

Subject Description Form

Subject Code	COMP 5522
Subject Title	Biometric Authentication: System and Application
Credit Value	3
Level	5
Pre-requisite/Exclusion	Nil
Objectives	<p>A “pattern” is the form of representation of an objectively existed event or object. For instance, voice, image and character are patterns. More broadly, any natural and social phenomenon may be considered as “Patterns”. But in our course we mainly concern the problems of recognizing patterns of characters, speech and images. In our course, “Pattern” is a set of measurements or observations, represented in vector or matrix notation. --- A basic intelligent ability of human being or animal; for instance, you guys come to attend this class, you have to be able to recognize the road from home to PolyU, this is the 3D scene analysis ability, you have to be able to recognize the number of classroom, which is the ability of number recognition, on the class you have to be able to understand what the teacher says and writes on the blackboard, this is the ability of speech and character recognition. From the system viewpoint, PR is an important component of intelligent systems; From the theoretical concept, PR is a mapping from feature space to class space.</p> <p>The main focus of this subject is to explore the major theories of pattern recognition and image information processing (PRIP) and to discuss how these techniques and models are applied to Biometric Systems and other related applications.</p>
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a) understand the basic concept of pattern and its specific application to biometrics computing; b) apply multimedia information technology for biometric feature extraction and representation; c) use data clustering and classification algorithms for personal authentication by biometrics features; and d) combine multiple biometrics features for various applications

Subject Synopsis/ Indicative Syllabus	<ul style="list-style-type: none"> • Introduction to Biometrics Authentication: What is biometrics authentication? Traditional methods for personal authentication. Some definitions of biometrics authentication technologies and systems. Software and hardware biometrics systems. Image processing and pattern recognition in living body, including human head & face, the mechanism of human eye, hand & skin characteristics. • Biometrics Sensors and Data Acquisition: Biometric data acquisition and database. How to design various biometric sensors and how to evaluate their system performance? • Biometrics Pre-processing: The related biometrics preprocessing technologies, including: noise removing, edge sharpening, image restoration, image segmentation, pattern extraction and classification. etc. • Biometrics Feature Extraction: Basic elements in pattern recognition system, and some basic introduction of pattern recognition systems on biometrics (such as fingerprint, palm-print, finger, hand, face, iris, and face, as well as dental, DNA, and retina recognition). • Features Matching and Decision Making: Various matching methods, including PCA and LDA. Introduce decision theory and their examples. • Design and Implementation of Biometric Systems: Basic approaches of automated biometrics identification and verification systems. Various performance comparison and their analysis for large population authentication, accuracy and reliability of authentication in an e-world. • Biometric Authentication Applications: Various applications, including access control like a lock or an airport check-in area; immigration and naturalization; welfare distribution; military identification; banking, e.g., check cashing, credit card, ATM (automated teller machine); computer login; intruder detection; smart card; multi-media communication; WWW and an electronic purse; sensor fusion; decision fusion; categorization: e.g., age and gender; industrial automation; gesture interpretation; efficient enrollment; audio-visual tracking; stock market; on-line shopping; compact embedded systems and other commercialized services. 																										
Teaching/Learning Methodology	39 hours of class activities including - lecture, tutorial, lab, workshop seminar where applicable.																										
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 35%;">Specific Assessment Methods/Tasks</th> <th rowspan="2" style="width: 15%;">% weighting</th> <th colspan="5">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th style="width: 5%;">a</th> <th style="width: 5%;">b</th> <th style="width: 5%;">c</th> <th style="width: 5%;">d</th> <th style="width: 5%;"></th> </tr> </thead> <tbody> <tr> <td>Assignments, Tests & Projects</td> <td style="text-align: center;">55</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>Final Examination</td> <td style="text-align: center;">45</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> </tr> </tbody> </table>	Specific Assessment Methods/Tasks	% weighting	Intended subject learning outcomes to be assessed					a	b	c	d		Assignments, Tests & Projects	55	✓	✓	✓	✓		Final Examination	45	✓	✓	✓	✓	
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Final Examination	45	✓	✓	✓	✓																						

	Total	100	
Student study effort expected	Class Contact:		
	Class activities (lecture, tutorial, lab)	39 hours	
	Other student study effort:		
	Assignments, Quizzes, Projects, Exams	65 hours	
	Total student study effort	104 hours	
Reading list and references	(1). Zhang, D., 2000, Automated Biometrics: Technologies & Systems, Kluwer Academic Publisher, USA. (2). Zhang, D., 2003, Palmprint Authentication, Kluwer Academic Publishers, USA. (3). Zhang, D (ed.), 2002, Biometrics Solutions for Authentication in an e-World, Kluwer Academic Publishers, USA. (4). Jain, et al., (eds), 1999, Biometrics: Personal Identification in Networked Society, Kluwer Publisher. (5). Awcock. G.W., et al., 1996, Applied Image Processing, McGraw-Hill. IEEE Transaction on Pattern Analysis and Machine Intelligence. IEEE Transaction on Image Processing.		