The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	BME5150
Subject Title	Medical Artificial Intelligence and Data Analytics
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	(1) Introduce the concept of artificial intelligence and data analytics in the hospital and community healthcare service models (2) Equip the students with the fundamental knowledge of artificial intelligence techniques and data analytic algorithms in clinical applications (3) Master the clinical problem formulation and typical data analytic skills (4) Understand the trend of technical development in medical artificial intelligence (5) Be aware of the opportunities and risks in the field
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. Understand ideological and theoretical underpinning, the potentials and fundamentals of artificial intelligence and data analytic techniques in medicine; b. Describe the emerging and increasing healthcare demands for artificial intelligence and data analytics c. Articulate the major technological approaches of articular intelligence and machine learning to transform current healthcare service model in both hospital and community setting d. Apply basic articular intelligence techniques and machine learning algorithm to tackle the given medical problem

	e. Understand the quality, regulatory, and ethical issues related to the use of artificial intelligence and data analytic technologies in the hospital and community healthcare setting.

Subject Synopsis/ Indicative Syllabus
 	
(Note 2)
	▪ Landscape changes and opportunities- introduction of artificial intelligence and data analytic techniques for medical needs
	
	▪ The trend of artificial intelligence and data technology to transform current healthcare system
	
	▪ Characterization of medical signals: feature engineering and extraction
	
	▪ Basic understanding of supervised and unsupervised learning, neural networks, machine learning, and deep learning
	
	▪ Artificial intelligence and data analytic technologies to transform the healthcare service in the future of hospital, including but not limited to
	
	   • Introduction of Hospital Authority Data Sharing Portal
	
	   • AI-enabled patients triage system and surgical planning
	
	   • Big data analytics-based diagnostics and prognostics
	
	   • Brain-machine interface, neural decoding, neuralink
	
	   • Patients data privacy and security
	
	▪ Artificial intelligence and data analytic technologies to promote healthcare in the community, including
	
	   • Health and wellness monitoring using wearable and home-based personal devices
	
	   • Mental health promotion via robotics-assisted speech, facial and emotion recognition
	
	▪ Laboratory sessions with hand-on experience on dealing various types of clinical tabular, imaging and bio-signal datasets
	
	   • Tabular data retrieval and analysis
	
	   • Compute vision for medical imaging (histopathology)
	
	   • Advanced electrophysiology: practical session

Teaching/Learning Methodology *(Note 3)*	Students will learn the fundamentals and principles in lectures; Sufficient laboratory and practice hours will be provided in labs and tutorials hours; Practice projects/assignments will be adopted to assess the students' learning outcome.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. In-class quiz	10%	√	√	√		√
2. Assignments (×2)	30%	√	√	√	√	√
3. Labs (×2)	30%			√	√	
4. Final project (×1)	30%	√	√	√	√	√
Total	100 %					

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Student Study Effort Expected

Class contact:	
▪ Lectures	30 Hrs.
▪ Laboratories	9 Hrs.
Other student study effort:	
▪ Self-study	38 Hrs.
▪ Assignments and lab reports	22 Hrs.
▪ Group project	18 hrs
Total student study effort	117 Hrs.

Reading List and References

Textbooks:

- Artificial intelligence in medical imaging: opportunities, applications and risks; Erik R Ranschaert (editor), Sergey Morozov (editor), P. R. Algra (editor); Cham, Switzerland: Springer; 2019
- Medical imaging: artificial intelligence, image recognition, and machine learning techniques; K. C. Santosh (editor); Boca Raton, FL: CRC Press; 2020
- Biomedical Signal Processing and Artificial Intelligence in Healthcare; Walid Zgallai, Academic Press; 2020

Note 1: Intended Learning Outcomes
Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus
The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology
This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method
This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

(Form AR 140) 8.2020