

DSC6019: EMBODIED AI AND APPLICATIONS

Effective Term

Semester A 2026/27

Part I Course Overview

Course Title

Embodied AI and Applications

Subject Code

DSC - Data Science

Course Number

6019

Academic Unit

Data Science (DS)

College/School

College of Computing (CC)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

SDSC5001 or DSC5001 Statistical Machine Learning I

Precursors

Nil

Equivalent Courses

SDSC6019 Embodied AI and Applications

Exclusive Courses

Nil

Additional Information

Intended Students:

- Upper-level undergraduates or graduate students in computer science, robotics, electrical engineering, or related fields.
- Professionals seeking to transition into Embodied AI or robotics research and development.

Part II Course Details

Abstract

This course explores the interdisciplinary field of Embodied AI, where intelligent agents interact with and learn from physical environments through perception, action, and adaptation. Students will dive into SOTA technologies in robotics, reinforcement learning, and multi-modal learning, with a focus on physical applications such as autonomous navigation, manipulation, and human-robot collaboration. The course integrates theoretical foundations with hands-on projects using simulation platforms and real robotic systems, while examining recent trends like foundation models for robotics, sim-to-real transfer, and humanoid robotic system. **By the end, students will design and implement an Embodied AI system addressing a real-world challenge.**

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the basic framework of current Embodied AI System	15	x		
2	Describe the key modules within Embodied AI System	20	x	x	
3	Apply software tools to the key module design	30	x	x	
4	Analysis the experiment results under different case studies	20		x	x
5	Develop and analysis the Embodied AI system, and evaluate the performance in Sim/Real environments.	15		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	Learning through teaching is primarily conducted via lectures. Lectures are designed to introduce key concepts, theories, and methodologies related to medical data analysis.	1, 2, 3, 4	30 hours/sem

2	Tutorial Sessions	Tutorial sessions provide students with additional exercises and hands-on practice to reinforce their learning.	1, 2, 3, 4, 5	9 hours/sem
---	-------------------	---	---------------	-------------

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Assignments Questions are designed to evaluate how well students can apply the analytical methods and computational tools learned in class to analyze Embodied AI problems.	1, 2, 3, 4, 5	30	-	Yes
2	Midterm Exam The examination will assess students' understanding of analytical methods, tools, and their applications in solving problems.	1, 2, 3, 4, 5	20	-	No
3	Project A final group project using real-world health/ healthcare data will evaluate students' ability to collaborate and apply appropriate analytical techniques to solve complex, real-world problems.	1, 2, 3, 4, 5	20	-	Yes

Continuous Assessment (%)

70

Examination (%)

30

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

Final Exam

The examination will cover the general understanding for the whole technical theory and methodology and evaluate the student's problem-solving ability for the embodiment AI tasks.

Assessment Rubrics (AR)

Assessment Task

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

Criterion

Ability to identify suitable models and techniques for specific tasks, apply analytical tools effectively, solve problems with suitable tools and modules.

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

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

Criterion

Demonstration of a strong grasp of key concepts, accurate implementation of analytical methods, logical interpretation of results, and appropriate conclusions based on the data provided.

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

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

Criterion

Capacity to showcase in-depth knowledge, work collaboratively, select and apply correct analytical methods, provide meaningful interpretations, derive well-reasoned conclusions, and effectively communicate findings in a comprehensive manner.

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

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

Criterion

Ability to solve conceptual and operational questions

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

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

Criterion

Ability to identify suitable models and techniques for specific tasks, apply analytical tools effectively, solve problems with suitable tools and modules.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task

Midterm Exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Demonstration of a strong grasp of key concepts, accurate implementation of analytical methods, logical interpretation of results, and appropriate conclusions based on the data provided.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task

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

Criterion

Capacity to showcase in-depth knowledge, work collaboratively, select and apply correct analytical methods, provide meaningful interpretations, derive well-reasoned conclusions, and effectively communicate findings in a comprehensive manner.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task

Final Exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to solve conceptual and operational questions.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Embodied AI, Robotics, Reinforcement Learning

Reading List

Compulsory Readings

Title	
1	- Reinforcement Learning: An Introduction by Sutton and Barto (2nd Edition).
2	- Robotics: Modelling, Planning, and Control by Siciliano et al.

Additional Readings

Title	
1	- Selected papers from conferences like ICRA, IROS, CoRL, and NeurIPS 2024/2025.