

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
Predmet:		Bayesova statistika				
Course title:		Bayesian statistics				
Študijski program in stopnja Study programme and level		Študijska smer Study field		Letnik Academic year	Semester Semester	
Magistrski študijski program Matematika		ni smeri		1 ali 2	prvi ali drugi	
Master's study programme Mathematics		none		1 or 2	first or second	
Vrsta predmeta / Course type				izbirni		
Univerzitetna koda predmeta / University course code:				M2518		
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	15	30			105	6
Nosilec predmeta / Lecturer:		prof. Jaka Smrekar, prof. Mihael Perman				
Jeziki / Languages:		Predavanja / Lectures: slovenski/Slovene, angleški/English				
		Vaje / Tutorial: slovenski/Slovene, angleški/English				
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:		
Vsebina:				Content (Syllabus outline):		

<p>Bayesovi modeli z enim in več parametri. Povezava s standardnimi statističnimi metodami. Hierarhični modeli. Preverjanje modelov in analiza občutljivosti. Bayesovo načrtovanje poskusov.</p> <p>Bayesov pristop k združevanju rezultatov več raziskav, potenčne apriorne porazdelitve, analiza odvisnosti združene analize od preteklih raziskav.</p> <p>Uvod v regresijsko analizo. Analiza variance in kovariance, informativne hipoteze in njihovo ovrednotenje. Bayesov faktor, kompleksnost in prilaganje. Aposteriorne verjetnosti hipotez - modelov, vpliv apriorne porazdelitve, učni vzorec.</p> <p>Povzemanje aposteriorne porazdelitve, ocene parametrov, centralni kredibilnostni interval, pomen konjugiranih porazdelitev. Gibbsov vzorčevalnik, konvergenca ocen, Metropolis Hastingsov algoritem. Aposteriorne simulacije. Drugi specifični modeli Bayesove analize.</p>	<p>Bayesian models with one and more parameters. Connection with standard statistical methods. Hierarchical models. Testing of models and sensitivity analysis. Bayesian design of experiment.</p> <p>Bayesian approach to evidence synthesis of multiple surveys, power priors, analysis of dependence of synthesis analysis on previous surveys.</p> <p>Introduction into regression analysis. Analysis of variance and covariance. Hypothesis testing via Bayes factor, complexity and fit. Posterior probabilities of hypotheses – models, and influence of priors on them, training sample.</p> <p>More on posterior probabilities, estimating parameters, central credibility interval, the importance of conjugated distributions. Gibbs sampler, convergence of estimates, algorithm Metropolis-Hastings. Posterior simulations. Some other specific models of Bayesian analysis.</p>
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Temeljni literatura in viri / Readings:

A. Gelman, J.B. Carlin, H.S. Stern, D.B. Rubin: Bayesian Data Analysis. Chapman&Hall, 1995.

H. Hoijtink: Bayesian Data Analysis. In: R.E. Millsap and A. Maydeu-Olivares, The SAGE Handbook of Quantitative Methods in Psychology. London: SAGE, 2009.

I. Ntzoufras: Bayesian Modeling Using WinBUGS. New York: Wiley, 2009.

Cilji in kompetence:

Študent spozna temeljne Bayesove metode za obdelavo podatkov.

Spozna se tudi z uporabo teh metod v praksi. Zato je predvideno, da bodo pri predmetu sodelovali tudi strokovnjaki iz prakse.

Objectives and competences:

Basic knowledge of Bayesian statistics is acquired.

Bayesian methods are of great importance in practice. Therefore, experts with practical knowledge will present their experience in class.

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje:
Razumevanje osnovnih konceptov Bayesove statistike.

Knowledge and understanding:
Understanding of basic concepts of Bayesian statistics.

Metode poučevanja in učenja:

predavanja, vaje, seminarske naloge, praktične naloge z uporabo statističnih paketov, konzultacije

Learning and teaching methods:

Lectures, exercises, seminar type homework, homework that require the use of statistical packages, consultations

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):
Izpit iz vaj

izpit iz teorije

ocene: 5 (negativno), 6-10 (pozitivno) (po Statutu UL)

50%
50%

Type (examination, oral, coursework, project):
Exercise-based exam.

Theoretical knowledge exam.

Grading: 5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Jaka Smrekar:

SMREKAR, Jaka. Homotopy type of space of maps into a $K(G,n)$. Homology, homotopy, and applications, ISSN 1532-0073, 2013, vol. 15, no. 1, str. 137-149. [COBISS.SI-ID 16643929]

SMREKAR, Jaka. Turning a self-map into a self-fibration. Topology and its Applications, ISSN 0166-8641. [Print ed.], 2014, vol. 167, str. 76-79. [COBISS.SI-ID 16943705]

SMREKAR, Jaka. Homotopy type of mapping spaces and existence of geometric exponents. Forum mathematicum, ISSN 0933-7741, 2010, vol. 22, no. 3, str. 433-456. [COBISS.SI-ID 15638105]

Mihael Perman:

PERMAN, Mihael, WELLNER, Jon A. An excursion approach to maxima of the Brownian bridge. *Stochastic Processes and their Applications*, ISSN 0304-4149. [Print ed.], 2014, vol. 124, iss. 9, str. 3106-3120.

PERMAN, Mihael. A decomposition for Markov processes at an independent exponential time. *Ars mathematica contemporanea*, ISSN 1855-3966. [Tiskana izd.], 2017, vol. 12, no. 1, str. 51-65.

PERMAN, Mihael, ZALOKAR, Ana. Optimal hedging strategies in equity-linked products. *Journal of Computational and Applied Mathematics*, ISSN 0377-0427. [Print ed.], 2018, vol. 344, str. 601-607.