SDSC4009: DATA INTELLIGENCE IN ACTION

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Data Intelligence in Action

Subject Code
SDSC - Data Science
Course Number
4009

Academic Unit
Data Science (DS)

College/School
College of Computing (CC)

Course Duration
One Semester

Credit Units
3

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

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
SDSC2001 Python for Data Science

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract
This is an advanced project-based course on the interplay of data science and artificial intelligence. This course aims to equip students with latest methodologies and provide an opportunity for students to implement state-of-the-art

methodologies to solve real-world problems. Students will be taught latest advanced methodologies and applications in data-driven artificial intelligence, including knowledge representation, reasoning/learning/planning (with certainty and uncertainty), pattern recognition, etc. Datasets from real-world problems will be provided as the practice platform, including healthcare, marketing, finance engineering, transportation, social science, etc. The students are required to carry out a project that solves the problems through implementing the advanced models and algorithms learned from this course. The student project should generate data-driven insights for practice.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the basic concepts and typical application models at the interface of data science and artificial intelligence.	10	x		
2	Describe the ideas and innovations of recent advances in AI.	10	x		
3	Understand the various typical algorithms and their distinctive features for the appropriate domains in applications.	20	x	x	
4	Formulate the AI-related problems and execute the classics algorithms for the given datasets.	20	x	x	
5	Deliver a course project by formulating and solving one specific application in practice with moderate scale with the implementation of models.	40	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	Learning through teaching is primarily based on lectures.	1, 2, 3	39 hours/semester
2	Laboratory Work	Tutorials and project consultations	2, 3, 4	In or after class

3	Course Project	The team-based projects provide students with the opportunities to familiarize and apply the tools learnt during the lectures through practical problem solving.	2, 3, 4, 5	After class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Hand-in assignments	2, 3, 4, 5	30	The assignments enable students to demonstrate their skills and understanding of recent advances in AI.
2	Course Project	1, 2, 3, 4, 5	70	The course project provides students the chance to demonstrate their achievements on practical use of state-of-the-art models for practical problems.

Continuous Assessment (%)

100

Examination (%)

0

Additional Information for ATs

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

Hand-in assignments

Criterion

Assess students' understanding of the basic materials in lectures.

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

Course Project

Criterion

The project is to evaluate the overall performance and the attitude of the students in understanding, utilizing, applying the methodologies, principles and skills. The teamwork and collaboration is also accessed.

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

Introduction of Real-life Intelligences Powered by Data
Data-driven Modelling:
Data-driven modelling problem formulation; system inputs and outputs; field data processing and selection; machine learning algorithms for systems modelling; modelling performance evaluation.
Agent-based Modelling:
Agents and environments; agent system and multi-agent system; agent-based simulation; cellular automata;
Applications of Data-driven Models:
Data-driven model based optimization; data-driven scheduling and planning; data-driven control; data-driven model based condition monitoring; data-driven model based diagnosis and prognosis.
Introductory Computational Intelligence Subjects:
NP-hard problems; NP-Complete problems; Branch and bound methods.
Real Applications: Data intelligence in healthcare; computer vision in automated sensing; natural language processing in speech recognition and text parsing.
Project Supervision: Topics selection; Data collection; Problem formulation; Project Progress Planning; Project Evaluation.

Reading List

Compulsory Readings

	Title
1	Lecture notes and papers

Additional Readings

	Title
1	Practical applications of computational intelligence techniquesJain, L. C; De Wilde, Philippe,Boston; London: Kluwer Academic Publishers, c2001
2	Artificial Intelligence with Python: A Comprehensive Guide to Building Intelligent Apps for Python Beginners and Developers, by Prateek Joshi, Packt Publishing 2017
3	Introduction to Artificial Intelligence, by Wolfgang Ertel. 2nd ed. Springer (2017);
4	Artificial intelligence: foundations of computational agentsPoole, David L. (David Lynton), 1958- author. Mackworth, Alan K. author.Second edition. Cambridge, United Kingdom: Cambridge University Press, 2017