# Connecting the library from GitHub

```
!git clone
https://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@github.com/MKJenna/
Recognition_of_electric_circuits
```

```
Cloning into 'Recognition_of_electric_circuits'...
remote: Enumerating objects: 53, done.ote: Counting objects: 100%
(53/53), done.ote: Compressing objects: 100% (52/52), done.ote: Total
53 (delta 13), reused 0 (delta 0), pack-reused 0
```

```
cd '/content/Recognition_of_electric_circuits'
```

```
/content/Recognition_of_electric_circuits
```

```
pwd
```

```
{"type":"string"}
```

```
!pip install easyocr
```

```
Looking in indexes: https://pypi.org/simple, https://us-
python.pkg.dev/colab-wheels/public/simple/
Collecting easyocr
  Downloading easyocr-1.6.2-py3-none-any.whl (2.9 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 2.9/2.9 MB 20.1 MB/s eta
0:00:00
anylinux_2_5_x86_64.manylinux1_x86_64.whl (608 kB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 608.2/608.2 KB 8.0 MB/s eta
0:00:00
ent already satisfied: scipy in /usr/local/lib/python3.9/dist-packages
(from easyocr) (1.10.1)
Requirement already satisfied: torch in /usr/local/lib/python3.9/dist-
packages (from easyocr) (1.13.1+cu116)
Requirement already satisfied: torchvision>=0.5 in
/usr/local/lib/python3.9/dist-packages (from easyocr) (0.14.1+cu116)
Requirement already satisfied: PyYAML in
/usr/local/lib/python3.9/dist-packages (from easyocr) (6.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.9/dist-
packages (from easyocr) (1.22.4)
Collecting python-bidi
  Downloading python_bidi-0.4.2-py2.py3-none-any.whl (30 kB)
Requirement already satisfied: Shapely in
/usr/local/lib/python3.9/dist-packages (from easyocr) (2.0.1)
Requirement already satisfied: Pillow in
/usr/local/lib/python3.9/dist-packages (from easyocr) (8.4.0)
Collecting opencv-python-headless<=4.5.4.60
  Downloading opencv_python_headless-4.5.4.60-cp39-cp39-
manylinux_2_17_x86_64.manylinux2014_x86_64.whl (47.6 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 47.6/47.6 MB 7.8 MB/s eta
```

```
0:00:00
ent already satisfied: scikit-image in /usr/local/lib/python3.9/dist-
packages (from easyocr) (0.19.3)
Collecting ninja
  Downloading ninja-1.11.1-py2.py3-none-
manylinux_2_12_x86_64.manylinux2010_x86_64.whl (145 kB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 146.0/146.0 KB 6.2 MB/s eta
0:00:00
ent already satisfied: typing-extensions in
/usr/local/lib/python3.9/dist-packages (from torchvision>=0.5-
>easyocr) (4.5.0)
Requirement already satisfied: requests in
/usr/local/lib/python3.9/dist-packages (from torchvision>=0.5-
>easyocr) (2.27.1)
Requirement already satisfied: six in /usr/local/lib/python3.9/dist-
packages (from python-bidi->easyocr) (1.16.0)
Requirement already satisfied: packaging>=20.0 in
/usr/local/lib/python3.9/dist-packages (from scikit-image->easyocr)
(23.0)
Requirement already satisfied: imageio>=2.4.1 in
/usr/local/lib/python3.9/dist-packages (from scikit-image->easyocr)
(2.25.1)
Requirement already satisfied: PyWavelets>=1.1.1 in
/usr/local/lib/python3.9/dist-packages (from scikit-image->easyocr)
(1.4.1)
Requirement already satisfied: tifffile>=2019.7.26 in
/usr/local/lib/python3.9/dist-packages (from scikit-image->easyocr)
(2023.3.21)
Requirement already satisfied: networkx>=2.2 in
/usr/local/lib/python3.9/dist-packages (from scikit-image->easyocr)
(3.0)
Requirement already satisfied: idna<4,>=2.5 in
/usr/local/lib/python3.9/dist-packages (from requests-
>torchvision>=0.5->easyocr) (3.4)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in
/usr/local/lib/python3.9/dist-packages (from requests-
>torchvision>=0.5->easyocr) (1.26.15)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.9/dist-packages (from requests-
>torchvision>=0.5->easyocr) (2022.12.7)
Requirement already satisfied: charset-normalizer~=2.0.0 in
/usr/local/lib/python3.9/dist-packages (from requests-
>torchvision>=0.5->easyocr) (2.0.12)
Installing collected packages: pyclipper, ninja, python-bidi, opencv-
python-headless, easyocr
  Attempting uninstall: opencv-python-headless
    Found existing installation: opencv-python-headless 4.7.0.72
    Uninstalling opencv-python-headless-4.7.0.72:
      Successfully uninstalled opencv-python-headless-4.7.0.72
```

```
Successfully installed easyocr-1.6.2 ninja-1.11.1 opencv-python-
headless-4.5.4.60 pyclipper-1.3.0.post4 python-bidi-0.4.2
```

Importing all functions

```python
from circuits_recognition import *
```

## Element recognition

```python
ex = '/content/drive/MyDrive/Colab Notebooks/C116_D2_P1.jpg'
ex2 = '/content/drive/MyDrive/Colab Notebooks/C151_D2_P3.jpg'
df = detect_elements(ex)
df
```

```
Downloading: "https://github.com/ultralytics/yolov5/zipball/master" to
/root/.cache/torch/hub/master.zip
```

|    | xmin | ymin | xmax | ymax | confidence | class |
|----|------|------|------|------|------------|-------|
| 0  | 1002.592651 | 462.200836 | 1109.412720 | 513.973572 | 0.916025 | 1 |
| 1  | 731.323425 | 490.996887 | 827.845947 | 546.989990 | 0.904477 | 1 |
| 2  | 320.214294 | 575.075256 | 435.268250 | 633.633362 | 0.896061 | 1 |
| 3  | 315.809814 | 373.099640 | 416.507721 | 421.227844 | 0.884853 | 1 |
| 4  | 674.243774 | 351.402374 | 861.372620 | 504.295227 | 0.867660 | 39 |
| 5  | 295.469513 | 266.250214 | 434.117920 | 376.991333 | 0.818418 | 38 |
| 6  | 301.005554 | 459.192993 | 451.751007 | 579.897583 | 0.792786 | 38 |
| 7  | 967.844666 | 383.416534 | 1100.620239 | 471.135986 | 0.764852 | 40 |
| 8  | 552.846252 | 502.989868 | 573.909485 | 524.179199 | 0.753864 | 2 |
| 9  | 550.154175 | 301.464325 | 574.544495 | 323.714600 | 0.731971 | 2 |
| 10 | 557.544983 | 396.262421 | 574.390625 | 413.620270 | 0.730569 | 2 |
| 11 | 1278.467896 | 425.778290 | 1301.450684 | 447.097717 | 0.729362 | 4 |
| 12 | 558.079285 | 437.394196 | 574.752869 | 454.117432 | 0.700697 | 2 |
| 13 | 147.936371 | 294.228851 | 166.163910 | 309.871277 | 0.656945 | 4 |
| 14 | 183.409103 | 539.861694 | 201.265778 | 554.925842 | 0.655168 | 4 |
| 15 | 184.093689 | 499.333405 | 201.795303 | 514.982666 | 0.649880 | 4 |
```

```
16   162.453964  336.861298   178.975769  350.085663     0.626256
4

         name
0        text
1        text
2        text
3        text
4          or
5         and
6         and
7         not
8    junction
9    junction
10   junction
11   terminal
12   junction
13   terminal
14   terminal
15   terminal
16   terminal

df2 = detect_elements(ex2, p=0.6)
df2

Using cache found in /root/.cache/torch/hub/ultralytics_yolov5_master

            xmin          ymin          xmax          ymax  confidence
class  \
0    2701.203369  1353.492065  2830.249512  1460.335693    0.850246
1
1    1000.135132  1356.864380  1131.133545  1431.224243    0.838423
1
2    1544.046631  1107.252563  1662.726807  1192.524414    0.835824
1
3    2649.101562  1183.625977  2775.333008  1269.936401    0.828721
1
4    3105.239746  1415.812012  3177.355469  1502.929321    0.818401
1
5    1989.751343  1257.983521  2111.117920  1532.632812    0.818192
10
6    1181.753418  1106.057129  1301.232300  1178.586548    0.811133
1
7    1683.839478  1318.081543  1770.311890  1423.061035    0.804831
1
8    1145.921631   990.571533  1350.141968  1096.656006    0.794563
10
9    2125.985107  1381.370117  2240.943848  1494.807373    0.778735
1
10   2881.257324   933.339722  2979.327637  1036.334351    0.772812
1
```

```
11  1795.990967  1259.162231  1865.598145  1435.162109    0.746018
10
12  1013.917542   849.167480  1095.791016   923.448425    0.729992
1
13  2978.837891  1011.662659  3036.552490  1077.687622    0.664370
1

        name
0       text
1       text
2       text
3       text
4       text
5   resistor
6       text
7       text
8   resistor
9       text
10      text
11  resistor
12      text
13      text
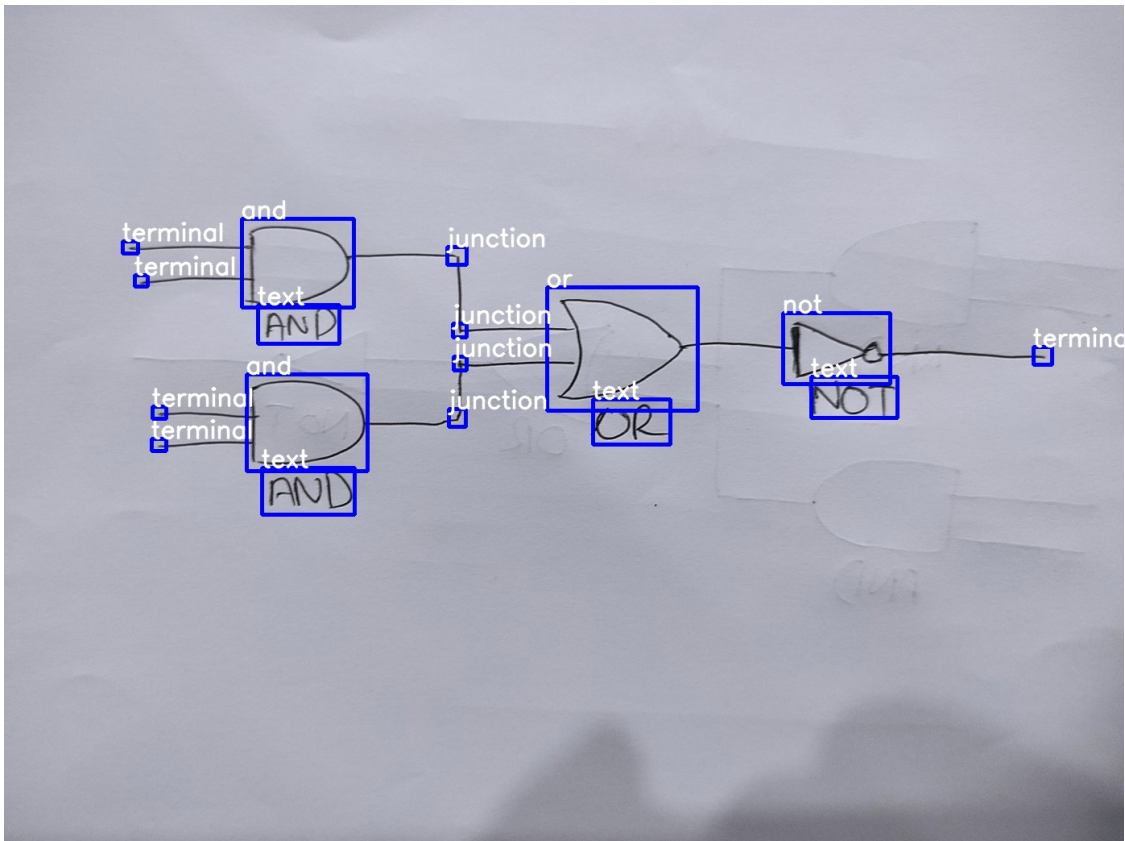```

Write a question mark (?) and the name of the function you are interested in to get more information about the parameters:

```
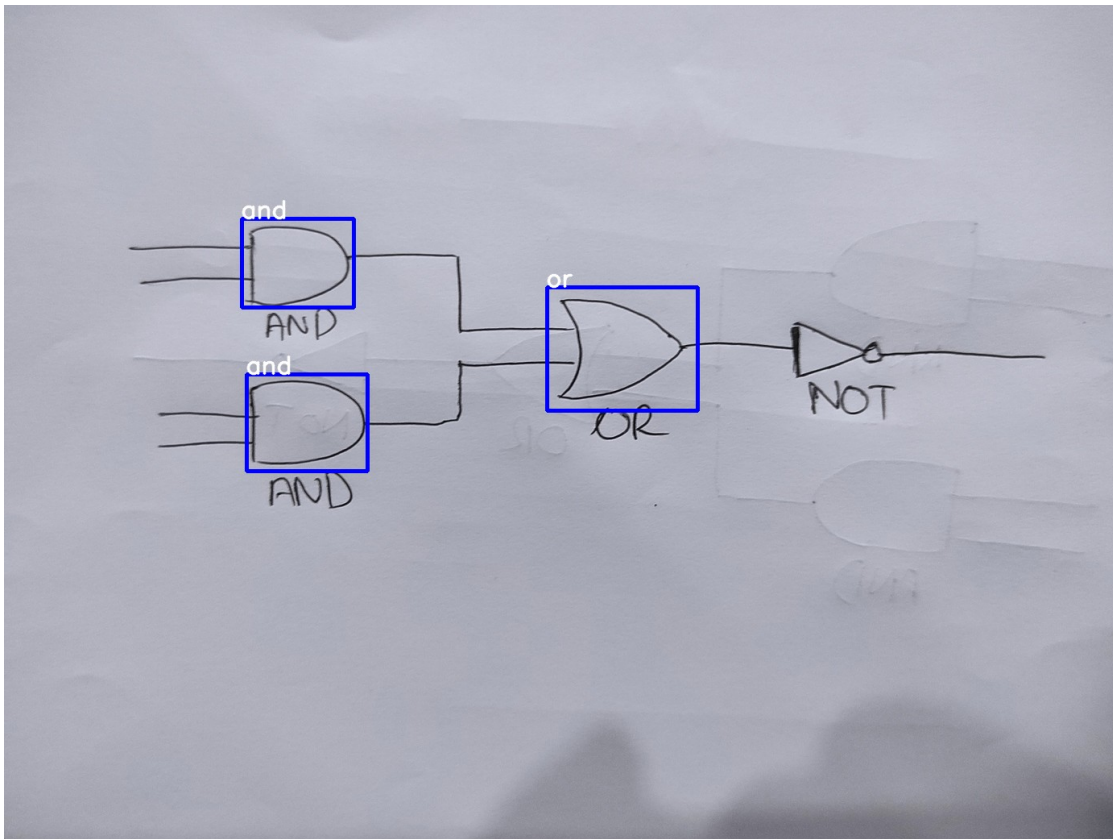?detect_elements
```

## Displaying elements in the image

```
draw_boxes(ex, df, ['all'], display_names=True)
```

```
draw_boxes(ex, df, ['or', 'and'], display_names=True)
```

```
draw_boxes(ex2, df2, ['all'], display_names=True)
```

## Recognizing text in an image

Text recognition takes 1 to 5 minutes.

```
df_with_text = text_recognition(ex, df)
df_with_text
```

```
WARNING:easyocr.easyocr:CUDA not available - defaulting to CPU. Note:
This module is much faster with a GPU.
WARNING:easyocr.easyocr:Downloading detection model, please wait. This
may take several minutes depending upon your network connection.
```

Progress: |████████████████████████████████████████████| 100.0%
Complete

```
WARNING:easyocr.easyocr:Downloading recognition model, please wait.
This may take several minutes depending upon your network connection.
```

Progress: |████████████████████████████████████████████| 100.0%
Complete

```
          xmin         ymin         xmax         ymax   confidence
class  \
0    1002.592651   462.200836   1109.412720   513.973572     0.916025
1
```

| | | | | | |
|---|---|---|---|---|---|
| 1 | 731.323425 | 490.996887 | 827.845947 | 546.989990 | 0.904477 |
| 1 | | | | | |
| 2 | 320.214294 | 575.075256 | 435.268250 | 633.633362 | 0.896061 |
| 1 | | | | | |
| 3 | 315.809814 | 373.099640 | 416.507721 | 421.227844 | 0.884853 |
| 1 | | | | | |
| 4 | 674.243774 | 351.402374 | 861.372620 | 504.295227 | 0.867660 |
| 39 | | | | | |
| 5 | 295.469513 | 266.250214 | 434.117920 | 376.991333 | 0.818418 |
| 38 | | | | | |
| 6 | 301.005554 | 459.192993 | 451.751007 | 579.897583 | 0.792786 |
| 38 | | | | | |
| 7 | 967.844666 | 383.416534 | 1100.620239 | 471.135986 | 0.764852 |
| 40 | | | | | |
| 8 | 552.846252 | 502.989868 | 573.909485 | 524.179199 | 0.753864 |
| 2 | | | | | |
| 9 | 550.154175 | 301.464325 | 574.544495 | 323.714600 | 0.731971 |
| 2 | | | | | |
| 10 | 557.544983 | 396.262421 | 574.390625 | 413.620270 | 0.730569 |
| 2 | | | | | |
| 11 | 1278.467896 | 425.778290 | 1301.450684 | 447.097717 | 0.729362 |
| 4 | | | | | |
| 12 | 558.079285 | 437.394196 | 574.752869 | 454.117432 | 0.700697 |
| 2 | | | | | |
| 13 | 147.936371 | 294.228851 | 166.163910 | 309.871277 | 0.656945 |
| 4 | | | | | |
| 14 | 183.409103 | 539.861694 | 201.265778 | 554.925842 | 0.655168 |
| 4 | | | | | |
| 15 | 184.093689 | 499.333405 | 201.795303 | 514.982666 | 0.649880 |
| 4 | | | | | |
| 16 | 162.453964 | 336.861298 | 178.975769 | 350.085663 | 0.626256 |
| 4 | | | | | |

| | name | attribute |
|---|---|---|
| 0 | text | None |
| 1 | text | None |
| 2 | text | None |
| 3 | text | None |
| 4 | or | Op |
| 5 | and | AnD |
| 6 | and | ND |
| 7 | not | NOT |
| 8 | junction | None |
| 9 | junction | None |
| 10 | junction | None |
| 11 | terminal | None |
| 12 | junction | None |
| 13 | terminal | None |
| 14 | terminal | None |

```
15  terminal      None
16  terminal      None
```