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A Probabilistic Approach to Joint Cell Tracking and Segmentation in High-Throughput Microscopy Videos

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Highlights

- We propose an unsupervised, automatic tracking and segmentation framework for high-throughput microscopy image sequences.
- Cell segmentation and tracking are tied together via Bayesian inference of dynamic models.
- The Kalman inference problem is exploited to estimate the time-wise cell shape uncertainty in addition to cell trajectory. The inferred cell properties are integrated with the observed image, using a fast marching algorithm, to obtain the image likelihood for cell segmentation and association.
- We present highly accurate results, surpassing the state of the art, for a variety of microscopy data sets with high dynamics, including long sequences (hundreds of frames).

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