

SDSC4009: DATA INTELLIGENCE IN ACTION

Effective Term

Semester A 2022/23

Part I Course Overview

Course Title

Data Intelligence in Action

Subject Code

SDSC - School of Data Science

Course Number

4009

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

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 DEC-A1 DEC-A2 DEC-A3 app.)			
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.

Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lecture	Learning through teaching is primarily based on lectures.	1, 2, 3	26 hours/semester
2	Take-home assignments	Learning through take-home assignments is primarily based on interactive problem solving and hand-on computer exercises allowing instant feedback.	2, 3, 4, 5	after class

3	Laboratory Work	Tutorials and project consultations	2, 3, 4	13 hours/semester
4	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

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 techniques Jain, 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 agents Poole, David L. (David Lynton), 1958- author. Mackworth, Alan K. author. Second edition. Cambridge, United Kingdom: Cambridge University Press, 2017