Univerza v Mariboru

FRAMEWORK PROGRAMME OF EARLY STAGE RESEARCHER TRAINING[1]

1. BASIC DATA

Mentor's name and surname	**Damjan Strnad**	Mentor's register number at ARIS (SICRIS)**:**	**18726**
Mentor's e-mail:	damjan.strnad@um.si	Mentor's tel. no.:	+386 2 220 7472
Research programme (RP) leader's name and surname:	Domen Mongus	RP leader's register number at ARIS (SICRIS):	29243
Title of research programme:	Računalniški sistemi, metodologije in inteligentne storitve	RP's Register number at ARIS (SICRIS):	P2-0041
Research organisation (RO) of University of Maribor, where training shall be conducted:	UM FERI	RO Register number at ARIS (SICRIS):	0552-0796
Research field according to ARIS classification:	2.07.07	Research field according to Ortelius classification (EURAXESS)	9.4

2. DEFINITION OF RESEARCH PROBLEM AND GOALS OF DOCTORAL RESEARCH[2]

Starting point of research task of the early stage researcher and its position in the research programme, where the mentor is included, work hypothesis, research goals and foreseen result with emphasis on an original contribution to science:

> The young researcher's work will focus on the design and implementation of a federated learning system between nodes with heterogeneous local models, where distributed knowledge is aggregated in a centralised or decentralised way. The main goal of the research will be to achieve the compatibility of heterogeneous knowledge representations with a limited amount of communication between nodes, and the young researcher will develop a novel machine learning approach based on a hybridisation of personalised federated learning, modular model design and

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[1] Term early stage researcher (ESR) is written in male form and used as neutral for women and men.

[2] Research and study programme of training have to harmonise with contents of the research programme, where the mentor is a member.

knowledge distillation. The new approach will be tested on real data from digital twins and other solutions being developed in the research programme. The working hypothesis of the proposed research will be the following: the proposed federated learning approach, which allows knowledge transfer between heterogeneous local models, can improve performance compared to a system of homogeneous local models using the same or smaller amount of communication. Among the expected original scientific contributions are the development of a new federated learning methodology, the introduction of knowledge sharing strategies according to the complementarity of local models and the demonstration of the benefits of the proposed approach in relevant validation studies.

3. STUDY PROGRAMME

Foreseen study programme, to which early stage researcher shall be enrolled in academic year 2024/2025:

Computer science and informatics

4. DESCRIPTION OF WORK AND TASKS

Participates in scientific and research projects, participates in the design of research programs. Professionally cooperates with clients of research tasks, prepares reports and studies on research. Monitors and coordinates research work in accordance with financing agreements. Takes care of safe and healthy work. Organizes and teaches employees and students on the use of personal protective equipment and other safety measures. Performs other related tasks on the instructions of the supervised worker. Participates in the working and standing commissions of the bodies of UM and its members. Replaces employees and supervisors in his absence (by authorization). Participates in annual and other inventory work. Performs other related work on the order of superiors.

5. REQUESTED LEVEL OF EDUCATION

VII/2 tariff group

6. REQUESTED FIELD OF EDUCATION

Electrical engineering, computer science, informatics, pedagogical, technical, natural sciences

7. KLASIUS SRV

Level 7: Second-level higher education and similar education / second-level higher education and similar education

8. KLASIUS P

522 - Electrical engineering and energy
523 - Electronics and automation
481 - Computer science

9. REQUESTED KNOWLEDGE

Computer skills: MS Windows, Word, Excel, Internet, email

10. REQUESTED SPECIAL REQUIREMENTS

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11. REQUESTED LANGUAGES

Active knowledge of English

12. REQUESTED WORK EXPERIENCE

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13. FORESEEN POSTDOCTORAL TRAINING

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Mentor's signature: Research programme leader's signature:

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Name and surname of Dean or
authorised person[3]:
prof. dr. Gorazd Štumberger

Signature of dean or authorised person:

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Place and date: Maribor, 1.3.2024

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[3] The training program is signed by the dean of the member where the ESR's employment and training will take place.

Maribor   28. 02.
                                 2024

Stamp: