UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18)			
Predmet:	Zaznavanje v kognitivnih sistemih		
Course title:	Perception in cognitive systems		

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Interdisciplinarni magistrski študijski program Računalništvo in matematika	ni smeri	1 ali 2	prvi
Interdisciplinary Master's study programme Computer Science and Mathematics	none	1 or 2	first

Vrsta predmeta / Course type	izbirni / elective
Univerzitetna koda predmeta / University course code:	63513

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike študija**	**Samost. delo** **Individ. work**	**ECTS**
45		**30**			**105**	**6**

Nosilec predmeta / Lecturer:	prof. dr. Aleš Leonardis

Jeziki / Languages:	**Predavanja / Lectures:**	
	Vaje / Tutorial:	

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Vpis v letnik študija.	Enrolment in the programme.
Vsebina:	**Content (Syllabus outline):**

Predavanja: - Računske teorije zaznavanja - Kognitivne arhitekture zaznavanja - Učenje, razpoznavanje, kategorizacija in abstrakcija vizualnih entitet - Aktivni vid - Računske teorije pozornostnih mehanizmov - Vizualni kontekst - Računske teorije zaznavanja prostora in prostorskih relacij Vaje: Študenti se na vajah spoznajo z dodatnimi vidiki računskih modelov zaznavanja in z njihovo praktično implementacijo v okviru razvoja senzorskih ali robotskih sistemov. Pod vodstvom mentorja razvijejo programske in strojne rešitve s področja razpoznavanja in kategorizacije objektov, robotske lokalizacije in aktivnega vida.	Lectures: - Computational theories of perception - Cognitive architectures of perception - Learning, recognition, categorization and abstractions of visual entities - Active vision - Computational theories of attentional mechanisms - Visual context - Computational theories of spatial perception Exercises: Practical implementation of computational models related to perception and cognition. Under supervision, development of software and hardware solutions for object recognition and categorisation, robot localisation, and active vision.

Temeljni literatura in viri / Readings:

1. Object Categorization: Computer and Human Vision Perspectives, S. J. Dickinskon, A. Leonardis, B. Schiele, M. J. Tarr, (Eds.), Cambridge University Press, 2009, (ISBN-13: 9780521887380).

2. A. Pinz, Object Categorization, Foundations and Trends® in Computer Graphics and Vision, 1(4), pp. 255-353, 2006, (ISBN: 1-933019-13-1). Dostopna tudi: http://www.emt.tugraz.at/system/files/CGV003-journal.pdf

3. S. Thrun, W. Burgard, D. Fox, Probabilistic Robotics: Intelligent Robotics and Autonomous Agents, (ISBN-10: 0262201623).

Cilji in kompetence:

Cilj predmeta je študente naučiti osnov zaznavanja v kognitivnih sistemih, kar vključuje nekatere izbrane teorije računskega zaznavanja, računalniško modeliranje zaznavnih procesov ter uporabo teh modelov pri izgradnji aktivnih kognitivnih robotskih sistemov.

Objectives and competences:

The objective of the course is to teach the students basic competences in the area of artificial perception in cognitive systems, including selected computational theories of perception, computational models of perceptual processes, and application of these models for designing active cognitive robotic systems.

Predvideni študijski rezultati:

Znanje in razumevanje:
Poznavanje in razumevanje računskih modelov zaznavanja ter njihove implementacije v umetnih kognitivnih sistemih. Znanje snovanja praktičnih rešitev s področja umetnega zaznavanja v kognitivnih sistemih.

Uporaba:
Snovanje in implementiranje praktičnih rešitev s področja umetnega zaznavanja v kognitivnih

Intended learning outcomes:

Knowledge and understanding: Understanding of computational models of perception and their implementation in artificial cognitive systems. Understanding of design principles for practical problems in the area of artificial prerception in cognitive systems.

Application:
Design and implementation of practical solutions in the area of machine perception in

sistemih, npr. v avtonomnih robotih, nadzornih sistemih, inteligentnih okoljih ali mobilnem računalništvu. Raziskovalno in izobraževalno delo na tem področju. Refleksija: Spoznavanje in razumevanje širšega raziskovalnega področja umetnega in naravnega zaznavanja ter kognitivnih sistemov. Prenosljive spretnosti - niso vezane le na en predmet: Sposobnost samostojnega in multidisciplinarnega raziskovanja na osnovi strokovne literature in eksperimentalnega dela. Sposobnost programiranja senzorskih ali robotskih sistemov.	cognitive systems, e.g., in autonomous robots, control systems, intelligent environments or mobile computing. Reflection: Understanding of a wider research area of artificial and natural perception and cognitive sytems. Transferable skills: Ability to perform research based on professional literature and experimental work. Ability to program sensorial and robot systems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja s podporo avdio-vizualne opreme. Laboratorijske vaje v primerno opremljenem laboratorijskem prostoru. Delo posamezno in v skupinah. Praktično delo in vrednotenje produktov.	Lectures with slides. Exercises in appropriately equipped laboratories. Individual work and work in small groups.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt): Sprotno preverjanje (domače naloge, kolokviji in projektno delo) Končno preverjanje (pisni in ustni izpit) Ocene: 6-10 pozitivno, 1-5 negativno (v skladu s Statutom UL)	50% 50%	Type (examination, oral, coursework, project): Continuing (homework, midterm exams, project work) Final (written and oral exam) Grading: 6-10 pass, 1-5 fail (according to the rules of University of Ljubljana)

Reference nosilca / Lecturer's references:

LEONARDIS, Aleš, GUPTA, Alok, BAJCSY, Ruzena. Segmentation of range images as the search for geometric parametric models. International journal of computer vision, ISSN 0920-5691. [Print ed.], 1995, vol. 14, str. 253-277. [COBISS.SI-ID 482388]

LEONARDIS, Aleš, JAKLIČ, Aleš, SOLINA, Franc. Superquadrics for segmenting and modeling range data. IEEE transactions on pattern analysis and machine intelligence, ISSN 0162-8828. [Print ed.], November 1997, vol. 19, no. 11, str. 1269-1295, ilustr. [COBISS.SI-ID 714324]

LEONARDIS, Aleš, BISCHOF, Horst. Robust recognition using eigenimages. Computer vision and image understanding, ISSN 1077-3142. [Print ed.], 2000, vol. 78, no. 1, str. 99-118, graf. prikazi. [COBISS.SI-ID 1851732]

JOGAN, Matjaž, ŽAGAR, Emil, LEONARDIS, Aleš. Karhunen-Loéve expansion of a set of rotated templates. IEEE transactions on image processing, ISSN 1057-7149. [Print ed.], July 2003, vol. 12, no. 7, str. 817-825, ilustr. [COBISS.SI-ID 3780692]

FIDLER, Sanja, SKOČAJ, Danijel, LEONARDIS, Aleš. Combining reconstructive and discriminative subspace methods for robust classification and regression by subsampling. IEEE transactions on pattern analysis and machine intelligence, ISSN 0162-8828. [Print ed.], Mar. 2006, vol. 28, no. 3, str. 337-350, ilustr. [COBISS.SI-ID 5235540]