

Image segmentation with minimal supervision for live-cell imaging

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Summary

Microscopy is an important tool for studying the dynamic processes of life. In particular, live-cell imaging enables the observation of cell development and behavior and is widely used in the life sciences, for example to study how drugs affect the growth of tumor cells. With this technique cells can be imaged over long periods of time, resulting in large datasets that are infeasible to analyze manually.

My project aims at developing methods to automate the most tedious parts of analysis: the identification and delineation of cells. To this end, I will develop machine learning based algorithms for cell segmentation that work for phase-contrast images, the main modality used in live-cell imaging. My main focus will be on algorithms that can be applied to new data without many annotated example images, a requirement that makes current methods difficult to apply in practice. To achieve this goal, I will make use of transfer learning and self-supervised learning techniques.

The methods I develop will be integrated with the IncuCyte Live-Cell Imaging Platform in Göttingen and made available as open-source tools in order to enable quantitative analysis of live-cell images and accelerate research based on this technique.