Annotation of Cellular Compartments with CARS in Combination with Fluorescence

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Cancer is one of the raising problems of the ageing society and tumor growth is not fully understood yet. In the common techniques the samples are manipulated by dyes, which can lead to artefacts. Raman microscopy provides a label-free approach, but suffers from fluorescence background and the time consuming measurement. With Coherent Anti-Stokes Raman Spectroscopy (CARS) as a further technique of Raman spectroscopy the measurement time is reduced drastically.

CARS-spectra of pancreatic tumor cells (MIA PaCa-2) were measured in the C-H stretching region from 2700 to 3000 cm^{-1}. These spectra were analysed with an unsupervised learning algorithm (hierarchical cluster analysis). The obtained clusters were assigned to false-colour images and were annotated by colocalization with the corresponding fluorescence images of stained cellular components. With these data a supervised learning algorithm (random forest) was trained and used to automatically annotate the cellular components.