

Feature Extraction Using ImageJ

Submitted by Mary Franczine Tan

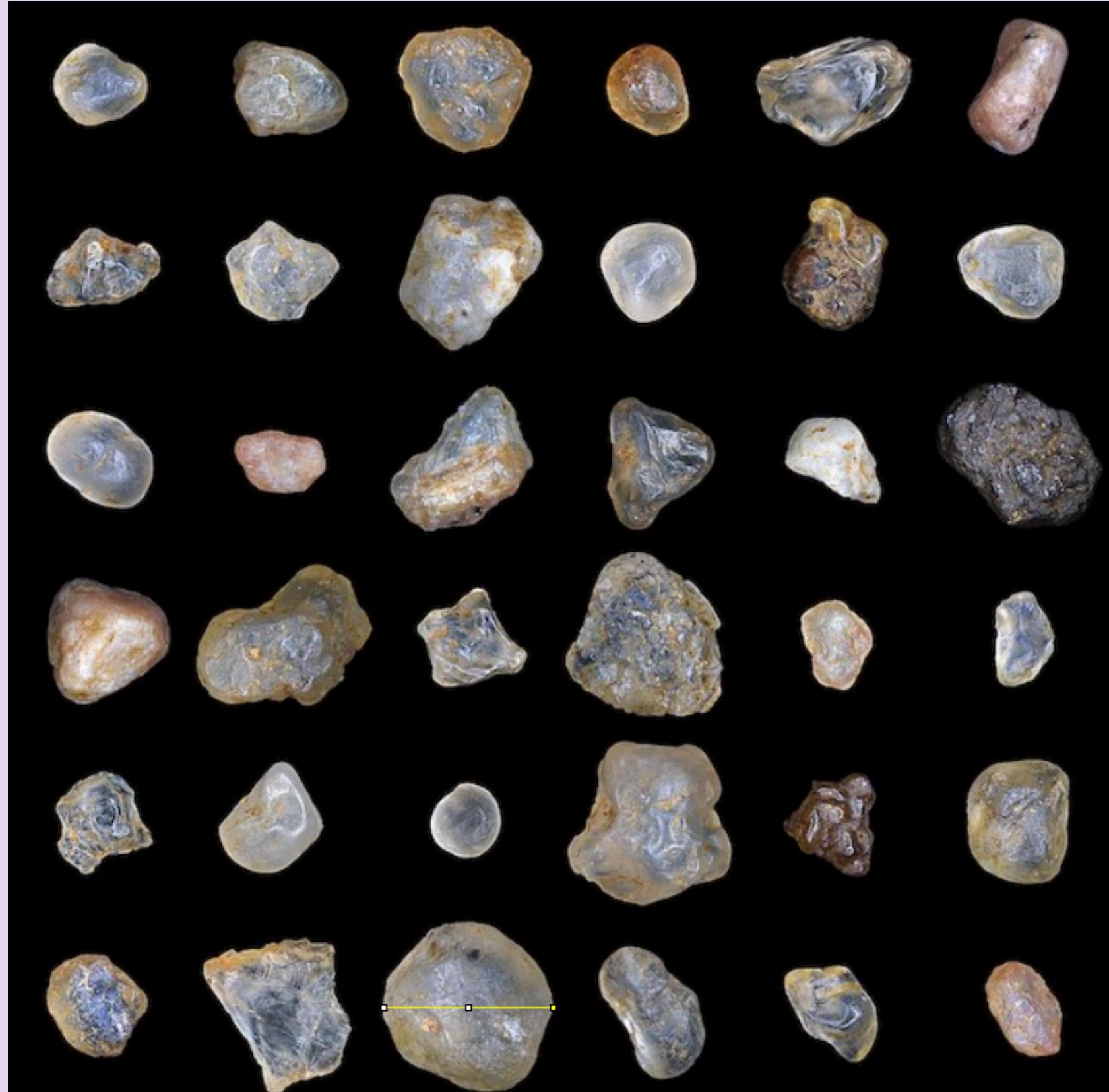
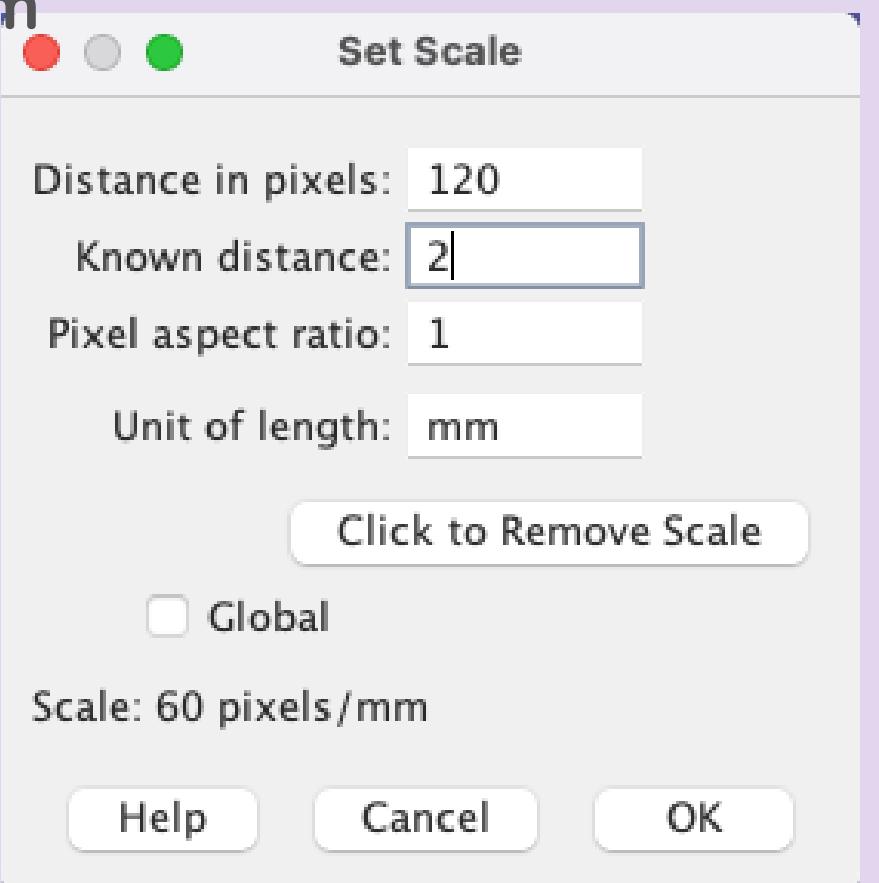
Objectives

- 1 Extract the features of Sand Grains using ImageJ

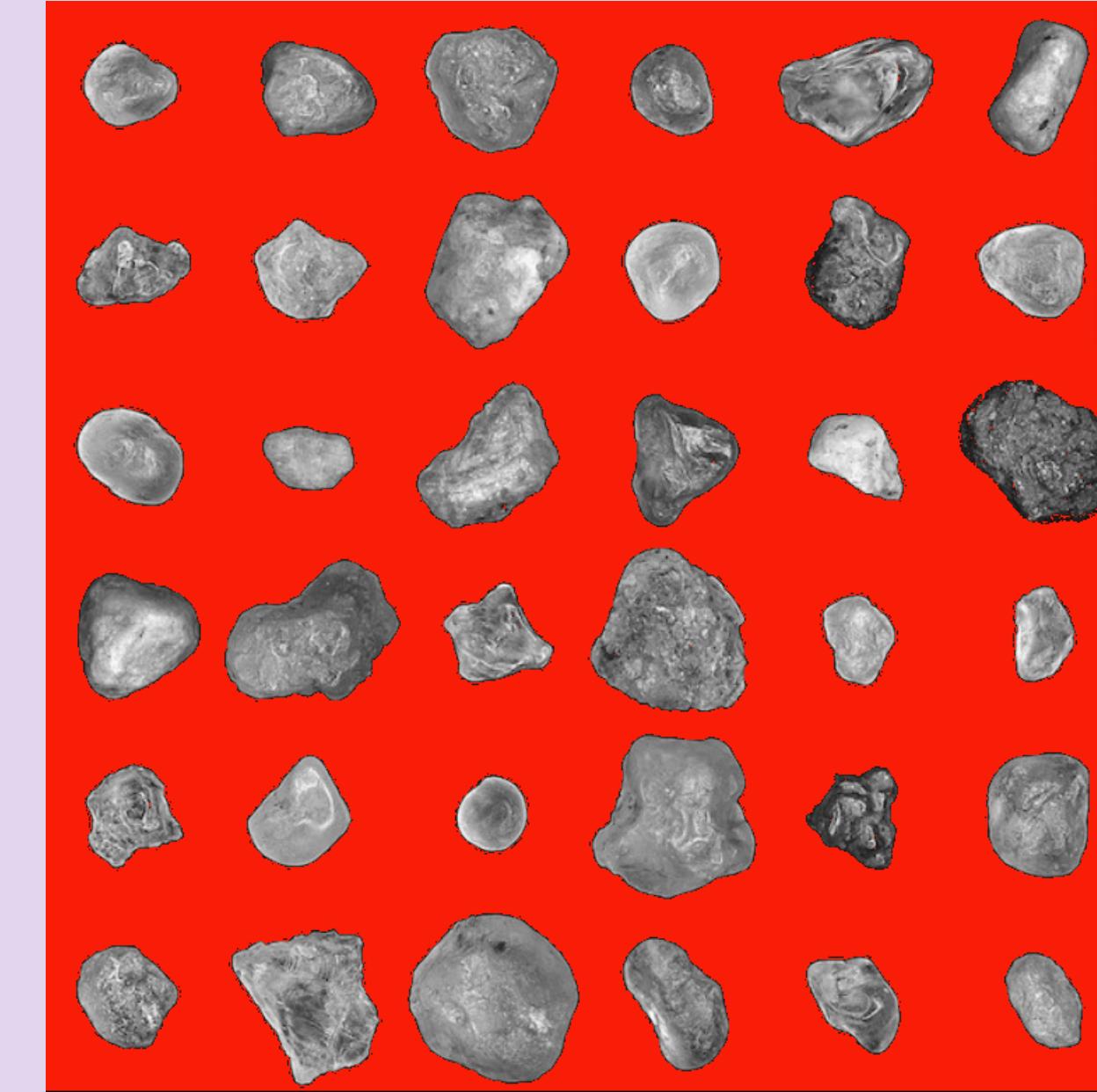
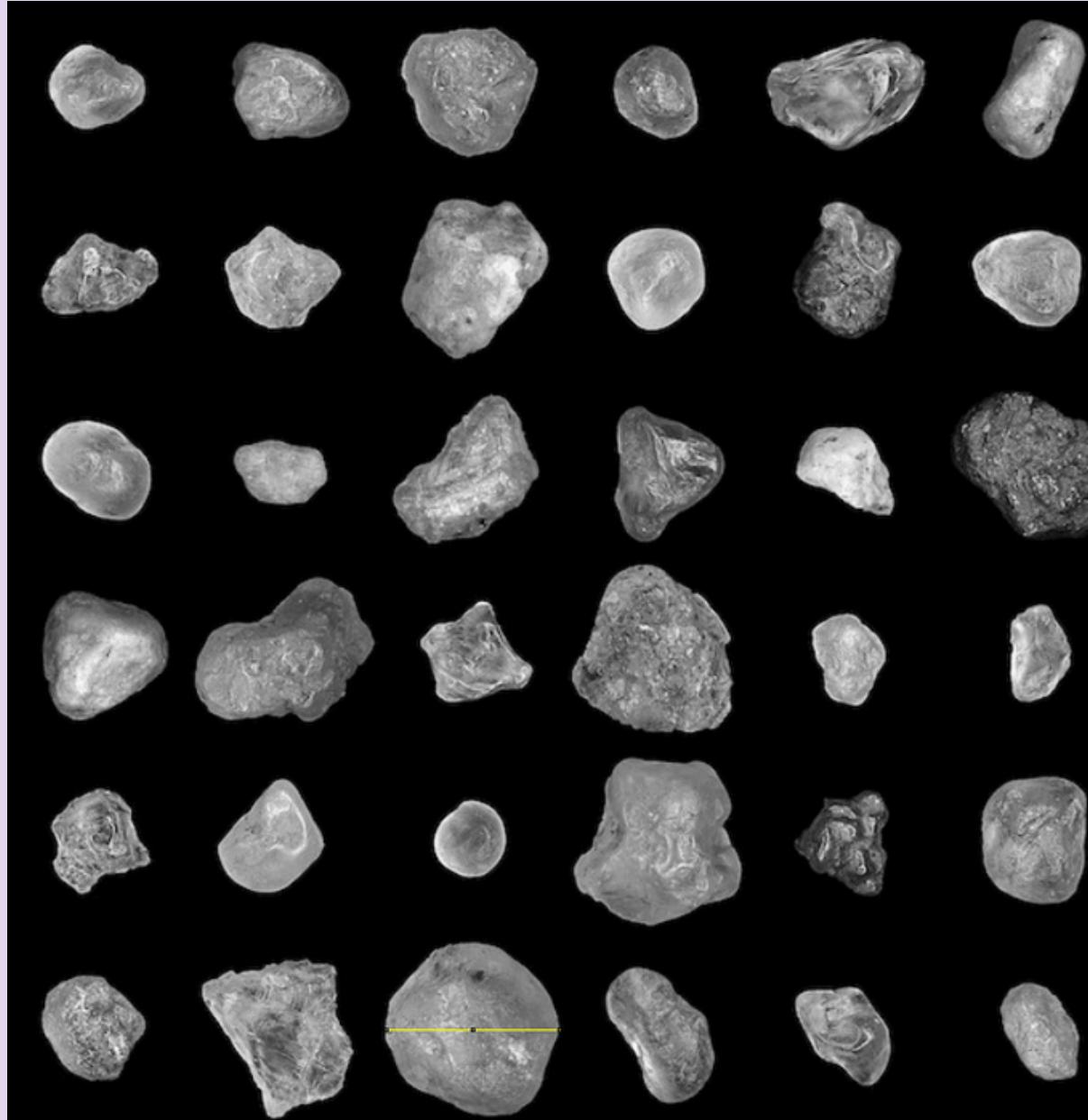
Results and Analysis

Feature Extraction of Sand Grains

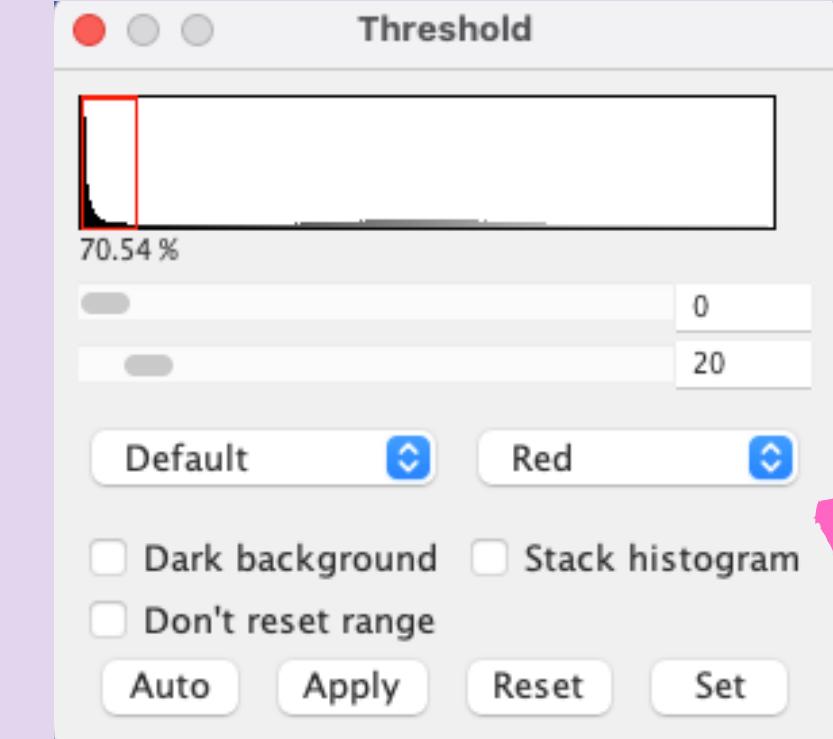
The first step to feature extraction is to **establish the scale of the image**. In the case of this image with grains of sand, there is no scale bar included. Thus, we use an arbitrary scale for the purpose of this activity. I've chosen to set the **largest grain of sand as 2.0 mm**, since the maximum size for a grain of sand is 2.0 mm [2]. Using ImageJ, we know that the scale is **60 pixels/mm**



Results



Threshold Image for Segmentation



Thresholds used for the segmentation

Afterwards, the image is **set to 8-bit to convert it to grayscale**. This is in preparation for image segmentation using thresholding. ImageJ already has a built in feature for **thresholding**, and we use this feature to segment the image. Here, we are isolating the rocks from the background.

Results

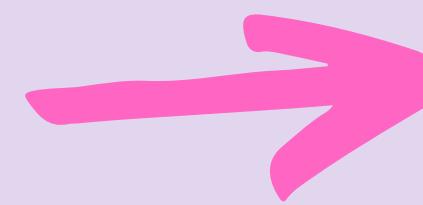
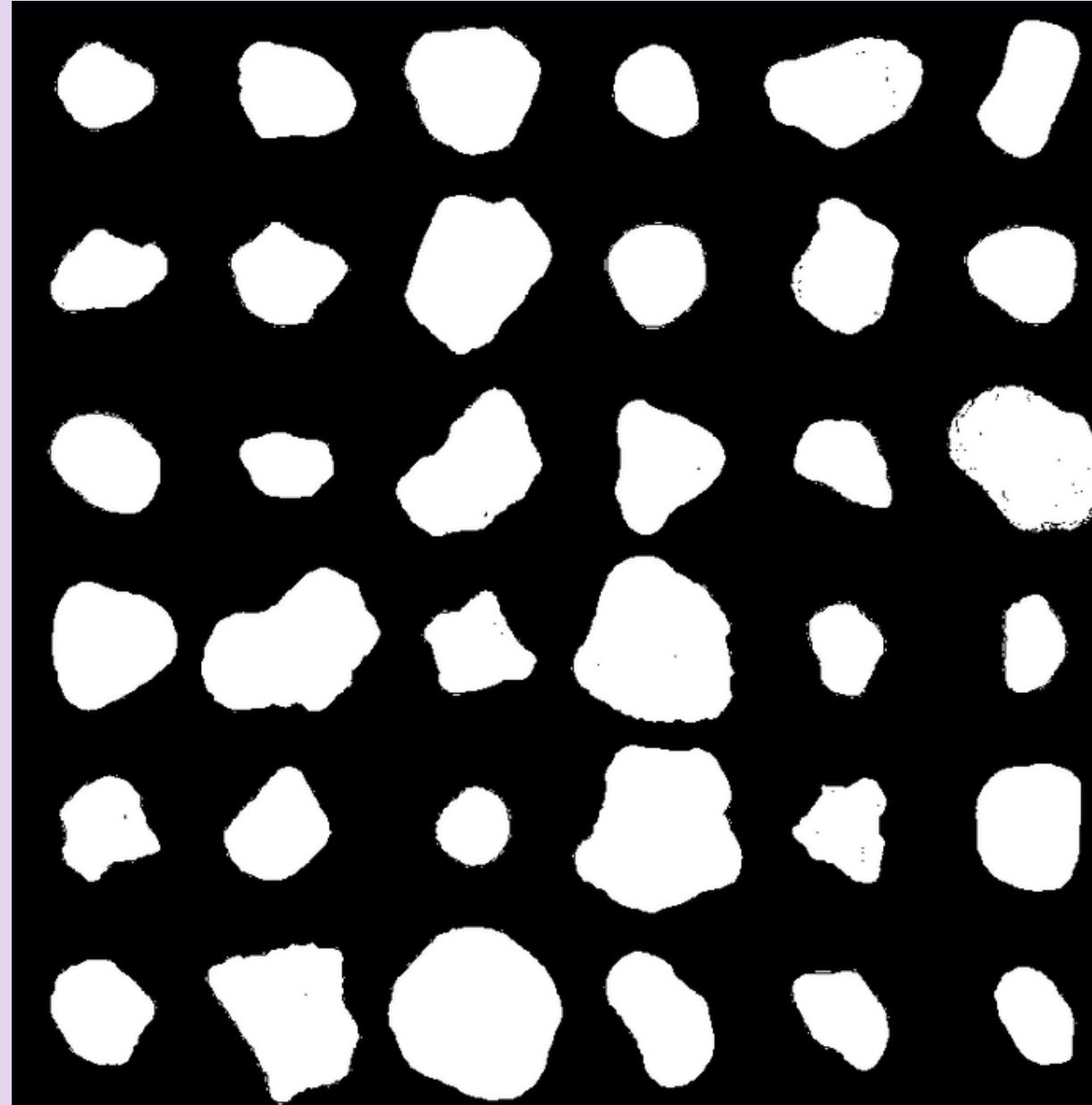
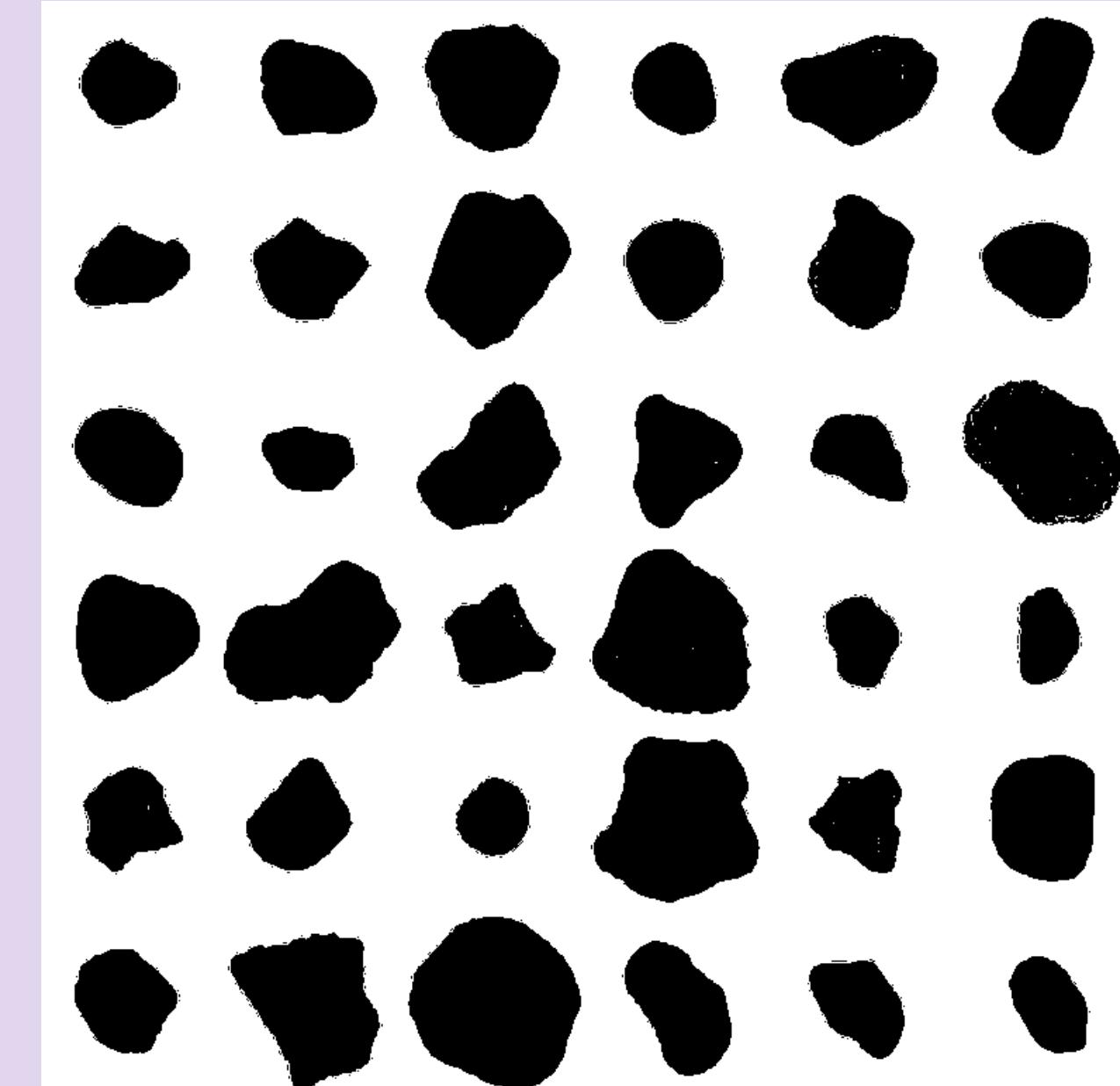
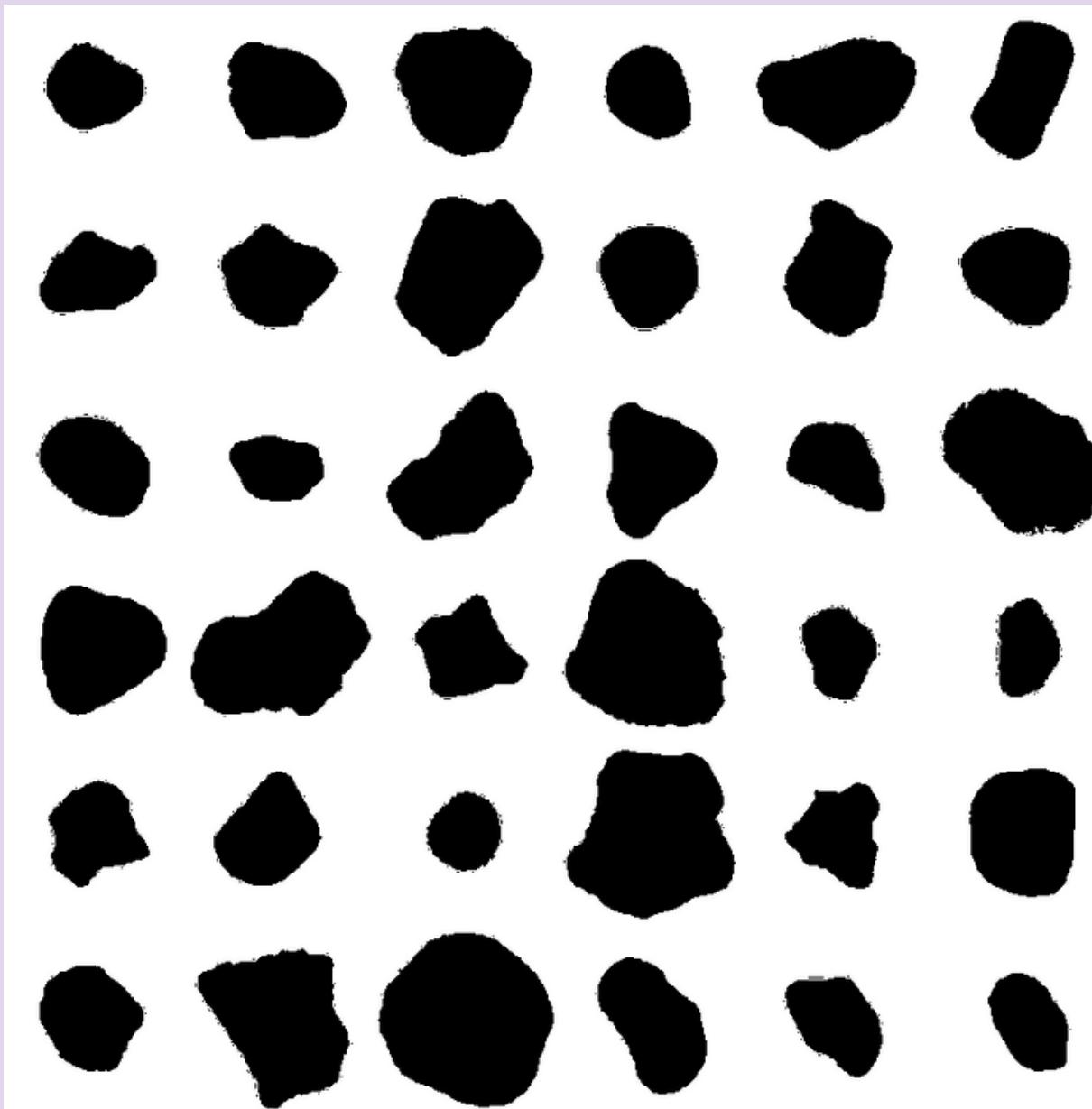


Image Inversion

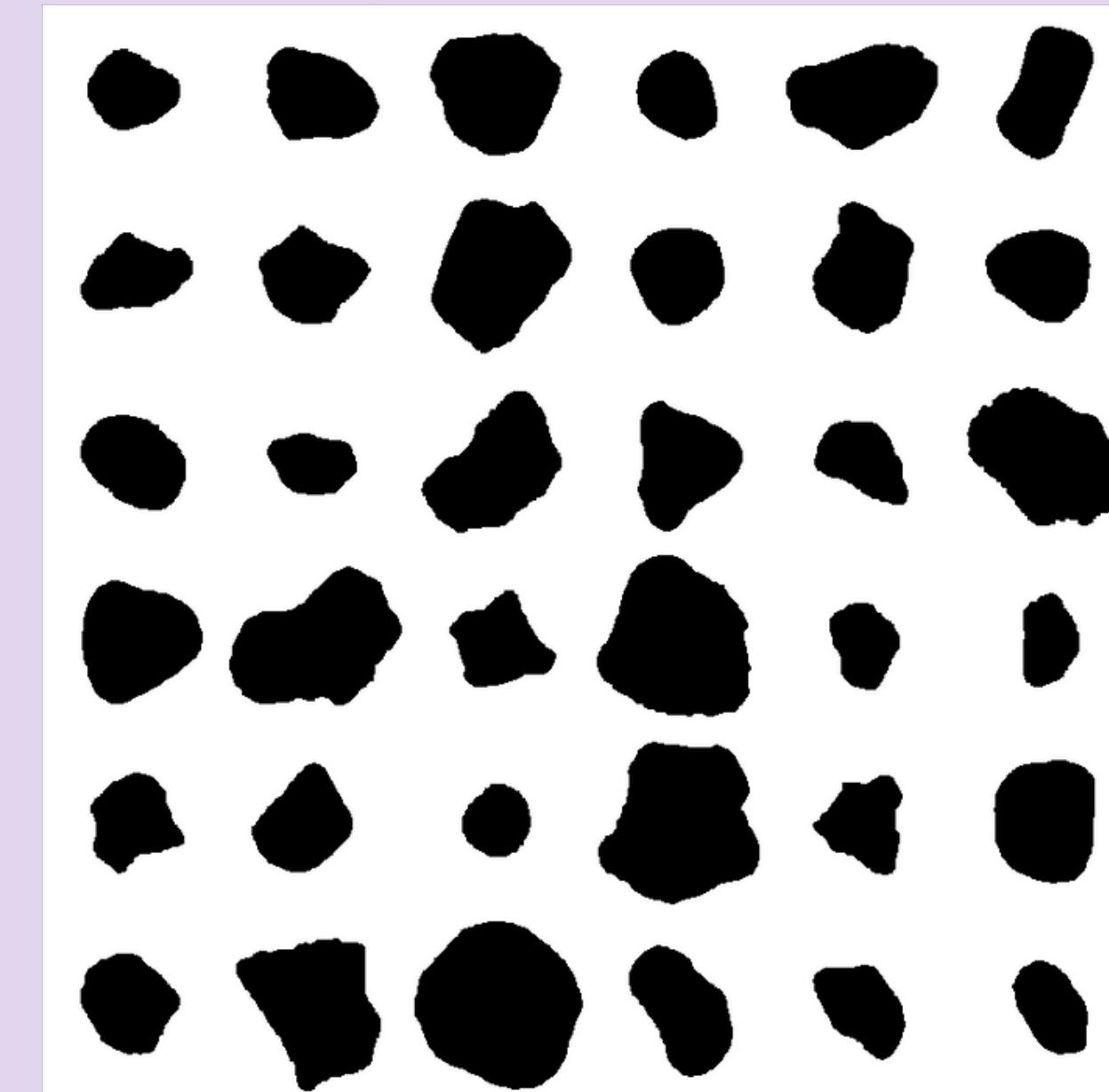


The binary image is inverted to make the region of interests black

Result of 'Fill Holes' Operation



Result of 'Close' Operation



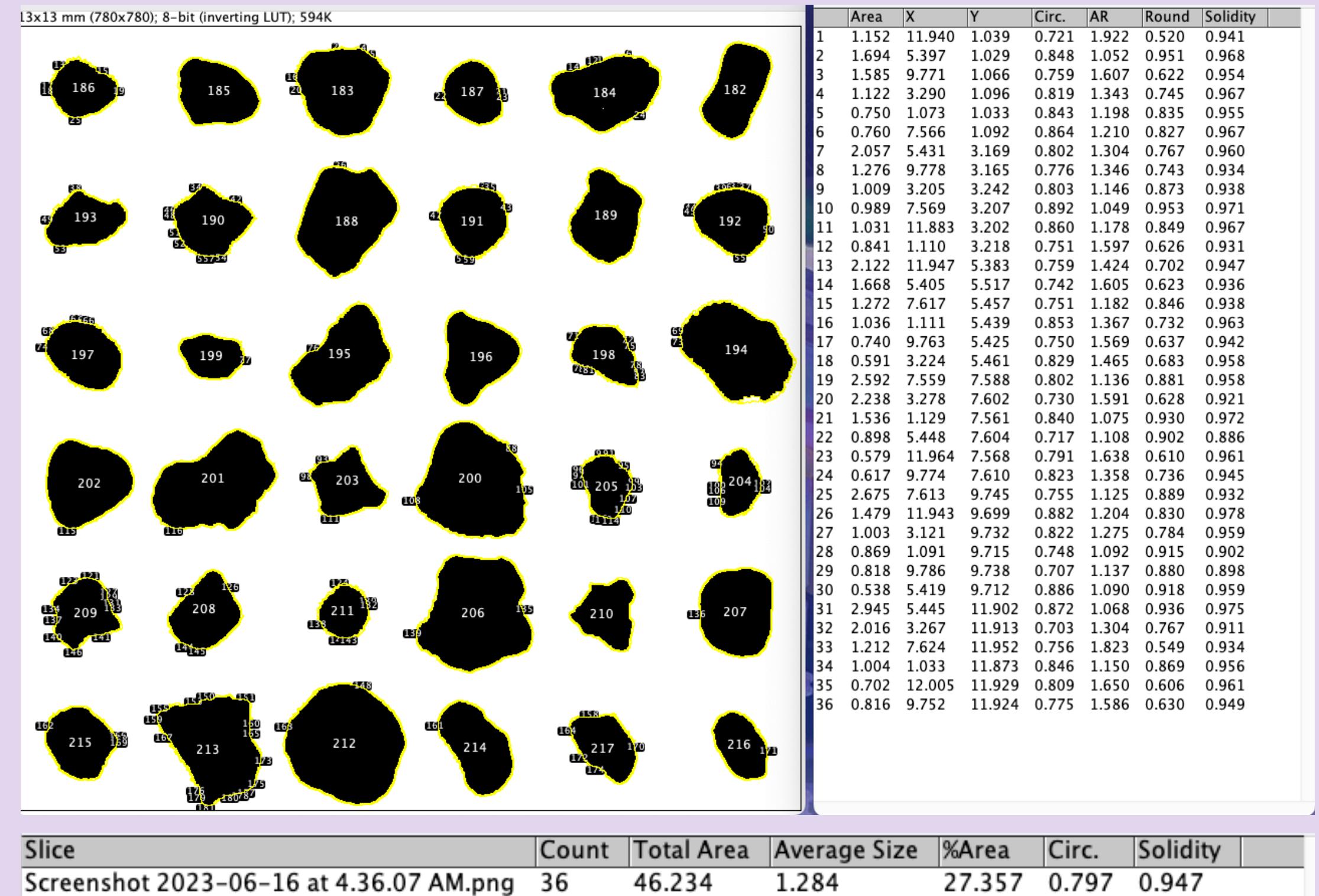
The shapes of the **sand grains** are cleaned using morphological operations that are built in to ImageJ. First, I used the '**fill holes**' option to fill in the holes inside the shapes. Then, I **close** the images to get rid of the noise around the edges of the shape

Results

Feature Extraction Results

Using the automatic feature extraction tool in ImageJ, we were able to successfully extract the area, position, circumference, roundness, and solidity of each sand grains.

This image is now ready for further data processing and analysis.



Extra Challenge

Feature Extraction of Rice Grains

As a bonus activity, I took an image of rice grains to extract their features.

When taking the image, I had to make sure I included a **measuring tape for the scale bar**.

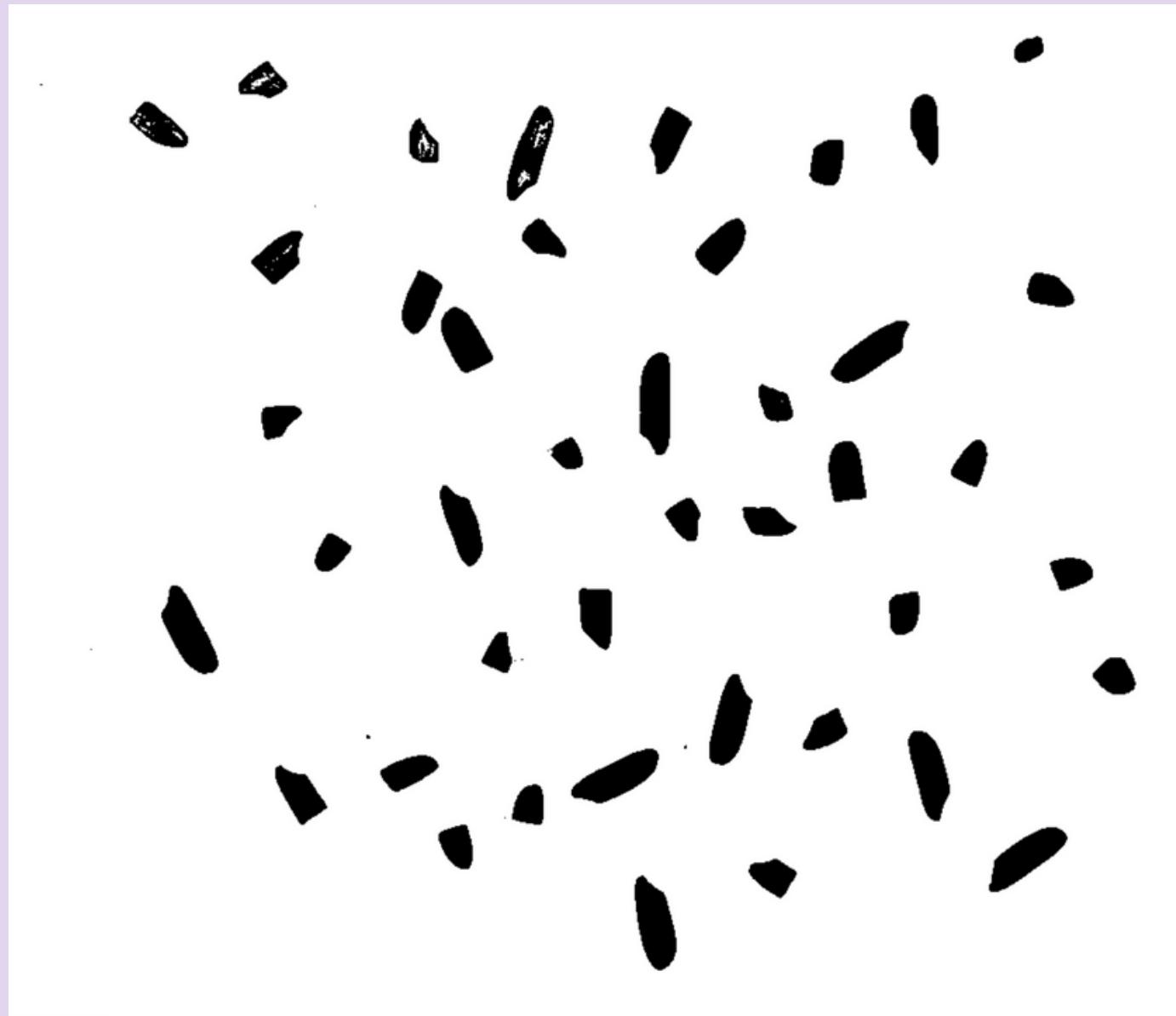
Additionally, I also use a **high-contrast background compared to the rice**. This is to make thresholding easy for us later on.



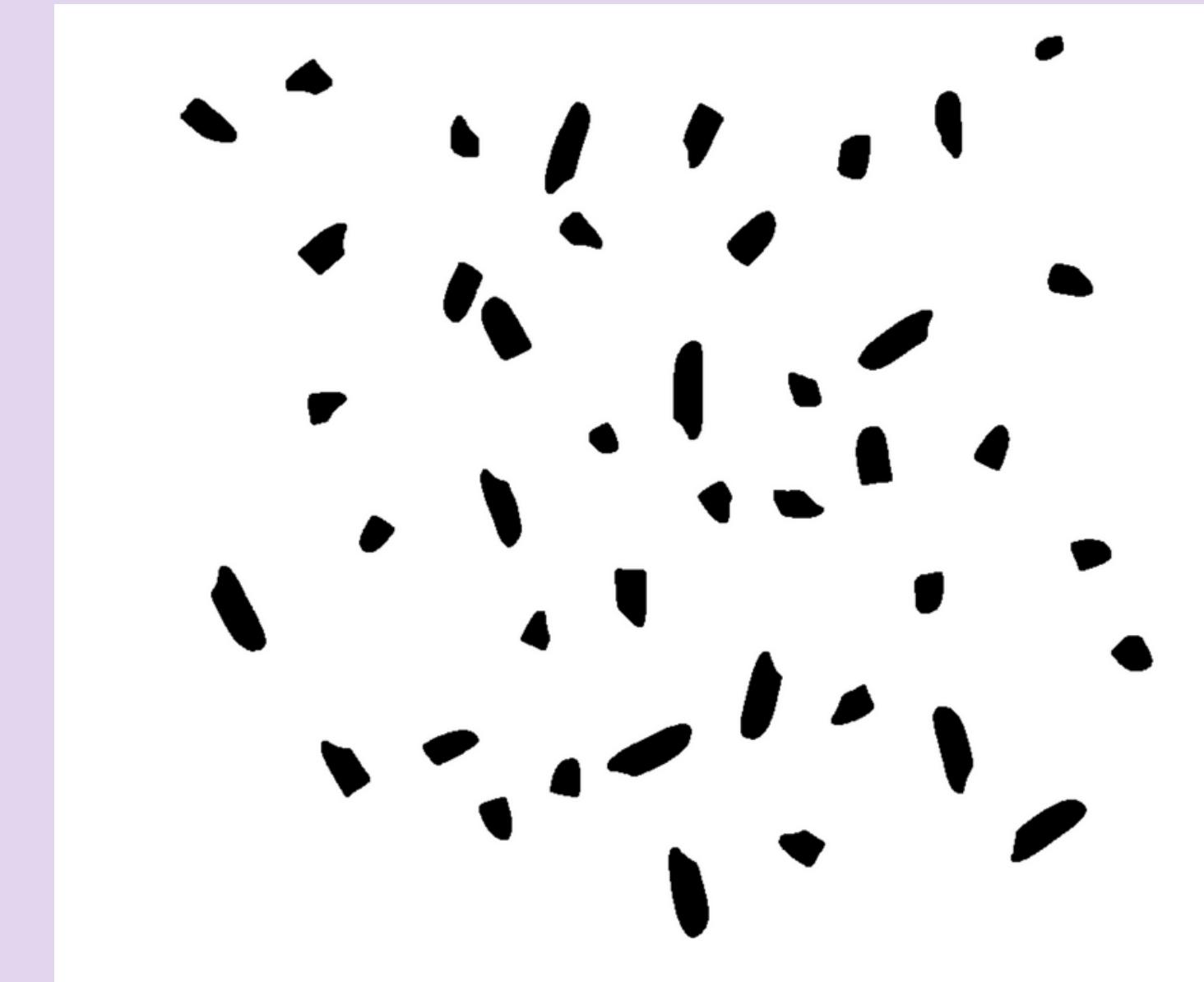


The same process is done with the rice grains. After **converting the image to black and white**, we **segment the image** to isolate the rice grains. Then, the **image is inverted** to assign the correct color to the shapes.

Before Cleaning



After Cleaning



Then, the **image is cleaned using morphological operations**. We use the '**fill holes**' feature again to get rid of the holes in the rice grains, then use the **close** method to get rid of the unwanted pixels in the image.

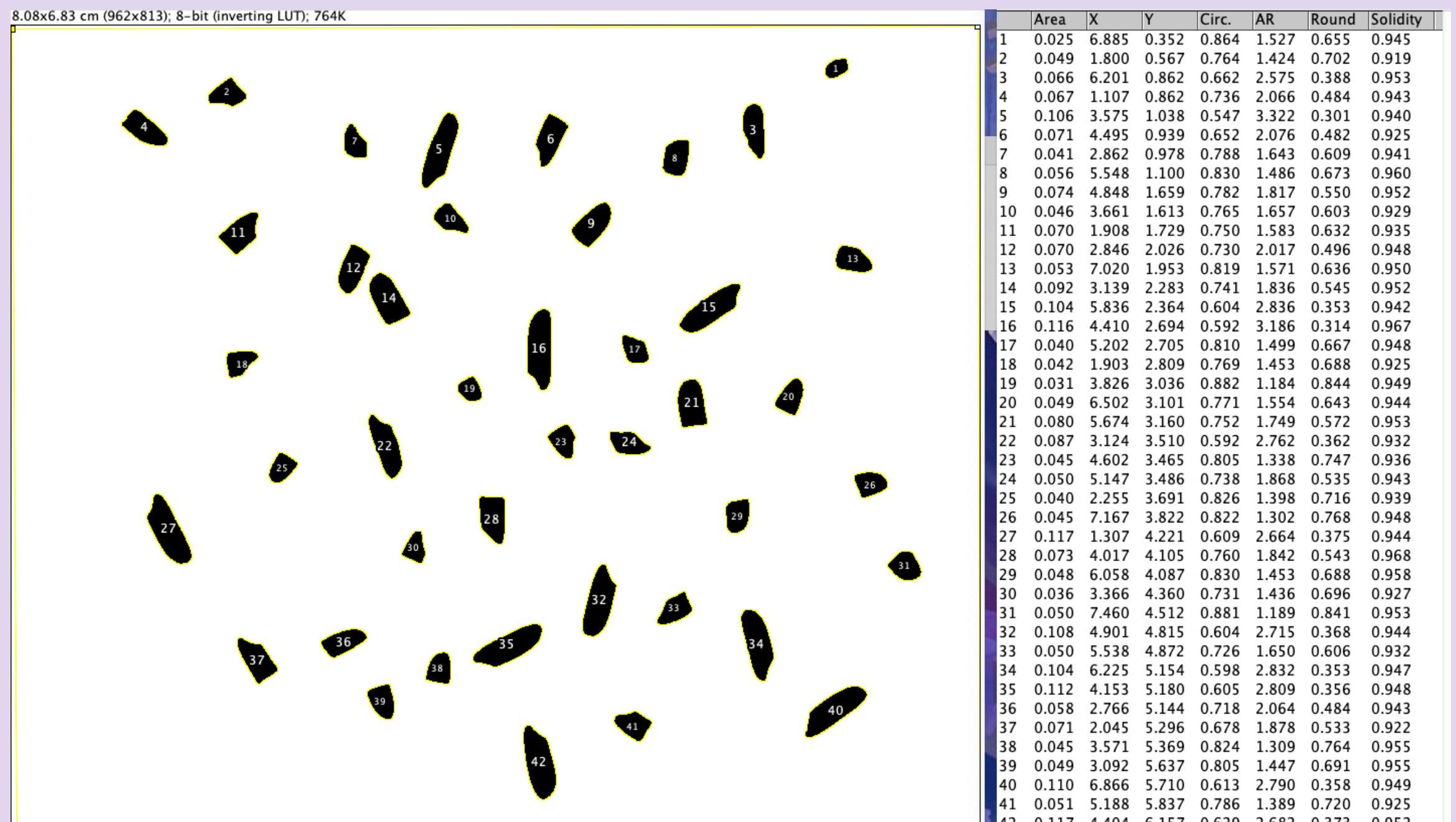
Results

Feature Extraction Results

Again using the **automatic feature extraction tool** in ImageJ, we were able to successfully extract the area, position, circumference, roundness, and solidity of each rice grains.

It was able to automatically count the number of rice in the image, which would be a difficult task to do in real life.

This image is now ready for further data processing and analysis.



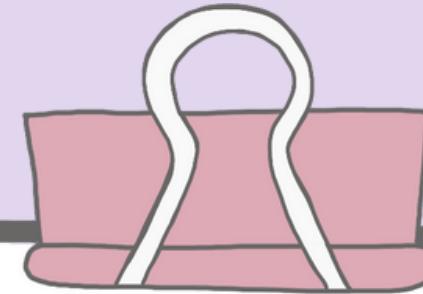
Slice	Count	Total Area	Average Size	%Area	Circ.	Solidity
rice.png	42	2.812	0.067	5.136	0.733	0.944

Reflection

The results of this activity are as expected, as shown by the fact that we have successfully extracted the features of the sand grains and rice grains image. It resulted in data that could be used for further quantified analysis.

This activity turned out to be pretty doable. The app really carried this activity, because it had all these features to get the results we want. I also really appreciated the step-by-step guide in the powerpoint. I was motivated to do the extra challenge assigned because of these reasons.

Overall, I'm very happy with my results. I think it would be incredible if the app allowed an automation of a process that you can choose for multiple images. It would make feature extraction for multiple images easier.



Self-grading

- Technical Correctness = 35
- Quality of Presentation = 35
- Self-reflecton = 30
- Initiative = 10

Total: 110

References

I would also like to cite and thank the following sources that I used in this activity!

- [1] Soriano, M. (2023). Feature Extraction From Images
- [2] Das, Gautam Kumar (2015). Encyclopedia of Estuaries. Retrieved from this [link](#).