Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Fakulteta za elektrotehniko (Faculty of Electrical Engineering)

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

Boštjan Batagelj, bostjan.batagelj@fe.uni-lj.si

3. Raziskovalno področje (*Research field*):

telekomunikacije (telecommunications)

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Mladi raziskovalec bo delal na uporabi tehnologije mikrovalovne fotonike, ki združuje optično in mikrovalovno tehniko v šesti (6G) in sedmi (7G) generaciji mobilnih komunikacij. Osredotočil se bo na nova raziskovalna obzorja mikrovalovne fotonike, namenjene zlitim komunikacijskim in senzorskim omrežjem 6G in 7G. Ključni del senzorskih omrežij je že danes daljinsko zaznavanje, ki se izvaja z radarskimi ali lidarskimi sistemi. Cilj raziskovalnega dela mladega raziskovalca bo integracija radarja in lidarja na integrirano vezje (čip), kar odpira pot naprednim kvantnim komunikacijam in radarjem. Delo bo osnova za konvergentna kvantna in senzorska omrežja. *Doktorski študent bo zaposlen na Fakulteti za elektrotehniko v Laboratoriju za sevanje in optiko (http://lso.fe.uni-lj.si), ki ima že bogato zgodovino delovanja na omenjenih področjih ter primerno okolje za razvoj tehnologij, potrebnih za opravljanje doktorske naloge. Mladi raziskovalec bo prispeval k znanju iz vseh področij, s katerimi se laboratorij ukvarja in s tem k izkušnjam vseh njegovih pedagogov. S svojim delom bo zajel tudi predhodne raziskave in delo laboratorija na področju integriranih senzorskih in komunikacijskih sistemov.* *Kandidat mora poznati osnove znanstvenih eksperimentov, imeti zadostno tehnično znanje in potrebne osnove za študij mikrovalovne fotonike, biti računalniško pismen, tekoče govoriti angleško, biti sposoben analizirati in sintetizirati, interpretirati meritve in empirično pridobljene podatke ter biti sposoben samostojno opisovati dejavnosti v obliki znanstvenih publikacij. Položaj doktorskega študenta zahteva visoko analitično mišljenje, sposobnost hitrega učenja novih tehnologij in izjemne RF in mikrovalovne spretnosti pri izdelavi visokofrekvenčnih vezji na namenskem laminatu, ter poznati tehniko hitrega prototipiranja elektronskih vezji, ki omogoča učinkovito implementacijo teoretičnih konceptov v raziskovalne prototipe. Delati mora z raziskovalci iz drugih disciplin, znotraj raziskovalne skupine in v intenzivno interdisciplinarnem okolju mikrovalovne fotonike.*

Eng.: The young researcher will work on applying microwave photonics technology, which combines optical and microwave techniques, to the sixth (6G) and seventh (7G) generations of mobile communications. The researcher will focus on new directions in microwave photonics for integrated 6G and 7G communication and sensor networks. Remote sensing, using radar or lidar systems, is already a key component of current sensor networks. The goal of the research is to integrate radar and lidar on a single integrated circuit (chip), paving the way for advanced

quantum communications and radars. This work will lay the foundation for convergent quantum and sensor networks.

The doctoral student will be employed at the Faculty of Electrical Engineering in the Laboratory for Radiation and Optics (http://lso.fe.uni-lj.si), which has a strong history in these areas and provides an environment suitable for developing the technologies needed for the doctoral research. The young researcher will contribute to knowledge in all fields of the laboratory's interests and to the experience of its educators. The young researcher's work will also include preliminary research and laboratory work in the field of integrated sensors and communication systems.

The candidate must understand the basics of scientific experiments, have sufficient technical knowledge and the necessary basics for studying microwave photonics, be computer literate, speak English fluently, analyze and synthesize information, interpret measurements and empirical data, and independently describe activities in the form of scientific publications. The position of a doctoral student requires strong analytical thinking, the ability to quickly learn new technologies, and exceptional RF and microwave skills in producing high-frequency circuits on a dedicated laminates, and to know the technique of rapid prototyping of electronic circuits, which enables the effective implementation of theoretical concepts into research prototypes. The candidate must collaboate with researchers from other disciplines, within a research group, and in the highly interdisciplinary environment of microwave photonics.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):
  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)
  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)
- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):
  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

☐ **nagrade –** univerzitetna Prešernova nagrada ali Prešernova nagrada članice Univerze v Ljubljani oz. druga enakovredna nagrada *(awards, e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☒ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☒ **priporočilno pismo** *(letter of recommendation)*

☒ **druge priloge** *(other attachments):* **potrdilo o morebitnem zaključenem znanstvenem magisteriju (certificate of completed scientific master's degree)**

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Fakulteta za elektrotehniko

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

Benjamin Lipovšek (benjamin.lipovsek@fe.uni-lj.si)

3. Raziskovalno področje (*Research field*):

2.09.01 Materiali za elektronske komponente
2.09.03 Mikroelektronika
2.09.04 Optoelektronika

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.:

Raziskovalno delo mladega raziskovalca bo osredotočeno na razvoj naprednih polprevodniških gradnikov iz strateških področij mikroelektronike, optoelektronike in nanoeletronike, ki v zadnjih letih beležijo izjemen razvoj tako v Evropi kot tudi v Sloveniji. Cilj raziskav bo poglobljena karakterizacija, načrtovanje in optimizacija inovativnih elementov (kot npr. pomnilniških elementov na osnovi konfiguracije naboja (CCM), kubitnih struktur za potrebe kvantnega računalništva, učinkovitih perovskitnih tandemskih celic itd.), pri čemer bo poseben poudarek namenjen razvoju in uvajanju naprednih konceptov za izboljšanje njihovih lastnosti in zmogljivosti.

Cilji:

- Razvoj naprednih kombiniranih numeričnih modelov in simulatorjev za računalniško podprto načrtovanje mikroelektronskih, optoelektronskih in nanoelektronskih gradnikov,
- razvoj inovativnih karakterizacijskih metod za natančno analizo njihovega delovanja,
- zasnova, optimizacija in realizacija novih konceptov gradnikov z izboljšanimi lastnostmi in zmogljivostmi.

Mladi raziskovalec bo svoje delo opravljal v okviru Laboratorija za fotovoltaiko in optoelektroniko (LPVO) na Fakulteti za elektrotehniko (UL FE). Aktivno bo sodeloval v raziskovalnem programu »Fotovoltaika in elektronika« (P2-0415, 2022-2027) ter pri drugih tekočih raziskovalnih projektih. Poleg tega bo vključen v sodelovanje s priznanimi raziskovalnimi organizacijami doma in v tujini, kar mu bo omogočilo vpogled v najnovejše trende in razvojne smernice.

Kandidat bo vpisal doktorski študij Elektrotehnika na UL FE. Od kandidata se pričakuje, da je suveren v programiranju in numeričnem modeliranju, ima izkušnje z eksperimentalnim delom v elektroniki ali optoelektroniki ter obvlada angleški jezik.

Eng.:

The research work of the young researcher will focus on the development of advanced semiconductor elements in the strategic fields of microelectronics, optoelectronics, and nanoelectronics, which have experienced remarkable growth in recent years both in Europe and in Slovenia. The aim of the research will be the in-depth characterization, design, and optimization of innovative devices (such as charge configuration memory (CCM) elements, qubit structures for quantum computing applications, efficient perovskite tandem cells, etc.), with special emphasis placed on the development and implementation of advanced concepts to improve their properties and performance.

Objectives:

- Development of advanced combined numerical models and simulators for computer-aided design of microelectronic, optoelectronic, and nanoelectronic devices,
- development of innovative characterization methods for precise analysis of their operation,
- design, optimization, and realization of new device concepts with improved properties and performance.

The young researcher will carry out their work within the Laboratory for Photovoltaics and Optoelectronics (LPVO) at the Faculty of Electrical Engineering (UL FE). They will actively participate in the research program "Photovoltaics and Electronics" (P2-0415, 2022–2027) as well as in other ongoing research projects. In addition, they will be involved in collaborations with renowned research organizations both nationally and internationally, enabling them to gain insight into the latest trends and development directions.

The candidate will enroll in the doctoral study program in Electrical Engineering at UL FE. The candidate is expected to be proficient in programming and numerical modeling, have experience with experimental work in electronics or optoelectronics, and have a good command of the English language.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):
  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)
  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)
- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):
  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

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☐ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☐ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Fakulteta za elektrotehniko (*University of Ljubljana, Faculty of Electrical Engineering*)

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

Samo Mahnič, samo.mahnic@fe.uni-lj.si

3. Raziskovalno področje (*Research field*):

2.06.07 Biomedicinska tehnika (*Biomedical engineering*)

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.:

Usposabljanje mladega raziskovalca ali raziskovalke bo potekalo v Laboratoriju za biokibernetiko, ki ga sestavlja interdisciplinarna skupina inženirjev, biologov, mikrobiologov in kemikov. Glavna usmeritev raziskovalne skupine je uporaba pulzirajočih električnih polj v medicini, biologiji in biotehnologiji. Izpostavitev bioloških celic in tkiv pulzirajočim električnim poljem povzroči kratkotrajno spremembo v strukuri celičnih membran in poveča prepustnost membran. To povečanje prepustnosti omogoča dostavo različnih učinkovin v celice ali učinkovito ekstrakcijo dragocenih snovi iz celic (kratek pregled različnih aplikacij elektroporacije je predstavljen v naslenjem videu https://www.youtube.com/watch?v=VqDf9DxZIXc).

Medtem ko je obravnava posameznih celic in celičnih suspenzij s pulznimi električnimi polji (PEF) že obsežno raziskana, pojavi, ki uravnavajo vpliv elektroporacije na biološka tkiva (kompleksne, med seboj povezane strukture z bogatim zunajceličnim okoljem) ostajajo nezadostno razumljeni. Delo kandidata bo usmerjeno v poglobljeno razumevanje procesov prenosa toplote in snovi v tkivih rastlinskega in živalskega (*ex vivo*) izvora, obravnavanih s pulznimi električnimi polji. To lahko vključuje razvoj in uporabo metod slikanja z magnetno resonanco (MRI) za karakterizacijo prerazporeditve tekočin in transportnih pojavov v elektroporiranih tkivih, izvajanje eksperimentov na tkivih različnih struktur in sestav, prispevek k razvoju računskih modelov ter ovrednotenje nadomestnih tkivnih modelov, kot so fantomi, ki posnemajo lastnosti tkiv. Raziskave povezujejo biomedicinske aplikacije elektroporacije z aplikacijami v živilski industriji in bodo predvidoma potekale v tesnem sodelovanju s strokovnjaki za jedrsko magnetno resonanco na Institutu »Jožef Stefan«.

Prednost bodo imeli kandidati z izobrazbo s področja elektrotehnike, fizike, biomedicinskega inženirstva ali sorodnega področja. Zanimanje za eksperimentalno delo in interdisciplinarno sodelovanje je dobrodošlo.

Eng.:

The Young Researcher will be trained in the Laboratory of Biocybernetics, which is an interdisciplinary group composed of engineers, biologists, microbiologists and chemists. The major direction pursued in the research group is the use of high-intensity pulsed electric fields in medicine and biotechnology. Exposure of biological cells and tissues to pulsed electric fields induces transient structural alteration of the cell membrane, which increases the membrane's permeability. This increase in permeability allows to deliver therapeutic molecules into cells or efficiently extract valuable molecules from cells (see the following video for an overview of different applications of electroporation https://www.youtube.com/watch?v=VqDf9DxZIXc).

While pulsed electric field (PEF) treatment of single cells and cell suspensions has been extensively investigated, the phenomena governing how electroporation affects biological tissues, which are complex, interconnected structures with rich extracellular environments, remain insufficiently understood. The candidate's work will be oriented towards advancing our understanding of heat and mass transfer processes in PEF-treated tissues of both plant and animal (*ex vivo*) origin. This can include developing and applying magnetic resonance imaging (MRI) methods for characterizing fluid redistribution and transport phenomena in electroporated tissues, conducting experiments on tissues of varying structure and composition, contributing to the development of computational

models, and evaluating surrogate tissue models such as tissue-mimicking phantoms. The research bridges biomedical and food processing applications of electroporation and is likely to be carried out in close collaboration with experts in nuclear magnetic resonance at the Jožef Stefan Institute.

A background in electrical engineering, physics, biomedical engineering, or a related field is an advantage. Interest in experimental work and interdisciplinary collaboration is welcome.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):
  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)
  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)
- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):
  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

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☐ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☐ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Fakulteta za elektrotehniko

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

Matjaž Mihelj, matjaz.mihelj@fe.uni-lj.si

3. Raziskovalno področje (*Research field*):

Robotika

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Disertacija bo obravnavala delovanje robotskih manipulatorjev v človeku prilagojenih okoljih, kjer zaznavanje in odločanje potekata v razmerah delne spoznavnosti, negotovosti in stikov z okolico. Cilj je razviti metode vodenja na podlagi temeljnih modelov (*foundation models*), s poudarkom na dvoročnih robotskih sistemih, pri katerih sta usklajevanje in delitev vlog (npr. stabilizacija–manipulacija, preprijemanje, vodenje v stiku) ključna za uspešno izvedbo nalog v nestrukturiranem okolju.

Izhodišče raziskave predstavljajo sodobni pristopi, modeli, ki povezujejo vizualno zaznavanje, jezikovne opise in akcije (*vision-language-action*), generativne strategije na osnovi difuzijskih modelov (*diffusion policies*) in transformerjev (*transformers*) ter hierarhično planiranje z modeli sveta (*world models*). Disertacija bo te koncepte povezala v enovito metodologijo, ki bo združila večmodalno zaznavanje z dolgoročnim planiranjem. Temeljni model bo služil kot semantični sloj za razčlenitev naloge, določanje preverljivih vmesnih ciljev in podporo razložljivosti, medtem ko bo nizkonivojsko izvajanje temeljilo na učenih (tudi generativnih) strategijah, ki omogočajo preklapljanje med vodenjem lege in sile.

Ključni gradniki bodo aktivno zaznavanje (*active perception*), odločanje z upoštevanjem negotovosti (*uncertainty-aware decision making*), kooperativna koordinacija manipulatorjev prek skupne predstavitve stanja in ciljev ter postopno izboljševanje iz izkušenj ob prenosu med simulacijo in realnim sistemom (*sim-to-real*, *real-to-sim*). Metode bodo ovrednotene na nalogah, značilnih za človeku prilagojena okolja, z merili uspešnosti, robustnosti, varnosti interakcije, učinkovitosti planiranja in ponovljivosti. Pričakuje se znanja matematike, robotike in senzornih sistemov ter programiranja v Python/C++ z implementacijo v ROS 2, podprto z analitičnim eksperimentalnim delom.

Eng.: The dissertation will address the operation of robotic manipulators in human-centered environments, where perception and decision-making take place under partial observability, uncertainty, and physical contact with the surroundings. The goal is to develop control methods based on foundation models, with a focus on bimanual robotic systems in which coordination and role assignment (e.g., stabilization–manipulation, regrasping, and contact-rich control) are crucial for successful task execution in unstructured environments.

The research builds on state-of-the-art approaches, including vision–language–action models, generative strategies based on diffusion policies and transformers, and hierarchical planning using world models. The dissertation will integrate these concepts into a unified methodology that combines multimodal perception with long-horizon planning. The foundation model will act as a semantic layer for task decomposition, the specification of verifiable subgoals, and support for interpretability, while low-level execution will rely on learned (including generative) strategies that enable switching between position and force control.

Key building blocks will include active perception, uncertainty-aware decision-making, cooperative coordination of manipulators through shared representations of state and goals, and continual improvement from experience via transfer between simulation and real systems (sim-to-real, real-to-sim). The proposed methods will be evaluated on tasks characteristic of human-centered environments, using metrics such as success rate, robustness,

interaction safety, planning efficiency, and repeatability. The work requires strong background in mathematics, robotics, and sensing, as well as programming in Python/C++ with implementation in ROS 2, supported by analytical experimental work.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):
  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)
  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)
- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):
  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

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☐ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☐ **motivacijsko pismo** *(motivation letter)*

☐ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Fakulteta za elektrotehniko *University of Ljubljana, Faculty of Electrical Engineering*

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

Matej Možek (matej.mozek@fe.uni-lj.si) *Matej Možek (matej.mozek@fe.uni-lj.si)*

3. Raziskovalno področje (*Research field*):

2.09 Elektronske komponente in tehnologije *2.09 Electronic components and technologies*

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Tema raziskovalnega dela mladega raziskovalca/ke (MR) bo načrtovanje, izdelava in integracija MEMS senzorskih in aktuatorskih struktur nadgrajenih s pametno elektroniko, kar bo vodilo v realizacijo kompleksnejših mikroelektronskih sistemov za avtomatizacijo, pametne naprave in industrijske procese. Delo MR predstavlja nadaljevanje obstoječih raziskav Laboratorija za mikrosenzorske strukture in elektroniko (LMSE) na področju polprevodniške tehnologije, MEMS, elektronskih vezij, mikrofluidike in debelo- ter tankoplastnih materialov v elektroniki. Cilj raziskovalnega dela MR je nadgraditev obstoječih znanj s sistemi, ki bodo poleg osnovnih mikrofluidnih funkcij (kontrole pretoka, mešanja, usmerjanja itd.) izvajali še druge pomembne funkcije, kot so merjenje temperature, prevodnosti (slanost vode), globine, biološko zaznavanje, zbiranje električnega naboja idr. Narava dela MR bo izrazito interdisciplinarna, saj bo vključevala raziskovalna področja materialov, mikrofluidike, elektronskih komponent, vezij, numeričnih simulacij in programiranja. Tema MR se tesno prepleta z izvajanjem obstoječih projektov programske skupine Mikrostrukture in nanostrukture in ostalih projektov, ki jih izvaja raziskovalna skupina LMSE. MR mora imeti sposobnost strokovnega delovanja v mednarodnem okolju, kar zajema osnove pisanja znanstvenih člankov in dobro znanje angleškega jezika (B2/C1). Od MR se pričakuje visoka motiviranost, ki obsega samoiniciativnost, inovativnost, natančnost in zanesljivost pri delu. MR se aktivno vključuje v ekipo LMSE, pri čemer mora pokazati vnemo za sodelovanje z ostalimi sodelavci LMSE. MR bo opravljal/a doktorski študij na doktorskem študijskem programu Elektrotehnika, Univerze v Ljubljani.

Eng.:
Main research topic of the young researcher candidate (YRC) will be the design, manufacturing and integration of silicon sensor and actuator structures with smart electronics, which will lead to the realization of more complex microelectronic systems for medical, pharmaceutical or chemical process engineering applications.

Research work of YRC will represent a continuation of existing research of the Laboratory for Microsensor Structures and Electronics (LMSE) in the field of semiconductor technology, MEMS, electronic circuits, microfluidics and thick- and thin-film materials in electronics.

Primary aim of YRC research work is to expand existing knowledge in the field of advanced sensor systems for key applications in medicine, pharmacy and chemical process engineering. In addition to basic microfluidic functions (flow control, mixing, etc.), such systems will perform other important functions, such as measurement of conductivity (water salinity), temperature, depth as well as biological detection, electric charge collection, etc.

Nature of YRC activity will be highly interdisciplinary, as it will include research areas of materials, microfluidic mechanics, electronic components, circuits, numerical simulations and programming. Research topic of YRC is closely intertwined with implementation of existing projects of the program group Microstructures and Nanostructures.

YRC must have the ability to work professionally in international environment, which includes the basics of writing scientific articles and a good knowledge of English (B2 / C1). YRC is expected to be highly motivated, which includes self-initiative, innovation and reliability at work. YRC can look forward to integration into the LMSE team, and must therefore exhibit enthusiasm to work with other LMSE staff.

YRC will conduct his/her doctoral study within doctoral studies program of Electrical Engineering, University of Ljubljana.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):
  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)
  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)
- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):
  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

☐ **nagrade –** univerzitetna Prešernova nagrada ali Prešernova nagrada članice Univerze v Ljubljani oz. druga enakovredna nagrada *(awards, e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Fakulteta za elektrotehniko

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

Miloš Pantoš, milos.pantos@fe.uni-lj.si

3. Raziskovalno področje (*Research field*):

2.03.05 Tehnika, Energetika, Sistemske raziskave (po klasifikaciji ARRS)

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Razvoj metodologije za modeliranje fleksibilnosti gospodinjstev in storitvenega sektorja za zagotavljanje sistemskih in omrežnih potreb po prožnosti elektroenergetskega sistema

Elektroenergetski sistem (EES) se v zadnjem desetletju pospešeno preoblikuje zaradi rasti obnovljivih virov energije (OVE), predvsem sončnih in vetrnih elektrarn, elektrifikacije ogrevanja in prometa ter postopnega opuščanja klasičnih termoelektrarn. Evropska ocena zadostnosti virov (European Resource Adequacy Assessment – ERAA) in nacionalna ocena zadostnosti virov (National Resource Adequacy Assessment – NRAA) obravnavata vprašanje zadostnosti proizvodnih zmogljivosti, medtem ko ocena potreb po prožnosti (Flexibility Needs Assessment – FNA) naslavlja vprašanje sposobnosti EES za prilagajanje časovni spremenljivosti proizvodnje in porabe ter za obvladovanje kratkoročnih negotovosti. FNA tako prepoznava sistemske potrebe po prožnosti (integracija OVE, potrebe po spremembah moči – ramping, ter kratkoročne potrebe zaradi napak napovedi) in omrežne potrebe po prožnosti (lokalne omejitve zaradi zasičenosti omrežja ali napetostnih razmer).

Ob naraščajoči variabilnosti proizvodnje iz OVE postaja prožnost eden ključnih dejavnikov zanesljivega delovanja sistema. Tradicionalni proizvodni viri, ki so v preteklosti zagotavljali večino prožnosti, postopno izginjajo ali pa se njihova vloga zmanjšuje. Hkrati se na distribucijski ravni pojavljajo nove tehnologije z izrazitim potencialom prilagodljivega odjema, predvsem toplotne črpalke, električni sistemi ogrevanja in hlajenja, hranilniki toplote ter električna vozila. Gospodinjstva in storitveni sektor (npr. poslovne stavbe, trgovski centri, javne ustanove) tako postajajo pomemben, vendar še vedno nezadostno modeliran vir sistemske in lokalne prožnosti.

Raziskovalna tema doktorske naloge je razvoj metodologije za modeliranje in kvantitativno vrednotenje prožnosti razpršenega odjema, s poudarkom na gospodinjstvih in storitvenem sektorju, ter ocena njihove sposobnosti pokrivanja sistemskih in omrežnih potreb po prožnosti. Ključni raziskovalni izziv je vzpostavitev modela, ki bo na reprezentativen način opisal obnašanje toplotnih črpalk, sistemov ogrevanja in hlajenja ter polnjenja električnih vozil, ob upoštevanju tehničnih omejitev, uporabniškega udobja in časovne dinamike porabe. Model bo moral omogočati agregacijo velikega števila razpršenih odjemalcev ter simulacijo njihove aktivacije v podporo sistemskim potrebam (npr. integracija OVE, pokrivanje sprememb residualne obremenitve, odziv na napake napovedi) in omrežnim potrebam (zmanjševanje konic obremenitve, razbremenitev lokalnih zasičenj).

Cilj doktorske raziskave je razviti celovit metodološki okvir, ki bo omogočal primerjavo učinkovitosti različnih tehnologij prožnosti razpršenega odjema pri pokrivanju ugotovljenih potreb po prožnosti ter oceno njihovega prispevka k varnemu, stabilnemu in ekonomsko učinkovitemu obratovanju elektroenergetskega sistema v prihodnjih scenarijih razvoja.

Development of a Methodology for Modelling the Flexibility of Households and the Service Sector to Provide System and Network Flexibility in the Power System

The power system is undergoing a profound structural transformation driven by the large-scale deployment of renewable energy sources (RES), particularly solar and wind generation, the electrification of heating and transport, and the gradual phase-out of conventional thermal power plants. The European Resource Adequacy Assessment (ERAA) and the National Resource Adequacy Assessment (NRAA) address the sufficiency of generation capacity, whereas the Flexibility Needs Assessment (FNA) focuses on the system's capability to adapt to temporal variability in generation and demand and to manage short-term uncertainties. In this context, FNA identifies system flexibility needs (RES integration needs, ramping requirements, and short-term needs arising from forecast errors) as well as network flexibility needs (local constraints due to congestion or voltage limitations).

With the increasing variability of RES generation, flexibility has become a central prerequisite for secure system operation. Conventional generation units, which historically provided the majority of system flexibility, are progressively being decommissioned or are experiencing a reduced operational role. At the same time, new electricity-consuming technologies with significant demand-side flexibility potential are emerging at the distribution level. In particular, heat pumps, electric heating and cooling systems, thermal storage units, and electric vehicles represent controllable loads whose operation can be shifted in time without compromising core service delivery. Households and the service sector (e.g., commercial buildings, retail facilities, public institutions) are therefore becoming increasingly relevant sources of flexibility, yet their technical and behavioural characteristics remain insufficiently represented in current system-level modelling frameworks.

The doctoral research will focus on the development of a comprehensive methodology for modelling and quantitatively evaluating distributed demand-side flexibility, with a particular emphasis on households and the service sector, and on assessing their capability to contribute to both system and network flexibility needs. The central research challenge lies in constructing a modelling framework capable of realistically representing the operational behaviour of heat pumps, heating and cooling systems, and electric vehicle charging processes, while accounting for technical constraints, thermal dynamics, user comfort requirements, and temporal consumption patterns. The proposed model will enable aggregation of a large number of heterogeneous end-users and simulation of their coordinated activation in support of system-level objectives (e.g., RES integration, residual load ramping, response to forecast errors) as well as local network objectives (e.g., peak load reduction and congestion mitigation).

The overarching objective of the doctoral thesis is to develop a methodological framework that enables a comparative assessment of the effectiveness of different distributed flexibility technologies in covering identified flexibility needs and to quantify their contribution to secure, stable, and economically efficient operation of the future power system under evolving development scenarios.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):
  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)
  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)
- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):
  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

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☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

UL FE

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

Izr. prof. dr. Janez Perš, janez.pers@fe.uni-lj.si

3. Raziskovalno področje (*Research field*):

Računalniški vid, umetna inteligenca, vgradni sistemi

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Doktorsko raziskovalno delo bo usmerjeno v razvoj metod strojnega učenja in računalniškega vida z uporabo realnih (tudi multimodalnih) podatkov iz dinamičnih okolij. Raziskave bodo zajemale učenje in vrednotenje modelov za zaznavne naloge (npr. detekcija/segmentacija/sledenje), pri čemer bodo pomembni vidiki robustnost, generalizacija, negotovost ter sistematična analiza napak. Pri delu bo kandidat/ka uporabljal/a podatke, ki nastajajo v realnih sistemih (npr. senzorski podatki in spremljevalni zapisi/telemetrija iz vgrajenih platform, ter tudi interni podatki o delovanju platform), ter razvijal/a postopke za učinkovito obdelavo, pripravo, označevanje in preverjanje kakovosti podatkov. Delo bo potekalo po sodobnih raziskovalno-inženirskih načelih: ponovljivi eksperimenti, dobra programska praksa, testiranje in dokumentiranje ter uporaba ustrezne računske infrastrukture (po potrebi tudi superračunalnika). Zaželen profil kandidata/ke: osnove strojnega učenja (računalniški vid ali sorodno področje) in programiranja ter zanimanje za delo z realnimi podatki. Prednost predstavlja poznavanje sodobnih orodij za produktivnost (npr. AI/LLM-asistenti za programiranje in analizo) in sposobnost kritične verifikacije rezultatov.

Eng.: The PhD research will focus on developing methods in machine learning and computer vision using real-world (including multimodal) data from dynamic environments. The work will cover the training and evaluation of models for perception tasks (e.g., detection/segmentation/tracking), with emphasis on robustness, generalization, uncertainty, and systematic failure analysis. The candidate will work with data generated by real systems (e.g., sensor data and accompanying logs/telemetry from embedded platforms, as well as internal data on platform operation) and will develop procedures for efficient data processing, preparation, annotation, and data-quality verification. The research will follow modern research-engineering principles: reproducible experiments, good software practices, testing and documentation, and the use of appropriate computing infrastructure (including HPC when needed). Preferred candidate profile: fundamentals of machine learning (computer vision or a related field) and programming, and an interest in working with real-world data. Familiarity with modern productivity tools (e.g., AI/LLM-based assistants for coding and analysis) and the ability to critically validate results are considered an advantage.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):
  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)
  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)
- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):
  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

☐ **nagrade –** univerzitetna Prešernova nagrada ali Prešernova nagrada članice Univerze v Ljubljani oz. druga enakovredna nagrada *(awards, e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☐ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☐ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Fakulteta za elektrotehniko

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

Sara Stančin, sara.stancin@fe.uni-lj.si

3. Raziskovalno področje (*Research field*):

Raziskovalno področje bo vpeto med tehnične vede Informacijski sistemi – programska oprema, Inteligentni sistemi – programska oprema ter Meroslovje – Senzorji in zajemanje podatkov ter signali in prenos

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Raziskovalno delo bo potekalo v Laboratoriju za informacijske tehnologije (LaIT) na Katedri za Informacijsko komunikacijske tehnologije (KIKT) Fakultete za elektrothniko (FE). Obenem se bo spodbujalo sodelovanje z nacionalnimi in mednarodnimi raziskovalnimi organizacijami, klinikami oziroma medicinskimi centri ter industrijskimi partnerji LaIT.

Raziskovalno delo bo obsegalo neinvazivno brezkontaktno merjenje človeških vitalnih parametrov in ocenjevanje zdravstvenega stanja z uporabo sodobnih tehnik zajema in obdelave signalov. *Vključevalo bo predvsem:*

- *pregled literature in kritično presojo obstoječih rešitev brezkontaktnih meritev (kot so na primer infrardeča termografija in oddaljena fotopletismografija)*
- *raziskavo in identifikacijo ustrezne strojne opreme*
- *testiranje in vrednotenje različnih metod zajema in tehnik obdelave signalov*
- *oblikovanje novih smernic za standardiziran zajem signalov in razvoj novih tehnik obdelave, ki temeljijo tako na klasični obdelavi digitalnih signalov kot tudi na strojnem učenju*
- *izvajanje študij tako v domačem laboratorijskem kot tudi v kliničnem okolju v sodelovanju z zdravniki*
- *validacijo novo predlaganih metod z najsodobnejšimi rešitvami ter vrednotenje teh metod z uporabniškimi študijami*
- *diseminacijo rezultatov raziskovalnega dela na strokovnih in znanstvenih konferencah ter v znanstvenih publikacijah.*

Za uspešno izvedbo raziskovalnega dela je potrebno tekoče znanje angleščine. Zahtevane so izkušnje z izvajanjem študij ter z raziskovalnim delom. Zahtevano je znanje s področja digitalne obdelave signalov ter sodobnih tehnik strojnega učenja. Zaželene so izkušnje s sodobnimi tehnikami merjenja v kliničnem okolju.

Eng.: The research work will be carried out at the Laboratory for Information Technologies (LaIT) within the Department of Information and Communication Technologies (KIKT) at the Faculty of Electrical Engineering (FE). At the same time, collaboration with national and international research organizations, clinics or medical centers, and LaIT's industrial partners will be encouraged.

The research work will focus on non-invasive, contactless measurement of human vital parameters and the assessment of health status using modern signal acquisition and processing techniques. It will primarily include:

- *a literature review and critical evaluation of existing contactless measurement solutions (such as infrared thermography and remote photoplethysmography)*
- *research and identification of appropriate hardware*
- *testing and evaluation of various acquisition methods and signal processing techniques*
- *development of new guidelines for standardized signal acquisition and the creation of new processing techniques*

- *conducting studies both in the home laboratory environment and in clinical settings in collaboration with medical doctors*
- *validation of newly proposed methods against state-of-the-art solutions and evaluation of these methods through user studies*
- *dissemination of research results at professional and scientific conferences and in scientific publications.*

Fluency in English is required for the successful implementation of the research work. Experience in conducting studies and in research work is required. Knowledge in digital signal processing and modern machine learning techniques is required. Experience with modern measurement techniques in clinical environments is desirable.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):
  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)
  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)
- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):
  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

☐ **nagrade –** univerzitetna Prešernova nagrada ali Prešernova nagrada članice Univerze v Ljubljani oz. druga enakovredna nagrada *(awards, e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☒ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Fakulteta za elektrotehniko (Faculty of Electrical Engineering)

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

Žiga Špiclin, ziga.spiclin@fe.uni-lj.si

3. Raziskovalno področje (*Research field*):

Analiza biomedicinskih slik (Biomedical image analysis)

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Področje raziskovanja leži na stičišču medicinskega slikanja, umetne inteligence in kliničnega vpliva ter si prizadeva preoblikovati načine odkrivanja, razumevanja in obvladovanja bolezni. Delo, ki bo potekalo v Laboratoriju za slikovne tehnologije na Fakulteti za elektrotehniko, bo osredotočeno na razvoj naprednih metod umetne inteligence (UI) za avtomatizirano analizo 3D medicinskih slik, ki bo omogočala objektivno, ponovljivo in klinično smiselno kvantitativno ocenjevanje. Z obravnavo ključnih izzivov, kot je omejena količina označenih podatkov, prek inovativnih pristopov učenja z malo primeri (ang. few-shot learning) in novih nevronskih arhitektur, raziskave ciljajo na aplikacije z velikim vplivom, vključno z nevrodegenerativnimi boleznimi, možganskimi tumorji, anevrizmami in travmatskimi poškodbami. Projekt, umeščen v močno interdisciplinarno in mednarodno povezano okolje, združuje najsodobnejše raziskave na področju umetne inteligence s tesnim sodelovanjem s kliničnimi partnerji, z namenom razvoja medicinskih orodij nove generacije za računalniško podprto diagnostiko, ki merljivo izboljšujejo kakovost in učinkovitost oskrbe bolnikov.

Eng.: Research at the intersection of medical imaging, artificial intelligence, and clinical impact, is aimed to transform how diseases are detected, understood, and managed. Conducted within the Laboratory for Imaging Technologies at the Faculty of Electrical Engineering, the work shall focus on the development of advanced artificial intelligence (AI) methods for the automated analysis of 3D medical images, enabling objective, reproducible, and clinically meaningful quantitative assessment. By addressing key challenges such as limited annotated data through innovative few-shot learning and novel neural architectures, the research targets high-impact applications including neurodegenerative diseases, brain tumors, aneurysms, and traumatic injuries. Embedded in a strongly interdisciplinary and internationally connected environment, the project combines cutting-edge AI research with close collaboration with clinical partners, with the goal of delivering next-generation computer-assisted medical tools that measurably improve the quality and effectiveness of patient care.

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***
− kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja) *(candidate who has completed a Master's degree (2nd Bologna level)):*
o diplomska listina / potrdilo o zaključku študijskega programa

(diploma certificate / certificate of completion of the study programme)

- priloga k diplomi / potrdilo o opravljenih obveznostih
  (diploma supplement / official transcript of records containing all grades obtained in the study programme)

- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):

  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
    (official transcript of records listing all courses and grades obtained so far in the Master's degree programme on the basis of which the candidate will apply for enrollment in a doctoral degree programme.)

☐ **nagrade –** univerzitetna Prešernova nagrada ali Prešernova nagrada članice Univerze v Ljubljani oz. druga enakovredna nagrada *(awards, e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☐ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☐ **motivacijsko pismo** *(motivation letter)*

☐ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Fakulteta za elektrotehniko (UL FE) *University of Ljubljana, Faculty of Electrical Engineering*

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

Marko Topič (Marko.Topic@fe.uni-lj.si)

3. Raziskovalno področje (*Research field*):

2.09 Elektronske komponente in tehnologije *2.09 Electronic components and technologies*

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Raziskovalno delo mladega raziskovalca bo usmerjeno na področje elektronike in umeščeno v širše področje fotovoltaike, ki tako v Evropi kot tudi v Sloveniji v preteklih letih beleži strm razvoj. Osredotočeno bo na raziskave in razvoj porazdeljenih merilnih sistemov z lastnim napajanjem na osnovi silicijevih ali perovskitnih sončnih celic in njihove uporabe za potrebe napovedovanja, spremljanja in vrednotenja delovanja razvnovrstnih fotonapetostnih sistemov, ki so samostojni ali integrirani v druge sisteme. Mladi raziskovalec bo svoje delo opravljal v okviru Laboratorija za fotovoltaiko in optoelektroniko (LPVO) in Laboratorija za mikroelektroniko (LMFE) na Fakulteti za elektrotehniko Univerze v Ljubljani (UL FE). Njegovo raziskovalo delo bo tesno vpeto tako v raziskovalni program »Fotovoltaika in elektronika« (P2-0415) kot tudi v ostale tekoče mednarodne raziskovalne projekte, v sklopu katerih bo sodeloval z drugimi priznanimi raziskovalnimi organizacijami doma in v tujini. Mladi raziskovalec bo vpisal doktorski študij Elektrotehnika na UL FE. Od kandidata se pričakuje visoka stopnja motiviranosti za delo, veselje do eksperimentalnega dela v laboratoriju, suverenost v načrtovanju elektronskih vezij in programiranju ter da obvlada angleški jezik.	*Slov.:*

Eng.: *Research activities of the young researcher will focus on the area of electronics for photovoltaics (PV), which has grown rapidly in the recent years. The specific tasks will involve research and development of distributed custom-designed measurement/monitoring systems with own power supply based on silicon or perovskite solar cells and utilization of the systems in prediction, monitoring and evaluation of versatile PV systems, from utility-scale PV power plants and other integrated PV systems.* *The young researcher will work in the Laboratory of Photovoltaics and Optoelectronics (LPVO) and the Laboratory of Microelectronics (LMFE) at the Faculty of Electrical Engineering, University of Ljubljana (UL FE). His/Her research work will be closely connected to the research program "Photovoltaics and Electronics" (P2-0415) as well as other ongoing international research projects, where he/she will collaborate with other reputable research institutions at home and abroad.* *The young researcher will enroll in the doctoral study program in Electrical Engineering at UL FE.* *High motivation for research work, experience in electronic design, programming and numerical modeling, previous involvement in experimental projects in the fields of photovoltaics, electronics or electrical engineering, and proficiency in English language are expected.*

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***

- kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja)
  (candidate who has completed a Master's degree (2nd Bologna level)):

  - diplomska listina / potrdilo o zaključku študijskega programa
    (diploma certificate / certificate of completion of the study programme)

  - priloga k diplomi / potrdilo o opravljenih obveznostih
    (diploma supplement / official transcript of records containing all grades obtained in the study programme)

- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):

  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
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☐ **motivacijsko pismo** *(motivation letter)*

☐ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments):*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Fakulteta za elektrotehniko

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

Andrej Zdešar, andrej.zdesar@fe.uni-lj.si

3. Raziskovalno področje (*Research field*):

Avtomatika in kibernetika

4. Opis raziskovalnega dela *(Research work description*):
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Delo bo osredotočeno na raziskave in razvoj metod s področja umetne inteligence za avtomatizacijo in optimizacijo industrijskih dinamičnih procesov. Pri raziskovalnem delu se bodo uporabljale metode spodbujevalnega učenja in samorazvijajočih se sistemov, ki so osnovani na nevronskih mrežah in mehki logiki. Delo bo temeljilo na sodobnih simulacijskih orodjih, matematičnih modelih in digitalnih dvojčkih. Ti omogočajo preigravanje različnih scenarijev za strojno učenje optimalnih strategij vodenja in napredno sprotno analizo ter razumevanje delovanja procesa na podlagi zbranih podatkov in preteklega znanja o sistemu. Razvite metode bodo morale biti prilagojene za dinamične sisteme, delovanje ob prisotnosti motenj, zakasnitev in šuma ter delovanje v realnem času, kar je posebej kritično v primeru sistemov s hitro dinamiko. *Zaželeno je, da ima kandidat izkušnje s področja sistemske teorije in uporabe strojnega učenja za reševanje problemov vodenja na realnih sistemih. Pričakujemo, da je kandidat spreten tudi z rokovanjem s sodobnimi programskimi orodji in vešč uporabe različnih programskih jezikov.*

Eng.: The work will focus on research and development of artificial intelligence methods for automation and optimization of industrial dynamical processes. The research will use reinforcement learning and evolving systems, which are based on neural networks and fuzzy logic. The work will be based on modern simulation tools, mathematical models, and digital twins. These enable simulation of various scenarios for machine learning of optimal control strategies and advanced online analysis and understanding of process behaviour from collected data and past knowledge of the system. The developed methods will need to be optimized for dynamical systems, operation in the presence of disturbances, delays and noise, and real-time operation, which is particularly critical in the case of systems with fast dynamics. *It is desirable that the candidate has background in system theory and experience in the field of machine learning for solving control problems in real systems. We expect the candidate to be proficient in the use of modern software tools and skilled in the use of various programming languages.*

5. Priloge, ki jih je treba priložiti ob prijavi *(Documents required to be submitted with the application)*:

☒ **potrdilo o doseženi izobrazbi *(proof of completed education)***
− kandidat z zaključenim magistrskim študijskim programom (2. bolonjska stopnja) *(candidate who has completed a Master's degree (2nd Bologna level)):*

- diplomska listina / potrdilo o zaključku študijskega programa
  (diploma certificate / certificate of completion of the study programme)

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- kandidat, ki še ni zaključil študija na 2. stopnji
  (candidate who has not yet completed a Master's degree):

  - potrdilo o do sedaj opravljenih obveznostih z ocenami magistrskega študijskega programa, s katerim se bo kandidat prijavil na doktorski študij
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