Cell segmentation is the process of distinguishing cells in microscopic images. It is useful for determining cellular features, dynamics, and morphology. Since cell segmentation can be time-consuming, deep learning is used to analyze large amounts of images more efficiently. This project utilized two AI models, Cellpose and StarDist, to analyze cellular microscopy images for better accuracy and efficiency. Two public datasets, Livecell and Tissuenet, which contain label-free images and fluorescent labeled images respectively, were evaluated. To solve this problem, the team used pre-trained models to obtain prediction masks. Then, the prediction accuracy was evaluated using three main metrics: IOU (intersection over union), precision, and recall. These evaluations were performed by comparing the prediction masks to the ground truth labels, which were reconstructed separately. The team found that the Cellpose models outperform StarDist on the Tissuenet data across tissue types. The Cellpose models show poor performance on Livecell data, likely due to data quality issues. These results have provided a baseline for future evaluations and informed the next steps of data quality assurance and model tuning.

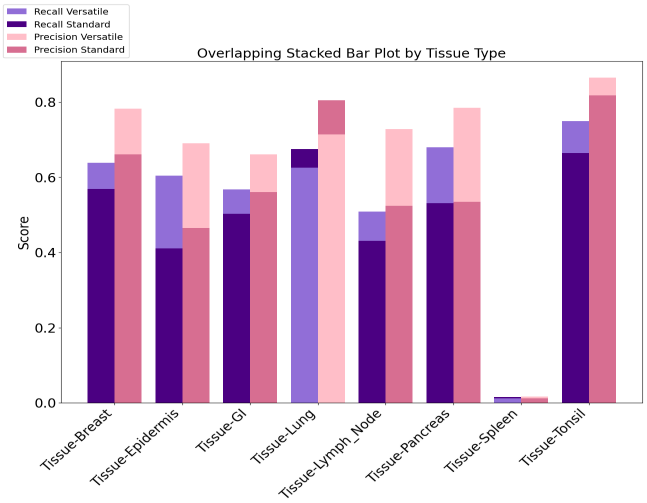

Figure 1: Precision and recall for Stardist models (versatile and standard) on Tissuenet data.

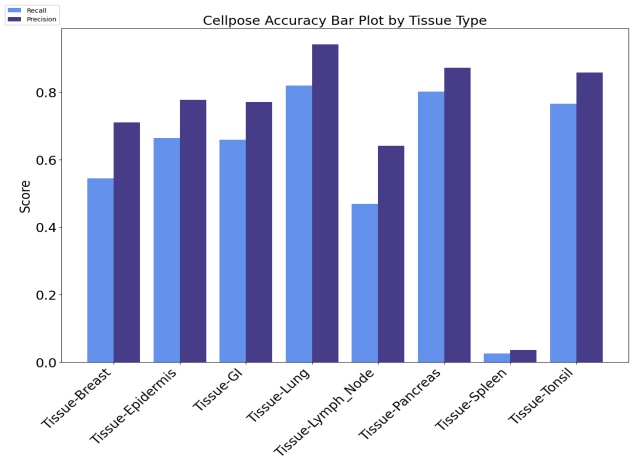

Figure 2: Precision and recall for Cellpose model on Tissuenet data.

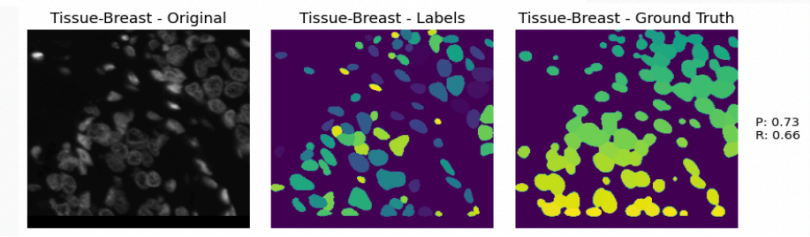

Figure 3: Quality Control plot example for Tissuenet data.

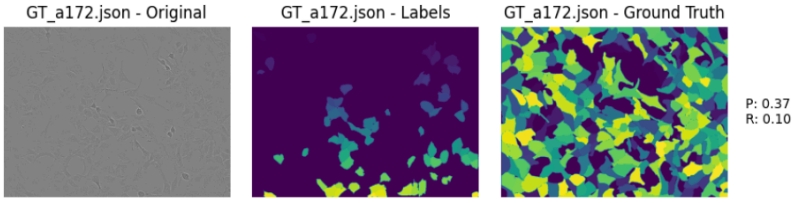

Figure 4: Quality Control plot example for Livecell data.