

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Vizualizacija podatkov
Course title: Data Visualization

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
3. stopnja	Informacijske in komunikacijske tehnologije	1	1
3 rd cycle	Information and Communication Technologies	1	1

Vrsta predmeta / Course type

Izbirni / Elective

Univerzitetna koda predmeta / University course code:

IKT3-908

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
20		5			125	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. Tea Tušar

**Jeziki /
Languages:**

Predavanja / Lectures: slovenščina, angleščina/
Slovenian, English

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

Izpolnjeni morajo biti pogoji za vpis na doktorski študij: zaključena druga stopnja bolonjskega študija ali diploma univerzitetnega študijskega programa.

Prerequisites:

Students must fulfill the formal requirements for enrolling to the doctoral study program: completed Bologna second-cycle study program or an equivalent pre-Bologna university study program.

Vsebina:

Osnove:
definicija vizualizacije podatkov, zgodovinske vizualizacije, nameni vizualizacije podatkov in načela dobrega oblikovanja vizualizacij.
Abstrakcija podatkov:
tipi podatkovnih zbirk, tipi atributov in njihov pomen.
Abstrakcija nalog:
cilji in naloge, akcije in subjekti.
Človeška vizualna zaznava:
spomin, vizualno kodiranje, vrstni red v vizualizaciji, zaznavanje in specifikacija barv.
Oblikovanje vizualizacije:

Content (Syllabus outline):

Foundations:
defining data visualization, historical visualizations, the purposes of data visualization and the principles of good visualization design.
Data abstraction:
dataset types, attributes types and semantics.
Task abstraction:
goals and tasks, actions and targets.
Human visual perception:
memory, visual encoding, visual order, color perception and color specification.
Designing a visualization:

koraki oblikovanja vizualizacij, osnovni prikazi, vizualizacija večdimenzionalnih podatkov, negotovosti in manjkajočih podatkov, interaktivnost, pripovedovanje zgodb in orodja. Primeri: (ne)verodostojne in (ne)dostopne vizualizacije. Vaje o ustvarjanju interaktivnih vizualizacij.

steps of visualization design, basic charts, visualizing multivariate data, uncertainty and missing data, interactivity, storytelling and tools. Examples: (un)trustworthy and (in)accessible visualizations. Tutorial on creating interactive visualizations.

Temeljni literatura in viri / Readings:

- Tamara Munzner. Visualization Analysis & Design. A K Peters Visualization Series, CRC Press, Boca Raton, 2014.
- Edward R. Tufte. The Visual Display of Quantitative Information. Graphics Press, Cheshire, 2015.
- Andy Kirk. Data Visualization: A Handbook for Data Driven Design. SAGE Publications, London, 2016.

Cilji in kompetence:

Cilj predmeta je zagotoviti znanje in praktične spretnosti, potrebne za razvoj trdnih temeljev o vizualizaciji podatkov.

Študenti, ki bodo uspešno zaključili ta predmet, se bodo naučili, kako vizualizirati podatke, da bi podprli sklepanje pri analizi podatkov in informacije posredovali drugim. Razumeli bodo, kako uporabiti abstrakcijo podatkov in nalog za oblikovanje vizualizacij, ki dosežejo svoj cilj. S preučevanjem človekove zaznavne/kognitivne obdelave in lastnosti vizualnih kanalov se bodo naučili sprejemati premišljene odločitve o oblikovanju vizualizacij. Razložili bodo med verodostojnimi in zavajajočimi vizualizacijami.

Objectives and competences:

The course objective is to provide the knowledge and practical skills necessary to develop a strong foundation in data visualization.

The students who will successfully complete this course will learn how to visualize data in order to support reasoning in data analysis and communicate information to others. They will understand how data and task abstraction can be used to design visualizations that achieve their goal. By studying human perceptual/cognitive processing and the properties of visual channels, they will learn to make informed decisions about visualization design. They will be able to discern between trustworthy and misleading visualizations.

Predvideni študijski rezultati:

- Študenti bodo z uspešno opravljenimi obveznostmi tega predmeta pridobili:
- razumevanje konceptov vizualizacije podatkov,
 - usposobljenost za oblikovanje vizualizacij, ki so dostopne in verodostojne,
 - spretnosti za pripravo učinkovitih predstavitev.

Intended learning outcomes:

- Students successfully completing this course will acquire:
- the understanding of the concepts of data visualization,
 - the ability to design visualizations that are accessible and trustworthy, and
 - the skills to make efficient presentations.

Metode poučevanja in učenja:

Predavanja, vaje, samostojno delo

Learning and teaching methods:

Lectures, tutorial, individual work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Seminarska naloga	50 %	Seminar work
Ustni zagovor seminarske naloge	50 %	Oral defense of seminar work

Reference nosilca / Lecturer's references:

- E. Medvet, M. Virgolin, M. Castelli, P. Bosman, I. Gonçalves and **T. Tušar**. Unveiling evolutionary algorithm representation with DU maps. *Genetic programming and evolvable machines*, 19(3):351-389, 2018.
- **T. Tušar** and B. Filipič. Visualization of Pareto front approximations in evolutionary multiobjective optimization: A critical review and the projection method. *IEEE Transactions on Evolutionary Computation*, 19(2):225-245, 2015.
- **T. Tušar** and B. Filipič. Visualizing exact and approximated 3D empirical attainment functions. *Mathematical Problems in Engineering*, 2014: Article ID 569346, 18 pages, 2014.
- **T. Tušar**. Interaktivna vizualizacija proračuna Republike Slovenije s Sankeyevim diagramom (Interactive visualization of the Slovenian budget with the Sankey diagram). *Human-Computer Interaction in Information Society*, Information Society, IS 2020, volume H., pp. 9-12, 2020.
- B. Filipič and **T. Tušar**. A taxonomy of methods for visualizing Pareto front approximations. In *Proceedings of the Genetic and Evolutionary Computation Conference, GECCO 2018*, pp. 649-656, 2018.