

Subject card

Subject name and code	An Introduction to Medical Data Visualization and Analysis in Python, PG_00192456						
Field of study	Medical Physics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2025/2026		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		2.0		
Learning profile	academic		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Michał Mońka				
	Teachers		dr Michał Mońka				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		0.0		20.0	50
Subject objectives	The objective of the course is to introduce fundamental methods of data analysis and visualization in Python, with a particular focus on medical data stored in the DICOM format. The course includes an introduction to and practical guidance on popular libraries such as pandas, matplotlib, seaborn, numpy, scipy, and pydicom. As part of the course, students prepare 2 projects focusing on the processing, analysis, and visualization of a selected medical dataset.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FIZMEDL3_U05] Can program and use specialised software for calculations and data analysis, including in the field of imaging diagnostics, radiotherapy and biomedical signal analysis.	Able to utilize the pandas library to load, filter, aggregate, organize, and structure complex tabular data, including various data types. Able to utilize the numpy library for basic numerical operations and matplotlib for the visualization of computational results. Able to process images extracted from DICOM files, including generating histograms and performing Hounsfield unit (HU) conversions.	[SU5] implementation of a problem task [SU8] observation of student's independent or team work
	[FIZMEDL3_U04] He can independently search for information in Polish and English professional and popular science literature, databases, and on the Internet, as well as from other sources. He can integrate and interpret this information, draw conclusions, and formulate opinions.	Familiar with open repositories for data storage and sharing, as well as tools that enable project deployment and sharing, such as GitHub and Streamlit.	[SU2] presentation/project/paper/report [SU8] observation of student's independent or team work
	[FIZMEDL3_W05] Knows and understands the most important computational and programming techniques used to solve physical and medical problems, present results, and analyse data.	Understands the specific nature of the DICOM standard and the fundamental methods of medical image processing. Knows and distinguishes between various types of medical and physical data. Able to utilize the pydicom library to review, analyze, and extract data (metadata) from the DICOM standard. Able to select appropriate libraries to solve specific problems and issues, and capable of performing conversions between different data types.	[SW2] presentation/project/paper/report
Subject contents	Introduction to Python – overview of the Spyder environment. Different data types – numerical, textual, images. Basic chart types and data visualization methods (histograms, scatter plots, line plots, box plots, 3D plots). DICOM as an international medical data standard – purpose of introduction and how to use it. What are metadata and tags? GitHub and Streamlit – practical guidelines for deploying and sharing online projects. The pandas library – how to organize data.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project 2	51.0%	50.0%
	Project 1	51.0%	50.0%
Recommended reading	Basic literature	Springer- Digital Imaging And Communications In Medicine (Dicom) A Practical Introduction And Survival Guide (Pianykh, 2008) + Materials are shared on an ongoing basis by the teacher.	

	Supplementary literature	+ Materials are shared on an ongoing basis by the teacher.
	eResources addresses	
Example issues/ example questions/ tasks being completed	How to open and read DICOM files? How to extract patient data and CT scan parameters from them? How to share your project via GitHub?	
Work placement	Not applicable	

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