

SDSC8003: MACHINE LEARNING

Effective Term

Semester A 2026/27

Part I Course Overview

Course Title

Machine Learning

Subject Code

SDSC - Data Science

Course Number

8003

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

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course focuses on machine learning models and their deployments. Topics include neural networks (principles, optimization, generalization) recent neural network models (convolutional, self-attention, transformers, generative adversarial networks) and system issues in machine learning (on-device machine learning federated learning).

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify and describe the fundamental principles, ideas and theories of machine learning and deep learning	20	x		
2	Compare and explain recent machine learning and deep learning models and algorithms	20	x	x	
3	Apply existing machine learning models and design new algorithms to practical datasets	30	x	x	x
4	Identify and discuss practices to deploy machine learning models to systems	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	Students will engage in formal lectures to gain knowledge about the principles, algorithms, and practices of recent machine learning and deep learning methods.	1, 2, 3, 4	39 hours in total
2	Group Projects	Students will participate in groups to design machine learning models for real-world datasets, present their research related to machine learning, and assess the presentation of peers.	1, 2, 3, 4	After classes; presentations in class in the last week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Programming Test: Open-book Python programming test to assess students' ability to apply and design machine learning methods on given real-world datasets	1, 2, 3	35	Group projects	Yes
2	Research Presentation: Group research to demonstrate the students' ability to formulate research questions and design preliminary solutions on topics related to machine learning models and systems	1, 2, 4	35	Group projects	Yes

Continuous Assessment (%)

70

Examination (%)

30

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

0

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

Examination: Questions are designed to see how well the students have learned the basic concepts, fundamental theory, and applications of learning algorithms.

Assessment Rubrics (AR)**Assessment Task**

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

Criterion

Ability to learn the basic concepts, apply methods and algorithms of machine learning.

Excellent

A+, A, A-

Good

B+, B, B-

Fair

C+, C, C-

Marginal

D

Failure

F

Assessment Task

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

Criterion

Ability to conduct and demonstrate research on machine learning models and systems.

Excellent

A+, A, A-

Good

B+, B, B-

Fair

C+, C, C-

Marginal

D

Failure

F

Assessment Task

Programming Test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to learn the basic concepts, apply methods and algorithms of machine learning.

Excellent

A+, A, A-

Good

B+, B

Marginal

B-, C+, C

Failure

F

Assessment Task

Research Presentation (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to conduct and demonstrate research on machine learning models and systems.

Excellent

A+, A, A-

Good

B+, B

Marginal

B-, C+, C

Failure

F

Part III Other Information

Keyword Syllabus

Neural networks, generalization, convolutional neural networks, self-attention, transformers, generative adversarial networks, on-device machine learning and federated learning.

Reading List

Compulsory Readings

Title	
1	Lecture slides

Additional Readings

Title	
1	I. Goodfellow, Y. Bengio, and A. Courville, Deep Learning, MIT Press, 2016.
2	The Elements of Statistical Learning, by Hastie, Tibshirani, Friedman, Springer 2001