

Developing fast compressive imaging systems

Postdoctoral fellowship

CREATIS laboratory (Lyon, France) opens a postdoctoral position funded for two years.

Keywords Single-pixel imaging, compressive video imaging, instrumentation development.

Background Our group is particularly interested in developing computational imaging systems that combine advances in hardware and software [1, 2, 3].

Single-pixel imaging is a paradigm that enables two-dimensional imaging from a point detector. It leads to high-performance optical imaging systems (e.g., hyperspectral and/or time-of-flight measurements) at very low cost. 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 reconstruction algorithms are implemented [4]. Successful applications of single-pixel imaging include three-dimensional imaging [5], hyperspectral imaging [6], fluorescence microscopy [7], infrared imaging [8] and terahertz imaging [9]. Compressive imaging also generated the interest of large private companies [10].

Project We aim to develop a fast single-pixel camera for fluorescence-guided surgery. Fluorescence-guided surgery is an imaging technique that helps surgeons to perform safer and less invasive surgery. While quantitative fluorescence imaging requires to exploit the full spectrum, there are no traditional hyperspectral cameras with sufficient spectral resolution. Therefore, current solutions are based on point measurements only. A single-pixel camera could bring high spectral resolution together with high spatial resolution. However, current single-pixel cameras are still too slow to operate in real time.

Context The position is funded for two years by the French National Research Agency (ANR). The position offers excellent opportunities for travel in France and abroad.

Skills We are looking for an enthusiastic and autonomous candidate who can develop optical instrumentation. The applicant must hold a PhD in Physics or Electrical Engineering with a specialization in optics or photonics and have a strong interest in medical imaging. Strong programming skills in Labview and Python are required. Knowledge of signal processing and/or machine learning is a bonus.

How to apply? Send CV, motivation letter, and academic records to nicolas.ducros@creatis.insa-lyon.fr, bruno.montcel@creatis.insa-lyon.fr, and peyrin@esrf.fr.

Salary €2200 net per month (this is a minimum, salary depends on experience and is negotiable)

References

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