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 Finančna matematika	ni smeri	1 ali 2	prvi ali drugi
Master's study programme Financial 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):

Bayesovi modeli z enim in več parametri. Povezava s standardnimi statističnimi metodami. Hierarhični modeli. Preverjanje modelov in analiza občutljivosti. Bayesovo načrtovanje poskusov.

Bayesov pristop k združevanju rezultatov več raziskav, potenčne apriorne porazdelitve, analiza odvisnosti združene analize od preteklih raziskav.

Uvod v regresijsko analizo. Analiza variance in kovariance, informativne hipoteze in njihovo ovrednotenje. Bayesov faktor, kompleksnost in prileganje. Aposteriorne verjetnosti hipotez - modelov, vpliv apriorne porazdelitve, učni vzorec.

Povzemanje aposteriorne porazdelitve, ocene parametrov, centralni kredibilnostni interval, pomen konjugiranih porazdelitev. Gibbsov vzorčevalnik , konvergenca ocen, Metropolis Hastingov algoritem. Aposteriorne simulacije. Drugi specifični modeli Bayesove analize.

Bayesian models with one and more parameters. Connection with standard statistical methods. Hierachical models. Testing of models and sensitivity analysis. Bayesian design of experiment.

Bayesian approach to evidence synthesis of multiple surveys, power priors, analysis of dependence of synthesis analysis on previous surveys.

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.

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 anlysis.

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:	Knowledge and understanding:
Razumevanje osnovnih konceptov Bayesove statistike.	Understanding of basic concepts of Bayesian statistics.

Metode poučevanja in učenja: | **Learning and teaching methods:**

Metode poučevanja in učenja:	Learning and teaching methods:
predavanja, vaje, seminarske naloge, praktične naloge z uporabo statističnih paketov, konzultacije	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		Type (examination, oral, coursework, project): Exercise-based exam.
izpit iz teorije		Theoretical knowledge exam.
ocene: 5 (negativno), 6-10 (pozitivno) (po Statutu UL)	50% 50%	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.