

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Računalniška ustvarjalnost
Course title: Computational Creativity

Študijski program in stopnja Study programme and level	Modul Module	Letnik Academic year	Semester Semester
Informacijske in komunikacijske tehnologije, 3. stopnja	Tehnologije znanja	1	1
Information and Communication Technologies, 3 rd cycle	Knowledge Technologies	1	1

Vrsta predmeta / Course type

Izbirni / Elective

Univerzitetna koda predmeta / University course code:

IKT3-721

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15	15			15	105	5

**Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transferred to individual work.*

Nosilec predmeta / Lecturer:

Doc. dr. Martin Žnidaršič
Prof. dr. Nada Lavrač

**Jeziki /
Languages:**

Predavanja / Lectures: Slovenščina, angleščina / Slovenian, English
Vaje / Tutorial:

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Zaključen študij druge stopnje s področja informacijskih ali komunikacijskih tehnologij ali zaključen študij druge stopnje na drugih področjih z znanjem osnov s področja predmeta. Potrebna so tudi osnovna znanja matematike, računalništva in informatike.

Prerequisites:

Completed second cycle studies in information or communication technologies or completed second cycle studies in other fields with knowledge of fundamentals in the field of this course. Basic knowledge of mathematics, computer science and informatics is also requested.

Vsebina:

Uvod:
uvod v področje računalniške ustvarjalnosti, umestitev raziskovalnega področja in primeri aplikacij
Teoretske osnove:
opredelitev človeške in računalniške ustvarjalnosti, ocenjevanje in metrike
Metodologija:
računalniška ustvarjalnost kot iskanje,

Content (Syllabus outline):

Introduction:
introduction to the field of computational creativity, positioning of the field and sample applications
Foundations:
definitions of human and computational creativity, evaluation and metrics
Methodology:
computational creativity as search, bisociative

<p>bisociativno odkrivanje znanja, tvorba in spajanje konceptov (angl. conceptual blending).</p> <p>Viri in orodja: jezikovni viri in programska orodja za obdelavo naravnega jezika (korpusi, knjižnice, leksikalni in semantični viri), rudarjenje strukturiranih podatkov in besedil, platforme za podporo računalniški ustvarjalnosti (Clowdflows, TextFlows, Flowr, Pattern)</p> <p>Aplikacije v znanosti, zdravju in trženju: ustvarjanje hipotez, odkrivanje znanja, dokazovanje matematičnih izrekov, izdelava prehranskih receptov, planov vadbe, ustvarjanje sloganov, akronimov in reklam</p> <p>Aplikacije v literaturi in umetnosti: ustvarjanje zgodb, metafor, humorja, poezije in slik, komponiranje glasbe</p> <p>Povzetek in diskusija: primerjava računalniške kreativnosti s človeško, potenciali, omejitve in etična vprašanja, vloga računalniške kreativnosti v industriji in v umetnosti</p>	<p>knowledge discovery, concept formation and conceptual blending</p> <p>Resources and tools: language resources and tools for natural language processing (corpora, programming libraries, lexical and semantic resources), structured and textual data mining, supporting platforms for computational creativity (Clowdflows, TextFlows, Flowr, Pattern)</p> <p>Applications in science, health and marketing: hypothesis creation, knowledge discovery, proving mathematical axioms, food recipe creation, exercise planning, generation of slogans, acronyms and advertisements</p> <p>Applications in literature and art: creation of stories, metaphor, humor, poetry and paintings, composing music</p> <p>Summary and discussion: comparison of human and computational creativity, opportunities, limitations and ethical issues, the role of computational creativity in industry and art</p>
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Temeljna literatura in viri / Readings:

- M. A. Boden, Ed. *Dimensions of creativity*. MIT Press, 1996. ISBN 0-262-02368-7
- M. A. Boden, *The creative mind: Myths and mechanisms*. Psychology Press, 2004. ISBN 0-203-50852-1
- T. R. Besold, M. Schorlemmer, and A. Smaill, *Computational Creativity Research: Towards Creative Machines*. Atlantis Publishing Corporation, 2014. ISBN 978-94-6239-084-3
- S. Colton, and G. A. Wiggins, *Computational Creativity: The Final Frontier?* In *ECAI 2012 - 20th European Conference on Artificial Intelligence*, 21-26, Montpellier, France, August 2012.
- G. A. Wiggins, A preliminary framework for description, analysis and comparison of creative systems. *Knowledge-Based Systems* 19 (7): 449–458, 2006.
- G. Ritchie, Some Empirical Criteria for Attributing Creativity to a Computer Program. *Minds and Machines*, 17(1):76-99, Springer, 2007.
- G. Fauconnier, and M. Turner, *The way we think: Conceptual blending and the mind's hidden complexities*. Basic Books, 2008. ISBN 0-465-08785-X
- M. R. Berthold, *Bisociative knowledge discovery*. Springer Berlin Heidelberg, 2011. ISBN 978-3-642-24799-6
- K.E. Jennings, Developing creativity: Artificial barriers in artificial intelligence. *Minds and Machines* 20(4): 489-501, 2011.

Cilji in kompetence:

Cilj predmeta je seznanjenje s področjem računalniške ustvarjalnosti, s teorijo tega področja, kakor tudi praktičnih vidikov: orodij, tehnologij in aplikacij.

Objectives and competences:

The goal of the course is introduction into the field of computational creativity, its theory, as well as its practical aspects: tools, technologies and applications.

Študentje spoznajo metode za ocenjevanje metod in rezultatov računalniške ustvarjalnosti, poznajo omejitve računalniške ustvarjalnosti in znajo razpoznati probleme, v katerih je uporabna.

Ključni splošni metodi področja sta spajanje konceptov (angl. »concept blending«) in bisociativno odkrivanje novih konceptov. Ob teh so predstavljene tudi nekatere metode in tehnike, ki se uporabljajo v specifičnih primerih uporabe: obdelava naravnega jezika in jezikovni viri, rudarjenje podatkov, predstavitev podatkov, uporaba in izdelava semantičnih mrež.

Predmet poda znanje, ki je potrebno za samostojen razvoj nove metode ali aplikacije računalniške ustvarjalnosti na problemu iz prakse.

Students learn the methodology for evaluation of the methods and results of computational creativity, recognize the limitations of computational creativity and know how to identify problems in which it is applicable.

Key general methods in this research area are conceptual blending and bisociative discovery of new concepts. In addition to these, selected methods and techniques are presented that are used in specific use cases: natural language processing and language resources, data mining, data representation, use and production of semantic networks.

Course aims to provide knowledge that is necessary for the independent development of new methods and applications of computational creativity in real world problems.

Predvideni študijski rezultati:

Študent, ki bo uspešno končal ta predmet, bo pridobil znanje in razumevanje:

- o teoretičnih temeljih računalniške ustvarjalnosti
- o temeljnih metodah odkrivanja ali ustvarjanja novih konceptov
- o uporabi virov in orodij na področju računalniške ustvarjalnosti
- o možnostih praktične uporabe naučenega

Prav tako bodo pridobili

- Sposobnost analize, sinteze in predvidevanja rešitev ter posledic
- Obvladanje raziskovalnih metod, postopkov in procesov, razvoj kritične in samokritične presoje
- Sposobnost uporabe znanja v praksi
- Avtonomnost v strokovnem delu
- Razvoj komunikacijskih sposobnosti in spretnosti
- Sposobnost izdelave lastnih rešitev s področja računalniške ustvarjalnosti
- Sposobnost vrednotenja metod in rezultatov računalniške ustvarjalnosti
- Sposobnost kritične presoje etičnih vidikov rešitev s področja računalniške ustvarjalnosti.

Intended learning outcomes:

A student who successfully completes this course will gain knowledge and understanding of:

- the theoretical foundations of computer creativity
- basic methods of detection and creation of new concepts
- the use of resources and tools in the field of computational creativity
- about the possibilities of practical application of lessons learned

They will also acquire:

- The ability to analyze, synthesize, and anticipate solutions and consequences
- Proficiency in research methods, procedures and processes, development of critical and self-critical assessment
- The ability to use knowledge in practice
- Autonomy in professional work
- The development of communication skills
- The ability to develop original solutions in the field of computational creativity
- The ability of evaluation methods and results of computer creativity
- The ability of critical thinking about ethical aspects of solutions in the field of computational creativity.

Metode poučevanja in učenja:

Predavanja, seminarji, konzultacije, individualno delo
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Learning and teaching methods:

Lectures, seminar work, konzultacije, individual work

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Pisni ali ustni izpit	40 %	Written or oral exam
Seminarska naloga	30 %	Seminar work
Ustni zagovor seminarske naloge	30 %	Oral defense of the seminar work

Reference nosilca / Lecturer's references:

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| <ul style="list-style-type: none"> • P. Tomašič, M. Žnidaršič, G. Papa, <i>Implementation of a slogan generator</i> In: <i>The Fifth International Conference on Computational Creativity</i>, 2014. • M. T. Llano, R. Hepworth, S. Colton, J. Gow, J. Charnley, N. Lavrač, M. Žnidaršič, M. Perovšek, M. Granroth-Wilding, and S. Clark, <i>Baseline Methods for Automated Fictional Ideation</i> In <i>Proceedings of the International Conference on Computational Creativity</i>. 2014. • J. Smailović, M. Grčar, N. Lavrač, and M. Žnidaršič, Stream-based active learning for sentiment analysis in the financial domain, <i>Information Sciences</i> 285: 181-203, 2014. • M. Žnidaršič, S. Pollak, D. Miljković, J. Kranjc, N. Lavrač, <i>Identifying creative fictional ideas</i> In: <i>Discovery science : book of abstracts</i>, 2014. • P. Tomašič, G. Papa, M. Žnidaršič, <i>Automated slogan production using a genetic algorithm</i>. In: <i>Bioinspired optimization methods and their applications : proceedings of the Student Workshop on Bioinspired Optimization Methods and their Applications - BIOMA 2014, 13 September 2014, Ljubljana, Slovenia</i>. Ljubljana: Jožef Stefan Institute, pp. 55-66, 2014 |
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