Dendritic Spine Detection

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Data Collection

- OneDrive
- Algorithm to extract files from subfolders

```python
import os
import shutil
from tqdm import tqdm
from PIL import Image

def extract_tiff_and_csv(main_folder, output_folder):
    if not os.path.exists(output_folder):
        os.makedirs(output_folder)

    for root, _, files in tqdm(os.walk(main_folder), desc="Extracting files"):
        for file in files:
            if file.endswith('.tif') or file.endswith('.tiff') or file.endswith('.csv'):
                file_path = os.path.join(root, file)
                output_file = os.path.splitext(file)[0] + ('.jpg' if file.endswith('.tif') or file.endswith('.tiff') else '.txt')
                output_file_path = os.path.join(output_folder, output_file)
                shutil.copy(file_path, output_file_path)
                if file.endswith('.tif') or file.endswith('.tiff'):
                    img = Image.open(file_path)
                    img.convert('RGB').save(os.path.join(output_folder, os.path.splitext(output_file)[0] + '.jpg'))
                    img.close()
                elif file.endswith('.csv'):
                    os.rename(output_file_path, os.path.splitext(output_file_path)[0] + '.txt')

main_folder = '/content/drive/MyDrive/Colab Notebooks/Labeled_Spines_SmirnovEtAl2018'
output_folder = 'data1'

extract_tiff_and_csv(main_folder, output_folder)
```

Pre-Processing

- Changing bounding boxes to be suited for Roboflow
- Train-test-val split

Fine tuning Yolov9

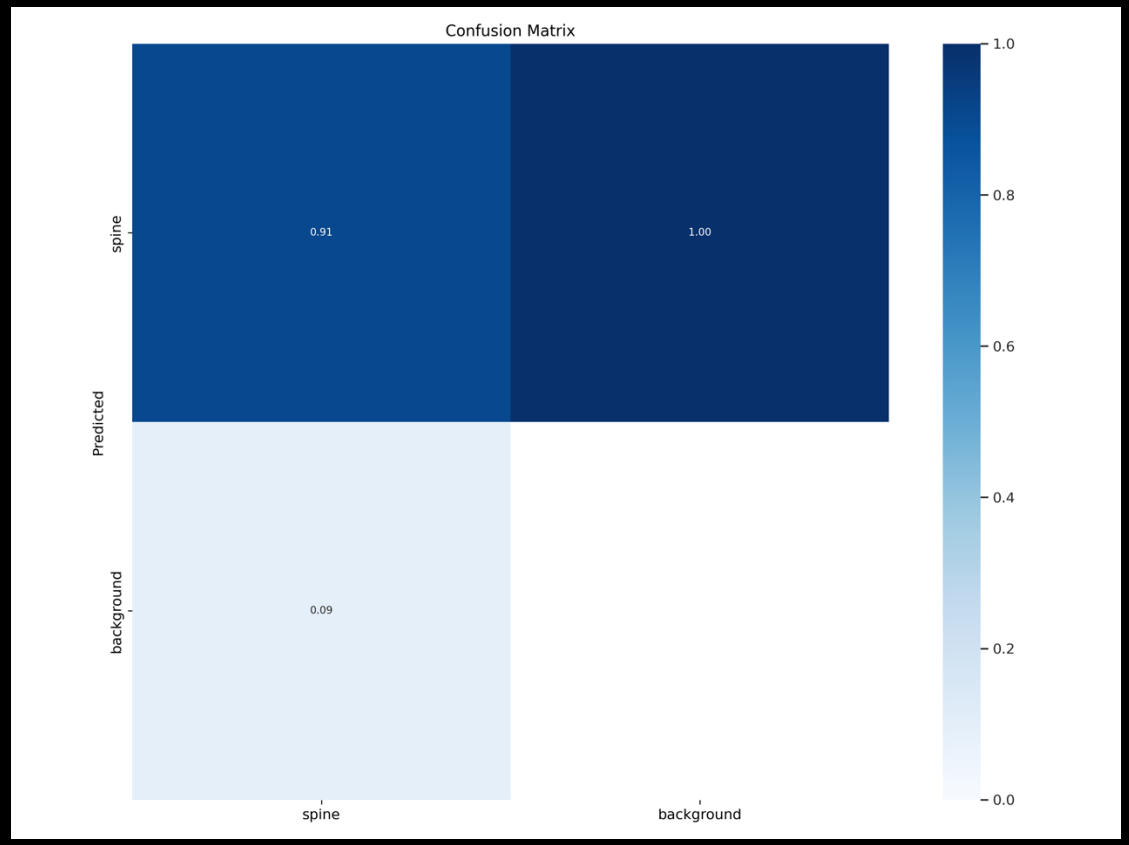
EPOCH SIZES

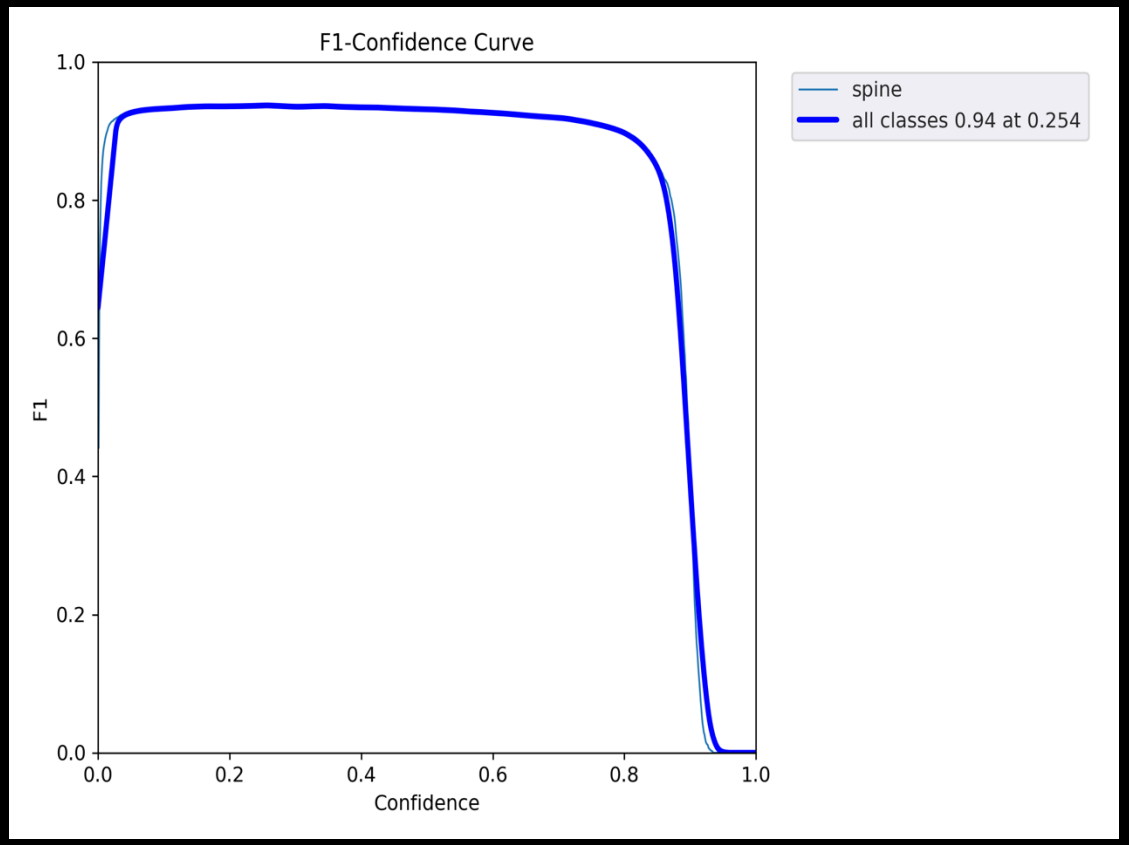
MODEL SIZES

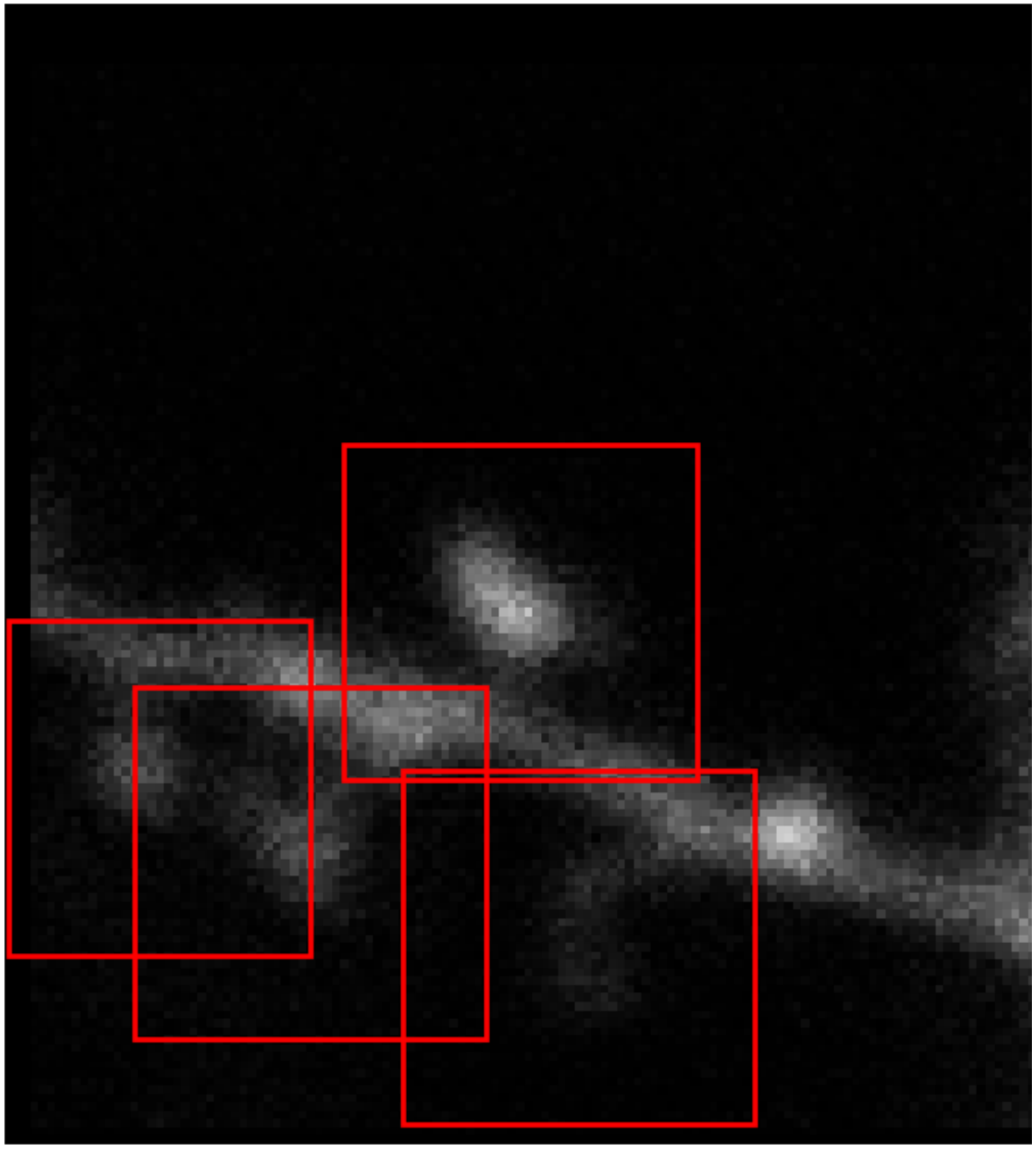
BATCH SIZES

IMAGE SIZES

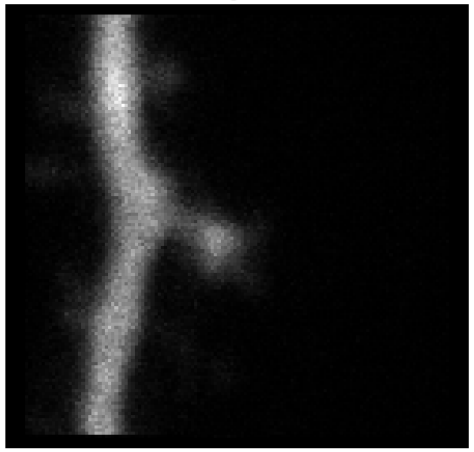
Validation Output



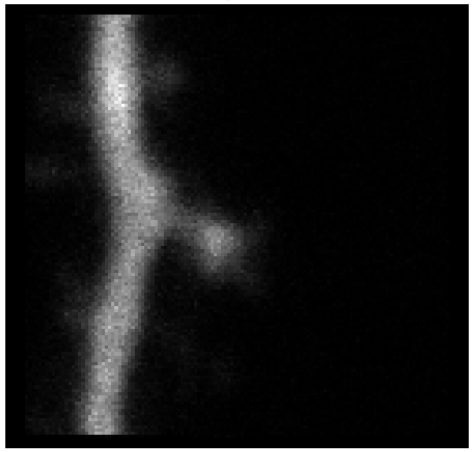




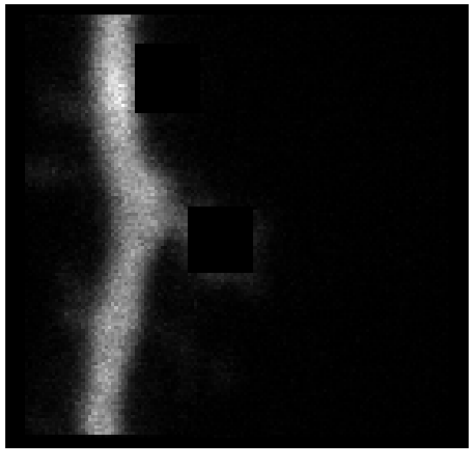
Original



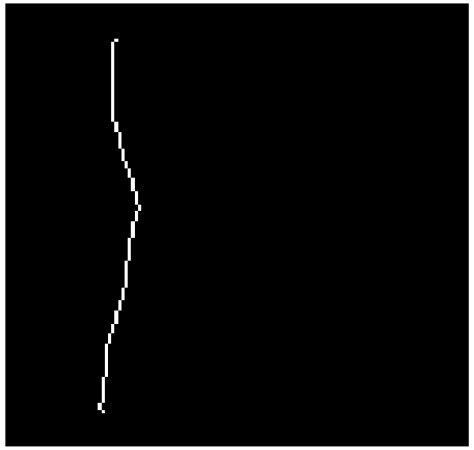
Grayscale



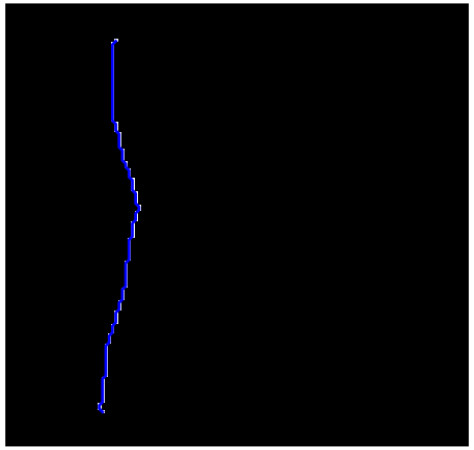
Boxes Filled



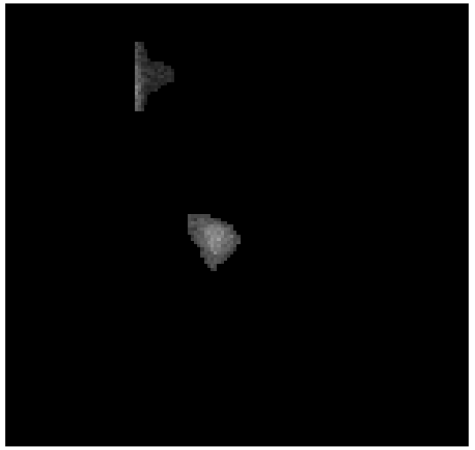
Skeletonized



Traced Line

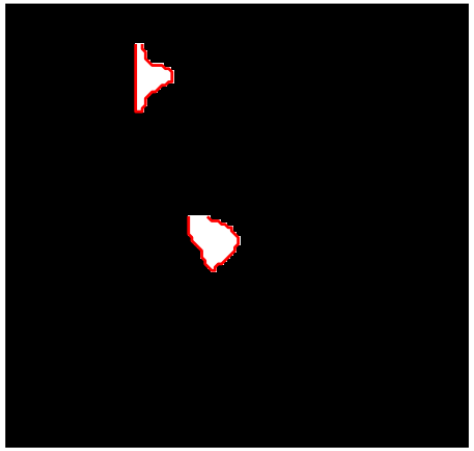


Masked

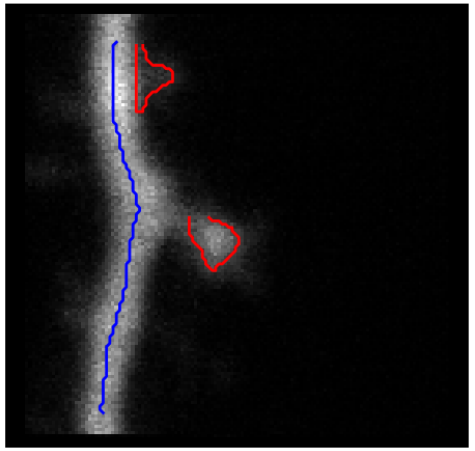


Thresholded

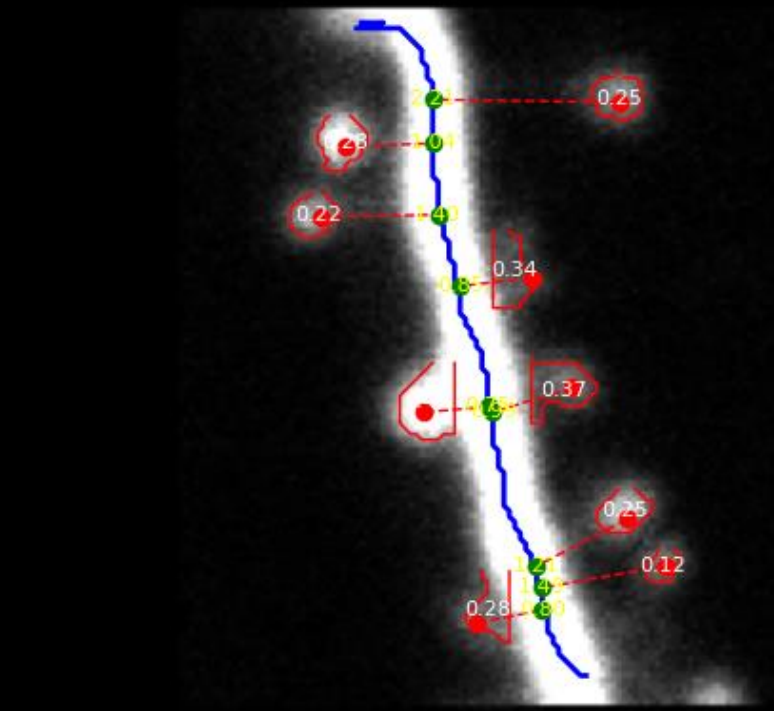
Contours



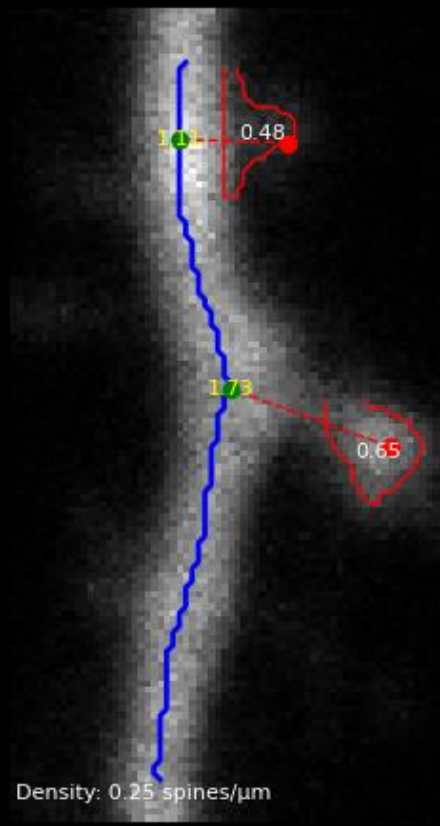
Overlay



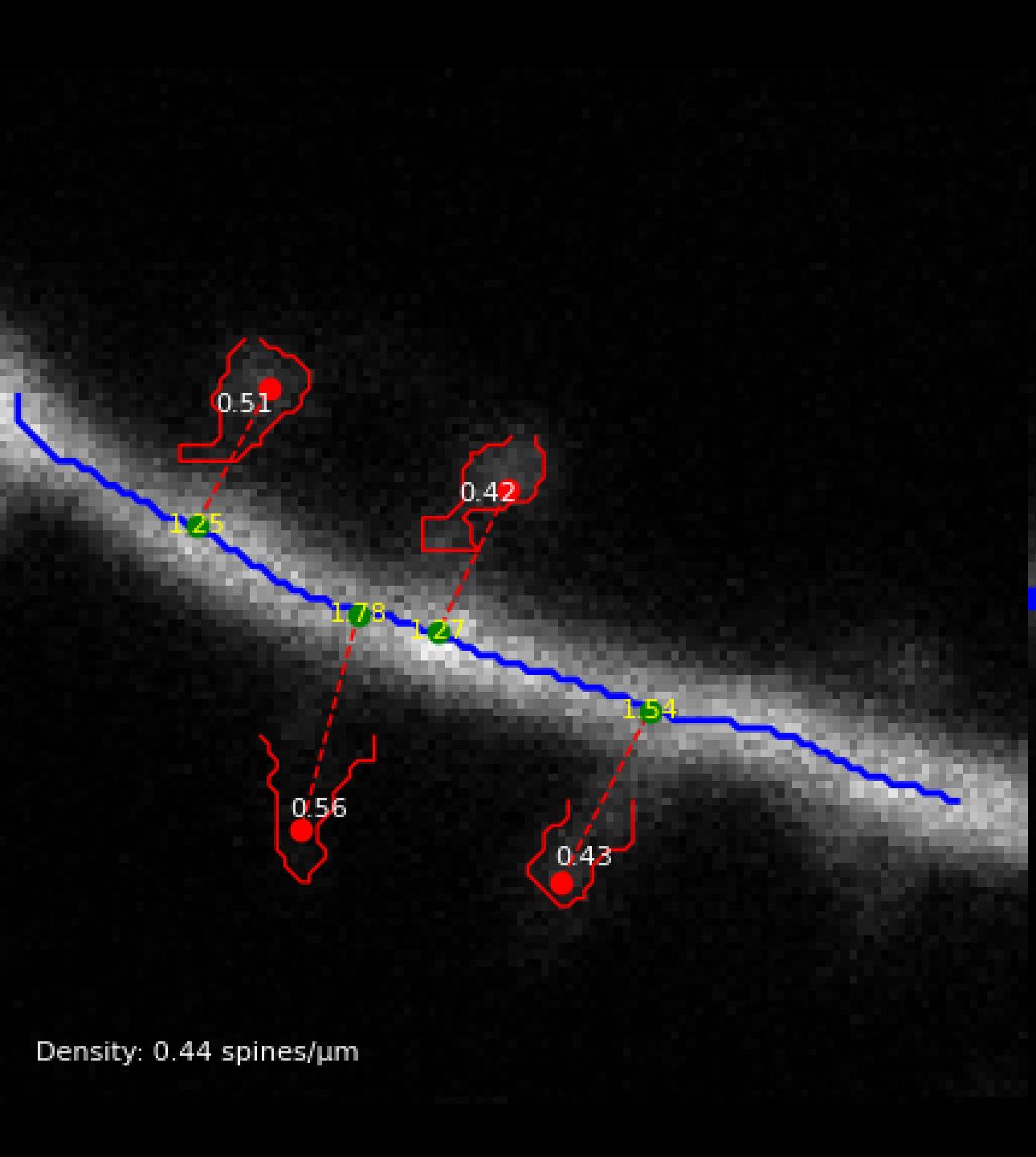
Results



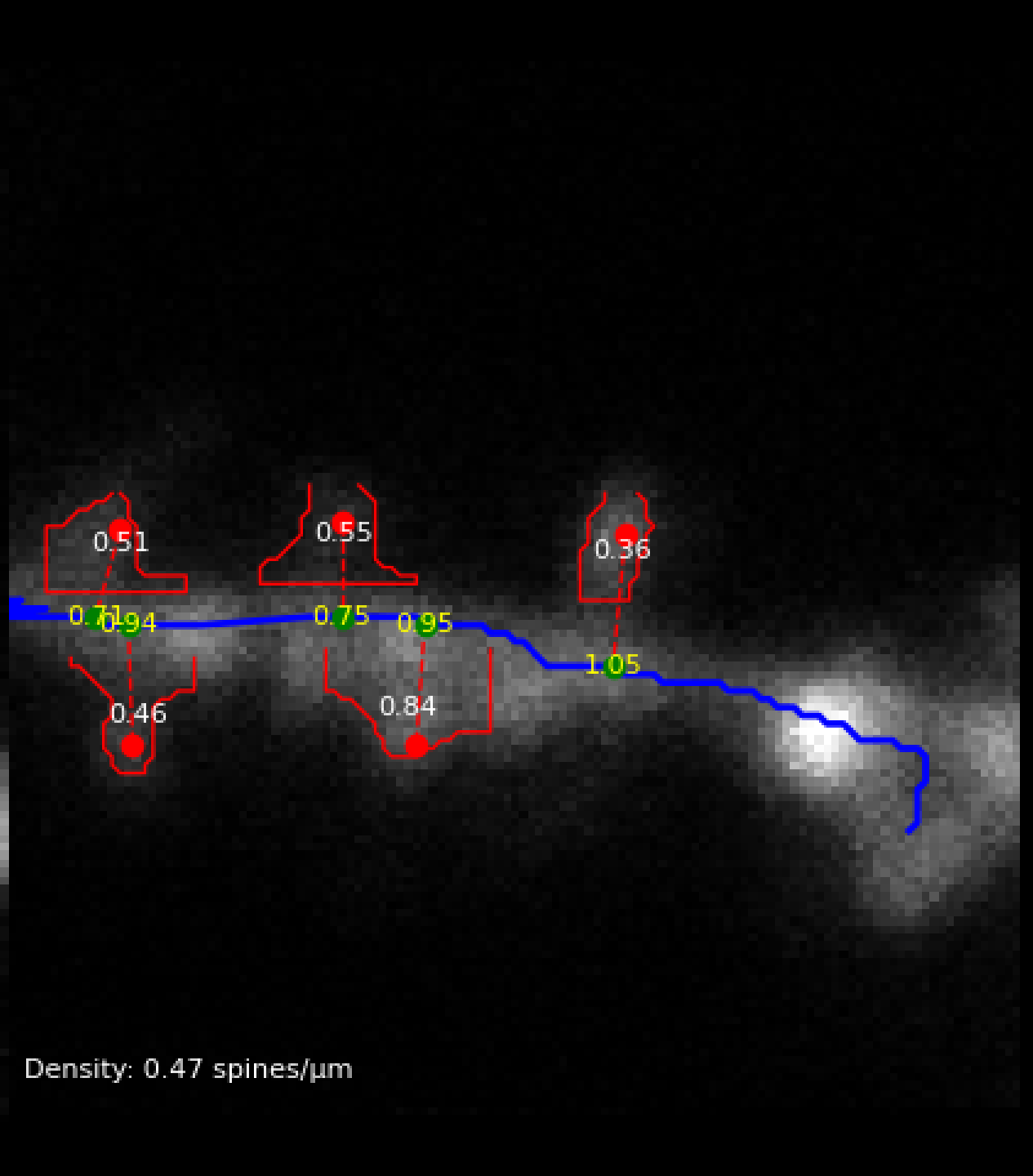
Density: 0.92 spines/µm



Density: 0.25 spines/µm

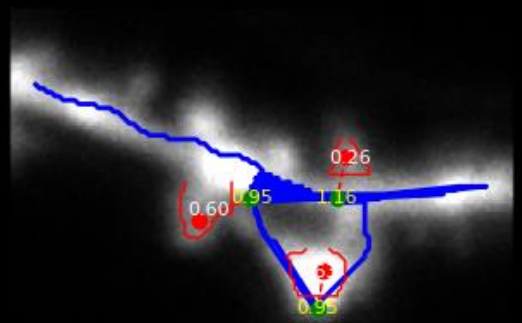


Density: 0.44 spines/µm

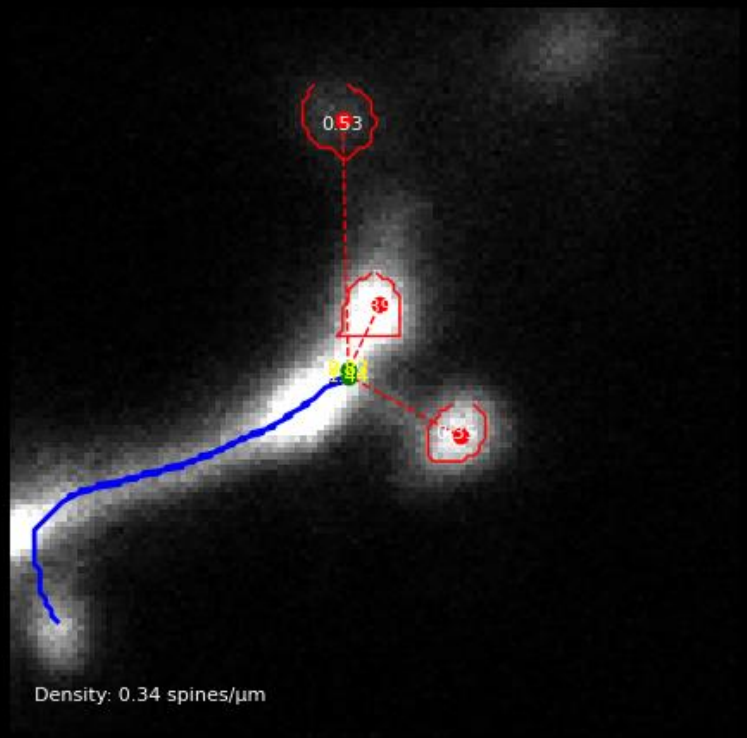


Density: 0.47 spines/µm

Limitations/Future Goals



Density: 0.10 spines/µm



Density: 0.34 spines/µm