

Large-scale & Comprehensive Mapping of Cellular Alterations in Brain Tissue

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Abstract— The altered brain needs our urgent attention. While international brain mapping initiatives remain focused on the structure and working of the neuronal networks, conditions like traumatic injury, ischemia, binge alcohol, tumor growth, and experimental drug treatments inflict complex and widespread brain cytoarchitectural alterations that deserve to be mapped. Many of these alterations can be subtle and/or latent, only discernible by sensing changes in cell morphology and/or the expression and/or intra-cellular distribution of specific molecular markers, and can be spread across brain regions that are distant from the injury/damage site. There is a compelling need to detect and quantify brain cytoarchitectural alterations in a sensitive and comprehensive manner, since missed changes in certain brain regions may eventually manifest as confounding clinical conditions, or dangerous side effects. In this talk, I will describe methods for comprehensive profiling of brain cytoarchitectural alterations using multiplexed fluorescence imaging, computational image analysis, atlas fitting, multivariate statistics, and machine learning methods.