

Obuda University Bánki Donát Faculty of Mechanical and Safety Engineering				Institute of Mechatronics and Vehicle Engineering			
Subject title and code:		Machine Learning - Statistical Approach BMXTSE5BNF				Credits: 4	
Full-time study		2026/2027		ac. 1		semester	
				year			
The course is available at:		mechatronics engineering BSc					
Supervised by:		Andrew Frigyik, PhD		Instructors:		Andrew Frigyik, PhD	
Prerequisite (neptun code):		Mathematics III (BTXMME3BNF), Object-oriented Programming (BMXOPE3BNF)					
Weekly number of lessons							
Lecture: 2		Group seminar: 0		Lab:1		Consultation: 0	
Way of assessment:		Exam		(Oral)			
Online consultation (in case it's required): ... (BBB link)							
Edu. goal:		The purpose of the subject is to give a survey of the theory of statistical machine learning. The course starts with a short introduction into machine learning. Next we cover the theory of statistical machine learning. The second part of the course deals with an assortment of practical questions. The curriculum of the course: Probability theory and statistics, theory of risk, supervised learning methods, method of nearest neighbors, support machine learning, optimization algorithms, theory of kernels. Through a sequence of Jupyter notebooks they will have an opportunity to test all the introduced methods on non-trivial databases both in the lab and at home.					
Schedule							
Education week		Topics					
1.		Basic idea of statistical learning, Python introduction/refreshers					
2.		Simple and multiple Linear Regression					
3.		Classification using Logistic Regression, Linear and Quadratic Discriminant Analysis, as well as K-Nearest Neighbors model					
4.		Cross-Validation and Bootstrap methods					
5.		Linear Model Selection and Regularization, Dimension Reduction method					
6.		Non-linear methods: Polynomial Regression, Splines and Generalized Additive Models					
7.		Tree-Based methods: Decision Trees, Bagging, Random Forests					
8.		Support Vector Classifiers and Machines					
9.		Single Layer and Multilayer Neural Networks, Convolutional Neural Networks, Deep Learning					
10.		Time related methods: Survival Analysis and Censored Data					
11.		Unsupervised Learning: Principal Component Analysis, Clustering methods					
12.		Rector's Holiday					
13.		Methods for Inference: Multiple Testing					
14.		Overview					
Mid-semester requirements							
Test		Assignment to be submitted		Lab measurement			
amount		amount		amount		dates	
		12		deadlines			
		weekly					
According to the HKR attendance of group seminars and lab exercises are mandatory.							
Other requirements for participation in sessions not covered by the regulations and restrictions on substitutions:							

Test		Assignment to be submitted		Lab measurement	
maximum points available ...points	minimum score required to pass /test ...points	maximum points available 100 points	minimum score required to pass / assignment 50 points	maximum points available ...points	minimum score required to pass /lab ...points

Total number of points achievable in semester: ...points				
Grading thresholds	satisfactory 50 % and above	average 63 % and above	good 76 % and above	excellent 90 % and above
Other evaluation criteria: The grade is entirely based on the assignments. Assignments can be resubmitted for a better grade.				
Receive a signature denied entry:				
Required references:				
Recommended references:	- Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Jonathan Taylor; An Introduction to Statistical Learning with Applications in Python; Springer 2023 - Rodrigo Fernandes de Mello, Moacir Antonelli Ponti, Machine Learning. A Practical Approach on the Statistical Learning Theory, Springer (2018) - Sugiyama, Masashi, Introduction to Statistical Machine Learning, Morgan Kaufmann (2016)xs			
Quality assurance methods of the subject:				

Things, that are not included, can be found within the regulations of Óbuda University.