
BIOM 693 - Advanced Biometrics
Spring 2009
West Virginia University

Prerequisites:

A background in Biometric Systems; Image Processing; Probability & Statistics; Linear Algebra; and Signal Processing; or equivalent is required. Please see instructor for permission, if necessary.

Instructor and Office Hours:

Arun Ross (arun.ross at mail.wvu.edu)
Office: 751 ESB
Office hours: Wednesday 1:00p – 2:00p, or by appointment.

Lecture Details:

Time: Tuesday and Thursday, 3:30 – 4:45p.
Room: MRB-E 109.

Description:

This course will introduce a graduate audience to advanced topics in Biometrics. Emphasis will be placed on the feature extraction, representation and matching modules of a biometric system.

Objective:

The objective of this course is to equip students with the advanced tools necessary to design, implement and analyze biometric systems. To facilitate this, special topics in machine learning, image processing, computer vision, and pattern recognition will be visited. Project work will involve the implementation of advanced biometric algorithms pertaining to the face, fingerprint, iris, hand and voice modalities.

Course Topics:

A tentative list of topics that will be covered in this course is indicated below:

- Fingerprints: Non-linear deformation, mosaicing.
- Iris: Analysis using texture-based methods.
- Face: Detection and recognition.
- Multimodal Biometrics: Fusion techniques, score normalization.
- Security: Biometric watermarking.

Related concepts:

- Image Processing – Mosaicing, Enhancement, Watermarking.
- Machine Learning – Hidden Markov Models
- Computer Vision – Morphological operators, Edge detection
- Pattern Recognition – Bayesian learning, Density estimation, Neyman-Pearson rule, Clustering.

Projects:

Students are required to initiate and complete a project based on one of the following topics. Alternate topics may be chosen after consulting with the instructor.

- Fingerprint/Iris super-resolution

- Fingerprint/Iris deformation models
- Rapid face detection
- Iris segmentation
- Hand shape matching
- Speaker recognition
- Biometric fusion
- Liveness detection
- Biometric watermarking
- Biometric performance analysis

Grading:

The *tentative* weight associated with each grading component is as follows:

- Paper Critique – 25%
- Homework – 25%
- Quiz – 20%
- Project – 30%

Grade Assignment:

The grading scheme will be as follows:

- 90-100 : A
- 80-89 : B
- 60-79 : C
- 0-59 : F

Academic Integrity:

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be compromised. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code at <http://www.arc.wvu.edu/rightsa.html>. During the course of completing an assignment, should you have any questions about improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.

Social Justice:

West Virginia is committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and nondiscrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangement with Disability Services (293-6700)."
