



Marie Curie Doctoral position at:

- Università Degli Studi di Roma Tor Vergata (Italy)
- Technevalue GmbH – Bäch (Switzerland)
- Fondazione Toscana G. Monasterio (Italy)

ESR09 - Clinical image processing and Big Data analysis

Keywords: Clinical database, Image processing, Artificial intelligence/Big data.

General framework: 14 Early Stage Researchers (ESRs) will be offered doctoral positions as part of the MeDiTATe project, which is funded through the H2020 program: Marie Skłodowska-Curie Actions (MSCA) Innovative Training Networks – European Industrial Doctorate. The whole MeDiTATe project aims to develop state-of-the-art image based medical Digital Twins of cardiovascular districts for a patient specific prevention and treatment of aneurysms. The individual research projects of each ESR within MeDiTATe are defined across five research tracks: (1) High fidelity CAE multi-physics simulation with RBF mesh morphing; (2) Real time interaction with the digital twin by Augmented Reality, Haptic Devices and Reduced Order Models; (3) HPC tools, including GPUs, and cloud-based paradigms for fast and automated CAE processing of clinical database; (4) Big Data management for population of patients imaging data and high fidelity CAE twins; (5) Additive Manufacturing of physical mock-up for surgical planning and training to gain a comprehensive Industry 4.0 approach in a clinical scenario.

The work of each ESR, hired for two 18 months periods (industry + research) and enrolled in a PhD programme, will be driven by the multi-disciplinary and multi-sectoral needs of a multi-disciplinary research consortium (clinical, academic and industrial) which will offer the expertise of Participants to provide scientific support, secondments and training. Recruited researchers will become active players of a strategic sector of the European medical and simulation industry and will face the industrial and research challenges daily faced by clinical experts, engineering analysts and simulation software technology developers.

During their postgraduate studies they will be trained by the whole consortium receiving a flexible and competitive skill-set designed to address a career at the cutting edge of technological innovation in healthcare. The main objective of MeDiTATe is the production of high-level scientists with a strong experience of integration across academic, industrial and clinical areas, able to apply their skills to real life scenarios and capable to introduce advanced and innovative digital twin concepts in the clinic and healthcare sectors.

Description of the ESR project: The objective of ESR9 is to identify morphological/bio-humoral/hemodynamic variables which are of greatest importance in aneurysm stabilization or rupture, through big data analysis.

Big Data science refers to the massive amounts of multiple digital data sets that are captured, collected, integrated, and analysed. We intend to bring cutting edge frameworks and techniques in order to maximize Big Data potentials for knowledge discovery in Medical Digital Imaging field, with special focus on cardiovascular diseases (aortic aneurysm). Big data analytics in imaging field is crucial and difficult due to large imaging data to manage for a single patient. In modern hospitals data is consolidated in large PACS (Picture Archive and Communication Systems) installations. Data is related to the EHR (Electronic Health Record) environment by means of standard protocols and taxonomy. Every patient can have multiple studies related to a single pathology, and studies can have hundreds or thousands of images to be analysed. The proposed system must work in parallel with the installed systems (EHR and PACS) thanks to the DICOM (Digital and Communication in Medicine) standard protocol



and HL7 (Health level 7) that permit to retrieve, analyse and compare data and are compatible with PACS or VNA (Vendor Neutral Archives) archives and EHR systems. Big data analytics has the potential to transform the way healthcare providers use technologies to gain insight from their clinical and other data repositories in order to make informed decisions.

Additional Information:

ESR9 will be enrolled in the PhD programme of the Department of Enterprise Engineering of the University of Rome “Tor Vergata” (UTV), Italy. The ESR’s individual project will be realized at two different places: (a) TechneValue GmbH – (Switzerland) under the supervision of Mr. Mauro Odino, dynamic entrepreneurial venture providing superior and innovative business IT solutions. Areas of expertise consist in multi-channel customer service and support, sales processes automation, marketing and analytics, mobile and contact centre solutions with a special experience on Big Data science that TechneValue intends to bring in Medical Digital Imaging field; (b) Fondazione Toscana G. Monasterio (Italy) in the BioCardioLab headed by Eng. S. Celi. It is a public entity specialized in healthcare and research activities in the field of cardiology, cardio-surgery and electrophysiology for the treatment of cardiopulmonary diseases, including rare disorders such as congenital heart defects. It has participated in several projects involving big data analysis, numerical simulation and image processing. A one-month secondment is foreseen at National Technical University of Athens (NTUA, Greece).

Benefits, salary and duration:

The selected candidate will receive a salary in accordance with the MSCA regulations for ESR. The gross salary includes a living allowance (€3,270 per month, subject to MSCA country correction coefficient, i.e. 121.2 % for Switzerland and 104.4 % for Italy), a mobility allowance (€600 per month), and a family allowance (€500 per month, if the researcher has family by the date of recruitment, regardless of whether the family will move with the researcher or not). The guaranteed funding is for 36 months (i.e. EC funding).

Eligibility criteria:

Applicants can be of any nationality and must hold a Master of Science degree (or equivalent) in engineering. They need to fully respect both eligibility criteria (to be demonstrated in the Europass CV): (a) Early-Stage Researchers (ESRs) must, at the date of recruitment by the beneficiary, be in the first four years (full-time equivalent research experience) of their research careers and have not been awarded a doctoral degree. (b) Conditions of international mobility of researchers: Researchers are required to undertake trans-national mobility (i.e. move from one country to another) when taking up the appointment. At the time of selection by the host organization, researchers must not have resided or carried out their main activity (work, studies, etc.) in Italy for more than 12 months in the 3 years immediately prior to their recruitment. Short stays, such as holidays, are not taken into account.

Candidate profile: Candidates with background in biomedical image processing and analysis, PACS system (Picture Archive and Communication Systems), DICOM (Digital and Communication in Medicine) standard protocol, HIS (Hospital Information System) and Machine Learning should apply for this position. Good programming skills (SQL, Java, Python) are needed. Motivation and interest in Multi-physics, Medical Informatics and Biomedical engineering is preferable. Excellent knowledge of written and spoken English is required.

How to apply: Send CV, cover letter, BSc and MSc degrees, and letters of recommendation to all the following recipients: biancolini@ing.uniroma2.it, mauro.odino@technevalue.com and s.celi@ftgm.it.