School of Engineering and Natural Sciences / Computer Engineering (English)

2023 - 2024 Academic Year

INTRODUCTION to BIOMETRIC SYSTEMS

Syllabus

Course Description					
Name	**Code**	**Semester**	**T+A Hour**	**Credit**	**ECTS**
INTRODUCTION to BIOMETRIC SYSTEMS	COE4115413	Fall Semester	3+3	4,5	6

Prerequisites Courses	LİNEER CEBİR
Recommended Elective Courses	BioInformatics
Language of Instruction	English
Course Level	First Cycle (Bachelor's Degree)
Course Type	Elective
Course Coordinator	Prof.Dr. Mehmet Kemal ÖZDEMİR
Name of Lecturer(s)	Lect.Dr. Umut ULUDAĞ
Assistant(s)	Lecture Notes
Aim	Biometric systems, that rely on physiological and/or behavioral characteristics (e.g., fingerprint, face, iris, voice ...), for personal authentication, are becoming ubiquitous: from national e-ID cards, to accessing secure sites (e.g. airports), from web-based applications to law enforcement checks (e.g. AFIS), these systems that go beyond the usage of traditional username/password/card combinations are securing our lives & creating added value every day. In this course, design, implementation, and evaluation of unimodal & multimodal biometric systems with primers on relevant signal processing & pattern recognition topics will be covered. The intersection with cryptography and future prospects will also be highlighted.
Course Content	This course contains; Introduction to biometric systems, general characteristics, building blocks, applications,Identity verification methods: biometrics based and others,Relevant pattern recognition and signal processing topics, feature extractors & classifiers ,Parmakizi tanıma: sensörler, öznitelikler, başarım, sınıflandırma, indeksleme, tekillik,Fingerprint recognition, features, performance, classification, indexing, and uniqueness. ,Face recognition,Iris recognition,Exam Week - Midterm,Voice recognition,Gait, vein, palmprint, signature recognition & novel modalities,Multimodal biometric systems,Cryptography & biometrics: system security & template privacy,Standard databases, evaluation & tests,Future prospects, research directions, challenges; project evaluations,Future prospects, research directions, challenges; project evaluations.

Course Learning Outcomes	**Teaching Methods**	**Assessment Methods**
1. Understand design principles for a biometric system, appropriate for a given set of requirements	9	A, E, F
2. Evaluate alternative biometric systems, in terms of accuracy, cost, practicality	9	A, E, F
3. Learn how to assist software developers in implementing a successful biometric system	9	A, E, F
4. Make informed decisions considering limitations and advantages of biometric systems, with respect to traditional identity verification systems	9	A, E, F

Teaching Methods	9: Lecture Method
Assessment Methods	A: Traditional Written Exam, E: Homework, F: Project Task

Lecture Schedule

Sequence	**Topics**	**Preliminary Preparation**
1	Introduction to biometric systems, general characteristics, building blocks, applications	Ref.1 Ch. 1
2	Identity verification methods: biometrics based and others	Ref. 1 Ch. 1
3	Relevant pattern recognition and signal processing topics, feature extractors & classifiers	Ref. 4 Ch. 1
4	Parmakizi tanıma: sensörler, öznitelikler, başarım, sınıflandırma, indeksleme, tekillik	Ref. 2 Ch. 2-4, 5, 8
5	Fingerprint recognition, features, performance, classification, indexing, and uniqueness.	Ref. 2 Ch. 2-4, 5, 8
6	Face recognition	Ref.1 Ch. 3
7	Iris recognition	Ref.1 Ch. 4
8	Exam Week - Midterm	Lectures till Week 7
9	Voice recognition	Ref.1 Ch. 8
10	Gait, vein, palmprint, signature recognition & novel modalities	Ref.1 Ch. 6&9&10
11	Multimodal biometric systems	Ref.3 Ch. 2&3
12	Cryptography & biometrics: system security & template privacy	Ref.1 Ch. 19
13	Standard databases, evaluation & tests	Ref.1 Ch. 24&25
14	Future prospects, research directions, challenges; project evaluations	Publication websites
15	Future prospects, research directions, challenges; project evaluations	Publication websites

Evaluation Methods	**Weight(%)**
Midterm Exam	30
General Exam	70

Resources

A.K. Jain, P. Flynn, A.A. Ross, Handbook of Biometrics, Springer, 2008.1- D. Maltoni, D. Maio, A.K. Jain, and S. Prabhakar, Handbook of Fingerprint Recognition, 2. Ed., Springer, 2009.
2- A. Ross, K. Nandakumar, and A.K. Jain, Handbook of Multibiometrics, 2006.
3- R.O. Duda, P.E. Hart, and D.G. Stork, Pattern Classification, 2. Ed., Wiley, 2001.