The Hong Kong Polytechnic University

Subject Description Form

Subject Code	DSAI624
Subject Title	Advanced Human Identification
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil (but some knowledge of artificial intelligence is preferable)
Objectives	This subject introduces the concepts and principles of AI-empowered human identification. It teaches students the fundamentals and advanced human identification technology, covering methods, techniques, systems and applications.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) Understand fundamental principles and algorithms of AI-based human identification. b) In-depth understanding of quantitative methods for performance evaluation of person identification systems; c) Develop and implement new methods that are appropriate for specific human identification problems in real-world applications; d) Well-prepare to conduct methodological and applied research in human identification and related fields.
Subject Synopsis/ Indicative Syllabus	**Introductory:** Human identification using artificial intelligence, physiological and behavioral imprints, biometrics systems, and strengths and weaknesses of biometric imprints. **Advanced:** Biometrics detection and segmentation using deep neural network models, Advanced algorithms for matching human imprints like fingerprints, iris, palmprints, face, and knuckle, template protection and security, presentation attacks, and detection, etc. **Applications:** Performance evaluation for human identification systems, authentication, and error rates, failure to acquire, false match rate and false non-match rate, receiver operating characteristics, equal error rate, open set and closed set performance evaluation, cumulative match characteristics, false positive identification, and false negative identification rates, societal challenges in biometric identification.

<table>
<tr><td>Teaching/Learning Methodology</td><td>The subject will be delivered mainly through lectures and tutorials, as well as class discussions, questions, and answers. Additional reading of relevant books and research papers will be encouraged. The teaching and learning approach is mainly problem-solving oriented. Students are encouraged to adopt a deep study approach by employing high-level cognitive strategies, such as critical and evaluative thinking, as well as relating, integrating, and applying theories to practice.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Assignments</td><td>20%</td><td>✓</td><td></td><td></td><td>✓</td></tr>
<tr><td>2. Quiz</td><td>20%</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>3. Projects</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
</table>

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignment: Assessment of the understanding of the basic concepts and the ability to self-learn by acquiring knowledge from published works and online information.

Quiz: assessment of the ability to comprehend fundamental concepts, principles, algorithms, and theories by providing answers to given questions.

Project: assessment of the ability to develop methods and algorithms for solving practical problems. The results will be presented in written reports and oral presentations.</td></tr>
<tr><td>Student Study Effort Required</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>13 Hrs.</td></tr>
<tr><td>Other student study efforts:</td><td></td></tr>
<tr><td>▪ Assignment</td><td>30 Hrs.</td></tr>
<tr><td>▪ Self-study</td><td>61 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>130 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and</td><td>• Ajay Kumar, Iris and Periocular Recognition using Deep Learning, Academic Press, 2024. ISBN: 9780443273186</td></tr>
</table>

References	• R. M. Bolle, J. H. Connell, S. Pankanti, N. K. Ratha, A. W. Senior, *Guide to Biometrics*, Springer, ISBN 978-1-4757-4036-3, 2013. • A. Kumar, Contactless 3D Fingerprint Identification, Springer, 2018. ISBN 978-3-319-67680-7 • A. K. Jain, A. Kumar, Biometrics on Next Recognition, An Overview, Second Generation Biometrics, Springer, 2010. • IEEE Transaction on Pattern Analysis and Machine Intelligence. • IEEE Transaction Biometrics Behavior and Identity Science.