



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Multivariatne statistične metode
Course title:	Multivariate Statistics Methods

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 2. stopnja		1. ali 2.	1. ali 3.
Mathematics, 2 nd cycle		1. or 2.	1. or 3.

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			30		135	7

Nosilec predmeta / Lecturer:

Jeziki / Languages:

Predavanja / Lectures:	SLOVENSKO/SLOVENE
Vaje / Tutorial:	SLOVENSKO/SLOVENE

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

Poznavanje splošne (osnovne) statistike in linearne algebre.

Vsebina:

- Uvod v multivariatno analizo: Osnove statistične analize podatkov. Variančno-kovariančna matrika in korelacijska matrika. Standardiziranje podatkov. Grafična predstavitev multivariatnih podatkov.
- Razvrščanje v skupine: Proces razvrščanja v skupine. Mera podobnosti in različnosti. Optimizacija in kriterijske funkcije. Hierarhične metode (minimalna, maksimalna, Wardova,...) in nehierarhične metode (metoda

Prerequisites:

Knowledge of general (basic) statistics and linear algebra.

Content (Syllabus outline):

- Introduction to multivariate analysis: Basic statistical data analysis. Variance-covariance matrix and correlation matrix. Data standardization. Graphical representation of multivariate data.
- Clustering: Clustering process. Measure of similarity and dissimilarity. Optimization and criteria functions. Hierarchical methods (minimal, maximal, Ward's) and non-hierarchical methods (k-means clustering).

voditelj). Dendrogram. Določanje števila skupin. Grafična predstavitev večrazsežnih podatkov.

- Metoda glavnih komponent: Večrazsežnost podatkov. Korelacijska matrika. Komunalitete in pojasnjena varianca. Določanje števila glavnih komponent.
- Faktorska analiza: Manifestne in latentne spremenljivke. Splošni faktorski model in ocenjevanje. Metode faktorske analize (metoda glavnih osi, metoda največjega verjetja). Pravokotne in poševne rotacije.
- Diskriminantna analiza: Predpostavke. Diskriminantni kriterij. Pravila uvrščanja enot v skupine. Diskriminantna funkcija in klasifikacijska tabela. Pomen napovednih spremenljivk in centroidov.
- Kanonična korelacijska analiza: Kanonične rešitve. Kanonične in strukturne uteži.

Dendrogram. Choosing the number of clusters. Graphical representation of high-dimensional data.).

- Principal component analysis: High-dimensional data space. Correlation matrix. Commonalities and explained variance. Choosing the number of principal components.
- Factor analysis: Manifest and latent variables. Factor model and estimation. General factor model and estimation. Factor analysis methods (principal axis factoring and maximum likelihood). Orthogonal and oblique rotations.
- Discriminant analysis: Assumptions. Discriminant criteria. Classification rules. Discriminant function and classification table. Importance of manifest variables and centroids.
- Canonical correlation analysis: Canonical solutions. Canonical and structure loadings.

Temeljni literatura in viri / Readings:

1. Dillon W.R. in Goldstein M.: Multivariate Analysis, Wiley, New York, 1984.
2. Mardia K.V., Kent J.T. in Billy J.m.: Multivariate Analysis, Academic Press, London, 1979.
3. Sharman S.: Applied multivariate techniques, Wiley, New York, 1996.
4. Ferligoj A.: Razvrščanje v skupine, Metodološki zvezki, 4, FSPN, Ljubljana, 1989.
5. Omladič V.: Uporaba linearne algebre v statistiki, Metodološki zvezki, 13, FDV, Ljubljana, 1997.

Cilji in kompetence:

Glavni cilj predmeta je proučiti najpomembnejše koncepte, metode in rezultate multivariatne analize.

Objectives and competences:

The main goal of the course is to study the fundamental concepts, methods and results of multivariate analysis.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje in poznavanje osnovnih pojmov multivariatne analize.
- Razumevanje, izvajanje in interpretacija različnih metod multivariatne analize.
- Obvladanje ustrezne programske opreme za namene statističnega raziskovanja.

Prenosljive/ključne spretnosti in drugi atributi:

Intended learning outcomes:

Knowledge and Understanding:

- Understanding and knowledge of the basic concepts of multivariate analysis.
- Understanding, correct application and interpretation of different methods of multivariate analysis.
- Knowledge of using an appropriate software for statistical research.

Transferable/Key Skills and other attributes:

<ul style="list-style-type: none"> • Prenos znanja iz statistike na različna strokovna in znanstvena področja, kjer se uporabljajo metode multivariatne analize. 		<ul style="list-style-type: none"> • Knowledge transfer of statistical methods into different areas dealing with multivariate analysis methods.
Metode poučevanja in učenja:		Learning and teaching methods:
<ul style="list-style-type: none"> • Predavanja • Laboratorijske vaje • Projekt 		<ul style="list-style-type: none"> • Lectures • Laboratory exercises • Project
Načini ocenjevanja:		Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt):	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):
<ul style="list-style-type: none"> - Pisni test – praktični del - Izpit (ustni) – teoretični del - Projekt 	<ul style="list-style-type: none"> 50% 30% 20% 	<ul style="list-style-type: none"> - Written test – practical part - Exam (oral) – theoretical part - Project
<ul style="list-style-type: none"> - Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. 		<ul style="list-style-type: none"> - Each of the mentioned commitments must be assessed with a passing grade.
<ul style="list-style-type: none"> - Pozitivna ocena pri pisnem testu je pogoj za pristop k izpitu. 		<ul style="list-style-type: none"> - Passing grade of the written test is required for taking the exam.

Reference nosilca / Lecturer's references:

1. BENKOVIČ, Dominik, GRAŠIČ, Mateja. Generalized skew derivations on triangular algebras determined by action on zero products. *Communications in algebra*, ISSN 0092-7872, 2018, vol. 46, iss. 5, str. 1859-1867. <https://doi.org/10.1080/00927872.2017.1360334>.
2. BENKOVIČ, Dominik. Generalized Lie derivations of unital algebras with idempotents. *Operators and matrices*, ISSN 1846-3886, 2018, vol. 12, no. 2, str. 357-367. <https://doi.org/10.7153/oam-2018-12-23>.
3. BENKOVIČ, Dominik. Jordan σ -derivations of triangular algebras. *Linear and Multilinear Algebra*, ISSN 0308-1087, 2016, vol. 64, no. 2, str. 143-155. <http://dx.doi.org/10.1080/03081087.2015.1027646>.
4. BENKOVIČ, Dominik. A note on f-derivations of triangular algebras. *Aequationes mathematicae*, ISSN 0001-9054, 2015, vol. 89, iss. 4, str. 1207-1211. <http://dx.doi.org/10.1007/s00010-014-0298-y>.
5. BENKOVIČ, Dominik. Lie triple derivations of unital algebras with idempotents. *Linear and Multilinear Algebra*, ISSN 0308-1087, 2015, vol. 63, no. 1, str. 141-165. <http://dx.doi.org/10.1080/03081087.2013.851200>.