Medicinski fakultet u Rijeci

IZVEDBENI NASTAVNI PLAN
2023/2024

Za kolegij

Introduction to Computer Assisted Medical Decision

Studij:	**Medical Studies in English (R)** Sveučilišni integrirani prijediplomski i diplomski studij
Katedra:	**Katedra za bioinformatiku i razvoj djelatnika i studenata**
Nositelj kolegija:	**prof. dr. sc Bilić-Zulle Lidija, dipl. inž., specijalist med. biokemije**
Godina studija:	**4**
ECTS:	**1.5**
Stimulativni ECTS:	**0 (0.00%)**
Strani jezik:	**Mogućnost izvođenja na stranom jeziku**

Podaci o kolegiju:

Medical decision-making is a central process in medical practice and science. To assume appropriate responsibility, physicians must have a clearly informed decision-making process that is based on a rational process and consistent with evidence-based medicine and medical practice. Regardless of the nature, pathway, and support of the decision-making process, the responsibility for the decision always rests with the health care professional and the patient who accepts the decision. Decision-making is a cognitive process in which a choice is made from a set of options. Decision-making may be intuitive or reasoned, biased or unbiased, and the quality of the decision clearly depends on the input variables, which may be the result of learning, search, and measurement processes, each of which is subject to bias. Information technology supports medical decision making with a variety of knowledge-based methods. The ability to search large amounts of information and process data in a short period of time, as well as machine learning, can contribute to rational decision making.
The main objective of the course is to familiarize students with the decision-making process and the formalization of decision-making, and to explain and understand the chosen methods of decision-making with direct application in medicine. Course content includes interpretation and adoption of information about the decision-making process and formalization, consequences of decision-making, risk assessment in decision-making, decision rules, knowledge-based decision-making methods, machine learning, pattern recognition, artificial neural networks, and artificial intelligence in medical decision-making.

The list of lectures (with topics and descriptions):
1. Introductory lecture / Decision making process and formalization
Lecture 1 is an introductory course lecture. The students will receive basic information about the course, schedule, teaching and assessment. They are acquainted with the definition and emergence of decision-making process and formalization. Students are familiarized with the structure and scope of the topics covered by the course.
Learning outcome: To define the decision-making process and the concept of decision-making formalization.
2. Decision tree / decision rules
The students will receive basic knowledge about decision tree method for multicriteria decision- making and decision rules in biomedicine.
Learning outcome: Compare the decision tree and decision rules methods.
3. Knowledge-based decision-making methods
Lecture 3 is introductory about knowledge-based decision-making methods as ELECTRE (ELimination Et Choice Translating REality), TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution), AHP (Analytic Hierarchy Process) and ANP (Analytic Network Process) Learning outcome: Identify knowledge-based decision-making methods, describe advantages and disadvantages.
4. Artificial Intelligence (Neural Networks and Pattern Recognition)
In lecture 4 is described the application of artificial intelligence (pattern recognition and artificial neural networks) in the decision-making process in medicine. Learning outcome: Compare methods of pattern recognition and artificial neural networks.
5. Decision making modeling (project)
The lecture is interactive discussion, students and teacher are gathered together at the end of the course, guidance for further learning and development in the application of information technology and multicriteria decision-making methods in medicine are provided.

The list of seminars:
1-2 Practical implication of decision-making process in medicine
3-4 Free software for decision making modeling
5-6 How to transform decision tree into decision rules (Rapid Miner tool)
7-8-Clinical decision rules – case studies
9-10 Analysis of decision-making methods
11-12 Graphic type of decision-making model using the AHP method
13-14 Applying the Analytic Hierarchy Process in healthcare research
15-16 Neural networks in medicine
17-18 Deep dive in clinical data (The Hypothetico-Deductive model of reasoning, and pattern recognition)
19-20 Decision making modeling with Superdecisions tool

Popis obvezne ispitne literature:

1. Coiera Enrico, Guide to health informatics, CRC Press, London, 2015.

Popis dopunske literature:

1. Medicine, https://journals.lww.com/md-journal/pages/default.aspx

Nastavni plan:

Predavanja popis (s naslovima i pojašnjenjem):

P1 Introductory lecture / Decision making process and formalization

Learning outcome: To define the decision-making process and the concept of decision-making formalization.

P2 Decision tree / decision rules

Learning outcome: Compare the decision tree and decision rules methods.

P3 Knowledge-based decision-making methods

Learning outcome: Identify knowledge-based decision-making methods, describe advantages and disadvantages.

P4 Artificial Intelligence (Neural Networks and Pattern Recognition)

Learning outcome: Compare methods of pattern recognition and artificial neural networks.

P5 Decision making modeling (project)

The lecture is interactive discussion, students and teacher are gathered together at the end of the course, guidance for further learning and development in the application of information technology and multicriteria decision-making methods in medicine are provided.

Seminari popis (s naslovima i pojašnjenjem):

S1-2 Practical implication of decision-making process in medicine

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S3-4 Free software for decision making modeling

-

S5-6 How to transform decision tree into decision rules (Rapid Miner tool)

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S7-8 Clinical decision rules – case studies

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S9-10 Analysis of decision-making methods

-

S11-12 Graphic type of decision-making model using the AHP method

-

S13-14 Applying the Analytic Hierarchy Process in healthcare research

-

S15-16 Neural networks in medicine

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S17-18 Deep dive in clinical data (The Hypothetico-Deductive model of reasoning, and pattern recognition)

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S19-20 Decision making modeling with Superdecisions tool

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Obveze studenata:

Students must regularly attend online lectures (webinars, synchronous or asynchronous) as part of active on-line instruction, use interactive course materials, participate in the use of online tests for assessment (self-assesment) and/or verification of acquired knowledge, actively participate in guided discussions, create assignments either individually or as part of a team, create a presentation of the final project (create a decision model using the chosen method), which is the final exam.

Ispit (način polaganja ispita, opis pisanog/usmenog/praktičnog dijela ispita, način bodovanja, kriterij ocjenjivanja):

Assessment of student work is continuous (formative and summative assessment) through the evaluation of activities such as webinar monitoring, use of interactive instructional materials, use of on-line tests for self-assessment and/or verification of acquired knowledge, activity in guided discussions, assignments either independently or in a team whose assessment may include other participants. Preparation and presentation of the final project for decision making according to the chosen method, all in accordance with the Regulation on Assessment of Work and Assessment of Students at the Faculty of Medicine in Rijeka (70% of the total grade from the assessment during the monitoring of activities in the online course and 30% from the presented final project - final exam).

The final grade is the sum of the ECTS grade obtained during the course and the final exam:
Final grade
A (90-100%) excellent (5)
B (75-89.9%) very-good (4)
C (60-74.9%) good (3)
D (50-59.9%) sufficient (2)
F (students who obtained less than 34.9 points during classes or did not pass the final exam) insufficient (1)

Ostale napomene (vezane uz kolegij) važne za studente:

A weekly organization of on-line course is presented in this syllabus. Detailed schedule of synchronous and asynchronous parts of the course will be published during the first week of the course after the first contact with students, respecting their obligations at the home faculties.

SATNICA IZVOĐENJA NASTAVE 2023/2024

Introduction to Computer Assisted Medical Decision

Predavanja (mjesto i vrijeme / grupa)	**Seminari** (mjesto i vrijeme / grupa)
13.03.2024	

P1 Introductory lecture / Decision making process and formalization:
• ONLINE (15:00 - 16:30) [217]
  ○ ICAMD
 	
P2 Decision tree / decision rules:
• ONLINE (15:00 - 16:30) [217]
  ○ ICAMD
	S1-2 Practical implication of decision-making process in medicine :
	• ONLINE (16:30 - 18:00) [215]
	  ○ ICAMD

prof. dr. sc Bilić-Zulle Lidija, dipl. inž., specijalist med. biokemije [217] · doc. dr. sc. Gligora Marković Maja, prof. mat. i inf. [215]	
21.03.2024	
	S3-4 Free software for decision making modeling : • ONLINE (18:30 - 20:00) [215] ○ ICAMD
doc. dr. sc. Gligora Marković Maja, prof. mat. i inf. [215]	
28.03.2024	

	S5-6 How to transform decision tree into decision rules (Rapid Miner tool):
	• ONLINE (18:00 - 21:00) [215]
	  ○ ICAMD
	
	S7-8 Clinical decision rules – case studies:
	• ONLINE (18:00 - 21:00) [215]
	  ○ ICAMD

doc. dr. sc. Gligora Marković Maja, prof. mat. i inf. [215]	
08.04.2024	

	S9-10 Analysis of decision-making methods:
	• ONLINE (14:00 - 17:00) [215]
	  ○ ICAMD
	
	S11-12 Graphic type of decision-making model using the AHP method:
	• ONLINE (14:00 - 17:00) [215]
	  ○ ICAMD

doc. dr. sc. Gligora Marković Maja, prof. mat. i inf. [215]	
15.04.2024	

	S13-14 Applying the Analytic Hierarchy Process in healthcare research:
	• ONLINE (14:00 - 17:00) [215]
	  ○ ICAMD
	
	S15-16 Neural networks in medicine:
	• ONLINE (14:00 - 17:00) [215]
	  ○ ICAMD

doc. dr. sc. Gligora Marković Maja, prof. mat. i inf. [215]	
16.04.2024	

	S17-18 Deep dive in clinical data (The Hypothetico-Deductive model of reasoning, and pattern recognition):
	• ONLINE (15:00 - 18:00) [215]
	  ◦ ICAMD
	
	S19-20 Decision making modeling with Superdecisions tool:
	• ONLINE (15:00 - 18:00) [215]
	  ◦ ICAMD

doc. dr. sc. Gligora Marković Maja, prof. mat. i inf. [215]	
18.04.2024	

P3 Knowledge-based decision-making methods:
• ONLINE (16:00 - 18:15) [217]
  ◦ ICAMD
 	
P4 Artificial Intelligence (Neural Networks and Pattern Recognition):
• ONLINE (16:00 - 18:15) [217]
  ◦ ICAMD
 	
P5 Decision making modeling (project) :
• ONLINE (16:00 - 18:15) [217]
  ◦ ICAMD	

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Popis predavanja, seminara i vježbi:

PREDAVANJA (TEMA)	Broj sati	Mjesto održavanja
P1 Introductory lecture / Decision making process and formalization	1	ONLINE
P2 Decision tree / decision rules	1	ONLINE
P3 Knowledge-based decision-making methods	1	ONLINE
P4 Artificial Intelligence (Neural Networks and Pattern Recognition)	1	ONLINE
P5 Decision making modeling (project)	1	ONLINE

SEMINARI (TEMA)	Broj sati	Mjesto održavanja
S1-2 Practical implication of decision-making process in medicine	2	ONLINE
S3-4 Free software for decision making modeling	2	ONLINE
S5-6 How to transform decision tree into decision rules (Rapid Miner tool)	2	ONLINE
S7-8 Clinical decision rules – case studies	2	ONLINE
S9-10 Analysis of decision-making methods	2	ONLINE
S11-12 Graphic type of decision-making model using the AHP method	2	ONLINE
S13-14 Applying the Analytic Hierarchy Process in healthcare research	2	ONLINE
S15-16 Neural networks in medicine	2	ONLINE
S17-18 Deep dive in clinical data (The Hypothetico-Deductive model of reasoning, and pattern recognition)	2	ONLINE
S19-20 Decision making modeling with Superdecisions tool	2	ONLINE

ISPITNI TERMINI (završni ispit):