CSIT 291: COMPUTER VISION

1. Course Information

Subject
CSIT - Computer Science/ Information Technology

Course Number
291

School
Science, Technology, Engineering, Mathematics

Course Title
Computer Vision

2. Hours

Semester Hours
3

Lecture
3

Lab
0

Practicum
0

3. Catalog Description

For display in the online catalog
This course introduces the student to Computer Vision and how it is used in current Artificial Intelligence and other applications. The theoretical grounding of the basic concepts and techniques in the Computer Vision domain will be explored. Computer vision concepts covered include pixels, convolutional neural networks, and various vision related AI algorithms. This course will also explain how computers represent, analyze, and recognize images. Students will learn how to use the Intel OpenVino Toolkit to perform image classification and object detection. Open lab time required.

4. Requisites

Prerequisites
CSIT 192

5. Course Type

Course Fee Code
3

Course Type for Perkins Reporting
vocational (approved for Perkins funding)

6. Justification

Describe the need for this course
This is a required course for Computer Science, Associate in Applied Science with Artificial Intelligence Concentration. Students will master the concepts and applications of Computer Vision, study Computer Vision algorithms and various image detection and classification techniques. Students will use this knowledge and a pre-trained industry model to evaluate a Computer Vision application.

7. General Education

Will the college submit this course to the statewide General Education Coordinating Committee for approval as a course, which satisfies a general education requirement?

No

If the course does not satisfy a general education requirement, which of the following does it satisfy:

Program-specific requirement

8. Consistency with the Vision and Mission Statements, the Academic Master Plan, and the strategic initiatives of the College

Please describe how this course is consistent with Ocean County College's current Vision Statement, Mission Statement, Academic Master Plan, and the strategic initiatives of the College:

	Add item
1	Offer comprehensive educational programs that develop intentional learners of all ages and ensure the full assessment of student learning in these programs. (Mission Statement)
2	Foster educational innovation through effective teaching-learning strategies, designed to develop and nurture intentional learners who are informed and empowered. (Vision Statement)
3	Employ technology and learning outcomes assessment to ensure student success in an increasingly diverse and complex world. (Vision Statement)
4	Prepare students for entrance into the workforce and empower students through the mastery of intellectual and Practical Skills. (Academic Master Plan)
5	Challenge students to transfer information into knowledge and knowledge into action. (Academic Master Plan)

9. Related Courses at Other Institutions

Transferability of Course

If not transferable to any institution, explain:

This is a required course for Computer Science, Associate in Applied Science with Artificial Intelligence Concentration. There is no known course for the schools listed here where transfer credit will be given.

10. Course Learning Outcomes

Learning Outcomes

	Students who successfully complete this course will be able to:
CLO1	Explain what Computer Vision is and current applications of the technology.
CLO2	Describe the techniques and concepts used in Computer Vision such as pixels, matrices, image features, Support Vector machines and Convolutional Neural Networks.
CLO3	Demonstrate how Computers see and how an image is represented.
CLO4	Analyze topics of pre-processing images, K-Nearest Neighbor algorithm and train a CV application based on a simple machine learning implementation.
CLO5	Evaluate pre-trained industry models used in CV applications such as the OpenVINO toolkit and the Neural Compute Stick and use it to perform image classification and object detection.

11. Topical Outline

(include as many themes/skills as needed)

	Major Themes/ Skills	Assignments (Recommended but not limited to)	Assessments (Recommended but not limited to)	Course Learning Outcome(s)
TO1	Introduction to Computer Vision a) What is Computer Vision b) How Computers See c) Computer Vision Applications	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CLO1

TO2	Basics of Computer Vision a) Image Representation (pixels, matrices) b) CV Concepts: Thresholding, masking, region of interest c) Geometric transformation, resizing and cropping d) Convolutional Neural Networks	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CL01,CLO2,CLO3
TO3	Computer Vision Models and Algorithms a) Introduction to CV models b) Training and Evaluating CV models c) Modifying CV model to improve accuracy and efficiency	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CLO1,CLO2,CLO3, CLO5
TO4	Applying CV Models a) Preprocessing images b) Introduction to K-Nearest Neighbor algorithm c) Training a Simple Machine Learning CV algorithm d) Support Vector Machines in CV applications	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CLO3,CLO4
TO5	CV Industry Model Review a) OpenVINOTM Toolkit b) Neural Compute Stick 2 (NCS2) c) Using a Pre-trained model from OpenVINOTM d) Run an inference model using the Neural Compute Stick 2 e) Image classification f) Object detection	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CL01-CLO5

12. Methods of Instruction

In the structuring of this course, what major methods of instruction will be utilized?

o Class lecture
o Discussion
o Demonstrations
o Lab assignments
o Programs and online presentations

13. General Education Goals Addressed by this Course (this section is to fulfill state requirements)

Information

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Technological Competency

Yes

Related Course Learning Outcome

CLO1-CLO5

Related Outline Component

TO1-TO5

Assessment of General Education Goal (Recommended but not limited to)

Assessment of General Education Goal (Recommended but not limited to)

Presentations
Exams
Homework

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Information Literacy

Yes

Related Course Learning Outcome

CLO1,CLO3

Related Outline Component

TO1-TO3

Assessment of General Education Goal (Recommended but not limited to)

Assessment of General Education Goal (Recommended but not limited to)

Presentations
Exams
Homework

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Independent/Critical Thinking

Yes

Related Course Learning Outcome

CLO1-CLO5

Related Outline Component

TO1-TO5

Assessment of General Education Goal (Recommended but not limited to)

Assessment of General Education Goal (Recommended but not limited to)

Presentations
Exams
Homework

14. Needs

Instructional Materials (text etc.):

Appropriate textbooks and/or open educational resources will be selected. Contact the department for current adoptions. Class notes, presentations, software and online materials.

Technology Needs:

College Portal and/or College Distance Learning Platform and/or Textbook or Instructor Website.

Human Resource Needs (Presently Employed vs. New Faculty):

Presently employed.

Facility Needs:

Laboratory classrooms equipped with computer workstations, each configured to support AI applications. Podium computer similarly equipped plus the ability to present audio-video presentations to the class.

Library needs:
NA

15. Grade Determinants

The final grade in the course will be the cumulative grade based on the following letter grades or their numerical equivalents for the course assignments and examinations

A: Excellent

B+: Very Good

B: Good

C+: Above Average

C: Average

D: Below Average

F: Failure

I: Incomplete

R: Audit

For more detailed information on the Ocean County College grading system, please see Policy #5154.

16. Board Approval

History of Board approval dates
New course board approved: August 26, 2021