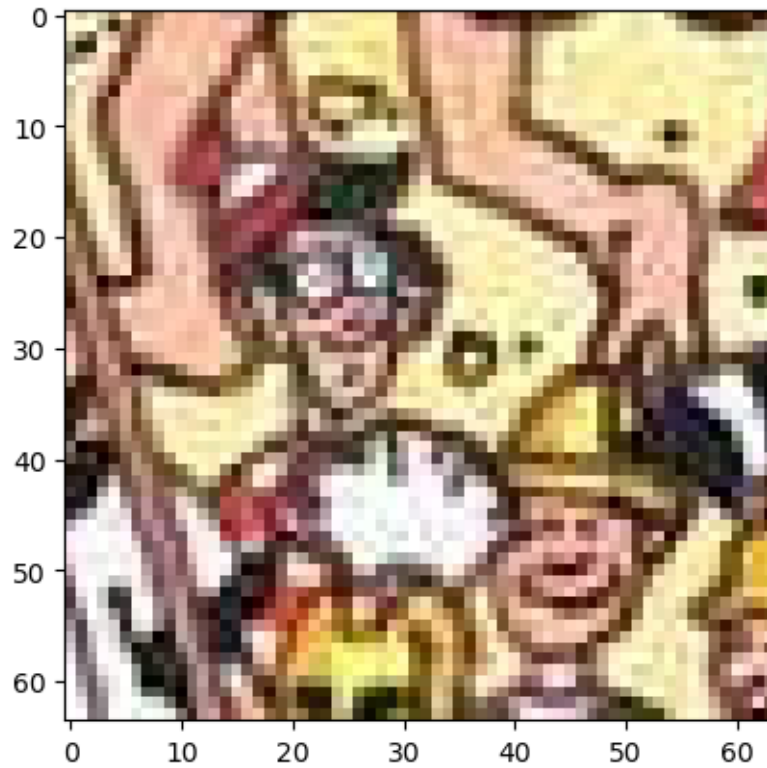


```
[47]: output_path_10 = os.path.join(output_path, "waldo10.jpg")
      save_crop_from_box(path_10, box_10, output_path_10)
```

Image saved in ../data/expanded\_data/waldo/waldo10.jpg

## 14 Waldo from image 11

```
[12]: import matplotlib.pyplot as plt
      path_11 = "../data/original-images/11.jpg"
      box_11 = (450, 1520, 514, 1584)
      print_box(path_11, box_11)
```



```
[13]: output_path_11 = os.path.join(output_path, "waldo11.jpg")  
      save_crop_from_box(path_11, box_11, output_path_11)
```

Image saved in ../data/expanded\_data/waldo/waldo11.jpg

## 15 Second crop from image 11

```
[18]: import matplotlib.pyplot as plt  
      output_path_112 = os.path.join(output_path, "waldo112.jpg")  
      image_112 = Image.open(path_11).convert("RGB")  
      image_112 = image_112.crop((460, 1530, 492, 1562))  
      image_112 = image_112.resize((64,64))  
      save_crop_from_box(image_112, ((0,0,64,64)), output_path_112)
```

Image saved in ../data/expanded\_data/waldo/waldo112.jpg

## 16 Waldo from image 12

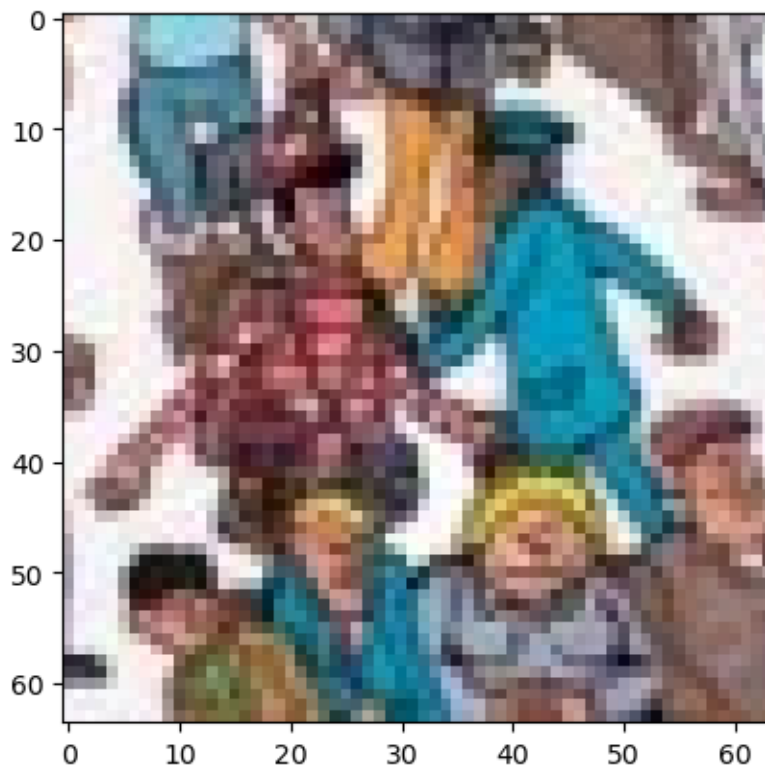
```
[ ]: import matplotlib.pyplot as plt
path_12 = "../data/original-images/12.jpg"
box_12 = (830,520,894,584)
print_box(path_12, box_12)
```

```
[54]: output_path_12 = os.path.join(output_path, "waldo12.jpg")
save_crop_from_box(path_12, box_12, output_path_12)
```

Image saved in ../data/expanded\_data/waldo/waldo12.jpg

## 17 Waldo from image 13

```
[56]: import matplotlib.pyplot as plt
path_13 = "../data/original-images/13.jpg"
box_13 = (915,265,979,329)
print_box(path_13, box_13)
```



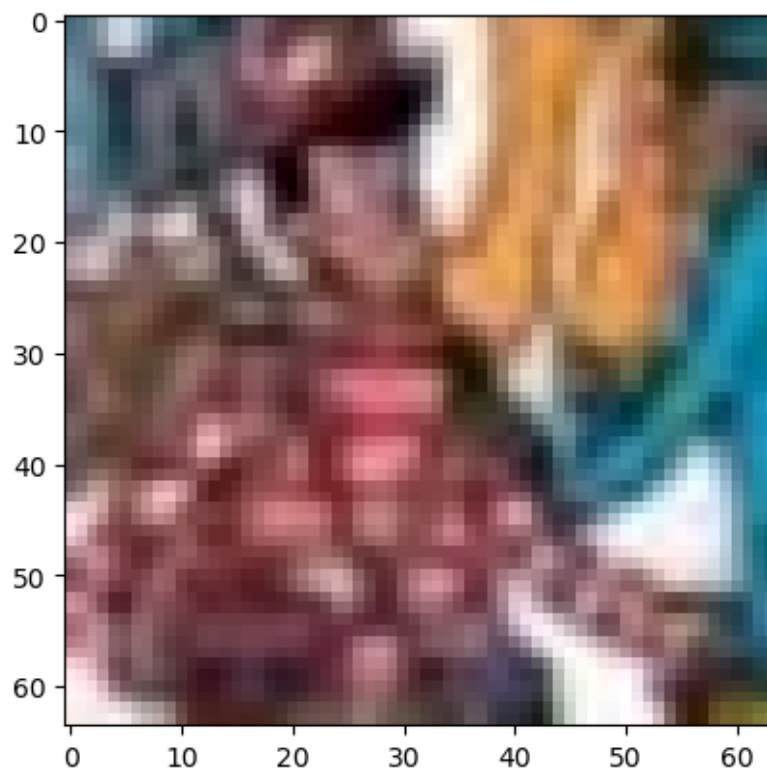
```
[57]: output_path_13 = os.path.join(output_path, "waldo13.jpg")
save_crop_from_box(path_13, box_13, output_path_13)
```



Image saved in ../data/expanded\_data/waldo/waldo13.jpg

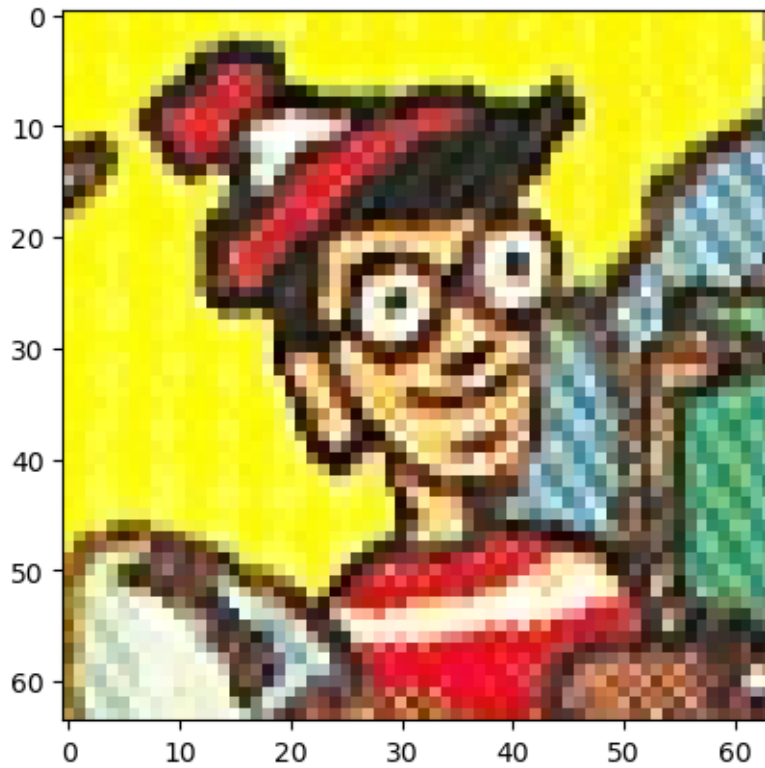
```
[89]: import matplotlib.pyplot as plt
path_132 = "../data/original-images/13.jpg"
box_132 = (925,275,957,307)
image = Image.open(path_132).convert("RGB")
image = image.crop(box_132)
image = image.resize((64,64))
plt.imshow(image)
os_path_132 = os.path.join(output_path,"waldo132.jpg")
save_crop_from_box(image, ((0,0,64,64)), os_path_132)
```

Image saved in ../data/expanded\_data/waldo/waldo132.jpg



## 18 Waldo from image 14

```
[58]: import matplotlib.pyplot as plt
path_14 = "../data/original-images/14.jpg"
box_14 = (190,1875,254,1939)
print_box(path_14, box_14)
```



```
[59]: output_path_14 = os.path.join(output_path, "waldo14.jpg")
      save_crop_from_box(path_14, box_14, output_path_14)
```

Image saved in ../data/expanded\_data/waldo/waldo14.jpg

## 19 Waldo from image 15

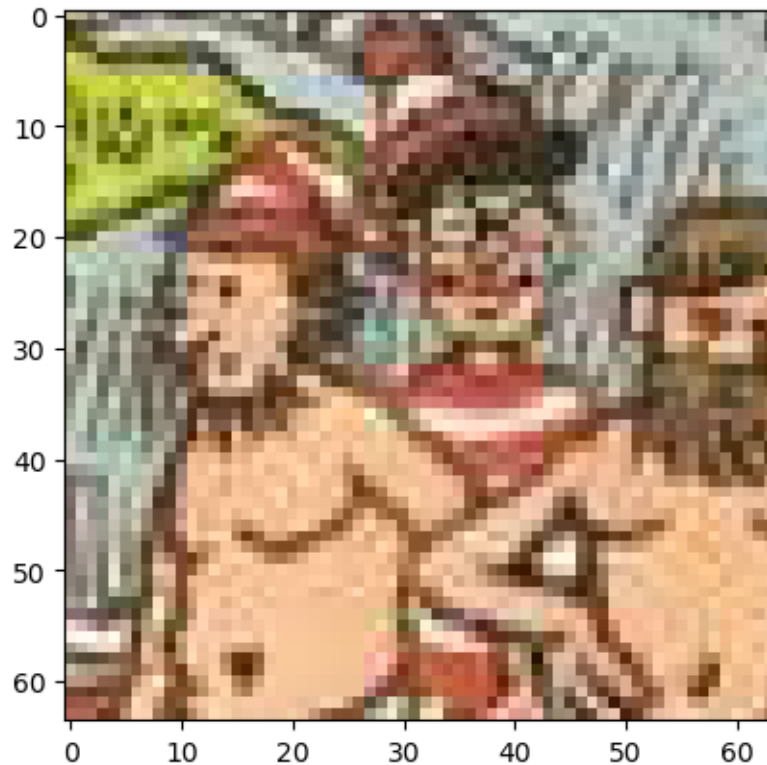
```
[ ]: import matplotlib.pyplot as plt
      path_15 = "../data/original-images/15.jpg"
      box_15 = (275, 430, 339, 494)
      print_box(path_15, box_15)
```

```
[63]: output_path_15 = os.path.join(output_path, "waldo15.jpg")
      save_crop_from_box(path_15, box_15, output_path_15)
```

Image saved in ../data/expanded\_data/waldo/waldo15.jpg

## 20 Waldo from image 17

```
[65]: import matplotlib.pyplot as plt
path_17 = "../data/original-images/17.jpg"
box_17 = (725,250,789,314)
print_box(path_17, box_17)
```

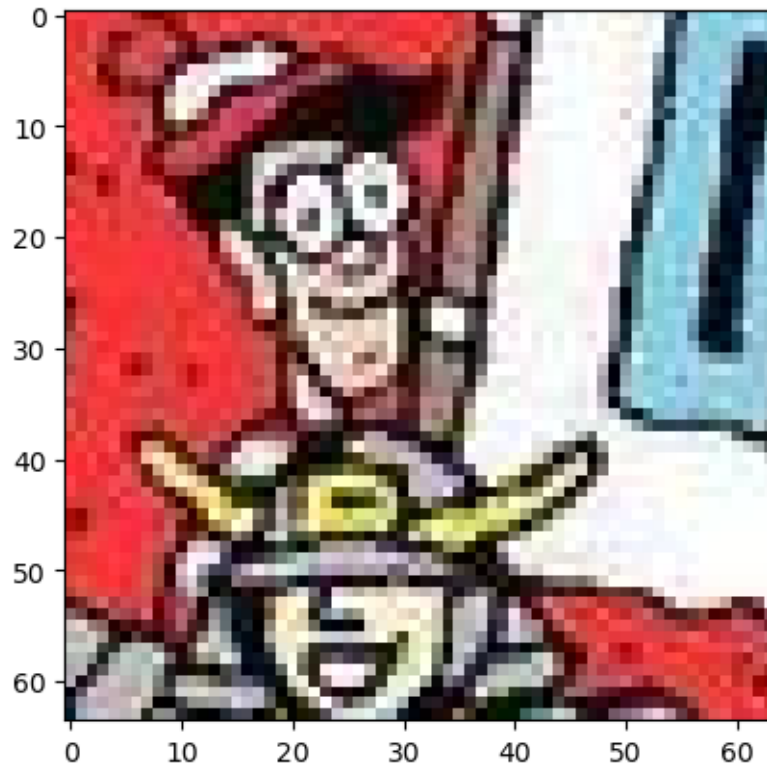


```
[66]: output_path_17 = os.path.join(output_path, "waldo17.jpg")
save_crop_from_box(path_17, box_17, output_path_17)
```

Image saved in ../data/expanded\_data/waldo/waldo17.jpg

## 21 Waldo from image 18

```
[67]: import matplotlib.pyplot as plt
path_18 = "../data/original-images/18.jpg"
box_18 = (1255,75,1319,139)
print_box(path_18, box_18)
```

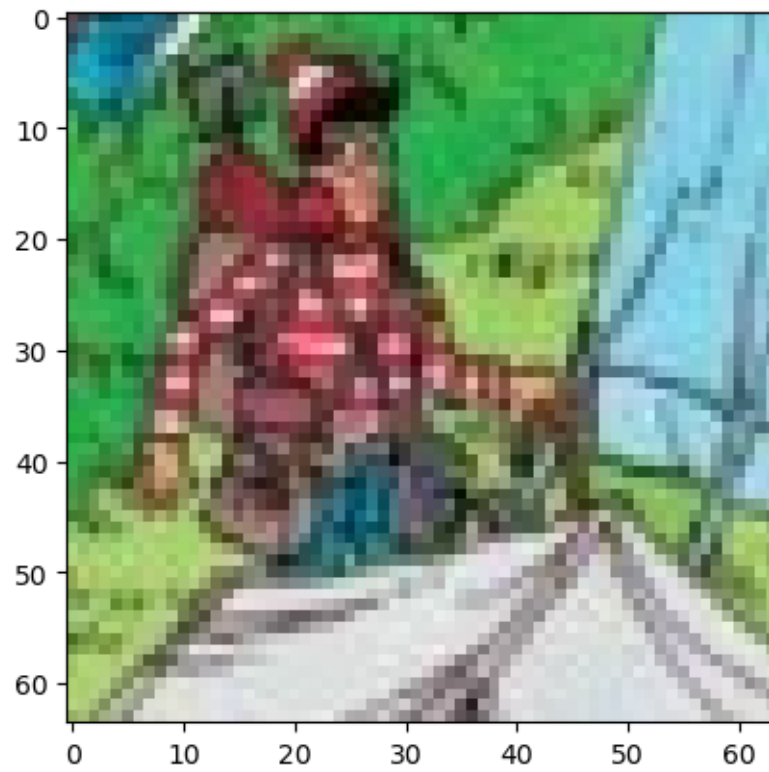


```
[68]: output_path_18 = os.path.join(output_path, "waldo18.jpg")  
      save_crop_from_box(path_18, box_18, output_path_18)
```

Image saved in ../data/expanded\_data/waldo/waldo18.jpg

## 22 Waldo from image 19

```
[70]: import matplotlib.pyplot as plt  
      path_19 = "../data/original-images/19.jpg"  
      box_19 = (320, 620, 384, 684)  
      print_box(path_19, box_19)
```



```
[71]: output_path_19 = os.path.join(output_path, "waldo19.jpg")  
      save_crop_from_box(path_19, box_19, output_path_19)
```

Image saved in ../data/expanded\_data/waldo/waldo19.jpg