

ECE 591-024 (11897)

Cyber-Physical System: Biometrics Sensing and Applications

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Objective or Description: Cyber-physical systems (CPS) are engineered systems that are built from, and depend upon, the seamless integration of computation and physical components. Given the increasing advances of mobile and wearable technologies in people's daily life, many biometrics and authentication techniques are being explored and developed (e.g., fingerprint lock on smartphones). This course introduces students to the theory and practice of biometric (e.g., face and voice) authentication cyber-physical systems. The course will cover the fundamental principles of biometrics, including physiological and behavioral characteristics (what & why), and the algorithms and system architecture used to extract, represent, and match these characteristics (how). Students will also learn about the newest approaches to biometrics and how they fit in its technological landscape, as well as the ethical and legal considerations surrounding the use of biometrics. The course will contain a project where students will group together to implement an authentication system prototype. By the end of the course, students should be able to do the following things:

- Explain the rationale of common biometrics
- Explain the ethic and legal factors of using biometrics
- Architecting a basic biometric authentication system
- Implement basic signal processing and machine learning algorithms required by biometrics system
- Evaluate and compare the security level of biometrics systems
- Explore potential new biometrics

Prerequisites: This class will need a general background in machine learning and interest in Cyber-Physical Systems (IoT). Light programming (Python or Matlab) will be involved.

Textbook: No textbook is required for this course

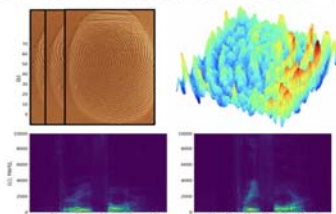
Topics:

- **Tired of Remembering Password?**
- **How Can Computer Verify You w/o Password?**
- **How Secure Is It Using Face/Finger to (un)Lock Phones?**

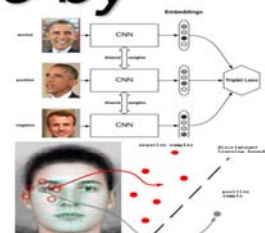
Find answers in this course by



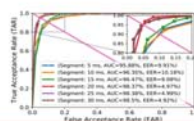
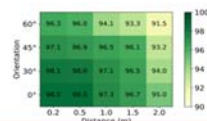
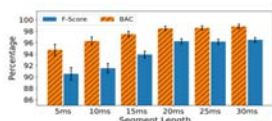
Human Sensor



Signal Processing



Machine Learning



Quantitative Evaluation and Case Study

Deliverables and Grading:

Graded Elements	Description	Weight
Mid-term	There will be a mid-term exam. Any unexcused absence from the mid-term exam will result in a grade of 0 for the exam.	25%
Attendance and Participation	Attendance and active participation in class is essential. Each absence without prior email notice by the noon of the class day will take 4% off	20%
Project Presentation	There is a course project , where students are expected to form groups and build biometrics systems. At the end of the semester, students will present slides on their (group) project and submit a report	10% (presentation) + 10% (project report)
Paper Review	There is a paper review homework. Students will review one selected paper, present, and submit review comments	2.5% (presentation) + 2.5% (review comments)
Final Exam	Any unexcused absence from the final exam will result in a grade of 0 for the exam.	30%

Cross-listing in other departments: CSC 591/791