**Syllabus: CAP 5516 - Medical Image Computing (Spring 2022)**

**Lecture time:** 1:30 pm - 2:45 pm, every Tuesday and Thursday

**Location:** Online via Zoom

**Zoom Link (the same link for all the online lectures):**

Please download and import the following iCalendar (.ics) files to your calendar system. Weekly: https://ucf.zoom.us/meeting/tJApc-iuqD0vGdKBbJ7G2enBh2Mxt20zPxwz/ics?icsToken=98tyKuCsqi8rHNKTtRqBRowlBo-gd-7wpiFYjad2vh3PVAcBZw3UPrBvKqYtrQMLg

Join Zoom Meeting
https://ucf.zoom.us/j/94441666536?pwd=RzNEV1ZmTFR0UVpnTm1rbUVUQTRDZz09

**Meeting ID:** 944 4166 6536  
**Passcode:** 081084

**Instructor**  
Dr. Chen Chen  
E-mail: chen.chen@crcv.ucf.edu  
*(Please put [CAP 5516] in the subject line of your emails)*

**Website:** [https://www.crcv.ucf.edu/chenchen/](https://www.crcv.ucf.edu/chenchen/)

**Office:** HEC 221

**Office Hours (online)**

Please email me for an appointment. Online meeting will be scheduled.

**Course description**

Imaging science is experiencing tremendous growth in the US. Biomedical imaging and its analysis are fundamental to understanding, visualizing, and quantifying medical images in clinical applications. With the help of automated and quantitative image analysis techniques, disease diagnosis will be easier/faster and more accurate, and leading to significant development in medicine in general. This course provides students with the foundation necessary for understanding, visualizing, and quantifying medical images with computational methods. In this course, we will examine some central topics and key techniques in computer vision and medical image processing, in particular employing Deep Learning, through reading, writing reviews on, presenting, discussing the most recent papers published on computer vision and medical imaging conferences (e.g., CVPR, ICCV, ECCV, MICCAI) as well as working on course projects.

The goal of the course is to give students the background and skills for graduate research in medical image computing. Through the class, the students are expected to understand in-depth the state-of-the-art approaches to various topics. By the end of this course, the students will also develop the skills that are vital to their graduate research, such as writing paper reviews, presenting technical papers, analyzing the strengths and weaknesses of the research papers, and identifying open questions and directions for future research.

**Textbook**

This course does not follow any textbook closely. We will discuss some of the recent top-quality research papers in the course materials. Among many recommended readings are:
Recommended online courses and resources

- CS231n: Convolutional Neural Networks for Visual Recognition; [http://cs231n.stanford.edu](http://cs231n.stanford.edu)
- Theories of Deep Learning (STATS 385): [https://stats385.github.io](https://stats385.github.io)
- CAP5415 – Computer Vision: [https://www.crcv.ucf.edu/courses/cap5415-fall-2021/](https://www.crcv.ucf.edu/courses/cap5415-fall-2021/)

Prerequisites and preparation

Recommended preparation: basic probability, statistics, linear algebra, calculus, optimization.

Proficient in programming languages (e.g., Python).

General knowledge of deep learning frameworks: PyTorch, TensorFlow, Keras, etc.

Course Requirements

1) Reading research papers and writing reports

Students will review 10 research papers throughout the semester. For each assigned paper, students must write a short report (one-page) about the paper, summarizing the problem being solved and the proposed method, and discussing the strengths and weaknesses of the paper, possible future directions, connections to other research, etc.

2) Class participation

All students are expected to take part in class discussions, e.g., asking questions about the paper.

3) Presentation

Each student will present one paper during the semester.

4) Programming assignments (medical image analysis using deep learning methods)

Students will complete three programming assignments.

5) Research project

Students will complete an individual research project (must be deep learning related) on a topic relevant to the course. Students will propose a research topic early in the semester and work alone. A list of candidate topics will be provided. Students can also propose research topics by themselves and get approved by the instructor.

A deadline for the research proposal will be assigned. After a project topic is finalized, students will meet occasionally with the instructor to discuss progress. Project milestone report is due in the mid-semster, which will include a preliminary set of results and additional experiments to be carried out. Students will also
produce a conference-formatted write-up of their project (final project report – CVPR style) and have an oral presentation to showcase the project. The ideal project is something with a clear direction to be completed in a couple of months.

**Grading Policy**

**Reports (10 paper reviews):** 20%

**Paper Presentation:** 15%

**Attendance and Discussion:** 5%

**Programming Assignments (3):** 30%

**Final Project:** 30%

**Grading**

- 95-100 = A
- 90-94 = A-
- 85-89 = B+
- 80-84 = B
- 75-79 = B-
- 70-74 = C+
- 65-69 = C
- 60-64 = C-
- 55-59 = D+
- 50-54 = D
- 45-49 = D-
- 0-44 = F

**Late policy**

No late report/assignment is allowed.

**Important Dates**

See: [https://calendar.ucf.edu/2022/spring](https://calendar.ucf.edu/2022/spring)

**Academic Integrity**

Students should familiarize themselves with UCF’s Rules of Conduct at [https://scai.sdes.ucf.edu/student-rules-of-conduct/](https://scai.sdes.ucf.edu/student-rules-of-conduct/). According to Section 1, “Academic Misconduct,” students are prohibited from engaging in

1. Unauthorized assistance: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
2. Communication to another through written, visual, electronic, or oral means: The presentation of material which has not been studied or learned, but rather was obtained through someone else’s efforts and used as part of an examination, course assignment, or project.
3. Commercial Use of Academic Material: Selling of course material to another person, student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to class notes, Instructor’s PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
4. Falsifying or misrepresenting the student’s own academic work.
5. Plagiarism: Using or appropriating another’s work without any indication of the source, thereby attempting to convey the impression that such work is the student’s own.
6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violate academic behavior standards.
8. Soliciting assistance with academic coursework and/or degree requirements.

Responses to Academic Dishonesty, Plagiarism, or Cheating
Students should also familiarize themselves with the procedures for academic misconduct in UCF’s student handbook, The Golden Rule <https://goldenrule.sdes.ucf.edu/>. UCF faculty members have a responsibility for students’ education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an “F” letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a “Z” designation on one’s transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc. Let’s avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

General Statement Regarding COVID-19

I recognize and understand the difficult times we are all in. The COVID-19 pandemic impacts us all in many ways, including physically, mentally, emotionally, financially, academically, and professionally. I will work with you on challenges you may be encountering and to provide support to help you succeed. However, please keep in mind that I will hold you accountable, especially in terms of class attendance, participation, and contributions.