SDSC4021: ADVANCED INTERNET OF THINGS

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Advanced Internet of Things

Subject Code
SDSC - School of Data Science
Course Number
4021

Academic Unit
School of Data Science (DS)

College/School
School of Data Science (DS)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
SDSC3018 Introduction to Internet of Things

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract
The Internet of Things, better known as IoT, represent a huge technological trend driving by the advancements of sensors, internet, information, data, and mobile usage. This course will coves some of the new challenges and issues to arise.

We will consider aspects of systems implementation and focus on both theoretical tools for the analysis of data as well as the vulnerabilities that arise because of the overall interconnectedness. We provide students with a comprehensive understanding of IoT by focussing on both the technical viewpoints as well as the systems implementation viewpoint and the societal impact. This course will introduce recent advances in IoT, particularly the integration of machine learning and IoT systems. Students will learn the principles, techniques, and tools to analyze, design, and implement machine learning enabled IoT systems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify and describe the technical challenges and opportunities of machine learning enabled IoT sensing and computing	20	x	x	
2	Explain principles and apply techniques of resource-efficient machine learning for IoT sensing and computing	40		x	x
3	Discuss practical issues to implement machine learning enabled IoT solutions	10	x	x	
4	Design and implement a machine learning enabled IoT system	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	Lectures	Students will engage in lecture activities to gain knowledge about the principles, techniques, and tools of machine learning enabled IoT sensing and computing.	2, 3	3 hours/week
2	Group Project	Students will work in groups to design and implement machine learning enabled IoTs prototype and present their findings. They will also evaluate works by other peers.	1, 2, 4	after class; presentation in class in the last week

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Mini-Test	1	15	Qualitative questions to assess how well the students have learned concepts and principles to augment IoT systems with machine learning
2	Group Project Topic: machine learning enabled IoT system	1, 2, 3, 4	35	Group assessment that enables students to design and prototype machine learning enhanced IoT solutions

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

Examination:
Qualitative and quantitative questions to see how far students have achieved their intended learning outcomes

Note:
To pass the course, apart from obtaining a minimum of 40% in the overall mark, a student must also obtain a minimum mark of 30% in both continuous assessment and examination components.

Assessment Rubrics (AR)

Assessment Task

Mini-Test

Criterion

Ability to classify and describe challenges and opportunities to integrate machine learning into IoT sensing and computing.

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
Group Project

Criterion
Ability to apply principles and techniques of resource-efficient machine learning in designing and prototyping intelligent IoT systems.

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
Presentation

Criterion
Ability to analyse and optimize machine learning algorithms and IoT systems for sensing and computing.

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
Exam

Criterion
Subject matter understanding

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

- Internet of Things
- Data driven and innovative thinking
- System analysis and understanding
- IoT architecture
- Business case for IoT
- Societal impact of IoT
- Interconnectedness and society
- IoT applications in Smart City
- Resource-efficient machine learning
- Distributed machine learning
- Machine learning in IoT sensing
- Machine learning in IoT computing
- IoT system development

Reading List

Compulsory Readings

	Title
1	Lecture notes

Additional Readings

	Title
1	Nil