LiveSRRF: ADAPTIVE LIVE-CELL SUPER-RESOLUTION MICROSCOPY

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ABSTRACT: Live-cell super-resolution imaging is of major interest to biomedical research, as it enables the monitoring of dynamic biological behaviours at the nanoscale. Most super-resolution approaches, however, rely on high-intensity illumination, therefore limiting long-term imaging. Here, we present a new evolution of the SRRF approach [1] – LiveSRRF – which integrates an adaptive routine allowing the algorithm to achieve an optimal resolution and image quality given illumination constraints. This is achieved by using a hybrid computational engine where SQUIRREL [2] metrics are used to find optimal analytical settings, based on iterative data analysis. LiveSRRF thus achieves better quality images when compared with its predecessor, while retaining its benefits: compatibility with most microscopes and fluorophores, and live-cell friendly illumination. We present validation and demonstration datasets at different blinking densities and with different temporal dynamics. LiveSRRF is part of the NanoJ toolbox [3] our lab develops.

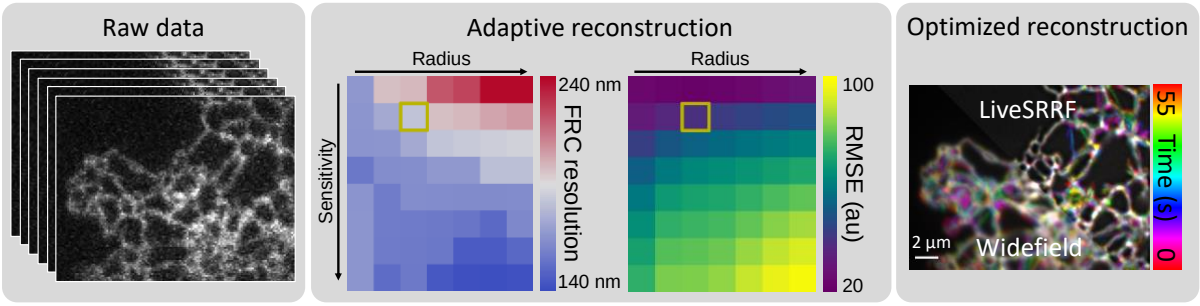

Figure 1: LiveSRRF pipeline. The raw data are analysed by adaptive parameter search in order to obtain the optimised LiveSRRF reconstruction, providing super-resolution at 10Hz. Endoplasmic Reticulum (ER) dynamics, COS-7 cells expressing the luminal ER marker, PrSS-mEmerald-KDEL.

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