

## MASTER: Motion-based image recovery for compressive video

CREATIS opens a Master internship of 5-6 months to address new questions in the emerging field of fast single-pixel video recovery

**Keywords** Computational imaging, compressive video acquisition, image processing, video compression, algorithm.

**Background** Recent advances in signal processing have made it possible to design new digital imaging systems. Single-pixel imaging is a new paradigm that enables two-dimensional imaging from a point detector. It has been raising increasing attention because it allows high-performance optical imaging systems (e.g., hyperspectral and/or time-resolved) to be developed at very low cost [1]. Single-pixel cameras comprise a single point detector that is coupled with a spatial light modulator. By performing a sequence of optical measurements for different modulation patterns, it is possible to recover the image of the observed scene provided that *ad-hoc* restoration algorithms are implemented. Our group recently showed that adapting the patterns to the object can significantly improve the recovery of still images [2-3].

**Work Plan** The aim of this work is to generalize the concept of adaptivity to compressive video imaging. In this case, motion estimation techniques can improve our ability to predict one frame from the knowledge of previous frames, which can be used to reduce the number of measurements per frame, and hence increase the imaging speed. State-of-the-art video compression algorithms rely heavily on strategies for motion estimation (e.g., block-based motion estimation, optical flow or wavelet lifting), that can be smartly and efficiently incorporated into an adaptive framework.

**Context** The expected duration of the internship is 5-6 months. The internship is supported by an ANR JCJC grant. A PhD position will be open in October 2018.

**Skills** We are looking for an enthusiastic student with a background in signal and image processing and computer science. He/she is expected to implement his idea on a real life setup. Knowledge in optics would be appreciated. Strong programming skills in Matlab are required.

**Salary** ~600€ net monthly

### How to apply?

Send your CV, a motivation letter, and your academic records to

Nicolas Ducros [nicolas.ducros@creatis.insa-lyon.fr](mailto:nicolas.ducros@creatis.insa-lyon.fr)

Françoise Peyrin [francoise.peyrin@creatis.insa-lyon.fr](mailto:francoise.peyrin@creatis.insa-lyon.fr)

### Reference

[1] R. G. Baraniuk *et al.*, "Compressive video sensing: Algorithms, architectures, and applications", *IEEE Signal Processing Magazine*, 34 (1), 52-66, 2017.

[2] F. Rousset *et al.* "Adaptive basis scan by wavelet prediction for single-pixel imaging", *IEEE Transactions on Computational Imaging*, 3 (1), 36-46, 2017. [Open access pdf](#).

[3] [https://www.creatis.insa-lyon.fr/~ducros/WebPage/single\\_pixel\\_imaging.html](https://www.creatis.insa-lyon.fr/~ducros/WebPage/single_pixel_imaging.html)