
Full Time Marie Curie Early Stage Researcher Position in the field of
Image Processing and 3D Reconstruction of
Cultural Heritage artifacts

Applications are invited from candidates who possess the necessary qualifications in order to fill one (1) full time Marie Curie Early Stage Researcher (ESR) Fellow Position within the Competence Center for Cultural Heritage Digitization at Fraunhofer Institute for Computer Graphics Research in Darmstadt, Germany.

The Fraunhofer Institute for Computer Graphics Research IGD is the world's leading institute for applied research in Visual Computing. It is one of 60 research institutes run by Fraunhofer-Gesellschaft, the largest organization for applied research in Europe.

In Darmstadt alone Fraunhofer IGD employs 120 full time staff members and about 250 student researchers in 8 departments and is associated to TU-Darmstadt. Fraunhofer IGD's other research locations are in Rostock (Germany), Graz (Austria) and Singapore, associated to University of Rostock, TU-Graz and Nanyang Technological University respectively.

Darmstadt (pop. 150.000), City of Science is home to three universities, three Fraunhofer Institutes with about 45.000 students and only 20min south of Frankfurt Rhein/Main airport, one of the largest international airports in Europe. Its universities are ranked among the best in Germany. Darmstadt is also home to ESOC the European Space Operations Center and GSI Helmholtzzentrum für Schwerionenforschung GmbH operating a unique large-scale accelerator for heavy ions.

Visual Computing is image- and model-based information technology. It includes Computer Graphics, Computer Vision, as well as Virtual and Augmented Reality. Fraunhofer IGD develops prototypes and complete solutions based on customer-specific requirements. The range of applications of our concepts, models and practical solutions spans from virtual product development for medicine, commerce to multimedia learning and training. Research and development projects are directly applicable to current problems in industry. Numerous spin-offs ensure that prototypes are quickly converted into market-ready products.

The Competence Center for Cultural Heritage Digitization at Fraunhofer IGD develops fast, economic digitization technologies for a faithful, virtual reproduction of real world objects, which enable an automated, accurate and physically correct reconstruction of their geometry, texture and optical material reflectance properties. The used



reconstruction techniques digitize objects using a variety of sensors and light-sources under controlled environmental conditions for comparable results of the highest quality.

The selected Marie Curie ESR will work for 36 months within the ITN-Digital Cultural Heritage (ITN-DCH: www.itn-dch.eu) Marie Curie ITN Programme which, is the only EU funded programme bringing together fourteen (14) leading European Institutions as full partners and nine (9) other as associated partners in a transnational network, aiming at implementing a multidisciplinary and intersectorial research and training programme between the academic and the industrial partners.

Description

Cultural Heritage (CH) is an integral element of Europe and vital for the creation of a common European identity and one of the greatest assets for steering Europe's social, economic development and job creation. However, the current research training activities in Cultural Heritage are fragmented and mostly design to be of a single-discipline, failing to cover the whole lifecycle of Digital Cultural Heritage (DCH) research, which is by nature a multi- disciplinary and intersectorial research agenda. ITN-DCH aims for the first time worldwide that top universities, research centers, industries and CH stakeholders, end-users and standardized bodies will collaborate to train the next generation of researchers in DCH. The project aims to analyze, design, research, develop and validate an innovative multi-disciplinary and intersectorial research training framework that covers the whole lifecycle of digital CH research for a cost-effective preservation, documentation, protection and presentation of CH. ITN-DCH targets innovations that covers all aspects of CH ranging from tangible (books, newspapers, images, drawings, manuscripts, uniforms, maps, artifacts, archaeological sites, monuments) to intangible content (e.g., music, performing arts, folklore, theatrical performances) and their inter-relationships. The project aims to boost the added value of CH assets by re-using them in real application environments (protection of CH, education, tourism industry, advertising, fashion, films, music, publishing, video games and TV) through research on (i) new personalized, interactive, mixed and augmented reality enabled e-services, (ii) new recommendations in data acquisition, (iii) new forms of representations (3D/4D) of both tangible /intangible assets and (iv) interoperable metadata forms that allow easy data exchange and archiving. **One ESR will be recruited by the host organization at the Competence Center for Cultural Heritage Digitization at Fraunhofer Institute for Computer Graphics Research in Darmstadt, Germany**



Position ESR7:

One ESR to be recruited by the host organization of the Competence Center for Cultural Heritage Digitization at Fraunhofer Institute for Computer Graphics Research in Darmstadt, Germany for the duration of 36 months under full employment contract. The selected candidate's contract can be extended up to 60 months when desired and if performing well.

The fellow will perform research along the following lines:

We are looking for a motivated early stage researcher to join our group and help us achieve fast and economic mass digitization of 3D cultural heritage artifacts by automation and parallel processing technologies from images or videos. This objective implies the sub-goals of optimizing performance and parallelism, accuracy, robustness and scalability of 3D reconstruction algorithms. The position will be tightly linked with research challenges in the computer vision domain, especially optical flow and feature recognition techniques, as well as development of parallel, multi-core and GPU-based technologies to speed up 3D photogrammetric reconstruction techniques. Drawing from a data pool of highly unstructured videos and still images, one of the challenges will be making the algorithms robust to changes in background, various lighting situations and optical degradation of input data, thus experience in automated data selection and filtering methodologies is vital.

The required competence and experience is as follows:

Knowledge in the field of computer vision and image processing is recommended, including the tasks of background extraction, robust separation of dynamic and static content, drawing from methods of optical flow and 2D features, as well as feature- and marker-based tracking.

3D reconstruction will be based on photogrammetric approaches, and thus, knowledge and experience in 3D/4D-reconstruction techniques based on videos and images, using Photometric Stereo and Multi-view Stereo, e.g., and other photogrammetric methods is recommended.

We also want to process image streams to do 3D reconstruction of dynamic content, so experience in video streaming and stream decomposition into frames is useful.

Furthermore, knowledge of parallelization techniques is welcome, such as methodologies for multi-threading, multi-core and multi-GPU computation, as well as out-of-core computation, as handling of large amounts of data.

The position will be tightly coupled with active research and practical implementation within a large software framework, which is why we require experience in scientific work and publication. From the implementation side, excellent programming skills in C++ and



optional Java, and GLSL or OpenCL, as well as experience with cross-platform build systems such as cmake are an absolute requirement.

Since we will be working intensely in a team, excellent proficiency in the English language is mandatory, and knowledge of the German language is encouraged. Professional experience in the industry and/or with previous EU projects is welcome.

The ESR is expected to present his/her research results on project meetings, international conferences and in scientific publications and to contribute to patent applications.

Research Fields

Computer Science, Computer Vision, Photogrammetry, Computer Graphics, Digital Heritage.

Career Stage

Early stage researcher or 0-4 years of experience (Post graduate) – According to the FP7-PEOPLE (Marie Curie Actions) Regulations. Eligibility rules for the Marie Curie fellows can be found at the FP7-PEOPLE 2013 Work programme:

http://ec.europa.eu/research/mariecurieactions/documents/about-mca/actions/itn/marie-curie-actions-fellowships-people-wp-201301_en.pdf

Research Profile

Early Stage Researcher

Benefits

- Competitive salary to cover living and, mobility costs, social and health insurance **(according to the FP7-PEOPLE Marie Curie Actions Programme regulations)**.
- In the context of a personal Career Development Plan, opportunities for international collaboration and exchanges to world-class academic and industrial partners will take place.
- Possibility for a PhD
- Training in a range of state-of-the-art scientific skills, intellectual property and project management skills.
- Secondment placements within the network's partners (max. duration 2 months).

For more details on salary and other benefits please refer to the FP7-PEOPLE Marie Curie actions website at: http://ec.europa.eu/research/mariecurieactions/careers_en.htm and



the FP7-PEOPLE ITN2013 work programme:

http://ec.europa.eu/research/mariecurieactions/documents/about-mca/actions/itn/marie-curie-actions-fellowships-people-wp-201301_en.pdf

Applicants are requested to submit the following:

1. Detailed Curriculum Vitae with all the certified copies of their awards translated in English.
2. Motivation Letter
3. Official transcripts of grades from all academic institutions of higher education listed in his/her application, certified copies of degrees, or/and certifications of fulfillment of the required obligations for entering a graduate PhD programme
4. Official certified copies of titles and documents in English
5. Names of three referees who, upon request, can provide recommendation letters
6. Copies of any related research papers or other significant work by the applicant

Applications must be submitted in a closed express courier envelope marked as “[Application for Marie Curie ITN-DCH Research Fellow Position](#)” – **Pedro Santos, Head of Competence Center Cultural Heritage Digitization, Fraunhofer Institute for Computer Graphics Research IGD, Fraunhoferstrasse 5 - 64283 Darmstadt – Germany**. Otherwise it must be sent via regular registered post with a clearly visible post office stamp of a date not later than 30th of June 2014, 24:00 that is the deadline for the submission of the applications.

Applicants are also requested to send their applications electronically to these email addresses pedro.santos@igd.fraunhofer.de and marinos.ioannides@cut.ac.cy before the deadline of 30th of June 2014, 24:00, however, please note that the electronic submission alone will not be considered as a formal application unless the printed application is received as requested in the previous paragraph.

For enquiries: pedro.santos@igd.fraunhofer.de

Start of the fellowship: 1st of August 2014

Comment/web site for additional job details

The Applicant should have:

- Master of Science Degree from a recognized university in Computer Science, Engineering, Mathematics or Physics, Optics, Archaeology, Geography, Geodesy or any other course providing the candidate with a background in image processing and/or 3D reconstruction
- Excellent knowledge of the English language at a proficiency level (spoken and written) is required, Knowledge of German is encouraged.



More information:

- <http://www.igd.fraunhofer.de>
- <http://www.cultlab3d.de>

Requirements

- **The ESR candidate, at the time of recruitment, must not have resided (or carried out his/her main activity e.g. work, studies, etc.) in Germany (host country), for more than 12 months in the last 3 years immediately prior to the reference recruitment date!**

(See also: http://ec.europa.eu/research/mariecurieactions/documents/about-mca/actions/itn/marie-curie-actions-fellowships-people-wp-201301_en.pdf)

- **The EST must not have PhD vet.**
- Required Education Level

Degree	Scientific Master Degree or equivalent, as described above
Degree Field	Computer Science, Engineering, Mathematics or Physics, Optics, Archaeology, Geography, Geodesy, Image processing

Required Languages

Language	ENGLISH
Language Level	Excellent

Additional Languages (optional)

Language	German, French
Language Level	Good

