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	COMP6709
Subject Title	Advanced Natural Language Processing
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil (but knowledge in Artificial Intelligent/ Machine Learning is preferable)
Objectives	- Provide students with comprehensive knowledge of advanced natural language processing (NLP) techniques and their wide range of applications in our daily life. - Enable students to master and apply state-of-the-art natural language understanding and generation approaches to produce creative solutions to specific NLP problems. - Equip students with practical skills to deal with real world NLP applications and research competence to make significance contributions to the NLP field.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: (a) master necessary knowledge in natural language processing and adopt advanced natural language processing techniques to solve real-world problems; (b) demonstrate the ability to identify and solve research problems in various natural language processing fields through critical thinking, and creative thinking; (c) systematically and logically design experiments to evaluate performance of research approaches, discover and/or interpret strengths and weaknesses of different approaches.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	**Part I: Introductory** Natural Language Processing Concepts: Morphological Analysis, Word Stemming and Segmentation, Syntactic Analysis and Sentence Parsing, Semantic Analysis, Sense Disambiguation, Discourse Analysis, Co-Reference Resolution, Problem of Ambiguity. Natural Language Processing Models and Techniques: Segmentation, Classification, Sequence Labeling, N-Gram Language Model, Topic Model, Role of Machine Learning and Data Mining in Natural Language Processing, Natural Language Processing Tools. **Part II: Advanced** Deep Learning in Natural Language Processing: Word Embedding (for Semantic Representation), Convolutional Neural Network (for Text Classification), Recurrent Neural Network (for Neural Language Model), Recursive Neural Network (for Sentence Parsing), Sequence-to-Sequence

	Model and Attention Model (for Machine Translation and Conversation).
	Part II: Applications
	Selected Natural Language Processing Applications: Machine Translation, Question Answering, Summarization, Opinion Mining and Sentiment Classification, Dialogue and Conversation, Reading Comprehension, Information Retrieval and Extraction, News Recommendation, etc.
Teaching/Learning Methodology *(Note 3)*	Lecture and tutorial classes teach students on the essential knowledge of natural language processing, together with comprehensive examples and question answering for easy understanding.
	Lab classes help students to master practical techniques and necessary tools in order to reproduce and/or improve state-of-the-art models for selected natural language applications.
	Students are also expected to understand the latest advances in natural language processing and related areas. They are encouraged to individually or form a group to read, present and discuss research papers.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c			
1. Assignment and Quiz	50%	√	√	√			
2. Project, and Presentation	50%	√	√	√			
Total	100 %						

Quiz evaluate student's ability to understand fundamental knowledge in natural language processing.

Assignment and presentation evaluate student's ability to understand latest development in natural language processing, independent learning and critical thinking abilities, written and oral communication skills.

Project evaluates student's critical thinking and creative thinking abilities and problem-solving skills. It also evaluates student's ability to apply learned techniques and tools to practical applications.

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial/Lab	39 Hrs.
	▪	
	Other student study effort:	
	▪ Self-Study, Doing Assignment and Project, Preparing for Quiz, and Presentation	83 Hrs.

	Total student study effort	122 Hrs.
Reading List and References	(1) Daniel Jurafsky and James H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Prentice Hall.	
	(2) Christopher D. Manning and Hinrich Schütze. Foundations of Statistical Natural Language Processing. The MIT Press.	
	(3) Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze. Introduction to Information Retrieval. Cambridge University Press	
	(4) Nitin Indurkhya and Fred J. Damerau. Handbook of Natural Language Processing. Chapman and Hall/CRC.	
	(5) Steven Bird, Ewan Klein and Edward Loper. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit. O'Reilly Media.	
	(6) Li Deng and Yang Liu, Deep Learning in Natural Language Processing. Springer.	
	(7) Yoav Goldberg and Graeme Hirst. Neural Network Methods for Natural Language Processing. Morgan & Claypool Publishers	
	(8) ACL Conference Proceedings (https://www.aclweb.org/anthology)	

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.