Introduction to Robot Vision
CAP 4453

Designation: Elective for BS-CS, BS-CpE
Catalog Description: CAP 4453 3 Credits
Course Name: Robot Vision
Course Description: Perspective and orthographic projections; the processing of edges, regions, motion, shading, texture, object detection, recognition, and machine learning. Fall, Spring.
Pre-requisite: COP 3530 and MAC 2312.
Textbook(s) and/or other required material(s):
• All materials are provided electronically. No Textbook.
Reference(s):
• None
Course learning outcomes/expected performance criteria:
The course goals are to enable students to:

• Be knowledgeably familiar with algorithms in vision for edge detection, object detection using AdaBoost, face recognition, motion computation (Critical)
• Be introduced to concepts in Machine Learning for computer vision. (Relevant)
• Write programs for computer vision (Critical)
• Integrate large portions of code and run effectively. (Critical)
• Orally present explanations for a current vision research paper. (Critical)
• Use existing vision libraries to demonstrate vision capabilities. (Critical)
• Be familiar with a broad set of current vision research topics. (Relevant)
• Become familiar with the process of reading a current vision research paper. (Critical)
• Be familiar with the process of understanding a current vision research paper. (Important)
• Gain experience writing an explanatory version of a current vision research paper. (Important)

Topics:
• Edge detectors (Roberts, Sobel, Canny)
• Face detection using AdaBoost
• Eigenfaces for recognition
• Optical flow motion and structure from motion
• Support Vector Machines
• SIFT and SURF features
• Variety of current research topics
Class Schedule:
Number of sessions per week: 2
Duration of each session: 1 hr 15 min

Laboratory Schedule:
Number of sessions per week: N/A

Contribution of course to meeting requirements of Criterion 5 Curriculum (credit hours):
Math & Science Topics: 0  *Computing Topics (A): 3  General Education: 0
*Computing Topics – Mark with (F) or (A) for Fundamental or Advanced

Student Outcomes in Criterion 3 addressed by the course:
Check if the course is used in assessment of the program’s student outcomes (✓)

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<thead>
<tr>
<th>Outcome</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Apply knowledge of computing and mathematics appropriate to the discipline; specifically to include the application of mathematics, science and engineering to solve and reason about computational problems.</td>
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<td>2</td>
<td>Analyze a problem, and identify and define the computing requirements appropriate to its solution.</td>
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<td>6</td>
<td>Communicate effectively with a range of audiences; in particular, graduating majors shall demonstrate effective oral and written communication skills while disseminating technical information about computing technology and its applications.</td>
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<td>8</td>
<td>Recognize the need for continuing professional development and shall demonstrate the knowledge of research tools and professional resources necessary to accomplish this end.</td>
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<td>9</td>
<td>Use current techniques, skills, and tools necessary for computing practices.</td>
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