

Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*)

1. Raziskovalna organizacija (*Research organisation*):

Univerza v Ljubljani, Fakulteta za elektrotehniko

2. Ime, priimek in elektronski naslov mentorja (*Mentor's name, surname and email*):

Franjo Pernuš (franjo.pernus@fe.uni-lj.si)

3. Šifra in naziv raziskovalnega področja (*Research field*):

2.06 Sistemi in kibernetika

4. Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*):

Navedite tudi morebitne druge zahteve, vezane na usposabljanje mladega raziskovalca (npr. znanje angleškega jezika, izkušnje z laboratorijskim delom, potrebne licence za usposabljanje...).

Mladi raziskovalec/raziskovalka (v nadaljevanju MR) se bo usposabljal v Laboratoriju za slikovne tehnologije (<http://lit.fe.uni-lj.si/>), Fakulteta za elektrotehniko, Univerza v Ljubljani, kjer raziskujemo in razvijamo nove postopke za analizo slik ter sisteme s strojnim in računalniškim vidom za zahtevne biomedicinske in industrijske aplikacije. Tema doktorske disertacije bo s področja obdelave in analize biomedicinskih slik in bo določena v dogovoru s kandidatom in glede na konkretno potrebe zunanjih kliničnih partnerjev Laboratorija za slikovne tehnologije.

Področje obdelave in analize biomedicinskih slik

S sodobnimi medicinskimi slikovnimi tehnikami, kot so magnetna resonanca, računalniška tomografija, ultrazvok, pozitronska izsevna tomografija, endoskopija, hiperspektralno slikanje, mikroskopija, itd., lahko zajamemo raznovrstne slike, ki vsebujejo komplementarno informacijo o zgradbi in funkciji slikanih molekul, celic, tkiv in organov. Bogato slikovno vsebino lahko koristno uporabimo le, če jo znamo pravilno izločiti, analizirati in interpretirati. Biomedicinske slike že dolgo ne služijo več samo za prikazovanje in diagnosticiranje, ampak vse bolj za boljše načrtovanje, izvajanje ter vrednotenje terapij in posegov v kirurgiji, radioterapiji, endoskopiji, intervencijski radiologiji, itd., spremljanje razvoja bolezni, učinkovitosti zdravil in poteka zdravljenja ter prognoze.

Zaradi interdisciplinarnosti raziskovalnega področja bo MR pridobil dodatna posebna znanja s področij biomedicinske tehnike, računalništva, statistike, strojnega učenja in medicine. MR bo pridobil in poglobil tudi znanja o temskem delu ter postopkih in fazah raziskovalnega dela, kot so analiza konkretnega in sorodnih problemov, iskanje literature, načrtovanje in izvajanje raziskav ter objavljanje in poročanje o rezultatih raziskav. Predvideno je, da se bo MR v okviru doktorskega študija nekaj mesecev izpopolnjeval na eni od priznanih tujih univerz v EU ali ZDA, s katerimi sodeluje Laboratorij za slikovne tehnologije.

Znanje angleškega jezika ter znanje ali izkušnje iz katerega iz navedenih področij so zaželeni.

The young researcher will pursue his or her PhD training in the Laboratory of Imaging Technologies (<http://lit.fe.uni-lj.si>) at the Faculty of Electrical Engineering, University of Ljubljana, where the focus of research is on the development and validation of novel methods for image processing and analysis for state-of-the-art biomedical and industrial computer vision applications. The specific topic of the PhD dissertation from the field of biomedical image processing and analysis will be defined after discussions with the candidate and with respect to the current needs of the clinical partners of the Laboratory of Imaging Technologies.

Field of biomedical image processing and analysis

Modern medical imaging techniques, like magnetic resonance, computed tomography, ultrasound, positron emission tomography, endoscopy, hyperspectral imaging, microscopy, etc., enable the acquisition of a variety of images with different characteristics that encode complementary information about the structure and function of imaged objects at different levels, from molecules, cells, tissues to whole organs. This information-rich imaging information can only be fully exploited if advanced methods for its correct extraction, analysis and interpretation are available. In clinical practice the biomedical images have had a primary role in visualizing the structure or function of objects of interest and to diagnose patients, but recent trends show an immense potential of processing and analyzing biomedical images for the purpose of planning, executing and validating treatments and therapies in surgery, radiotherapy, endoscopy, interventional radiology, etc., to monitor disease development, efficacy of drugs, course of treatment and for disease prognosis.

High interdisciplinarity of the research field will allow the young researcher to acquire specific knowledge from the field of biomedical imaging techniques, computer programming, statistics, machine learning, and medicine. The young researcher will also acquire and enhance skills in team work and all phases of research work, including problem identification, literature search, planning and executing research, and reporting and publishing research results. As part of the PhD training the candidate is expected to collaborate and act as a visiting researcher on world-renowned universities in the EU or USA, with which the Laboratory of Imaging Technologies has established collaborations.

English language proficiency and knowledge or prior experience from one or more of the aforementioned fields are desired.