CDS 468 - Image Operators and Processing
Spring 2022 – Thursday – 4:30 to 7:10
Classroom – Innovation Hall - 203

Instructors: Mike Wolf, PhD; Adjunct Professor
Email: mwolf7@masonlive.gmu.edu (best way to reach me)
Office: Exploratory Hall 2205
Office Hours: By appointment

Course Materials (recommended reference text):
- Image Operators: Image Processing in Python 1st Edition. by Jason M. Kinser (Author) ISBN-13: 978-1498796187
- Various peer reviewed journal articles
- Various Python Tutorials

Course Description:
This is an introductory examination of image mathematics, computational protocols, and applications. Topics include image operator notation, channel operators, informational operators, intensity operators, geometric operators, image transformations, frequency filtering, and image basis set expansions. The course will build the students' computational skill set as applied to visual data and create a library of image analysis scripts. Having prior experience working with Python is required and a very good linear algebra background is essential to maximize your learning.

Course Objectives:
This is a senior-level course and so it is expected that one has advanced mathematical abilities along with programming skills. By attending class lectures, performing background topic research and independent study, students will be able to:
- Understand the fundamentals of image analysis techniques
- Develop the ability to effectively describe protocols developed from the techniques
- Apply the learning to create simple Python scripts that replicate these protocols
- Most importantly, learn how to learn from each other in a collaborative environment

Planned Schedule:

Date	Topic	Lecture Scope
1/27/2022	Introduction & Lexicon	Problems at the end of the Jupyter Notebook
2/3/2022	Python	Problems at the end of the Jupyter Notebook
2/10/2022	Digital Images & Color	Problems at the end of the Jupyter Notebook
2/17/2022	Geometric Transformations	Problems at the end of the Jupyter Notebook
2/24/2022	Image Morphing	Problems at the end of the Jupyter Notebook
3/3/2022	PCA	Problems at the end of the Jupyter Notebook
3/10/2022	Eigen Images	Problems at the end of the Jupyter Notebook
3/24/2022	Image Frequencies	Problems at the end of the Jupyter Notebook
3/31/2022	Frequency Filtering	Problems at the end of the Jupyter Notebook
4/7/2022	Correlations	Problems at the end of the Jupyter Notebook
4/14/2022	Edge Detection & Hough Transforms	Problems at the end of the Jupyter Notebook
4/21/2022	Noise	Problems at the end of the Jupyter Notebook
4/28/2022	Deep Learning & Review	Prepare for Final
5/5/2022	Class wrap-up	Take Final Exam

Grading Policy:

Homework Assignments **(50%):**
All homework is due at the beginning of class in a jupyter notebook. Homework that is turned in late is subject receiving a maximum grade no higher than the lowest mark received by assignments turned in on time.

Final Exam **(25%)**
The final exam will count for 25% of the student's grade. The final exam will be the last day of class.

Class Participation **(25%):**
Students are expected to attend the class periods of the courses for which they register. In-class participation is important not only to the individual student, but also to the class as a whole. Instructors may use absence, tardiness, or early departure as de facto evidence of non-participation.

Expectations for Participation:
- Students prepare for and actively engage in class discussion (e.g., demonstrate active listening, not distracted by electronics or peers)
- Students thoughtfully engage in in-class assignments and activities
- Students participate in class discussion by:
    - raising informed discussion points
    - connecting discussion to reading material, news, and relevant experiences
    - asking questions
    - listening to other perspectives
    - sharing the floor with others

GMU Email Accounts & Blackboard:
You must use and regularly check your GMU email account and Blackboard to receive information for this class. Please do not send emails from non-GMU accounts, they will be ignored. I will normally respond within 24 hours.

Honor Code:
You are expected to follow the George Mason University rules of student conduct as noted in the catalog.

Office of Disability Services:
If you require academic accommodations due to a permanent or temporary disability, please contact the Office of Disability Services (ODS) at (703)993-2474, http://ods.gmu.edu. ODS will then contact me to arrange appropriate accommodations.

Classroom Expectations and other Miscellaneous:
Students are expected to be on time for class.
1. Should circumstances arise that make you late, do not disrupt the class as you enter, take the first available seat and do not walk across the room.
2. In the event of any class cancellation, including the pandemic or inclement weather (e.g. snow), the class will resume where we left off, adjustments, if necessary, will be made later.
3. Please turn cell phone sounds off and do not text or talk during class.
4. Please be respectful of your peers and your instructor and do not engage in activities that are unrelated to the class. Such disruptions show a lack of professionalism and may affect your participation grade.
5. Lecture slides will be provided within 24 hours after the lecture. If you feel note taking is necessary, research has shown that pen and paper is the most effective.