



**CAI 4841**

## **Introduction to Computer Vision**

**Section: RVC**

**Internet/Fully Online**

**Spring Term 2026**

**Course Time Zone: Eastern Time (ET). Course due dates and times are according to this time zone.**

### **Professor Information**

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**Dr. Lauren Ervin**

**Roles: Primary Instructor**

**Email: [laervin@fiu.edu](mailto:laervin@fiu.edu)**

**Phone: (305) 348-2683**

**Office Hours: By appointment. Due to the nature of the online course, the professor will be fastest to respond over email. One-on-one Zoom meetings may also be scheduled as needed.**

**Office Location: via Zoom**

**Department or Academic Unit: Electrical and Computer Engineering Department**

## Course Prerequisites

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Course prerequisites, if any, are listed below.

## Course Description

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We are now surrounded by cameras, for example cameras on robots, autonomous systems, computers & tablets/cameras built into our mobile phones/cameras in games consoles; cameras imaging difficult modalities (such as ultrasound, X-ray, MRI) in hospitals, and surveillance cameras. This course is concerned with helping the next generation of computer developers to make use of all these images in order to develop systems which are more intuitive and interact with us in more intelligent ways. Computer Vision is a rapidly expanding area and it is becoming progressively easier for developers to make use of this field due to the ready availability of high quality libraries (such as OpenCV 2). This course is intended to facilitate the practical use of computer vision with the goal being to bridge the gap between the theory and the practical implementation of computer vision. The course will explain how to use the relevant OpenCV library routines and will be accompanied by a full working program including the code snippets from the text.

## Textbook and Course Materials

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**A Practical Introduction to Computer Vision with OpenCV**

**Required/Recommended: Required**

**Authors: Kenneth Dawson-Howe**

**Publisher: Wiley**

**Publication Date: 2014**

**Copyright Date: 2014**

**ISBN 10: 9781118848456**

**ISBN 13: 9781118848456**

**Chapters/Pages: All**

**Introduction to Autonomous Mobile Robot**

**Required/Recommended: Recommended**

**Authors: Siegwart, Roland**

**Publisher: MIT Press**

**Publication Date: 2011**

**Copyright Date: 2011**

**ISBN 10: 9780262295093**

**ISBN 13: 9780262295093**

**Chapters/Pages: All**

**Hands-On ROS for Robotics Programming: Program Highly Autonomous and AI-capable Mobile Robots Powered by ROS**

**Required/Recommended: Recommended**

**Authors: Japón, Bernardo Ronquillo**

**Publisher: Packt Publishing**

**Publication Date: 2020**

**Copyright Date: 2020**

**ISBN 10: 9781838552886**

**ISBN 13: 9781838552886**

**Chapters/Pages: All**

**PRACTICAL INTRO.TO COMPUTER...W/OPENCV3**

**Required/Recommended: Required**

**Authors: DAWSON-HOWE**

**Publisher: WILEY**

**ISBN 13: 9781118848456**

Panther Book Pack

Get all required course materials for \$20.50 per undergrad credit hour through Panther Book Pack. You'll be charged automatically unless you opt out within 3 days after the add/drop deadline.

For more details, to compare costs, and to learn how to access your course materials, visit the [Panther Book Pack information page on FIU OneStop](#).

## **Student Learning Outcomes/Objectives**

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- Level I – Remembering (Knowledge): Define key CV concepts, and recall image-processing techniques**
  
- Level II – Understanding: Explain image transformation effects, and describe feature extraction methods**
  
- Level III – Applying: Implement Canny edge detection, and apply CNN for image classification**
  
- Level IV – Analyzing: Compare different segmentation techniques, and evaluate tracking algorithms**
  
- Level V – Evaluating: Assess deep learning models, and critique ethical issues in CV**
  
- Level VI – Creating: Design a custom object detection pipeline, and develop a real-world CV application**

## **Expectations of this Course**

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This is an online course, which means most (if not all) of the course work will be conducted online. Expectations for performance in an online course are the same as a traditional course. In fact, online courses require a degree of self-motivation, self-discipline, and technology skills which can make these courses more demanding for some students.

**Students are expected to:**

- **review the getting started page located in the course modules;**
- **introduce yourself to the class during the first week by posting a self-introduction in the appropriate discussion;**
- **take the practice quiz to ensure that your computer is compatible with the learning management system, Canvas;**
- **interact online with instructor and peers;**
- **review and follow the course calendar and weekly outlines;**
- **log in to the course 3 times per week;**
- **respond to discussions by the due date specified. No late work will be accepted;**
- **respond to emails within 2 days;**
- **submit assignments by the corresponding deadline.**

**The instructor will:**

- **log in to the course 3 times week;**
- **respond to emails within 3 days;**

- **grade assignments and/or provide feedback within 10 days of the assignment deadline.**

## **Assignments & Assessments**

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### **Assignments**

- **There will be six individual assignments throughout the course, each will be worth 10%.**
- **Specific assignment requirements will be posted for each assignment.**
- **No late submissions will be accepted.**
- **Assignment 1 is due by the end of week 3 on Sunday, January 25th by 11:59pm.**
- **Assignment 2 is due by the end of week 5 on Sunday, February 8th by 11:59pm.**
- **Assignment 3 is due by the end of week 7 on Sunday, February 22nd by 11:59pm.**
- **Assignment 4 is due by the end of week 10 on Sunday, March 15th by 11:59pm.**
- **Assignment 5 is due by the end of week 12 on Sunday, March 29th by 11:59pm.**
- **Assignment 6 is due by the end of week 14 on Sunday, April 12th by 11:59pm.**

## Quizzes

In order to mitigate any issues with your computer and online assessments, it is very important that you take the Practice Quiz from each computer you will be using to take your graded quizzes and exams. Assessments in this course are not compatible with mobile devices and should not be taken through a mobile phone or a tablet.

- There will be two individual quizzes throughout the course, each will be worth 20%.
- Specific requirements will be posted for each quiz.
- No late submissions will be accepted.
- Quiz 1 will become available on Thursday, March 5th at 8am and will be due by Friday, March 6th at 12pm.
- Quiz 2 will become available on Thursday, April 9th at 8am and will be due by Friday, April 10th at 12pm.

## Grading

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**Course Grades Distribution Table**

<b>Course Requirements</b>	<b>Number of Items</b>	<b>Points for Each</b>	<b>Total Points Available</b>	<b>Weight</b>
Assignments	6	10	60	60%
Quiz 1	1	20	20	20%
Quiz 2	1	20	20	20%
<b>Total</b>	<b>8</b>	<b>—</b>	<b>100</b>	<b>100%</b>

**Letter Grade Distribution Table**

<b>Letter Grade</b>	<b>Sample Range %</b>
<b>A</b>	<b>95 to 100</b>
<b>A-</b>	<b>90 to 94.99</b>
<b>B+</b>	<b>86 to 89.99</b>
<b>B</b>	<b>83 to 85.99</b>
<b>B-</b>	<b>80 to 82.99</b>
<b>C+</b>	<b>75 to 79.99</b>
<b>C</b>	<b>70 to 74.99</b>
<b>D</b>	<b>60 to 69.99</b>
<b>F</b>	<b>0 to 59.99</b>

## Schedule of Topics

<b>Week &amp; Topics</b>	<b>Contents</b>	<b>Assignment</b>	<b>Assessment</b>
<b>Week 1: Introduction to Computer Vision</b>	<ul style="list-style-type: none"> <li>• Overview of Computer Vision</li> <li>• Applications (Autonomous vehicles, medical imaging, biometrics, etc.)</li> <li>• Image formation &amp; perception</li> </ul>		
<b>Week 2-3: Image Processing Fundamentals</b>	<ul style="list-style-type: none"> <li>• Digital image representation (grayscale, RGB, HSV, etc.)</li> <li>• Image transformations (resizing, rotation, cropping)</li> </ul>	<b>Assignment 1</b>	

	<ul style="list-style-type: none"> <li>• Filtering (smoothing, sharpening, edge detection)</li> </ul>		
<b>Week 4-5: Feature Detection and Extraction</b>	<ul style="list-style-type: none"> <li>• Edge detection (Sobel, Canny)</li> <li>• Corner detection (Harris, FAST)</li> <li>• Blob detection (LoG, DoG)</li> <li>• Feature descriptors (SIFT, SURF, ORB)</li> </ul>	<b>Assignment 2</b>	
<b>Week 6-7: Image Segmentation &amp; Morphological Operations</b>	<ul style="list-style-type: none"> <li>• Thresholding (Global, Adaptive)</li> <li>• Contours and Connected Components</li> <li>• Region-based segmentation <ul style="list-style-type: none"> <li>◦ Morphological transformations</li> </ul> </li> </ul>	<b>Assignment 3</b>	
<b>Week 8 (Spring Break)</b>	<b>No Class</b>		
<b>Week 9-10: Motion and Object Tracking</b>	<ul style="list-style-type: none"> <li>• Optical Flow (Lucas-Kanade, Farneback)</li> <li>• Background subtraction methods</li> <li>• Tracking algorithms (Mean Shift, Kalman Filters,</li> </ul>	<b>Assignment 4</b>	<b>Quiz 1</b>

	<b>DeepSORT)</b>		
<b>Week 11-12: Machine Learning for Computer Vision</b>	<ul style="list-style-type: none"> <li>• <b>CNN Architectures (LeNet, AlexNet, VGG, ResNet)</b></li> <li>• <b>Transfer Learning &amp; Pretrained Models</b></li> <li>• <b>Object Detection (YOLO, Faster R-CNN)</b></li> <li>• <b>Semantic and Instance Segmentation (U-Net, Mask R-CNN)</b></li> </ul>	<b>Assignment 5</b>	
<b>Week 12-14: Deep Learning for Vision Tasks</b>	<ul style="list-style-type: none"> <li>• <b>Depth estimation &amp; stereo vision</b></li> <li>• <b>Structure from Motion (SfM)</b></li> <li>• <b>SLAM (Simultaneous Localization and Mapping)</b></li> <li>• <b>AI Ethics in Computer Vision</b></li> </ul>	<b>Assignment 6</b>	<b>Quiz 2</b>

## Canvas Schedule

Due Date	Assignment Name	Assignment Type	Points
	<a href="#">Introduce Yourself</a>	Discussion	0

Due Date	Assignment Name	Assignment Type	Points
	<a href="#">Open Forum</a>	Discussion	0
1/25/26	<a href="#">Assignment 1</a>	Assignment	10
2/8/26	<a href="#">Assignment 2</a>	Assignment	10
2/22/26	<a href="#">Assignment 3</a>	Assignment	10

## Course Communication

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Communication in this course will take place via **the Canvas Inbox**. Check out the [Canvas Conversations Tutorial](#) or [Canvas Guide](#) to learn how to communicate with your instructor and peers using Announcements, Discussions, and the Inbox.

I will respond to all correspondence within **2 days**.

## Policies & Resources

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### University's Code of Academic Integrity

**Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook. More**

information can be found at [http://academic.fiu.edu/academic\\_misconduct.html](http://academic.fiu.edu/academic_misconduct.html)

**University policies on sexual harassment, and religious holidays, and information on services for students with disabilities:**

- Please visit the following websites: <http://academic.fiu.edu/>, and <http://drc.fiu.edu>

**Course Policies:**

- **Academic Misconduct:** For work submitted, it is expected that each student will submit their original work. Any evidence of duplication, cheating, or plagiarism will result in at least a failing grade for the course.
- **Unexcused Absences:** Two unexcused absences are permitted during the term, but you need to send an email before the class to the instructor. More than two will result in the loss of points from your final grade. (1 point per absence above two, 3 points per absence above 5).
- **Excused Absences:** Only emergency medical situations or extenuating circumstances are excused with proper documentation. After reviewing documentation, you are required to email a description of the excuse and absence dates as a written record to [kaleemf@fiu.edu](mailto:kaleemf@fiu.edu) or the instructor.
- **On-Time:** As in the workplace, on-time arrival and preparation are required. Two “lates” are equivalent to one absence. (Leaving class early is counted the same as tardy.)
- **Deadlines:** Assignments are due at the beginning of the class period on the date specified. Assignments submitted late (within 1 week) will receive half credit.
- To get assistance try to see the instructor by an appointment.

- **Students are encouraged to ask questions and to discuss course topics with the instructor and with each other.**
- **Any work submitted should display Panther ID number and should be signed, as the students' work, and that no unauthorized help was obtained.**
- **DO NOT send assignments by email.**
- **The instructor reserves the right to change course materials or dates as necessary.**

### **Regulations Concerning an Incomplete Grade**

**An IN grade may be given: (1) at the discretion of the instructor for work not completed during the semester and not caused by the student's own negligence, or (2) in matters of alleged academic misconduct per Regulation 2501 Student Conduct and Honor Code.**

- **Student must contact (e.g., phone, email, etc.) the instructor to discuss the possibility of an Incomplete.**
- **An IN grade may only be awarded to a student when a small portion of the student's work is missing, not to exceed 50% of the course work, and only when the student is otherwise earning a passing grade.**
- **The instructor determines the timeline to complete the class, but it cannot exceed two consecutive terms (including summer term) after the initial course or it will automatically default to an F grade.**
- **Student must make up the incomplete work through the instructor of the course.**

## **Nondiscrimination Statement**

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The **Office of Civil Rights Compliance and Accessibility** (CRCA) is responsible for ensuring that FIU maintains a workplace and learning environment free from discrimination, where current and prospective faculty, staff, and students are treated equitably. If any student, employee, or applicant has a sincere and reasonable belief that they have been discriminated against or harassed based on age, color, disability, marital status, ethnic or national origin, race, religion, retaliation, sex, or any other protected category, they can report their concerns to the CRCA team through [report.fiu.edu](https://report.fiu.edu).