



PhD in FISICA / PHYSICS - 40th cycle

THEMATIC Research Field: MULTISPECTRAL FLUORESCENCE LIFETIME IMAGING BASED ON COMPUTATIONAL IMAGING TECHNIQUES

Monthly net income of PhDscholarship (max 36 months)
€ 1300.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	<p>Multispectral fluorescence lifetime imaging (FLIM) is a powerful optical technique to investigate physical, chemical, and biological processes at the molecular level. Many different physical parameters can influence fluorophores' local environment and, consequently, the de-excitation pathways of the molecules' excited state. There exists a growing interest in developing novel acquisition strategies to enhance throughput and reduce acquisition time of FLIM systems. Single-pixel camera combined with compressive sensing techniques is a promising scheme for acquiring a multidimensional dataset (space, spectrum and lifetime) and for reducing the measurement time with respect to conventional imaging schemes. Main objectives of the research will be to develop novel wide-field FLIM imaging techniques based on compressive sensing and high photon rate detection based on innovative computational approach and detectors. The systems will be applied to study the photophysics of biological samples and in particular photosynthetic systems. The objectives are in the framework of funded European project: UE-Horizon Europe-ERC/HERMES.</p>
Methods and techniques that will be developed and used to carry out the research	<p>The research activity is based on the combined development of optical systems and computational methods based on single pixel camera acquisition combined with compressive sensing schemes. In particular the experimental part will be mainly based on ultrafast laser sources, time resolved detectors, Time</p>



	<p>Correlated Single Photon Counting (TCSPC) systems. Computational approaches will be based on both model based and deep learning algorithms to solve the inverse problem. In particular adaptive approaches will be exploited and developed together with the experimental system.</p>
Educational objectives	<p>The research programme is intrinsically multi disciplinary and the PhD student will be trained in the photophysics of biological system, photonics devices, sensors, imaging optics and computational approaches. The capability to manage such interdisciplinary approach (computational imaging) in both designing, perform and interpret complex system is the fundamental educational objective to train the student in the field of research and engineering.</p>
Job opportunities	<p>The PhD research activity involves different areas, spanning from physics, optical design, detectors and related electronics, experimental work and computation approaches. Moreover soft skills such as teamwork and public speeches will be acquired. All the acquired skills are appreciate for future in academia, or for highly qualified positions in a wide range of industries related with the design of advanced optical instrumentation mainly in biomedical industry.</p>
Composition of the research group	<p>2 Full Professors 4 Associated Professors 4 Assistant Professors 5 PhD Students</p>
Name of the research directors	<p>C.D'andrea, A. Farina, G. Acconcia</p>

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	650.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities: purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences. Financial aid per PhD student per 3 years: max 5300,25 euros per student.

Teaching assistantship: There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer and desk availability: individual or shared use computer and desk