Hosting offer for Marie Sklodowska-Curie Postdoctoral Fellowships (PF) 2022 at University of Rijeka

MSCA Postdoctoral Fellowships are individual research grants offering excellent postdoctoral researchers the chance to develop their skills by means of international mobility. Through the implementation of an original and personalised research project, MSCA Postdoctoral Fellowships aim to foster excellence through training and mobility and to equip researchers with new skills and competences in order to identify solutions to current and future challenges.

University of Rijeka Laboratory for Pattern Recognition and Soft Computing at Faculty of Informatics and Digital Technologies and Laboratory for Computer Vision, Virtual and Augmented Reality at Centre for Artificial Intelligence, University of Rijeka invites motivated postdoctoral researchers to jointly prepare an application for the MSCA-PF-2022 call Marie Skłodowska-Curie Postdoctoral Fellowships call (MSCA-PF-2022) with them as host organisation.

Description of Hosting organisation/group

Short description (preferably max. 0.5 page) of the host research group/host centre - strengths and scientific achievements and (if applicable) important infrastructure

The laboratory for **Pattern Recognition and Soft Computing at the *Faculty of Informatics and Digital Technologies, University of Rijeka*** and **Laboratory for Computer Vision, Virtual and Augmented Reality at Centre for Artificial Intelligence, University of Rijeka** both focus on fundamental and applied research in image and video analysis that enables meaningful interpretations and understandings of the visual world. We want to develop computational methods and algorithmic solutions that perform visual perception tasks such as image representation and classification, object detection, object tracking, action and activity recognition, scene understanding, and image interpretation using visual data.

Our research has many potential applications in areas such as medicine, surveillance, entertainment, and sports analysis. The laboratory aims to be multidisciplinary, combining their current research lines in vision-based technology with soft computing, machine and deep learning, and with computational design and digital visualization such as VR and AR. The laboratory is strongly involved in domestic and international research activities, so that team members have led or participated in 5 national and EU projects in the last few years. Team members foster collaboration with colleagues from reputable academic institutions who share similar or compatible research interests and actively collaborate with industry experts.

To support the computationally intensive research in computer vision, the laboratory is equipped with NVidia GPU enabled workstations, and the researchers have access to the Bura supercomputer at the University.

Your profile including Topics/expertise

Describe here in which research domains/topics you welcome postdoctoral candidates for an MSCA-PF application (preferably max. 0.5 page)

The research team has the following research interests:

- **Detection, monitoring, and recognition of athletes' actions in sports videos; team tactics analysis.**

We worked on detecting and recognizing the actions of athletes in handball and swimming, and the goal is to adapt the models for other sports as well. We are especially involved in monitoring athletes in team sports to develop a model that will be able to detect the athlete on the recordings of original matches or training and monitor his activities and the way he performs action to improve his technique, guide the training process, prevent injuries and assistance in rehabilitation from injuries, but also to adjust strategy of the game according to player performance.

The task is challenging because it takes place on original sports scenes during training or matches. Those scenes are complex, with clutter environment, interior lighting, and with many players moving fast with different trajectories and with frequent changes of direction and speed and at different angle and distances from the camera.

The idea is to combine deep learning models and soft computing approaches (e.g. fuzzy Petri Nets) to analyse the scene more successfully and to recognize in more details and more accurately individual activities, as well as more complex individual activities or activities in which a larger number of players are involved. We are also interested in applying a multimodal approach to activity detection (inclusion of sound in addition to image/video).

- **Robust detection and tracking of objects in surveillance and rescue applications**.

We are working on the development of algorithms for robust detection, tracking and re-identification of persons in different scenarios including drone imagery, suspicious movement of a person in protected areas, group dynamics (e.g., spors scenes, crowd analysis). We have created a database of scenes captured by a thermal camera that simulate suspicious movements of people around the border and in protected areas. We have also built a database of drone scenes that simulate search and rescue scenes in which a missing or injured person is searched.

Our goal is timely real-time detection with as few false positives as possible, but also to monitor the detected persons, assess the direction of movement and the distance from the camera, i.e., the drone. To increase the data set for testing, a synth data set was created which is used to learn the detection model and develop a distance estimation algorithm.

The task is demanding because the shots were taken from a bird's eye view, with a complex and clutter background on which the detected persons occupy only a few pixels because the drone flies at high altitude to have as large a field of view as possible. The goal is to develop an algorithm that will automatically detect a missing person or migrant, estimate his speed and direction of movement and distance from the camera in different weather conditions.

Supervisors:

Assoc. Prof. Marina Ivašić-Kos, Pd.D (google scholar profile)

Marina Ivasic-Kos is an Associate Professor and Dean of the Faculty of Informatics and Digital Technologies and Head of the Laboratory for Computer Vision, Virtual and Augmented Reality at the Centre for Artificial Intelligence, University of Rijeka. She earned her Ph.D. in Computer Science at the Faculty of Electrical Engineering and Computing in Zagreb in 2012.

She has been involved in numerous business and research projects in information and computer science fields as well as several ICT COST, Erasmus+ and EU HKO projects. She is the leader of a national research project dealing with automatic recognition of actions in sports and a researcher at a project dealing with crowd analysis in surveillance. She also runs two projects funded by the University of Rijeka that deal with the automatic recognition of actions in sports. She received a project funded by the Science Foundation Agency for career development of young PhDs.

Her research interests are focused on artificial intelligence, computer vision, soft computing, and knowledge representation. She presented her research at several international scientific conferences and in journals. She is a technical committee member and reviewer for numerous scientific conferences and reviewer for high-cited journals such as Elsevier Pattern Recognition Journal (PR), Expert Systems with Applications (ESWA) and Computers and Electronics in Agriculture, IEEE Transactions on Fuzzy Systems, Transactions on Cybernetics, Signal Processing, Access, International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems, MDPI Sensors and Entropy, ACM Transactions on Multimedia Computing Communications and Applications, Journal of Artificial Intelligence Research (JAIR). She is a topic board member of MDPI Journal of Imaging.

Assist. Prof. Miran Pobar, Pd.D (google scholar profile)

MIRAN POBAR received the MS degree in electrical engineering n 2007 from the University of Rijeka, Faculty of Engineering, Rijeka, Croatia and the Ph.D. degree in computer science in 2014 from the University of Zagreb, Faculty of Electrical Engineering and Computing, Zagreb, Croatia in 2014. He is an Assistant Professor at the Department of Informatics, University of Rijeka, Croatia. His current research interests are in the fields of computer vision and action recognition

Preferably you can list one or more potential supervisors and (a short) reference to their expertise

- Expected qualifications/expertise of the candidate:
  - The candidate should have excellent programming skills, a strong mathematical background, good communication skills and the ability to work within a team. Desirable skills are the application of deep learning or machine learning techniques, demonstration of critical thinking capabilities, e.g. published research papers, abilities to convert research outcomes into prototype demonstrations for a general audience.
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  - **Please specify the required PhD degrees if applicable: PhD in Computer Science or** relevant field, with a research topic in computer vision, machine or deep learning, or computer visualization
- You must have a completed PhD at the time of the call deadline (14 September 2022).

- Candidates must have a maximum of 8 years full-time research experience from the PhD award date until September 14, 2022. Periods of inactivity in research (e.g. unemployment, periods of employment outside research, parental or sick leave) do not count towards the time of research experience.
- For European fellowships, candidates can be of any nationality and must not have resided or carried out their main activity (work, studies, etc.) in Croatia for more than 12 months in the 36 months immediately before September 14, 2022.
- Highly motivated candidate with an excellent research track record appropriate to career stage, as evidenced by academic publications and other scientific output.

What we offer

- Support and guidance for the preparation of your MSCA PF proposal
- A stimulating, interdisciplinary environment for high-level research.

How to apply?

Indicate your interest by contacting the host institution as follows:

Please contact *Assoc. Prof. Marina Ivašić-Kos* (marinai@uniri.hr) (cc tea.dimnjasevic@uniri.hr) by email with a short CV and motivation to indicate your interest to prepare a MSCA-PF application with a supervisor /host group/…

After the supervisor agrees to support you as a MSCA-PF candidate, you can start preparation of MSCA PF project proposal and will be supported further by the Research Support Office of the host university.

For more information please contact the MSCA coordinator of the host institution: Tea Dimnjasevic, tea.dimnjasevic@uniri.hr.