SDSC8009: DATA MINING AND KNOWLEDGE DISCOVERY

Effective Term
Semester B 2025/26

Part I Course Overview

Course Title
Data Mining and Knowledge Discovery

Subject Code
SDSC - Data Science
Course Number
8009

Academic Unit
Data Science (DS)

College/School
College of Computing (CC)

Course Duration
One Semester

Credit Units
3

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Basic Machine Learning Knowledge Python Programming

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

Data mining focuses on algorithms and computational paradigms that allow computers to find patterns and regularities in dataset, perform predictions and generally improve the performance through interaction with data. It is currently regarded as the key element of a more general knowledge discovery process that deals with extracting useful knowledge from raw data. Students in this course will learn advanced algorithms for mining data with various forms.

The learning journey will start with the classical data mining methods for tabular and graph data and next move into vision based analytics with advanced algorithms. Students will be exposed to different model architectures and learning algorithms such as classical and deep learning ones. The journey will go further into the various real-world applications.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe essential data mining algorithms	15	x		
2	Explain basics of problem solving via data mining	15	x		
3	Implement data mining algorithms introduced in this course.	20	x		
4	Apply algorithms taught in this course into emerging real-world problems.	20	x	x	x
5	Demonstrate novel knowledge extracted from data of considered real problems through utilizing algorithms taught in this course	30	x	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	Lecture	- large class activity - questions and discussion	1, 2, 3, 4, 5	39 hours/sem

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Group Project Students will conduct a collaborative research project based on taught concepts.	1, 2, 3, 4, 5	40	-	No

2	Individual Assignment Students will utilize designed assignments to test their gained understanding of a sub-set of taught concepts and their implementation.	1, 2, 3, 4	30	-	No
3	Take-home Test An open book and notes examination aiming at assessing the understanding of the overall materials and some open questions for demonstrating the capability of the further exploration.	2, 3, 4, 5	30	-	No

Continuous Assessment (%)

100

Examination (%)

0

Assessment Rubrics (AR)

Assessment Task

Group Project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Application of class materials and teamwork

Excellent

A+, A, A-

Good

B+, B, B-

Fair

C+, C, C-

Marginal

D

Failure

F

Assessment Task

Individual Assignment (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Application of class materials

Excellent
A+, A, A-

Good
B+, B, B-

Fair
C+, C, C-

Marginal
D

Failure
F

Assessment Task
Take-home Test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Understanding of class materials

Excellent
A+, A, A-

Good
B+, B, B-

Fair
C+, C, C-

Marginal
D

Failure
F

Assessment Task
Group Project (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Application of class materials and teamwork

Excellent
A+, A, A-

Good
B+, B

Marginal
B-, C+, C

Failure
F

Assessment Task
Individual Assignment (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Application of class materials

Excellent
A+, A, A-

Good
B+, B

Marginal
B-, C+, C

Failure
F

Assessment Task
Take-home Test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Understanding of class materials

Excellent
A+, A, A-

Good
B+, B

Marginal
B-, C+, C

Failure
F

Part III Other Information

Keyword Syllabus
- Data Mining Essentials
- Dimensionality Reduction and Visualization
- Clustering and Classification
- Introduction to Neural Networks
- Network Embedding

- Deep Neural Networks
- Selected Data Mining Applications

Reading List

Compulsory Readings

	Title
1	Pang-Ning Tan, Michael Steinbach, and Vipin Kumar. Introduction to Data Mining (2nd Edition), Pearson, 2018.
2	Lecture notes
3	Journal articles and conference papers selected by the instructor

Additional Readings

	Title
1	Nil