Semester II
Name of the Programme: M.Sc. in Artificial Intelligence
Course Code: CSI-525
Title of Course: Machine Translation
Number of Credits: 4 (2L-2T-0P)
Effective from AY: 2023-24

Prerequisites for the course	Knowledge of Mathematics for Computer Science and Machine Learning will prove beneficial, A previous course on Artificial Intelligence and Natural Language Processing will help; Exposure to Linguistics is useful, though not mandatory	
Objectives:	The objective of the course is to understand and get an insight into the different approaches used for Machine Translation (MT).	
Content:	Introduction: Data-driven MT, MT Approaches, Language divergence, three major paradigms of MT, MT Evaluation,	8 hours
	Bilingual Word Mappings: Combinatorial Argument, One-to-One Alignment, Heuristic and Iterative bases computation, Mathematics of Alignment, Expectation Maximization, IBM models of Alignment	4 hours
	Phrase-Based Machine Translation (PBMT): Need, Examples, Phrase Table, Mathematics of Phrase-Based SMT, Decoding.	10 hours
	Rule-Based Machine Translation (RBMT): Kinds, UNL, Interlingua and Word Knowledge, UNL conversion, Transfer-based MT.	5 hours
	Example-Based Machine Translation (EBMT): Essential steps of EBMT, Text similarity computation, Translation memory, Statistical Machine Translation	3 hours
	Assignments to be discussed during the Tutorial Slots -	30 hours
	Assignment 1: Data-driven MT, MT Approaches, Language divergence, three major paradigms of MT, MT Evaluation,	8 hours
	Assignment 2: Bilingual Word Mappings: Combinatorial Argument, One-to-One Alignment, Heuristic and Iterative bases computation, Mathematics of Alignment, Expectation Maximization, IBM models of Alignment	4 hours
	Assignment 3: Phrase-Based Machine Translation (PBMT): Need, Examples, Phrase Table, Mathematics of Phrase-Based SMT, Decoding.	10 hours
	Assignment 4: Rule-Based Machine Translation (RBMT): Kinds, UNL, Interlingua and Word Knowledge, UNL conversion, Transfer-based MT.	5 hours
	Assignment 5: Example-Based Machine Translation (EBMT): Essential steps of EBMT, Text similarity computation, Translation memory, Statistical Machine Translation	3 hours
Pedagogy:	lectures/ tutorials/assignments/self-learning/ flipped classroom	
References/ Readings	1. Machine Translation by Pushpak Bhattacharyya, Chapman and Hall/CRC, February 2015 2. Machine Translation on Coursera by Prof. Alexander Waibel and Jan Niehues https://www.coursera.org/learn/machinetranslation 3. An Open Source Neural Machine Translation System https://opennmt.net/ 4. Bhashini Project – https://bhashini.gov.in/bhashadaan/en/likho-india	
Course Outcomes	1.Understand the Machine Translation Approaches andUnderstand the differences between Phrase-Based, Rule-Based, and Example-Based Machine	

	Translation 2.explain, apply, and assess evaluation methods for machine translation;describe and critically discuss the architecture of machine translation systems; 3.build their own translation model using existing tools for machine translation and evaluate and analyse the translation results;compare different types of machine translation strategies, such as rule-based, statistical, and neural machine translation; 4.implement components of machine translation systems or components used in evaluation or pre-processing

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