



Syllabus for Image Analysis and Recognition **Fall 2017 CSCI569, Sections 01S, 41R, 71R, Location: BA244**

Meets 8/28/2017 through 12/15/2017, Day and Time: M 7:20PM- 10:00PM

Instructor: Dr. Nikolay Metodiev Sirakov
Office Hours: M 5PM-6:30PM
W 5PM-6PM
Th. 9:30AM-12 PM
Additional by appointment

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For web enhancement materials, please visit: <http://faculty.tamuc.edu/nsirakov/Teaching/>

Text: Digital Image Processing, 3rd Edition, by Rafael C. Gonzalez, Richard E. Woods, Prentice Hall, 2008, 0-13-168728-x, 978-0-13-168728-8

A book which provides IA algorithms and Matlab code: Digital Image Processing Using Matlab, by Rafael C. Gonzalez, Richard E. Woods, S. L. Eddins, Prentice Hall, 2004, ISBN 0-13-008519-7

Students Learning Outcomes:

- (1) Students will gain knowledge and skills and will be able to transform one color model to another;
- (2) Students will learn and will be able to utilize the basic multi-resolution methods: Scaling Functions, Wavelet transforms;
- (3) Students will learn and will be able to utilize the basic Mathematical Morphology operations for image analysis;
- (4) Students will learn, understand and will be able to apply set of image segmentation methods including: Points, Lines, Edge detection, and Active Contour Models;
- (5) Students will learn and will be able to utilize object recognition methods based on correlations and matching;
- (6) Students will conduct independent project development, which will help them develop skills for: survey, theoretical work, coding, performing experiments, writing and presenting reports.

Requirements: *instructor's permission*

Knowledge which may be of help: Integral and Differential Calculus of two variables;

For the project development the students may use any language including: C++, Java, C sharp, or Computer algebra programming systems as MatLab or Mathematica.

List of Topics

1. Defining the area of Image Analysis and Recognition;
2. Color Image Processing. Color Models. Transformation between models. Automatic coloring of gray level images and movies ;
3. Multi resolution images and processing. Multi resolution Expansion. Scaling and Wavelet functions. Discrete and continuous wavelet transformations.
4. Basics of Mathematical Morphology and its applications to image processing and analysis: erosion, dilation, opening, closing, hit and miss transformations;
5. Image segmentation fundamentals: Points, Lines, Edge detection, Thresholding and Region-based method, Active Contour Models;
6. Pattern Recognition: fundamentals; based on correlation; decision functions; rotational and scaling invariant methods.
7. CiraTefi methods -shape matching, Histograms of Oriented Gradients – for image description

Contemporary Active Contour models for objects & features extraction and introduction to Deep Learning for classification and recognition will be taught upon time permission.

Course Content & Calendar: *The 1st lecture will take place on August 28*

1st & 2nd weeks – topics 1. and 2.; 3rd to 5th weeks – topic 3 and independent study projects



assignment; 6th & 7th weeks – **topic 4.**; 8th to 10th week – **topic 5.** Guidelines on the projects development and writing reports; 11th & 12th weeks – **topic 6.**; 13th to 15th week – **topic 7.** Guidelines on how to prepare and deliver a presentation.

COURSE EVALUATION

Mid Term Exam	- 26%
HW	- 20%
Lab work, and in class problems	- 12 %
Project	- 22%
Final Exam (Project Presentation, and corrections)-	20%

Grading Policy:	A:	100%- 90%	
	B:	89% - 80%	
	C:	79% - 70%	
	D:	69% - 60%;	F: Less than 59 %

The professor reserves the rights to reward students for continuous hard work.

Additional Activities: Experiments; Home Practice Problems; Extra Credit Problems (ECP)

Instructional Method: Teaching lectures with proofs and example applications, testing the students with HW, quizzes, Exams, ECP, Final Project.

Final Test : CSCI569	Date: Monday – December 11, 2017	Time: 6PM-9PM
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COURSE POLICIES

In-class activity: *Problems to be solved during the class period.*

HW: *problems, which involve theoretical and practical skills above the average level. Some of the HW could be assigned as team works.*

Lab work: conduct experiments, during non-class time, with given Image Analysis tools and images

Mid term comprehensive exam: *Is to be given around mid semester. It will take 2/3 of a class period.*

Makeup: *Except in the case of a formal institutional excuse, no individual makeup test will be permitted.*

Project (most likely group): *closed itself innovative problem, whose development includes: survey of the present state of the art; development of a theoretical model; numerical analysis of the implementation; algorithm design and coding; performing experiment and deriving conclusions.*

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and/or consult your event organizer). Pursuant to PC 46.035, the open carrying of handguns is prohibited on all TAMUC campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

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Commerce, Texas
July 18, 2017

Dr. Nikolay Metodiev Sirakov