

Proposition de stage/ Internship proposal (**1 page max**)

Date de la proposition : 19/11/21

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<b>Nom du Laboratoire / laboratory name: Institut de la Vision</b>			
Code d'identification :	UMRS 968	Organisme :	Inserm
Site Internet / web site:	<a href="http://www.institut-vision.org/en/wavefront-engineering-microscopy.html">www.institut-vision.org/en/wavefront-engineering-microscopy.html</a>		
Adresse / address:	17 rue Moreau		
Lieu du stage / internship place:	Institut de la Vision, 17 rue Moreau, 75011 , Paris		

<b>Titre du stage / internship title: Wavefront shaping and light patterning for optical imaging of neuronal activity</b>
Résumé / summary
<p>A non- invasive approach to visualize neuronal activity with single cell resolution is critical to understand how the brain works, how it computes information and controls behavior.</p> <p>In recent years, the introduction of genetically expressed indicators of neuronal activity, <b>opened the way to optically detect neuronal activation via fluorescent optical imaging</b>. The development of dedicated imaging approaches is critical to fully exploit this capability. In particular, efforts are dedicated to image large field-of-views, with high acquisition speed and in deep region inside scattering tissue.</p> <p>The wavefront engineering microscopy group, at the Vision Institute, is pioneer in the development of advanced optical techniques applied to Neuroscience. In particular, it focuses on <b>approaches based on wavefront shaping and phase modulation of laser beam</b>, using Spatial Light Modulators (SLM), to generate arbitrary illumination patterns deep in living tissue.</p> <p>In this project, we propose to apply a recent technique for generation of 3D multispot illumination[3], combined with a fast refresh-rate SLM, camera or single-pixel detector and signal reconstruction algorithms, in order <b>to develop a novel approach for volumetric imaging of neuronal activity</b>.</p> <p>Accordingly with the interest of the candidate, the work will focus either on the <b>data treatment and signal reconstruction</b> part or on the experimental implementation of the optical setup and the recording on simple biological preparation such as organotypic brain slices and zebrafish.</p>
<b>References:</b>
[1] Ronzitti, E. <i>et al.</i> Recent advances in patterned photostimulation for optogenetics. <i>J. Opt.</i> <b>19</b> , (2017).
[2] Ji, N., et a. L. Technologies for imaging neural activity in large volumes. <i>Nat. Neurosci.</i> <b>19</b> , 1154–64 (2016).
[3] Accanto, N. <i>et al.</i> Multiplexed temporally focused light shaping for high-resolution multi-cell targeting. <i>Optica</i> <b>5</b> , 1478 (2018).

<b>Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : Oui</b>
<b>Si oui, financement de thèse envisagé/ financial support for the PhD: Fonds propres du laboratoire ou bourse ministérielle</b>