Early Stage Researcher (ESR) Doctoral Studentships in the Marie Sklodowska-Curie Innovation Training Network "Plenoptic Imaging"

The Institute of Optical Materials and Technologies (IOMT) is a research unit of the Bulgarian Academy of Sciences (BAS). IOMT offers unique environment for research and doctoral education in optics and photonics. In our collaborative community doctoral students gain fundamental knowledge and practical skills necessary to cultivate a creative and entrepreneurial mindset. BAS unites 43 institutes and laboratories and is the oldest and largest scientific institution in Bulgaria.

Plenoptic Imaging (PLENOPTIMA) is a four-year (2021–2024) H2020 Marie Sklodowska-Curie Innovative Training Network that develops a cross-disciplinary approach to plenoptic imaging, which includes new optical materials and sensing principles, signal processing methods, new computing architectures, and vision science modelling. With this aim, PLENOPTIMA joins five of the strongest research groups in nanophotonics, imaging and machine learning in Europe with twelve innovative companies, research institutes, and a pre-competitive business ecosystem developing and marketing plenoptic imaging devices and services.

Job Description

IOMT offers 2 positions for early-stage researchers (ESRs). An ESR job position requires conducting research on an individual project at a doctoral student level and studying toward completing a doctoral degree. We are looking for candidates who have the suitable background and motivation to work on highly innovative projects and be trained in competitive yet collaborative research and study environment. The ESRs funded by the project will be working on two specified individual projects (IP) and will be registered in Joint degree doctoral programmes at academic institutions in Bulgaria, Finland and Germany as described below.

IP 1: 4D biospeckle optical coherence tomography

Objectives: Optimize the spatiotemporal parameters for acquisition of optical coherence tomography (OCT) images and subsequent signal processing. Develop a model for analyzing biospeckle field at each point in the volume OCT image based on speckle phase. Develop an image processing method for recognition of different layers and structures in tissue in the images acquired by OCT. Prepare a protocol for recognition of malignant and healthy tissue.

Expected Results: Biospeckle OCT imaging system to be applied for recognition of healthy and malignant tissue. An appropriate numerical model for speckle field analysis of OCT images and their spatiotemporal (4D) visualization.

Planned secondments: Secondments to other network partners for up to 11 months have been planned. The secondments include denoising and filtering of OCT data in spatio-temporal domain and 4D display of OCT images.

Joint PhD degree with Tampere University, Finland.

IP 2: Analysis and compression of dynamic speckle

Objectives: Develop a rigorous numerical model of speckle formation depending on illumination, sensor parameters and object description as roughness and related to it reflection model. Develop approaches for optical generation of speckle with arbitrary temporal variation by using phase or amplitude spatial light modulators. Develop algorithms for quantitative

spatiotemporal mapping of processes or activity within 3D objects by point-wise processing of varying in time speckle images. Enhancement of quality of activity visualization. Improvement of temporal resolution by decreasing the number of images used for computation of a single activity map. Develop a processing scheme, which adapts to non-uniform illumination. Study approaches for data compression and their impact on the quality of the activity map.

Expected Results: An adequate numerical speckle model and a controllable optical speckle simulator. Quantitative characterization of speed of pro-cesses at high temporal resolution. An appropriate approach for data compression without affecting determination of activity. Better quality of the dynamic speckle analysis and widening the scope of its applications

Planned secondments: Secondments to other network partners for up to 11 months have been planned. The secondments include denoising in dynamic speckle analysis and compression of coherent raw data.

Joint PhD degree with Technische Universität Berlin.

The research will be supported by an extensive training program consisting of [training schools](), [workshops](), and [webinars]().

Mobility between network partners is supported by research visits and secondments. In this way, the employed researchers will be integrated in the network with the aim to help them to interact with their fellows and within different research, development and innovation environments.

Requirements

- We are looking for talented, creative and highly motivated researchers.
- Applicants **must** hold a Master's degree or equivalent in the fields of electrical engineering, communications engineering, physics, optics and photonics, information technology, computer science, or a closely related field, completed with good grades.
- The positions include transnational mobility (i.e. moving from one country to another)
- Applicants **shall**, at the time of recruitment by the host organization (IOMT), be in the first four years (full-time equivalent research experience) of their research careers and not yet have been awarded a doctoral degree. Full-time equivalent research experience is measured from the date when a researcher obtained the degree that would formally entitle him/her to embark on a doctorate.
- H2020 MSCA Mobility Rule: **To be eligible** at the time of recruitment by the host organization (IOMT), researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organization (Bulgaria) for more than 12 months in the 3 years immediately prior to the recruitment date. Compulsory national service and/or short stays such as holidays and time spent as part of a procedure for obtaining refugee status under the Geneva Convention are not taken into account.

We offer

We offer highly innovative training that will help you to build a solid fundamental of the area and will put you in an extremely good position in your future career endeavours in a rapidly growing sector.

The salary will be set in accordance with MSCA ESR rates.

We offer a wide range of staff benefits, flexible working hours, access to [facilities of IOMT](), National Science Infrastructure – [INFRAMAT]() and Centre of Excellence "Mechatronics and clean technologies", sports facilities and several restaurants and cafés on campus.

Sofia is the largest city and the capital of Bulgaria. Sofia is a cosmopolitan city of different nationalities and cultures. They elegantly coexist in the historic downtown, which has become a kind of open-air museum with preserved remains of ancient civilizations. Sofia is one of the major academic hubs on the Balkan peninsula and offers a dynamic living environment with a lot of cultural events. A favourite place for tourism for the citizens of Sofia is Vitosha mountain located at the southern border of the city (one hour access from the centre of the city by public transportation). Its highest point is Black peak (2290 m). Vitosha is a famous ski resort. For skiing and snowboarding, there are 20 km of slopes available. 15 lifts transport the guests. The winter sports area is situated between the elevations of 1,340 and 2,290 m. For more information about Sofia and Bulgaria, please visit https://www.visitsofia.bg/en/ and https://visitmybulgaria.com/

How to apply

Please submit your application to plenoptima.iomt@gmail.com . **The closing date for applications is 14 December 2020. Please write your application and all the accompanying documentation in English and attach them in PDF format.**

Please attach only the following documents to your application:

- A letter of motivation (max. 1 page)
- Curriculum vitae in a template https://europa.eu/europass/en and including a list of publications and the contact details of two referees
- Copy of your MSc+BSc degree certificates including transcripts of all university records and Diploma Supplement, and their English translations

For more information, please contact:

Prof. Elena Stoykova, DSc (elena.stoykova@gmail.com)

Assoc. Prof. Violeta Madjarova, PhD (vdmadjarova@gmail.com)

Please indicate in which ESR position(s) you would be interested in, in preferred order.

Can your application be shared with the other parties inside PLENOPTIMA network?