Partage de connaissance

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Anatomy of an image classifier

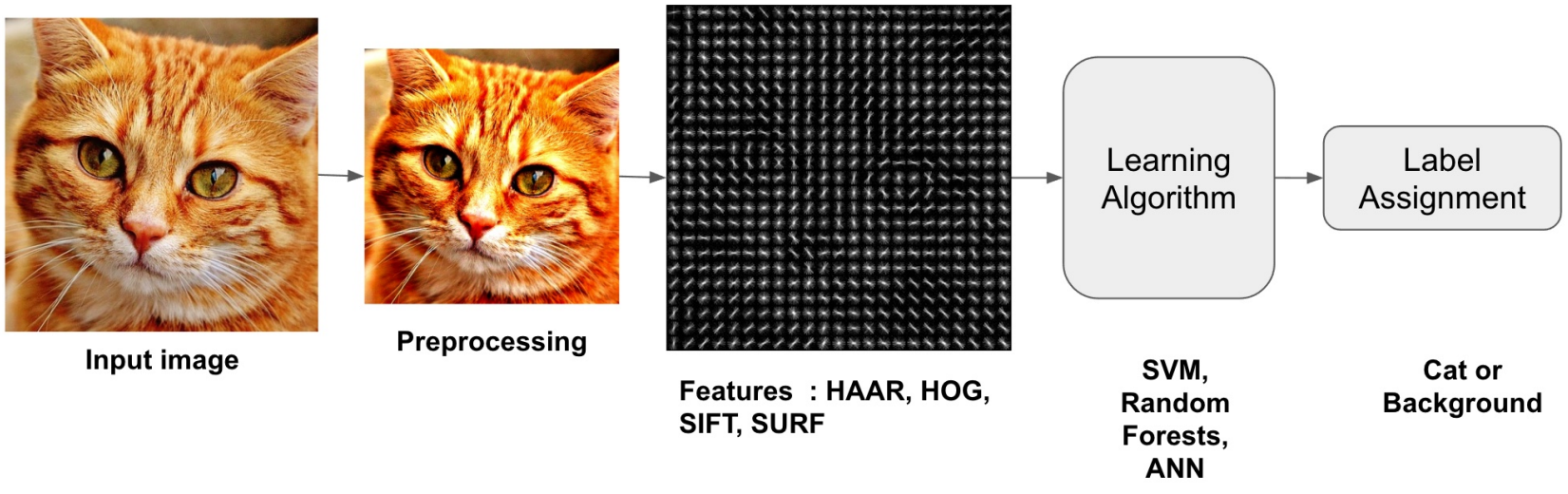
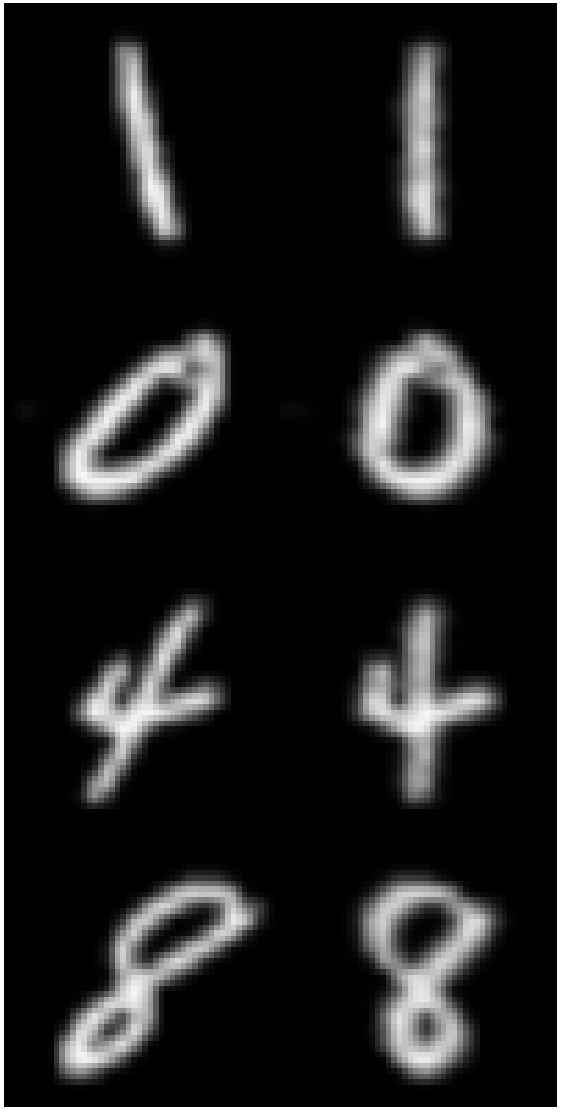


Figure 1

Preprocessing

Deskew

Align an image to a reference assits the classification algorithm [1]



Deskewing simple grayscale images can be achieved using image moments (distance and intensity of pixels).

```
def deskew(img):
    m = cv2.moments(img)
    if abs(m['mu02']) < 1e-2:
        # no deskewing needed.
        return img.copy()
    # Calculate skew based on central momemts.
    skew = m['mu11']/m['mu02']
    # Calculate affine transform to correct skewness.
    M = np.float32([[1, skew, -0.5*SZ*skew], [0, 1, 0]])
    # Apply affine transform
    img = cv2.warpAffine(img, M, (SZ, SZ), flags=cv2.WARP_I
    return img
```

Histogram equalization

Increase image contrast using the image's histogram.

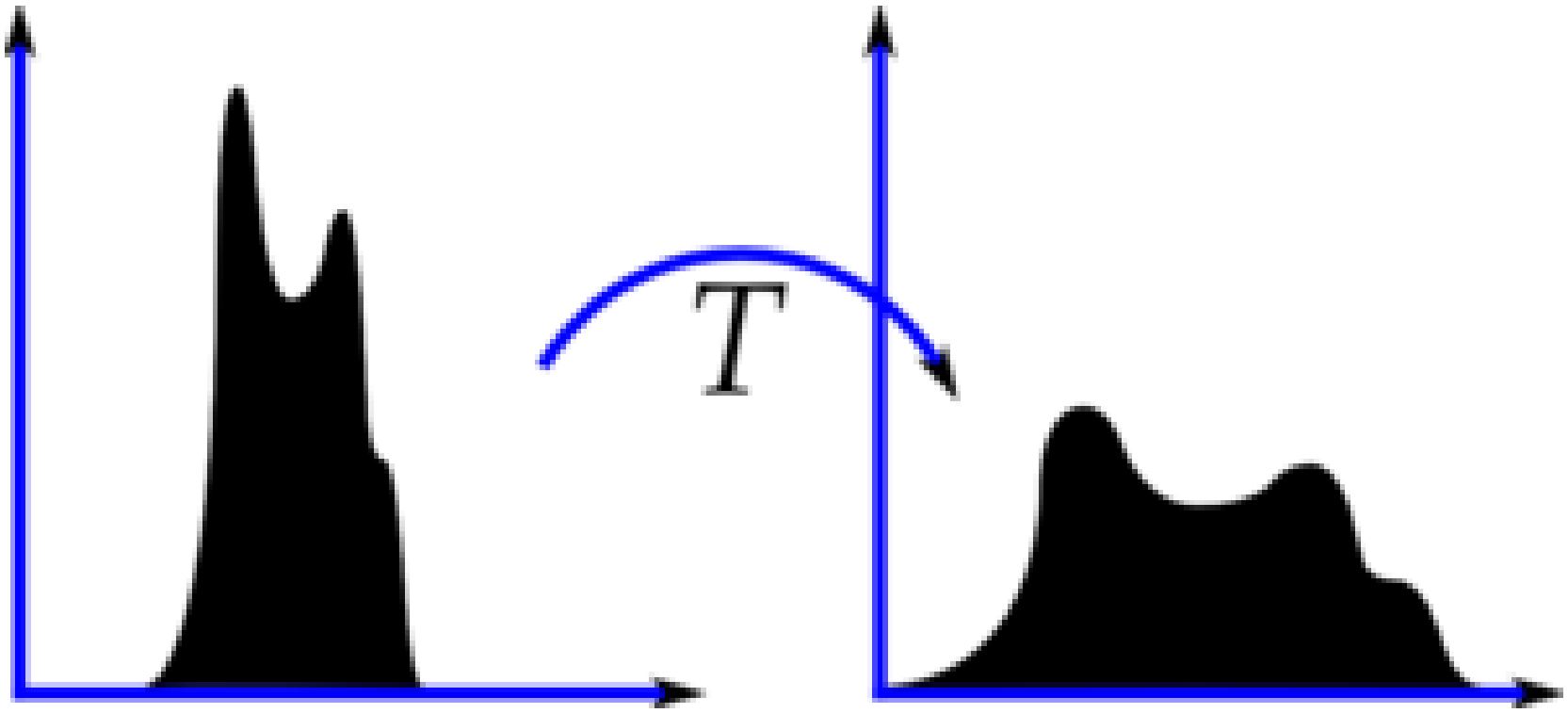
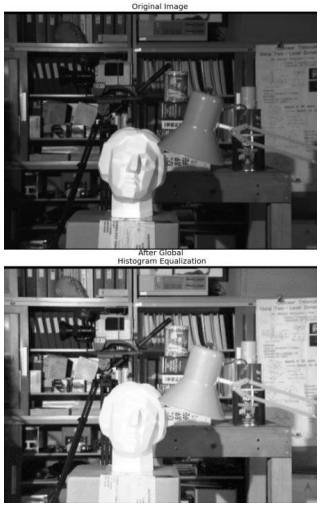


Figure 3

Transformation function which maps the input pixels in brighter region to output pixels in full region.

```
img = cv2.imread('wiki.jpg',0)
equ = cv2.equalizeHist(img)
res = np.hstack((img,equ)) #stacking images side-by-side
cv2.imwrite('res.png',res)
```

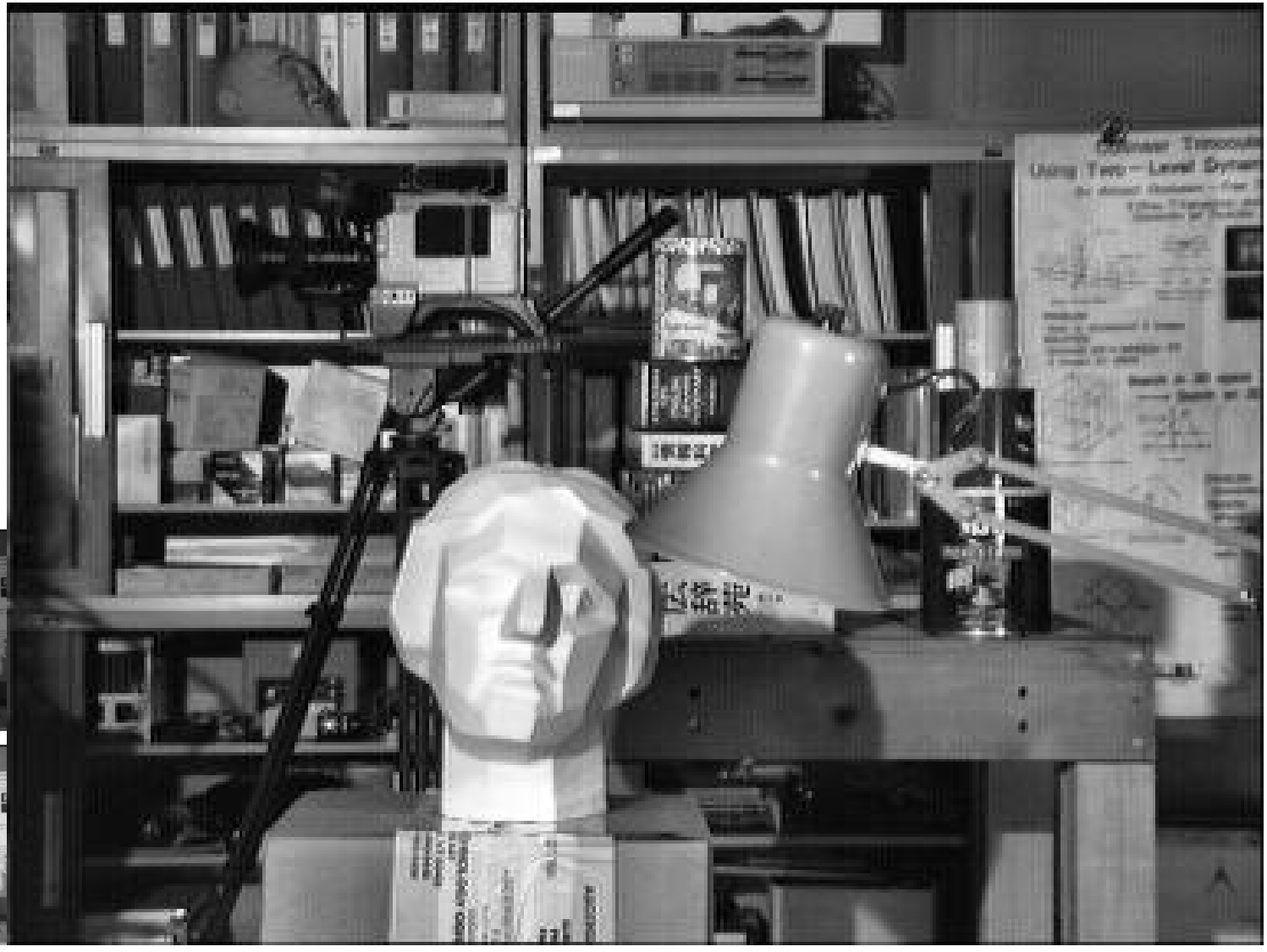
- Histogram equalization considers the global contrast of the image
- The background contrast improves after histogram equalization, but the face of statue lost most of the information there due to over-brightness.

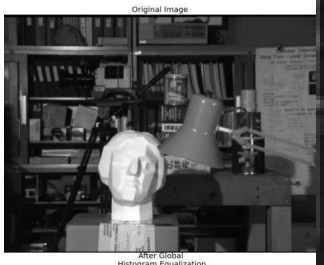


[1]

Adaptive Histogram Equalization

- Histogram is equalized inside blocks.
- Histogram would confine to a small region (unless there is noise).
- If noise is there, it will be amplified. To avoid this, contrast limiting is applied.
- If any histogram bin is above the specified contrast limit (by default 40 in OpenCV), those pixels are clipped and distributed uniformly to other bins before applying histogram equalization.
- After equalization, to remove artifacts in tile borders, bilinear interpolation is applied.

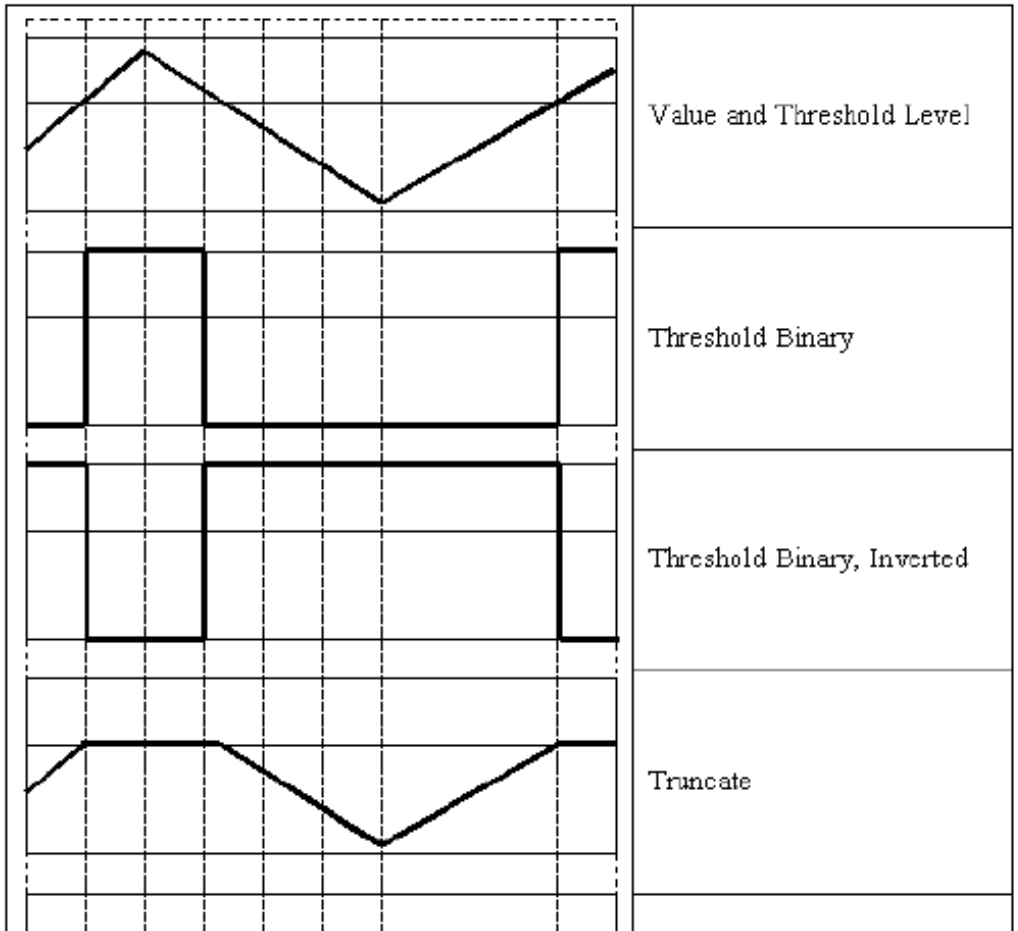



Original Image


After Global
Histogram Equalization

Image thresholding

- Method of image segmentation
- If pixel value is greater than a threshold value, it is assigned one value, else it is assigned another value.



```
# Thresholding with threshold value set 127
th, dst = cv2.threshold(src,127,255, cv2.THRESH_BINARY);
cv2.imwrite("opencv-thresh-binary.jpg", dst);

# Thresholding using THRESH_TOZERO
th, dst = cv2.threshold(src,127,255, cv2.THRESH_TOZERO);
cv2.imwrite("opencv-thresh-tozero.jpg", dst);

# Thresholding using THRESH_TOZERO_INV
th, dst = cv2.threshold(src,127,255, cv2.THRESH_TOZERO_INV)
cv2.imwrite("opencv-thresh-to-zero-inv.jpg", dst);
```

Adaptative thresholding

- The algorithm calculate the threshold for a small regions of the image.
- Different thresholds for different regions of the same image
- Gives us better results for images with varying illumination.

`cv2.ADAPTIVE_THRESH_MEAN_C` : threshold value is the mean of neighbourhood area. `cv2.ADAPTIVE_THRESH_GAUSSIAN_C` : threshold value is the weighted sum of neighbourhood values where weights are a gaussian window.

```
th2 = cv2.adaptiveThreshold(img,255,cv2.ADAPTIVE_THRESH_MEA
            cv2.THRESH_BINARY,11,2)
th3 = cv2.adaptiveThreshold(img,255,cv2.ADAPTIVE_THRESH_GAU
            cv2.THRESH_BINARY,11,2)
```

Otsu's Binarization

- Automatically calculates a threshold value from image histogram for a bimodal image
- Otsu 1

cv2.threshold() function is used, but pass an extra flag, cv2.THRESH_OTSU

```
# global thresholding
ret1,th1 = cv2.threshold(img,127,255,cv2.THRESH_BINARY)
# Otsu's thresholding
ret2,th2 = cv2.threshold(img,0,255,cv2.THRESH_BINARY+cv2.TH
# Otsu's thresholding after Gaussian filtering
blur = cv2.GaussianBlur(img,(5,5),0)
ret3,th3 = cv2.threshold(blur,0,255,cv2.THRESH_BINARY+cv2.T
```

Object detection

Test

Feature Extraction

- HOG
- SIFT
- SURF

Test

```
if (a > 3) {
  moveShip(5 * gravity, DOWN);
}
if (a > 3) {
  moveShip(5 * gravity, DOWN);
}
if (a > 3) {
  moveShip(5 * gravity, DOWN);
}
if (a > 3) {
  moveShip(5 * gravity, DOWN);
}
if (a > 3) {
  moveShip(5 * gravity, DOWN);
}
if (a > 3) {
```

fruit	price
apple	2.05
pear	1.37
orange	3.09

The limerick packs laughs anatomical
In space that is quite economical.
   But the good ones I've seen
   So seldom are clean
And the clean ones so seldom are comical

200 Main St.
Berkeley, CA 94718

- Eat eggs
- Drink coffee

In the evening

Dinner

This is an inline link, and here's one with a title.

See my website.