

# Computer Science 630

## Image Analysis

### Syllabus

---

<b>Catalog listing:</b>	CMSC 630
<b>Course Level:</b>	Graduate
<b>Prerequisites:</b>	-
<b>Instructor:</b>	Dr. Bartosz Krawczyk
<b>Office:</b>	virtual / Zoom
<b>Phone:</b>	(804) 828-7365
<b>email:</b>	bkrawczyk@vcu.edu
<b>Classroom:</b>	virtual / Zoom
<b>Class website:</b>	Blackboard
<b>Office Hours:</b>	T/R 3:15pm – 4:15pm (or by appointment)

---

#### 1.0 – Overview (Catalog Course Description):

Semester course; 3 lecture hours. 3 credits. Basics of image structure, operations and formats. Advanced operation on images. Image segmentation and feature extraction. Learning from images and intelligent image analysis. Students will work on three project assignments, as well as deliver a seminar presentation on a selected topic from image analysis area.

#### 2.0 – Course Structure:

Lecture hours/week – 3

#### 3.0 – Course Goals

This graduate course provides a thorough introduction into the topic of image analysis. The students will be expected to have programming and reasoning abilities, as well as background on data structures and algorithms.

Upon successful completion of this course, the student will be able to:

1. Understand image formats and structures.

2. Understand basic and advanced operation on images that may lead to an automatic improvement of image quality.
3. Understand the role of image segmentation and region-of-interest localization.
4. Understand feature extraction and embedding into vector and tensor representations.
5. Understand machine learning algorithms for intelligent image analysis, target detection and image understanding.

#### **4.0 – ABET Criteria Addressed:**

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.

#### **5.0 – Major Topics Covered:**

- Basics of image processing
- Advanced operations on images
- Image segmentation
- Feature extraction
- Machine learning for image analysis

#### **6.0 – Textbook:**

None required.

Suggested:

Maria Petrou & Costas Petrou: Image Processing: The Fundamentals. Wiley; 2 edition (May 17, 2010). ISBN-10: 047074586X. ISBN-13: 978-0470745861

#### **7.0 – Class Schedule:**

T/R online via Zoom 2:00-3:15 pm

## **8.0 – Evaluation:**

Grading system:

90pts or more	A
75pts up to 89pts	B
60pts up to 74pts	C
50pts up to 59pts	D
0pts up to 49pts	F

Percentage graded item:

Project 30pts

Midterm I 25pts

Midterm II 25pts

Seminar 20pts

General rules and instructions:

- Completing project, seminar, midterm I and midterm II for at least D is mandatory to pass this course
- Project deadlines cannot be exceeded. I do not accept late work.
- Attendance is strongly encouraged.
- Extra credit (>100pts) possible: up to 10pts extra for projects beyond the scope.
- Students are more than welcome to ask questions during class, as long as it does not obstruct the lecture content presentation
- All slides will be posted on Blackboard before the class
- Lecture recording will be posted on Blackboard after the class
- Cheating during quizzes and exams, as well as plagiarism will be strongly prosecuted according to VCU Honours rules.
- Lecture slides are an aid to students, not a complete source of information required for this course
- Only e-mails written in a professional manner will be answered - proper salutation, e-mail topic description, and signature requested

## **9.0 Technical requirements:**

For this class, you are required to have a personal computer (stationary or laptop) capable of running your selected programming environment, internet access, web camera with speaker and microphone.

## Technology Support

### Engineering & VCU Resources:

- **Personal Computer Requirement:** For our current system requirements and recommendations, see: <https://egr.vcu.edu/admissions/accepted/computer-recommendations/>
- **Remote Access to Public Lab computers:** To provide remote access, we use the Citrix App2Go environment to provide full and exclusive control over "the next available" computer in the lab. See this link for more details: <https://wiki.vcu.edu/x/Oa0tBg>
- **VCU provides a lot of software available for students to download to their personal computers.** For a list of software and the specifics for each, see: <https://ts.vcu.edu/software-center/>. In particular, [Microsoft Office](#) is available free to students.
- **VCU is transitioning to Canvas.** See the Canvas Student Guide at this link: <https://community.canvaslms.com/t5/Student-Guide/tkb-p/student>
- **For IT help in the College of Engineering,** see our Wikipedia for "student" help at: <https://wiki.vcu.edu/display/EGRITHELP>
- **VCU's Technology Services (TS) provides support for "central IT" services.** If you have a technical issue with any of the following services, please submit a ticket with VCU Technology Services at <https://itsupport.vcu.edu/> or call (804) 828-2227. VCU TS maintains and supports these services and will be able to provide assistance to you.
  - VCU Cisco VPN
  - 2Factor or Dual Authentication (DUO)
  - Blackboard/Canvas
  - Gmail or other Google Apps
  - Zoom videoconferencing
  - VCU App2Go (Application server)
  - Resetting VCU password
- **For IT issues related to College of Engineering teaching and research,** email [egrfixit@vcu.edu](mailto:egrfixit@vcu.edu)
- **For loaner Chromebooks for emergency purposes:** See this link for more details: <https://vcutsmpc.getconnect2.com/>

## Campus emergency information

What to know and do to be prepared for emergencies at VCU:

- Sign up to receive [VCU text messaging alerts](#). Keep your information up-to-date. Within the classroom, the professor will keep his or her phone on to receive any emergency transmissions.
- Know the safe evacuation route from each of your classrooms. Emergency evacuation routes are posted in on-campus classrooms.
- Listen for and follow instructions from VCU or other designated authorities. Within the classroom, follow your professor's instructions.

- Know where to go for [additional emergency information](#).
- Know the emergency phone number for the VCU Police (828-1234).
- Report suspicious activities and objects.
- Keep your permanent address and emergency contact information current in eServices.

### **Class registration required for attendance**

Students may attend only those classes for which they have registered. Faculty may not add students to class rosters or Blackboard. Therefore, if students are attending a class for which they have not registered, they must stop attending.

### **Honor System: upholding academic integrity**

The VCU Honor System policy describes the responsibilities of students, faculty and administration in upholding academic integrity, while at the same time respecting the rights of individuals to the due process offered by administrative hearings and appeals. According to this policy, "Members of the academic community are required to conduct themselves in accordance with the highest standards of academic honesty, ethics and integrity at all times." In addition, "To support a commitment to the Honor System, all members of the VCU community are required to:

- Adhere to the Honor System policy and its procedures;
- Report any suspicion or knowledge of possible violations of the Honor System;
- Answer truthfully when called upon to do so regarding Honor System matters;
- Maintain appropriate confidentiality regarding related to Honor System matters."

More information can be found at in the [VCU policy library](#).

### **Important dates**

You can view important dates for the semester in the [academic calendar](#).

### **Managing stress**

Students may experience situations or challenges that can interfere with learning and interpersonal functioning including stress, anxiety, depression, alcohol and/or other drug use, concern for a friend or family member, loss, sleep difficulties, feeling hopeless or relationship problems. There are numerous campus resources available to students including University Counseling Services (804-828-6200 MPC Campus, 804-828-3964 MCV Campus), University Student Health Services (MPC 804 828-8828, MCV Campus 804 828-9220) and the Wellness Resource Center (804-828-9355). 24 hour emergency mental health support is available by calling 828-1234

and asking to speak to the on-call therapist or utilizing the National Suicide Prevention Lifeline (1-800-784-2433).

### **Mandatory responsibility of faculty members to report incidents of sexual misconduct**

It is important for students to know that all faculty members are mandated reporters of any incidents of sexual misconduct/violence (e.g., sexual assault, sexual exploitation and partner or relationship violence). This means that faculty cannot keep information about sexual misconduct/violence confidential if you share that information with them and they must report this information immediately to the university's Title IX Coordinator. In addition, department chairs, deans, and other unit administrators are required to report incidents of sex or gender-based discrimination to the university's Title IX Coordinator. Once a report is made, you will receive important information on your reporting options, on campus and off campus resources and remedial measures such as no-contact directives, residence modifications, and academic modifications. If you would prefer to speak with someone confidentially for support and to discuss your options for reporting, contact:

VCU's Wellness Resource Center

804.828.9355 | [myoptions@vcu.edu](mailto:myoptions@vcu.edu) | [thewell.vcu.edu](http://thewell.vcu.edu)

Greater Richmond Regional Hotline (Community program)

804.612.6126 | 24-hour hotline

VCU's Counseling Services 804-828-6200

For more information on how to help, please [click here](#). The Policy on Sexual Misconduct/Violence and Sex/Gender Discrimination, can be found in the [VCU policy library](#). For more information about the University's Title IX process, please visit [equity.vcu.edu](http://equity.vcu.edu).

### **Military short-term training or deployment**

If military students receive orders for short-term training or for deployment/mobilization, they should inform and present their orders to Military Student Services and to their professor(s). For further information on policies and procedures contact Military Student Services at 828-5993 or access the corresponding policies.

### **Student conduct in the classroom**

According to the [Faculty Guide to Student Conduct in Instructional Settings](#), "The university is a community of learners. Students, as well as faculty, have a responsibility for creating and maintaining an environment that supports effective instruction. In order for faculty members (including graduate teaching assistants) to provide and students to receive effective instruction in classrooms, laboratories,

studios, online courses, and other learning areas, the university expects students to conduct themselves in an orderly and cooperative manner." Among other things, cell phones should be turned off while in the classroom. The Student Code of Conduct also prohibits the possession of or carrying of any weapon. For more information see <http://register.dls.virginia.gov/details.aspx?id=3436>.

### **Student email policy**

Email is considered an official method for communication at VCU because it delivers information in a convenient, timely, cost-effective, and environmentally aware manner. Students are expected to check their official VCU email on a frequent and consistent basis in order to remain informed of university-related communications. The university recommends checking email daily. Students are responsible for the consequences of not reading, in a timely fashion, university-related communications sent to their official VCU student email account. This policy ensures that all students have access to this important form of communication. It ensures students can be reached through a standardized channel by faculty and other staff of the university as needed. Mail sent to the VCU email address may include notification of university-related actions, including disciplinary action. Please read the policy in its entirety at the [VCU Policy Library](#).

### **Student financial responsibility**

Students assume the responsibility of full payment of tuition and fees generated from their registration and all charges for housing and dining services, and other applicable miscellaneous charges. Students are ultimately responsible for any unpaid balance on their account as a result of the University Financial Aid Office or their third party sponsor canceling or reducing their award(s).

### **Students representing the university – excused absences**

Students who represent the university (athletes and others) do not choose their schedules. Student athletes are required to attend games and/or meets. All student athletes should provide their schedules to their instructors at the beginning of the semester. The Intercollegiate Athletic Council strongly encourages faculty to treat missed classes or exams (because of a scheduling conflict) as excused absences and urges faculty to work with the students to make up the work or exam.

### **Students with disabilities**

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, as amended, require that VCU provide "academic adjustments" or "reasonable accommodations" to any student who has a physical or mental impairment that substantially limits a major life activity. To receive accommodations, students must register with the Office of Student Accessibility and Educational Opportunity on the Monroe Park Campus (828-2253) or the Division for Academic Success on the MCV campus (828-9782). Please also visit the [Student](#)

[Accessibility and Educational Opportunity website](#) and/or the [Division for Academic Success website](#) for additional information.

Once students have completed the registration process, they should schedule a meeting with their instructor (s) and provide their instructor (s) with an official accommodation letter. Accommodation letters will outline the required classroom accommodations. Additionally, if coursework requires the student to work in a lab environment, the student should advise the instructor or a department chairperson of any concerns that the student may have regarding safety issues related to a disability. Students should follow this procedure for all courses in the academic semester.

### **Withdrawal from classes**

Before withdrawing from classes, students should consult their instructor as well as other appropriate university offices. Withdrawing from classes may negatively impact a student's financial aid award and his or her semester charges. To discuss financial aid and the student bill, visit the [Student Services Center](#) at 1015 Floyd Avenue (Harris Hall) and/or contact your financial aid counselor regarding the impact on your financial aid.

### **Faculty communication about students**

VCU instructional faculty, administrators and staff maintain confidentiality of student records and disclose information in accordance with the Family Educational Rights and Privacy Act (FERPA). This means that VCU officials may disclose student record information without the consent of the student in certain situations. To support university operations, for example, VCU officials share information about students with other educational officials as necessary to perform their job duties. FERPA permits this disclosure to school officials who have a legitimate educational interest in the student information. In addition, VCU officials have obligations to report information shared by a student depending on the content of that information, for example, in compliance with VCU's policy on the duty to report ([policy.vcu.edu](#)). Unless FERPA permits a certain disclosure, VCU generally requires consent from a student to disclose information from their education record to another individual. You may find additional information on the VCU FERPA website: <http://rar.vcu.edu/records/family-educational-rights-and-privacy-act/>.

---