

Priloga 1 k Vlogi za akreditacijo krajšega izobraževanja in usposabljanja za pridobitev mikrodokazila – Učni načrt mikrodokazila
Enclosure 1 to the application for accreditation of short-term learning and training course
for the acquisition of micro-credentials – Micro-credential Syllabus

UČNI NAČRT MIKRODOKAZILA/MICRO-CREDENTIAL SYLLABUS

Naziv mikrodokazila:

Micro-credential title:

Osnove strojnega učenja za arhitekte
Machine Learning Basics for Architects

Študijsko področje po KLASIUS P-16

Study field according to KLASIUS P-16:

068

Razvrstitev v SOK: *SQF Classification in*

Razvrstitev v EOVK: *QF-EHEA Classification*

Razvrstitev v EOK: *EQF Classification*

7

1 stopnja

6

Univerzitetna koda/University code:

Način izvedbe (klasično, hibridno, na daljavo)

Method of implementation (classic, hybrid, online)

klasično

classic

Predavanja <i>Lectures</i>	Seminar <i>Seminar</i>	Vaje <i>Tutorial</i>	Klinične vaje <i>Clinical work</i>	Druge oblike študija <i>Other forms of study</i>	Samostojno delo <i>Individual work</i>	ECTS
6		6			18	1

Nosilec predmeta/Lecturer:

(So)izvajalci/(Co)-Lecturers:

Prof. Dr. Miklos Kresz

Dr. László Hajdu

Jezik izvedbe

Language of instruction

Angleščina

English

Maksimalno število udeležencev

Maximum number of participants:

15

Merila za izbor udeležencev v primeru večjega interesa od razpisanih mest:

Criteria for selecting participants in the event of greater interest than the number of places available:

Datum prijave

Date of application

Pogoji za vključitev:

Arhitekti, študenti arhitekture

Osnovno računalniško znanje: Poznavanje osnovnih računalniških operacij je nujno, saj izobraževanje vključuje praktične module.
Matematična podlaga: Osnovno razumevanje matematičnih konceptov, zlasti statistike in linearne algebre, je koristno, vendar ni nujno potrebno.

Prerequisites:

Architects, Students of Architecture

Basic Computer Skills: Familiarity with basic computer operations is essential since the course includes hands-on modules.
Mathematical Foundation: A basic understanding of mathematical concepts, particularly in statistics and linear algebra, is helpful but not strictly necessary.

Vsebina:

1. Strojno učenje:
 - a. Uvod in pregled strojnega učenja, različne vrste podatkov, vrste strojnega učenja, koncept učenja
 - b. Model strojnega učenja kot črna škatla, zagotavljanje zanesljivosti, koncept ocenjevanja modela, prenaučnost
 - c. Potek strojnega učenja, priprava podatkov, pregled algoritmov strojnega učenja, učenje modela, ocenjevanje modela, primeri uporabe iz gradbenega sektorja
2. Osnove Pythona:
 - a. Python okolje, osnove programskega jezika Python, operatorji, podatkovne strukture,

Content (Syllabus outline):

1. Machine Learning:
 - a. Introduction and overview of Machine Learning, different data types, types of Machine Learning, concept of learning
 - b. Machine Learning model as a black box, ensuring reliability, concept of model evaluation, overfitting.
 - c. Machine Learning Workflow, data preparation, overview of Machine Learning algorithms, model training, model evaluation, use cases from the construction sector
2. Python Basics:
 - a. Python environment, Basics of the python

Priloga 1 k Vlogi za akreditacijo krajšega izobraževanja in usposabljanja za pridobitev mikrodokazila – Učni načrt mikrodokazila

*Enclosure 1 to the application for accreditation of short-term learning and training course
for the acquisition of micro-credentials – Micro-credential Syllabus*

kontrolne strukture, funkcije in moduli, knjižnice 3. Strojno učenje v Pythonu: a. Raziskovalna analiza podatkov, vizualizacija, primeri strojnega učenja (nadzorovano/nenadzorovano učenje) b. Ustvarjanje poteka strojnega učenja, učenje in napovedovanje z različnimi modeli, nastavitve hiperparametrov, ocenjevanje modela c. Projekt od začetka do konca, povezan z gradbenim sektorjem	language, operators, data structures, control structures, functions and modules, libraries. 3. Machine Learning in Python: a. Exploratory Data Analysis, Visualization, Machine Learning examples (supervised/unsupervised learning) b. Creating ML workflow, Training and prediction with different models, hyperparameter tuning, evaluation of the model c. End to end project related to the construction sector.
---	--

Literatura in viri/Readings:

1. M.J. Kearns, U.V. Vazirani: An Introduction to Computational Learning Theory, MIT Press, Cambridge, Massachusetts, 1994 (221p)
2. T. Mitchell: Machine Learning, McGraw Hill, 1997. (414p)
3. R.O. Duda, P.E. Hart, D.G. Stork: Pattern Classification, Wiley and Sons, 2001.(p 654)
4. C. M. Bishop: Pattern recognition and machine learning, 2nd edition, Springer, 2007 (738p)

Druge pomembne sestavine (npr. licence, orodja, pripomočki ipd.):

/

Other important components (e.g. licenses, tools, utilities, etc.):

/

Cilji in kompetence:

Obvladovanje uporabe Pythona in njegovih knjižnic (kot so scikit-learn, pandas, numpy) za naloge strojnega učenja.
Spretnosti pri analizi in interpretaciji podatkov, prepoznavanju vzorcev ter razumevanju porazdelitev podatkov.
Zmožnost definiranja problemov, razvoja ustreznih modelov strojnega učenja in kritičnega vrednotenja njihove učinkovitosti.
Kompetence za sprejemanje informiranih odločitev na podlagi analize podatkov in rezultatov strojnega učenja.
Praktične spretnosti pri uporabi tehnik strojnega učenja v resničnih scenarijih gradbene industrije, kot je napovedovanje zamud pri projektih.

Objectives and competences:

Competence in using Python and its libraries (such as scikit-learn, pandas, numpy) for machine learning tasks.
Skills in analyzing and interpreting data, identifying patterns, and understanding data distributions.
Ability to define problems, develop appropriate machine learning models, and critically evaluate their performance.
Competence in making informed decisions based on data analysis and machine learning outcomes.
Practical skills in applying machine learning techniques to real-world scenarios in the construction industry, such as predicting project delays.

Predvideni učni izidi:

Znanje in razumevanje:
Poznavanje različnih tehnik in metod, ki se uporabljajo pri modeliranju podatkov s strojnim učenjem. Sposobnost za analizo, sintezo in predvidevanje rešitev ter njihovih posledic konkretnih problemov z uporabo znanstvenih metod.

Uporaba in refleksija:
Spoznavanje in razumevanje pomena strojnega učenja, uglasenosti med teorijo in njeno aplikacijo na konkretnih primerih s področja arhitekture. Avtonomnost, (samo)kritičnost, (samo)refleksivnost.
Prenos naučenih principov na načrtovanje obsežnih realnih sistemov. Sposobnost pridobivanja, selekcije in ocenjevanje novih

Intended learning outcomes:

Knowledge and understanding:

Expertise in several techniques and methods, used for data modeling with ML. The ability for analysis, synthesis and anticipation of solutions and their consequences for target problems using the scientific methodology.

Use and reflection:

Understanding and recognizing the importance of machine learning, the harmony between theory and its application to concrete examples in the field of architecture. Autonomy, (self)criticism, (self-reflection).
Transfer of learned principles to the design of large-scale real systems. Ability to acquire, select, and evaluate new information and the

Priloga 1 k Vlogi za akreditacijo krajšega izobraževanja in usposabljanja za pridobitev mikrodokazila – Učni načrt mikrodokazila

*Enclosure 1 to the application for accreditation of short-term learning and training course
for the acquisition of micro-credentials – Micro-credential Syllabus*

informacij in zmnožnost ustrezne interpretacije v kontekstu. Sposobnost za upravljanje s časom, za samo pripravo in načrtovanje ter samokontrolo izvajanja postopkov. Sposobnost timskega dela.	capacity for appropriate interpretation in context. Ability to manage time, self-preparation and planning, and self-monitoring of process execution. The ability to work in a team.
--	--

Metode učenja in poučevanja

Oblike dela: • predavanja • vaje • samostojno delo Metode dela: razlaga, dialog, diskusija, problemsko učenje, študije primerov	<i>Learning and teaching methods:</i> Forms of teaching: • lectures • exercises • individual work Teaching methods: explanation, debates, discussion, problem-based learning, case studies
---	---

Način preverjanja in ocenjevanja:

Type of examination and assessment:

Način (pisni izpit, ustni izpit, naloge, idr.)	Delež (v %): <i>Weight (in %)</i>	<i>Type (written exam, oral exam, assignments, etc.)</i>
Projektna naloga	100%	Project assignment

Priloga 1 k Vlogi za akreditacijo krajšega izobraževanja in usposabljanja za pridobitev mikrodokazila – Učni načrt mikrodokazila

*Enclosure 1 to the application for accreditation of short-term learning and training course
for the acquisition of micro-credentials – Micro-credential Syllabus*

Pogoji za pridobitev mikrodokazila:

*Minimal standards for obtaining
micro-credential:*

Udeleženec mora obiskovati usposabljanje in oddati ustrezno projektno nalogo.

The participant must attend the training and submit the relevant project assignment.

Reference nosilca/Lecturer's references:

BALDOUSKI, Daniil, KRÉSZ, Miklós Ferenz, DÁVID, Balázs. Scheduling truck arrivals for efficient container flow management in port logistics. Central European journal of operations research. Sep. 2025, vol. 33, iss. 3, str. 791-818

EGRI, Péter, DÁVID, Balázs, KIS, Tamás, KRÉSZ, Miklós Ferenz. Robust facility location in reverse logistics. Annals of operations research. 2023, vol. 324, str. 163-188

RIGGIO, Mariapaola, MARISSA, Michael Nicolas, KRÉSZ, Miklós Ferenz, VCELAK, Jan, SANDAK, Jakub Michal, SANDAK, Anna Malgorzata. Leveraging structural health monitoring data through avatars to extend the service life of mass timber buildings. Frontiers in built environment. 2022, vol. 8, art. 887593, str. 1-7

DÁVID, Balázs, KRÉSZ, Miklós Ferenz. Multi-depot bus schedule assignment with parking and maintenance constraints for intercity transportation over a planning period. Transportation letters. 2020, vol. 12, iss. 1, str. 66-75

EGRI, Péter, DÁVID, Balázs, KIS, Tamás, KRÉSZ, Miklós Ferenz. Robust reverse logistics network design. V: GOLINSKA-DAWSON, Paulina (ur.). Logistics operations and management for recycling and reuse. Berlin: Springer Nature, cop. 2020. Str. 37-53