DSC6028: MEDICAL IMAGE ANALYSIS

Effective Term
Semester A 2026/27

Part I Course Overview

Course Title
Medical Image Analysis

Subject Code
DSC - Data Science
Course Number
6028

Academic Unit
Data Science (DS)

College/School
College of Computing (CC)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Students should hold a Bachelor's degree in related disciplines such as Biomedical Engineering, Electrical Engineering, Computer Science, etc. Students should generally appreciate the deep content, diverse methods, and tremendous applications of medical imaging.

Precursors
Nil

Equivalent Courses
SDSC6028 Medical Image Analysis

Exclusive Courses
Nil

Part II Course Details

Abstract

Artificial intelligence (AI) and machine learning (ML), especially deep learning, have generated tremendous impacts throughout our society, including the tomographic medical imaging field. In contrast to computer vision and image analysis, which have been major application examples of deep learning and deal with existing images, tomographic medical imaging mainly produces cross-sectional or volumetric images of internal structures from sensor measurements. Recently, deep learning has started being actively developed worldwide for medical imaging, including both tomographic reconstruction and image analysis. While medical imaging is a well-established field, in which extensive teaching experience has been accumulated over the past few decades, updating the medical imaging course to reflect AI/ML influence is a new challenge given the rapidly changing landscape of AI-based medical imaging, particularly deep tomographic imaging.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Accurately interpret and analyze medical images from various modalities (e.g., MRI, CT, X-ray), enabling them to identify abnormalities and support clinical decision-making.	25	x	x	
2	Acquire skills in image processing techniques, including filtering, segmentation, and enhancement, allowing them to manipulate and improve the quality of medical images for better analysis.	50		x	x
3	Develop the ability to analyze complex datasets generated from medical imaging and effectively visualize the results, facilitating clearer communication of findings in clinical and research settings.	25		x	x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Explain key concepts and algorithms of medical imaging reconstruction and processing	1, 2, 3	39 hours in total
2	Tutorials	Solidify students' understanding with key concepts and algorithms	1, 2	included in the lecture hours

3	Presentation	Evaluate students' understanding and independent research ability	2, 3	included in the lecture hours

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Continuous Assessment	1	30	Attending classes is not only a good sign of learning altitude but also can facilitate the knowledge transfer. I will prepare the registration form to record the attendance. Students will be expected to attend every class including the guest lectures and particularly in the days you will present your term projects. During lectures, you are expected to be actively involved. Please feel free to interrupt and ask questions. Please don’ t hesitate to share your opinions and perspectives. When I am a student, I tell myself to ask a question in each lecture I am attending. This is a way I deem very effective to encourage my thinking.	Yes

2	Team project	2, 3	40	(1) Select a paper and make critiques and room to improvement (2) Implement your trick of improvement, either empirical or theoretical (3) Present in the class	Yes

Continuous Assessment (%)

70

Examination (%)

30

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

Medical image analysis is a highly empirical discipline, with an emphasis on strong understanding and coding ability. I will oversee students' progress when the term project is announced to make sure the quality of students' deliverables. I also set up the examination on the basic concepts.

Assessment Rubrics (AR)

Assessment Task

Continuous Assessment (for students admitted in Semester A 2026/27 & thereafter)

Criterion

Develop a rubric that assesses various aspects of participation, such as: (1) Frequency of Contributions: How often the student speaks up. (2) Relevance of Comments: How pertinent the contributions are to the discussion topic. (3) Quality of Insights: Depth of understanding and critical thinking demonstrated in their comments. (4) Engagement with Peers: How well they respond to and engage with classmates' ideas.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task
Team project (for students admitted in Semester A 2026/27 & thereafter)

Criterion
The specific criteria include but not limited to (1) Content Knowledge: Depth of understanding and accuracy of information presented. (2) Organization: Clear structure with a logical flow of ideas. (3) Engagement: Ability to engage the audience and encourage interaction or questions.

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Examination (for students admitted in Semester A 2026/27 & thereafter)

Criterion
The grade of the exam

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
1 lecture

Introduction to Medical Imaging. Overview of different imaging modalities, their applications, advantages, and disadvantages. Image formation principles.

2 lectures

X-ray and Radiography, Physics of X-ray production, image formation, and application in various clinical settings. Principles of CT scanning, image reconstruction algorithms, and clinical applications.

1 lecture

Principles of MRI, magnetic field interactions, and clinical applications in different body regions.

1 lecture

Physics of sound waves, transducer principles, and clinical applications, including sonography.

1 lecture

Principles of radionuclide imaging, PET/CT, and SPECT, and clinical applications.

1 lecture

Multimodality imaging

2 lectures

Introduction to digital image processing techniques, including contrast enhancement, filtering, and edge detection.

2 lectures

Large models in medicine. Deployment issues

2 lectures

Term project presentation

Reading List

Compulsory Readings

	Title
1	Machine Learning for Tomographic Imaging; Ge Wang, Yi Zhang, Xiaojing Ye and Xuanqin Mou
2	AI: A Modern Approach
3	Medical Image Analysis; Alejandro F. Frangi, Jerry L. Prince and Milan Sonka