

segmentacion-de-imagenes

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Segmentación y Refinamiento

```
[1]: import cv2
import numpy as np
import matplotlib.pyplot as plt
import os

# Ruta a la carpeta con las imágenes originales y las máscaras
image_folder = "/content/ImagenesReto"
output_folder = "/content/Segmentacion"

# Cargar todas las imágenes desde la carpeta
def load_images_from_folder(folder):
    images = []
    for filename in os.listdir(folder):
        img = cv2.imread(os.path.join(folder, filename), cv2.IMREAD_GRAYSCALE)
        if img is not None:
            images.append(img)
    return images

# Aplicar binarización por threshold
def apply_threshold(image, threshold_value=127):
    _, binary_img = cv2.threshold(image, threshold_value, 255, cv2.
    THRESH_BINARY)
    return binary_img

# Aplicar operación de apertura (erosión seguida de dilatación)
def apply_opening(binary_img, kernel_size=(5, 5)):
    kernel = np.ones(kernel_size, np.uint8)
    opening = cv2.morphologyEx(binary_img, cv2.MORPH_OPEN, kernel)
    return opening

# Aplicar operación de cierre (dilatación seguida de erosión)
def apply_closing(binary_img, kernel_size=(5, 5)):
    kernel = np.ones(kernel_size, np.uint8)
    closing = cv2.morphologyEx(binary_img, cv2.MORPH_CLOSE, kernel)
```

```

    return closing

# Mostrar imagen con matplotlib
def show_image(img, title="Image", cmap_type='gray'):
    plt.figure(figsize=(6, 6))
    plt.imshow(img, cmap=cmap_type)
    plt.title(title)
    plt.axis('off')
    plt.show()

# Cargar imágenes
images = load_images_from_folder(image_folder)

for idx, img in enumerate(images):
    print(f"Procesando imagen {idx+1}")

    # Mostrar imagen original
    show_image(img, title=f"Imagen Original {idx+1}")

    # Aplicar binarización
    binary_img = apply_threshold(img, threshold_value=127)
    show_image(binary_img, title=f"Imagen Binarizada {idx+1}")

    # Refinar blobs: aplicar apertura y cierre
    refined_mask = apply_opening(binary_img, kernel_size=(5, 5))
    refined_mask = apply_closing(refined_mask, kernel_size=(5, 5))
    show_image(refined_mask, title=f"Máscara Refinada {idx+1}")

    # Guardar máscara refinada en la carpeta de salida
    output_path = os.path.join(output_folder, f"refined_mask_{idx+1}.png")
    cv2.imwrite(output_path, refined_mask)

```

Procesando imagen 1

Imagen Original 1

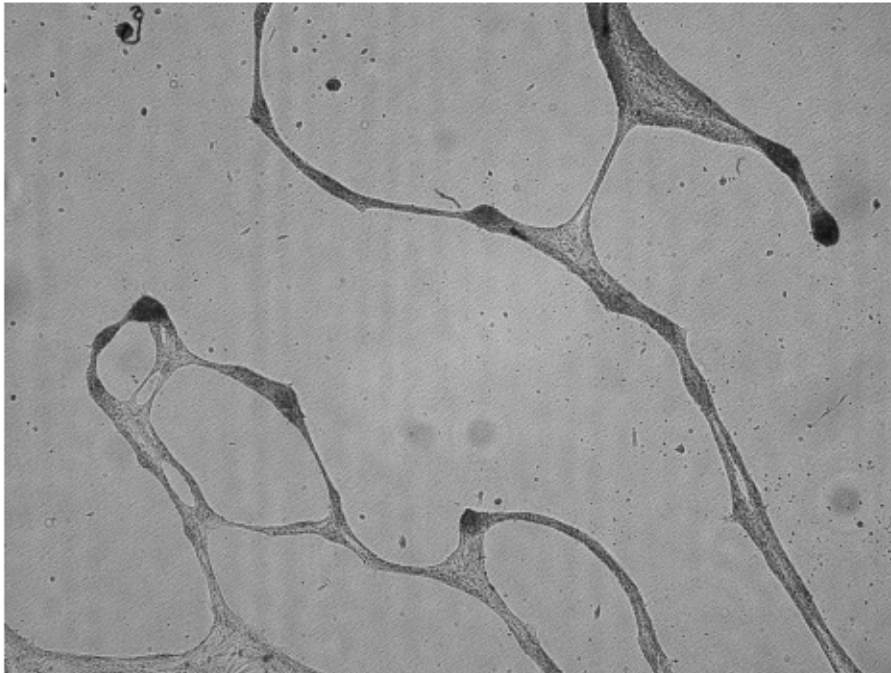
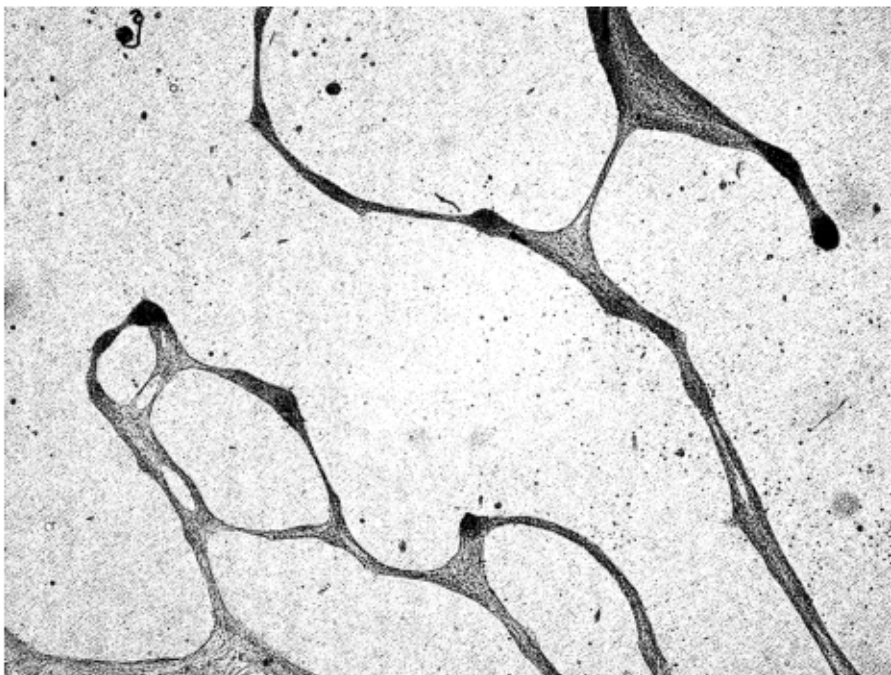


Imagen Binarizada 1



Máscara Refinada 1

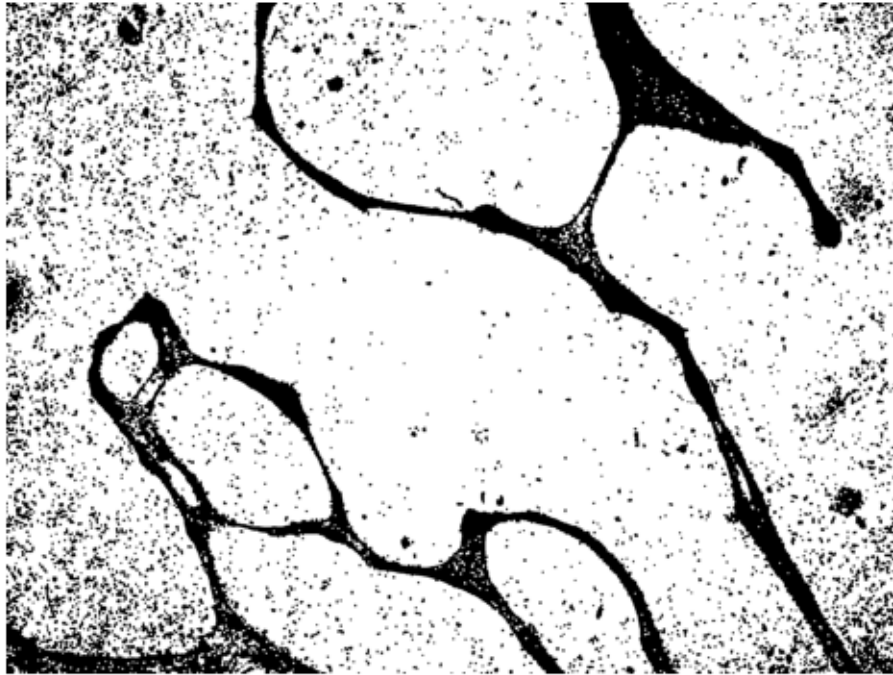


Image Masking y obtención de crops

```
[3]: # Función para obtener crops basados en la máscara
def get_crops(image, mask):
    contours, _ = cv2.findContours(mask, cv2.RETR_EXTERNAL, cv2.
    ↪CHAIN_APPROX_SIMPLE)
    crops = []

    for contour in contours:
        x, y, w, h = cv2.boundingRect(contour)
        crop = image[y:y+h, x:x+w] # Extraer el recorte
        crops.append((crop, w, h)) # Guardar la imagen y sus dimensiones
    return crops

# Aplicar "image masking" y obtener crops
for idx, img in enumerate(images):
    mask_path = os.path.join(output_folder, f"refined_mask_{idx+1}.png")
    mask = cv2.imread(mask_path, cv2.IMREAD_GRAYSCALE)

    # Obtener crops a partir de la máscara
    crops = get_crops(img, mask)

    # Mostrar y guardar los crops
```

```

for i, (crop, w, h) in enumerate(crops):
    print(f"Crop {i+1}: Ancho = {w}, Alto = {h}")
    #show_image(crop, title=f"Crop {i+1}")

```

```

Crop 1: Ancho = 5, Alto = 3
Crop 2: Ancho = 7, Alto = 3
Crop 3: Ancho = 7, Alto = 4
Crop 4: Ancho = 5, Alto = 4
Crop 5: Ancho = 9, Alto = 4
Crop 6: Ancho = 7, Alto = 5
Crop 7: Ancho = 6, Alto = 5
Crop 8: Ancho = 7, Alto = 6
Crop 9: Ancho = 5, Alto = 6
Crop 10: Ancho = 5, Alto = 6
Crop 11: Ancho = 15, Alto = 7
Crop 12: Ancho = 20, Alto = 7
Crop 13: Ancho = 5, Alto = 7
Crop 14: Ancho = 18, Alto = 8
Crop 15: Ancho = 5, Alto = 8
Crop 16: Ancho = 8, Alto = 6
Crop 17: Ancho = 5, Alto = 5
Crop 18: Ancho = 6, Alto = 5
Crop 19: Ancho = 24, Alto = 11
Crop 20: Ancho = 12, Alto = 12
Crop 21: Ancho = 5, Alto = 5
Crop 22: Ancho = 8, Alto = 14
Crop 23: Ancho = 28, Alto = 15
Crop 24: Ancho = 11, Alto = 11
Crop 25: Ancho = 8, Alto = 8
Crop 26: Ancho = 5, Alto = 5
Crop 27: Ancho = 6, Alto = 5
Crop 28: Ancho = 5, Alto = 5
Crop 29: Ancho = 6, Alto = 6
Crop 30: Ancho = 7, Alto = 5
Crop 31: Ancho = 5, Alto = 5
Crop 32: Ancho = 5, Alto = 5
Crop 33: Ancho = 6, Alto = 5
Crop 34: Ancho = 13, Alto = 9
Crop 35: Ancho = 7, Alto = 7
Crop 36: Ancho = 8, Alto = 6
Crop 37: Ancho = 6, Alto = 6
Crop 38: Ancho = 5, Alto = 5
Crop 39: Ancho = 10, Alto = 6
Crop 40: Ancho = 16, Alto = 8
Crop 41: Ancho = 5, Alto = 5
Crop 42: Ancho = 5, Alto = 5
Crop 43: Ancho = 5, Alto = 6

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Crop 44: Ancho = 5, Alto = 6
Crop 45: Ancho = 6, Alto = 6
Crop 46: Ancho = 25, Alto = 26
Crop 47: Ancho = 22, Alto = 23
Crop 48: Ancho = 6, Alto = 6
Crop 49: Ancho = 6, Alto = 5
Crop 50: Ancho = 10, Alto = 10
Crop 51: Ancho = 30, Alto = 30
Crop 52: Ancho = 6, Alto = 7
Crop 53: Ancho = 20, Alto = 31
Crop 54: Ancho = 13, Alto = 9
Crop 55: Ancho = 12, Alto = 19
Crop 56: Ancho = 7, Alto = 6
Crop 57: Ancho = 11, Alto = 9
Crop 58: Ancho = 6, Alto = 5
Crop 59: Ancho = 8, Alto = 9
Crop 60: Ancho = 6, Alto = 6
Crop 61: Ancho = 5, Alto = 5
Crop 62: Ancho = 8, Alto = 6
Crop 63: Ancho = 54, Alto = 36
Crop 64: Ancho = 6, Alto = 5
Crop 65: Ancho = 14, Alto = 29
Crop 66: Ancho = 5, Alto = 5
Crop 67: Ancho = 5, Alto = 5
Crop 68: Ancho = 8, Alto = 5
Crop 69: Ancho = 5, Alto = 5
Crop 70: Ancho = 19, Alto = 12
Crop 71: Ancho = 7, Alto = 9
Crop 72: Ancho = 26, Alto = 21
Crop 73: Ancho = 5, Alto = 6
Crop 74: Ancho = 12, Alto = 10
Crop 75: Ancho = 5, Alto = 6
Crop 76: Ancho = 7, Alto = 6
Crop 77: Ancho = 22, Alto = 22
Crop 78: Ancho = 7, Alto = 7
Crop 79: Ancho = 16, Alto = 12
Crop 80: Ancho = 96, Alto = 50
Crop 81: Ancho = 14, Alto = 19
Crop 82: Ancho = 5, Alto = 6
Crop 83: Ancho = 5, Alto = 5
Crop 84: Ancho = 6, Alto = 5
Crop 85: Ancho = 5, Alto = 6
Crop 86: Ancho = 6, Alto = 6
Crop 87: Ancho = 5, Alto = 5
Crop 88: Ancho = 19, Alto = 34
Crop 89: Ancho = 10, Alto = 17
Crop 90: Ancho = 10, Alto = 10
Crop 91: Ancho = 5, Alto = 5

Crop 92: Ancho = 18, Alto = 29
Crop 93: Ancho = 25, Alto = 12
Crop 94: Ancho = 7, Alto = 5
Crop 95: Ancho = 5, Alto = 6
Crop 96: Ancho = 5, Alto = 5
Crop 97: Ancho = 11, Alto = 12
Crop 98: Ancho = 6, Alto = 5
Crop 99: Ancho = 9, Alto = 5
Crop 100: Ancho = 8, Alto = 10
Crop 101: Ancho = 6, Alto = 5
Crop 102: Ancho = 7, Alto = 19
Crop 103: Ancho = 5, Alto = 8
Crop 104: Ancho = 15, Alto = 11
Crop 105: Ancho = 6, Alto = 6
Crop 106: Ancho = 15, Alto = 21
Crop 107: Ancho = 18, Alto = 10
Crop 108: Ancho = 8, Alto = 11
Crop 109: Ancho = 3, Alto = 7
Crop 110: Ancho = 5, Alto = 5
Crop 111: Ancho = 6, Alto = 5
Crop 112: Ancho = 6, Alto = 6
Crop 113: Ancho = 10, Alto = 6
Crop 114: Ancho = 7, Alto = 7
Crop 115: Ancho = 34, Alto = 21
Crop 116: Ancho = 7, Alto = 7
Crop 117: Ancho = 5, Alto = 5
Crop 118: Ancho = 6, Alto = 6
Crop 119: Ancho = 16, Alto = 10
Crop 120: Ancho = 78, Alto = 100
Crop 121: Ancho = 6, Alto = 5
Crop 122: Ancho = 79, Alto = 63
Crop 123: Ancho = 5, Alto = 5
Crop 124: Ancho = 8, Alto = 5
Crop 125: Ancho = 9, Alto = 8
Crop 126: Ancho = 8, Alto = 6
Crop 127: Ancho = 5, Alto = 7
Crop 128: Ancho = 6, Alto = 6
Crop 129: Ancho = 6, Alto = 5
Crop 130: Ancho = 9, Alto = 12
Crop 131: Ancho = 22, Alto = 16
Crop 132: Ancho = 14, Alto = 15
Crop 133: Ancho = 6, Alto = 7
Crop 134: Ancho = 6, Alto = 5
Crop 135: Ancho = 5, Alto = 5
Crop 136: Ancho = 5, Alto = 5
Crop 137: Ancho = 10, Alto = 8
Crop 138: Ancho = 5, Alto = 6
Crop 139: Ancho = 5, Alto = 5

Crop 140: Ancho = 9, Alto = 11
Crop 141: Ancho = 8, Alto = 6
Crop 142: Ancho = 6, Alto = 5
Crop 143: Ancho = 6, Alto = 8
Crop 144: Ancho = 5, Alto = 5
Crop 145: Ancho = 5, Alto = 6
Crop 146: Ancho = 5, Alto = 5
Crop 147: Ancho = 16, Alto = 13
Crop 148: Ancho = 6, Alto = 5
Crop 149: Ancho = 7, Alto = 7
Crop 150: Ancho = 13, Alto = 9
Crop 151: Ancho = 9, Alto = 18
Crop 152: Ancho = 18, Alto = 15
Crop 153: Ancho = 6, Alto = 7
Crop 154: Ancho = 5, Alto = 5
Crop 155: Ancho = 7, Alto = 14
Crop 156: Ancho = 5, Alto = 5
Crop 157: Ancho = 5, Alto = 8
Crop 158: Ancho = 5, Alto = 5
Crop 159: Ancho = 8, Alto = 6
Crop 160: Ancho = 5, Alto = 5
Crop 161: Ancho = 5, Alto = 5
Crop 162: Ancho = 3, Alto = 8
Crop 163: Ancho = 7, Alto = 7
Crop 164: Ancho = 5, Alto = 5
Crop 165: Ancho = 6, Alto = 9
Crop 166: Ancho = 9, Alto = 13
Crop 167: Ancho = 5, Alto = 5
Crop 168: Ancho = 6, Alto = 8
Crop 169: Ancho = 7, Alto = 5
Crop 170: Ancho = 6, Alto = 7
Crop 171: Ancho = 5, Alto = 5
Crop 172: Ancho = 12, Alto = 7
Crop 173: Ancho = 20, Alto = 23
Crop 174: Ancho = 7, Alto = 7
Crop 175: Ancho = 5, Alto = 7
Crop 176: Ancho = 5, Alto = 5
Crop 177: Ancho = 5, Alto = 5
Crop 178: Ancho = 5, Alto = 9
Crop 179: Ancho = 9, Alto = 15
Crop 180: Ancho = 5, Alto = 5
Crop 181: Ancho = 15, Alto = 25
Crop 182: Ancho = 6, Alto = 5
Crop 183: Ancho = 5, Alto = 5
Crop 184: Ancho = 20, Alto = 14
Crop 185: Ancho = 5, Alto = 5
Crop 186: Ancho = 10, Alto = 10
Crop 187: Ancho = 8, Alto = 5

Crop 188: Ancho = 10, Alto = 18
Crop 189: Ancho = 5, Alto = 5
Crop 190: Ancho = 5, Alto = 5
Crop 191: Ancho = 14, Alto = 9
Crop 192: Ancho = 14, Alto = 10
Crop 193: Ancho = 16, Alto = 17
Crop 194: Ancho = 5, Alto = 5
Crop 195: Ancho = 12, Alto = 12
Crop 196: Ancho = 12, Alto = 9
Crop 197: Ancho = 5, Alto = 5
Crop 198: Ancho = 5, Alto = 5
Crop 199: Ancho = 5, Alto = 5
Crop 200: Ancho = 5, Alto = 6
Crop 201: Ancho = 30, Alto = 31
Crop 202: Ancho = 6, Alto = 5
Crop 203: Ancho = 8, Alto = 6
Crop 204: Ancho = 6, Alto = 5
Crop 205: Ancho = 14, Alto = 22
Crop 206: Ancho = 5, Alto = 5
Crop 207: Ancho = 5, Alto = 5
Crop 208: Ancho = 5, Alto = 5
Crop 209: Ancho = 6, Alto = 5
Crop 210: Ancho = 5, Alto = 5
Crop 211: Ancho = 5, Alto = 5
Crop 212: Ancho = 5, Alto = 5
Crop 213: Ancho = 5, Alto = 5
Crop 214: Ancho = 22, Alto = 16
Crop 215: Ancho = 982, Alto = 443
Crop 216: Ancho = 13, Alto = 12
Crop 217: Ancho = 495, Alto = 446
Crop 218: Ancho = 6, Alto = 5
Crop 219: Ancho = 9, Alto = 12
Crop 220: Ancho = 6, Alto = 6
Crop 221: Ancho = 6, Alto = 8
Crop 222: Ancho = 5, Alto = 5
Crop 223: Ancho = 5, Alto = 9
Crop 224: Ancho = 5, Alto = 5
Crop 225: Ancho = 6, Alto = 5
Crop 226: Ancho = 5, Alto = 5
Crop 227: Ancho = 11, Alto = 11
Crop 228: Ancho = 5, Alto = 5
Crop 229: Ancho = 5, Alto = 5
Crop 230: Ancho = 44, Alto = 107
Crop 231: Ancho = 122, Alto = 139
Crop 232: Ancho = 5, Alto = 5
Crop 233: Ancho = 5, Alto = 5
Crop 234: Ancho = 5, Alto = 5
Crop 235: Ancho = 5, Alto = 7

Crop 236: Ancho = 9, Alto = 11
Crop 237: Ancho = 31, Alto = 37
Crop 238: Ancho = 6, Alto = 5
Crop 239: Ancho = 6, Alto = 10
Crop 240: Ancho = 5, Alto = 5
Crop 241: Ancho = 44, Alto = 35
Crop 242: Ancho = 6, Alto = 6
Crop 243: Ancho = 14, Alto = 23
Crop 244: Ancho = 25, Alto = 36
Crop 245: Ancho = 7, Alto = 8
Crop 246: Ancho = 5, Alto = 5
Crop 247: Ancho = 12, Alto = 9
Crop 248: Ancho = 6, Alto = 5
Crop 249: Ancho = 29, Alto = 20
Crop 250: Ancho = 57, Alto = 57
Crop 251: Ancho = 12, Alto = 17
Crop 252: Ancho = 45, Alto = 30
Crop 253: Ancho = 15, Alto = 10
Crop 254: Ancho = 5, Alto = 5
Crop 255: Ancho = 546, Alto = 471
Crop 256: Ancho = 5, Alto = 5
Crop 257: Ancho = 6, Alto = 5
Crop 258: Ancho = 8, Alto = 7
Crop 259: Ancho = 9, Alto = 5
Crop 260: Ancho = 11, Alto = 7
Crop 261: Ancho = 5, Alto = 5
Crop 262: Ancho = 22, Alto = 13
Crop 263: Ancho = 6, Alto = 6
Crop 264: Ancho = 19, Alto = 28
Crop 265: Ancho = 5, Alto = 5
Crop 266: Ancho = 11, Alto = 6
Crop 267: Ancho = 5, Alto = 5
Crop 268: Ancho = 19, Alto = 32
Crop 269: Ancho = 11, Alto = 14
Crop 270: Ancho = 188, Alto = 262
Crop 271: Ancho = 7, Alto = 6
Crop 272: Ancho = 8, Alto = 7
Crop 273: Ancho = 10, Alto = 11
Crop 274: Ancho = 5, Alto = 6
Crop 275: Ancho = 5, Alto = 5
Crop 276: Ancho = 8, Alto = 5
Crop 277: Ancho = 14, Alto = 11
Crop 278: Ancho = 7, Alto = 14
Crop 279: Ancho = 7, Alto = 12
Crop 280: Ancho = 5, Alto = 6
Crop 281: Ancho = 5, Alto = 5
Crop 282: Ancho = 16, Alto = 22
Crop 283: Ancho = 5, Alto = 5

Crop 284: Ancho = 5, Alto = 6
Crop 285: Ancho = 19, Alto = 27
Crop 286: Ancho = 5, Alto = 12
Crop 287: Ancho = 23, Alto = 27
Crop 288: Ancho = 6, Alto = 6
Crop 289: Ancho = 7, Alto = 5
Crop 290: Ancho = 5, Alto = 5
Crop 291: Ancho = 6, Alto = 5
Crop 292: Ancho = 5, Alto = 5
Crop 293: Ancho = 7, Alto = 6
Crop 294: Ancho = 23, Alto = 24
Crop 295: Ancho = 9, Alto = 14
Crop 296: Ancho = 5, Alto = 5
Crop 297: Ancho = 16, Alto = 8
Crop 298: Ancho = 5, Alto = 5
Crop 299: Ancho = 5, Alto = 6
Crop 300: Ancho = 8, Alto = 11
Crop 301: Ancho = 9, Alto = 6
Crop 302: Ancho = 14, Alto = 24
Crop 303: Ancho = 5, Alto = 6
Crop 304: Ancho = 8, Alto = 14
Crop 305: Ancho = 30, Alto = 37
Crop 306: Ancho = 5, Alto = 5
Crop 307: Ancho = 6, Alto = 11
Crop 308: Ancho = 5, Alto = 5
Crop 309: Ancho = 6, Alto = 5
Crop 310: Ancho = 56, Alto = 82
Crop 311: Ancho = 9, Alto = 9
Crop 312: Ancho = 5, Alto = 5
Crop 313: Ancho = 5, Alto = 7
Crop 314: Ancho = 6, Alto = 5
Crop 315: Ancho = 8, Alto = 6
Crop 316: Ancho = 6, Alto = 6
Crop 317: Ancho = 11, Alto = 17
Crop 318: Ancho = 5, Alto = 5
Crop 319: Ancho = 13, Alto = 10
Crop 320: Ancho = 5, Alto = 5
Crop 321: Ancho = 5, Alto = 6
Crop 322: Ancho = 14, Alto = 6
Crop 323: Ancho = 6, Alto = 6
Crop 324: Ancho = 10, Alto = 7
Crop 325: Ancho = 5, Alto = 5
Crop 326: Ancho = 8, Alto = 8
Crop 327: Ancho = 6, Alto = 5
Crop 328: Ancho = 5, Alto = 5
Crop 329: Ancho = 5, Alto = 5
Crop 330: Ancho = 5, Alto = 6
Crop 331: Ancho = 8, Alto = 6

Crop 332: Ancho = 5, Alto = 5
Crop 333: Ancho = 5, Alto = 5
Crop 334: Ancho = 5, Alto = 5
Crop 335: Ancho = 6, Alto = 6
Crop 336: Ancho = 6, Alto = 5
Crop 337: Ancho = 6, Alto = 8
Crop 338: Ancho = 5, Alto = 6
Crop 339: Ancho = 10, Alto = 10
Crop 340: Ancho = 6, Alto = 6
Crop 341: Ancho = 5, Alto = 5
Crop 342: Ancho = 5, Alto = 5
Crop 343: Ancho = 5, Alto = 5
Crop 344: Ancho = 5, Alto = 5
Crop 345: Ancho = 6, Alto = 5
Crop 346: Ancho = 8, Alto = 5
Crop 347: Ancho = 5, Alto = 6
Crop 348: Ancho = 5, Alto = 6
Crop 349: Ancho = 5, Alto = 7
Crop 350: Ancho = 5, Alto = 5
Crop 351: Ancho = 5, Alto = 5
Crop 352: Ancho = 6, Alto = 3
Crop 353: Ancho = 896, Alto = 1914
Crop 354: Ancho = 1039, Alto = 653
Crop 355: Ancho = 11, Alto = 8
Crop 356: Ancho = 22, Alto = 16
Crop 357: Ancho = 2412, Alto = 1944
Crop 358: Ancho = 5, Alto = 4

Análisis de dimensiones y visualización

```
[4]: import seaborn as sns
import pandas as pd

# Crear lista de anchos y altos
widths = []
heights = []

for idx, img in enumerate(images):
    mask_path = os.path.join(output_folder, f"refined_mask_{idx+1}.png")
    mask = cv2.imread(mask_path, cv2.IMREAD_GRAYSCALE)

    # Obtener crops a partir de la máscara
    crops = get_crops(img, mask)

    # Recopilar anchos y altos
    for _, w, h in crops:
        widths.append(w)
        heights.append(h)
```

```

# Convertir a DataFrame
df = pd.DataFrame({'Width': widths, 'Height': heights})

# Visualizar las distribuciones
plt.figure(figsize=(12, 6))
plt.subplot(1, 2, 1)
sns.histplot(df['Width'], bins=10, kde=True)
plt.title('Distribución de Anchos')

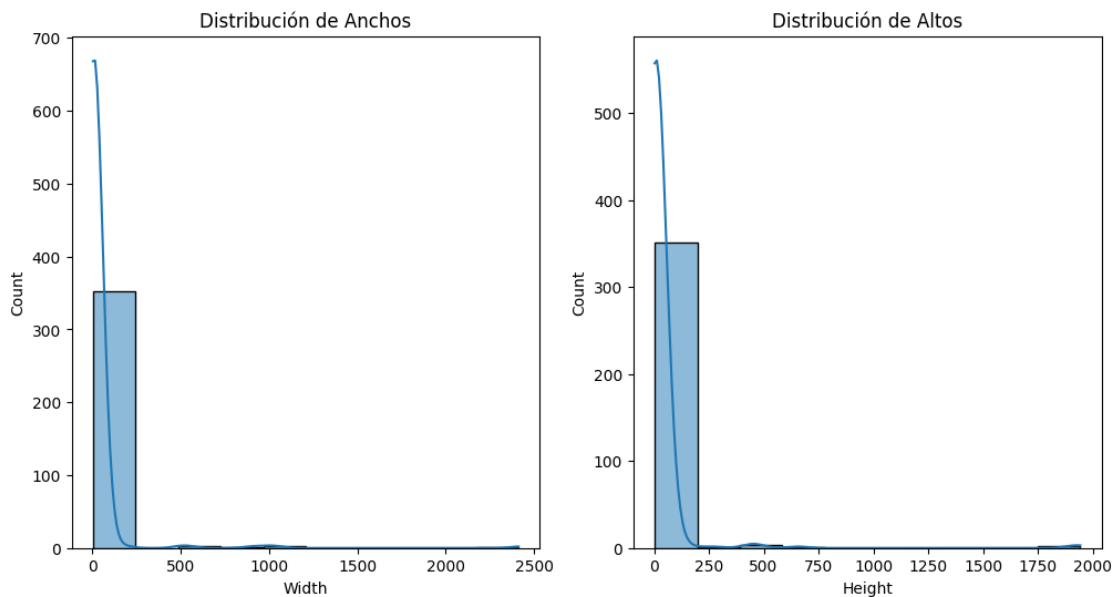
plt.subplot(1, 2, 2)
sns.histplot(df['Height'], bins=10, kde=True)
plt.title('Distribución de Altos')

plt.show()

# Calcular estadísticos
mean_width = np.mean(df['Width'])
mean_height = np.mean(df['Height'])
median_width = np.median(df['Width'])
median_height = np.median(df['Height'])
std_width = np.std(df['Width'])
std_height = np.std(df['Height'])

print(f"Media de Anchos: {mean_width}, Media de Altos: {mean_height}")
print(f"Mediana de Anchos: {median_width}, Mediana de Altos: {median_height}")
print(f"Desviación estándar de Anchos: {std_width}, Desviación estándar de ↵
↵Altos: {std_height}")

```



Media de Anchos: 28.46927374301676, Media de Altos: 27.39664804469274
Mediana de Anchos: 6.0, Mediana de Altos: 6.0
Desviación estándar de Anchos: 158.91508187029092, Desviación estándar de Altos:
153.05225744273574