

# School of Engineering and Applied Science (SEAS), Ahmedabad University

## ECE501: Digital Image Processing

**Group Name:** NetraByte

**Project:** 11. Automated Object Counting (Coins, Cells, etc.)

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### I. What has been done so far (Progress)

- In previous weeks, the BV2 cell subset from the LIVECell dataset containing 456 grayscale images was chosen for the segmentation experiment. Two segmentation methods were used and compared: Otsu Thresholding with contour-based segmentation and Adaptive Thresholding with connected component analysis. The results revealed that the adaptive thresholding strategy showed better performance in the treatment of clustered cells and uneven lighting. The intensity distribution of the cell images was further studied before and after Contrast Limited Adaptive Histogram Equalization (CLAHE) to check the impact of contrast enhancement.
- This week, we concentrated on preparing the truth data necessary for model evaluation and segmentation comparison.
- The LIVECell dataset annotations, which were in JSON format previously (COCO format), were successfully converted to binary TIFF mask images representing the ground truth segmentation.
- The process involved:
  - Loading and validating the COCO-style JSON annotation file.
  - Handling cases where the annotations or categories were stored as dictionaries, or missing.
  - Using the pycocotools library to generate binary masks from the annotation polygons.
  - Saving these masks as '.tif' images, wherein each white region is a cell and the background is black.

- These TIFF files will serve as ground truth masks for the performance evaluation of our segmentation pipeline.

## Results

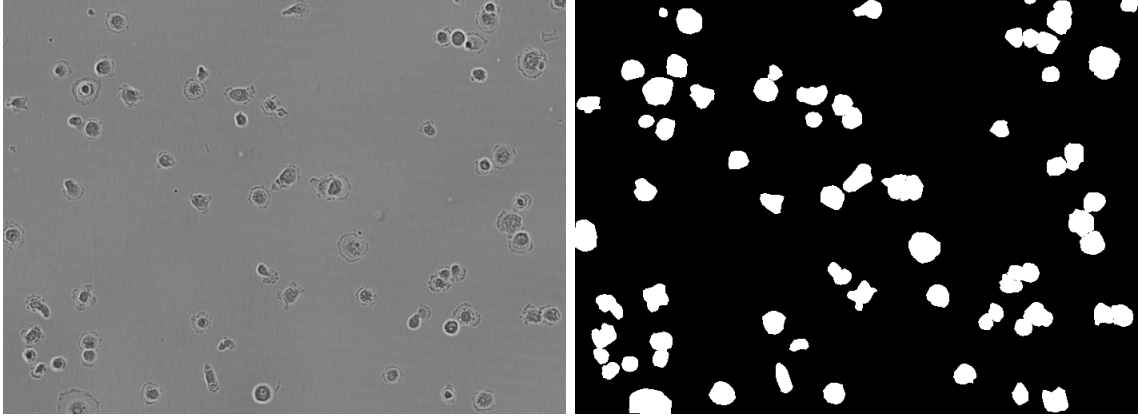


Figure 1: First Image is the original image for the dataset of A172 Phase A7 and the second image is the Ground Truth for the original image

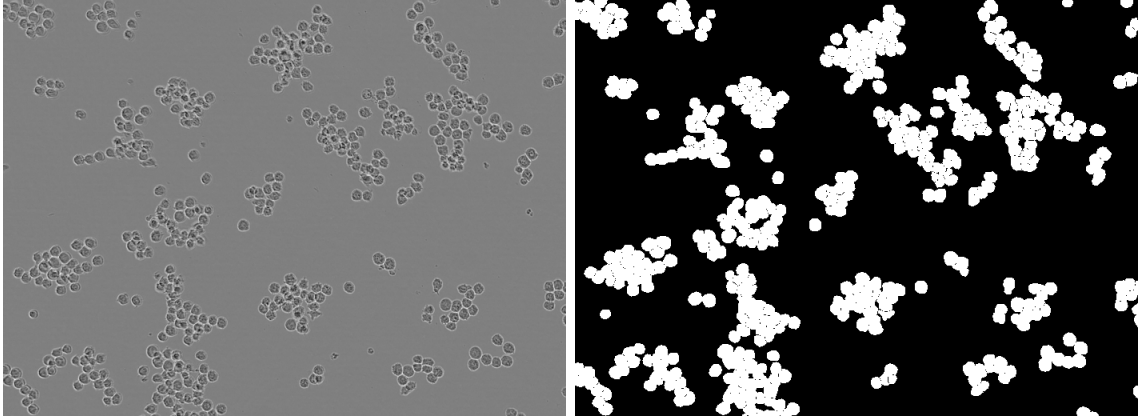


Figure 2: First Image is the original image for the dataset of BV2 Phase D4 and the second image is the Ground Truth for the original image

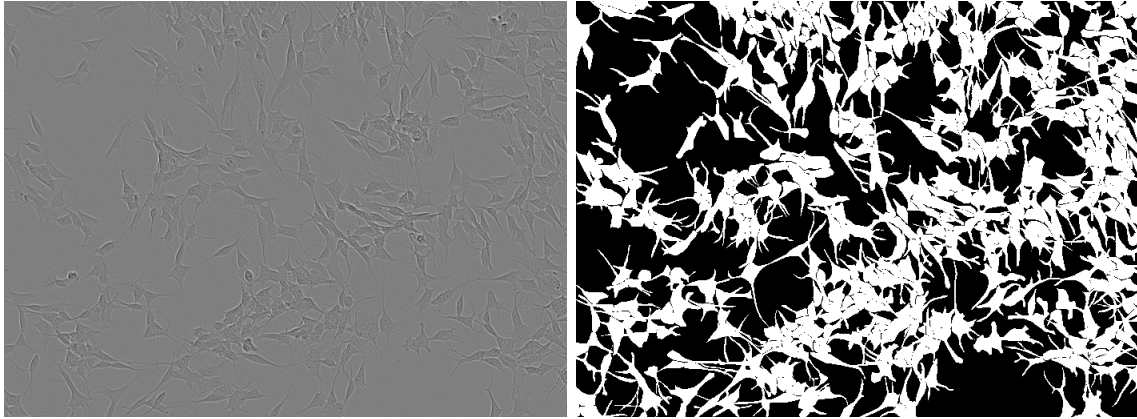


Figure 3: First Image is the original image for the dataset of SHSY5Y Phase B10 and the second image is the Ground Truth for the original image

## II. What is planned for next week

1. Compare the results with Ground Truth We will compare our result images to the ground truth images to evaluate the accuracy of our model. This will help us to know where the model performs well and where it requires improvement.
2. Test on Other Cell Types We will apply the same model to other cell types. Based on the outcomes, we will modify certain settings of the model to achieve improved accuracy for each cell type.
3. To study connected component analysis in detail and add it in our detection pipeline.

## References

- [1] C. Edlund, T. R. Jackson, N. Khalid, N. Bevan, T. Dale, A. Dengel, S. Ahmed, J. Trygg, and R. Sjögren, “LIVECell—A large-scale dataset for label-free live cell segmentation,” *Nature Methods*, vol. 18, no. 9, pp. 1038–1045, 2021. [Online]. Available: <https://www.nature.com/articles/s41592-021-01249-6>
- [2] Sartorius-Research, “GitHub - sartorius-research/LIVECell,” *GitHub Repository*, n.d. [Online]. Available: <https://github.com/sartorius-research/LIVECell>