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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Umetni inteligentni sistemi | | | | | | | | | | | | | | |
| **Course title:** | | | Artificial Intelligent Systems | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Podiplomski magistrski študijski program druge stopnje Elektrotehnika | | | | | Vse smeri | | | | | | | | 1 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | All study fields | | | | | | | | 1 | | 1 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Izbirni-splošni / Elective general | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64250 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **45** |  | | | **30** | | |  | | | |  | | | **75** | |  | **6** |
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| **Nosilec predmeta / Lecturer:** | | | | | Simon Dobrišek | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | angleščina in po potrebi slovenščina / English and Slovene, if necessary | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | angleščina in po potrebi slovenščina / English and Slovene, if necessary | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisites:** | | | | | | | |
| * Vpis v letnik. * Osnove linearne algebre, več-variabilne analize, optimizacije, statistike, verjetnostne teorije in računalniškega programiranja. | | | | | | | | |  | * Enrolment in the year of the course. * The basics of linear algebra, multivariate analysis, optimization, statistics, probability theory, and computer programming. | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| * Uvod v umetne inteligentne sisteme: umetno zaznavanje, umetna inteligenca, mehko računanje, strojno učenje, avtonomni agenti in ambientalna inteligenca, pametni nadzorni sistemi. * Inteligentno reševanje problemov: stanja problema in podproblemi, predstavitev problemov z grafi in algoritmi za preiskovanje grafov - izčrpno preiskovanje, hevristično preiskovanje. * Zgled: samodejno sestavljanje. * Z znanjem podprti sistemi: osnovne sestavine z znanjem podprtih sistemov, vmesnik človek-stroj, proceduralno in deklarativno znanje, proces sklepanja. * Predstavitev znanja: predstavitev s produkcijskimi pravili, neizrazita logika, obrazca za prikaz znanja, ki temeljita na Petrijevih omrežjih. * Sklepanje: metode sklepanje z veriženjem pravil, izjavni račun, predikatni račun, neizrazito logično sklepanja, verjetnostno sklepanje. * Zgled: z znanjem podprt sistem strojnega vida. * Znanje iz eksperimentalnih podatkov: več-variabilna regresije z umetnimi nevronskimi omrežji. * Več-agentni sistemi: inteligentni agenti, več-agentni sistemi, agentni komunikacijski jezik * Zgled: več-agentna FIPA platforma | | | | | | | |  | | * Introduction to artificial intelligent systems: artificial perception, artificial intelligence, soft computing, machine learning, autonomous agents, and ambient intelligence, smart surveillance systems. * Intelligent problem solving: problem decomposition and reduction, graph representation of problems, and graph search - exhaustive and heuristic search algorithms. * Case study: assembly automation. * Expert systems: expert-system components and human interfaces, procedural and declarative knowledge, and reasoning process. * Knowledge representation: production rules, fuzzy production rules, and representation based on the Petri nets. * Inference: forward and backward chaining, propositional calculus, predicate calculus, fuzzy inference, and probabilistic inference. * Case study: knowledge-based computer-vision systems. * Knowledge from experimental data: multivariate regression with artificial neural networks. * Multi-agent systems: intelligent agent, multi-agent systems, agent communication language. * Case study: FIPA-compliant multi-agent platform. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. S. J. Russell, P. Norvig: Artificial Intelligence: A Modern Approach, Prentice Hall, 2010. 2. Mohri M., Rostamizadeh A., Talwalkar, A. : Foundations of Machine Learning, The MIT Press, 2012. 3. N. Pavešić, Razpoznavanje vzorcev: uvod v analizo in razumevanje vidnih in slušnih signalov, (3. popravljena in dopolnjena izd., 2 zv.), Založba FE in FRI, 2012 | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Seznaniti študenta z osnovnimi matematičnimi in računalniškimi pristopi v umetni inteligenci, z zasnovami umetnih inteligentnih sistemov in s primeri izvedb takšnih sistemov. | |  | | To provide students with an understanding of the basic mathematical and computational approaches to artificial intelligence, the concepts of artificial intelligent systems, and examples of the implementations of such systems. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Znanje in razumevanje:  Po zaključku tega predmeta bo študent zmožen izkazati znanje in razumevanje:   * gradnje sistemov, ki temelje na uporabi metod umetne inteligence, * modeliranja določenih umskih sposobnosti človeka (reševanje splošnih problemov, učenje), * metod preiskovanja grafov, vključevanja človekovega znanja v umetne inteligentne sisteme in iskanja zakonitosti v podatkih.   Uporaba znanja:  Pridobljeno znanje bo študent lahko uporabil pri gradnji inteligentnih sistemov, ki so podprti z bazami problemsko usmerjenega znanja in mehanizmi sklepanja, z možnostjo zaznavanja prostora in komuniciranja z govorom ter z možnostjo samo-učenja in prilagajanja na nove okoliščine.  Prenosljive spretnosti:   * uporabe literature ter drugih virov s področja umetne inteligence, strojnega učenja in mehkega računanja; * porabe informacijske tehnologije: uporaba odprtokodnih razvojnih orodij (WEKA, CLIPS, FuzzyCLIPS, JADE), okolij za programiranje (Matlab, Netbeans), programskih jezikov (Java, Prolog); * reševanja problemov: analiza problema, načrtovanje algoritma, implementacija programa in testiranje programa; in * dela v skupini: organizacija in vodenje skupine, aktivno sodelovanje v skupini. | | |  | Knowledge and understanding:  After completing this course the student will be able to demonstrate a knowledge and understanding of the:   * construction of systems based on the use of the methods of artificial intelligence, * modelling of specific human mental abilities (general problem solving, learning), * graph search methods, the integration of human knowledge into artificial intelligent systems, searching for regularities in data.   The use of knowledge:  The student will be able to use the acquired knowledge to construct intelligent systems that are supported by problem-oriented knowledge bases and inference mechanisms, capable of spatial sensing and spoken communication as well as learning and adaptation to new circumstances.  Transferable skills:   * the use of literature and other resources in the field of artificial intelligence, machine learning and soft computing; * the use of information technology: the use of open source development tools (WEKA, CLIPS, FuzzyCLIPS, JADE), programming environments (Matlab, Netbeans), programming languages (Java, Prolog); * problem solving: problem analysis, algorithm design, implementation and testing of a program; * group work: the organisation and management of groups, active participation in groups. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| * predavanja, * laboratorijske vaje in projekti, * reševanje domačih nalog. | | |  | * lectures, * laboratory exercises and projects, * coursework. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: domače naloge, laboratorijske vaje, projekt, pisni izpit, ustni izpit.  Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Pozitivna ocena laboratorijskih vaj je pogoj za pristop k izpitu.  Prispevki k oceni:   * domače naloge, * laboratorijske vaje in projekt, * pisni izpit, * ustni izpit. | 10%  30%  30%  30% | | | | Type: homework, laboratory exercises, project, written exam, oral exam.  Negative grades: from 1 to 5, positive grades: from 6 to 10.  Positive evaluation of laboratory exercises is a prerequisite for the exam.  Contributions to the final grade:   * coursework, * laboratory exercises and project, * written exam, * oral examination. |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. DOBRIŠEK, Simon. Pametni nadzorni sistemi : je to grožnja umetne inteligence. V: 1. dnevi prava zasebnosti in svobode izražanja, [Kranjska Gora, 9. in 10. april 2015]. Zbornik 2015. 1. natis. Ljubljana: IUS Software, GV založba, 2015, str. 134-138. 2. GAJŠEK, Rok, MIHELIČ, France, DOBRIŠEK, Simon. Speaker state recognition using an HMM-based feature extraction method. Computer speech & language, ISSN 0885-2308, Jan. 2013, vol. 27, no. 1, str. 135-150. 3. SULIĆ KENK, Vildana, KRIŽAJ, Janez, ŠTRUC, Vitomir, DOBRIŠEK, Simon. Smart surveillance technologies in border control. European journal of law and technology, ISSN 2042-115X. [Online ed.], 2013, vol. 4, no. 2, str. 1-12. 4. DOBRIŠEK, Simon, GAJŠEK, Rok, MIHELIČ, France, PAVEŠIĆ, Nikola, ŠTRUC, Vitomir. Towards efficient multi-modal emotion recognition. International journal of advanced robotic systems, ISSN 1729-8814, 2013, vol. 10, no. 53, str. 1-10. 5. MIHELIČ, France (intervjuvanec), DOBRIŠEK, Simon (intervjuvanec), JUSTIN, Tadej (intervjuvanec). Vabljeni na pogovor s stroji! : Frekvenca X. Ljubljana: Val 202, 3. 10. 2013 | | | | | |