



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

MACHINE TRANSLATION								
VII Semester: CSE (AI&ML)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACAD28	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisites: Machine Learning Algorithms								

I. COURSE OVERVIEW:

Machine translation (MT) is the task to translate a text from a source language to its counterpart in a target language. This course explores the principles and applications of Example-Based Machine Translation (EBMT), a paradigm within machine translation that leverages a database of aligned source and target language examples. Students will delve into the essential components of EBMT, including database creation, word matching techniques, case reasoning, and text similarity computation.

II. COURSE OBJECTIVES:

The students will try to learn:

- I. Word matching algorithms for establishing correspondences between source and target language words.
- II. The impact of word matching on overall translation system performance.
- III. The case reasoning techniques to adapt and modify retrieved examples for new translation challenges.

III. COURSE OUTCOMES:

At the end of the course, student should be able to:

- CO1 Summarize the data-driven machine translation methods for enabling effective translation across languages with sentence structures and grammatical Conventions.
- CO2 Utilize Heuristics-based iterative computation for bilingual word mappings to Address real-world challenges in optimizing alignment.
- CO3 Estimate Parameters related to probabilistic and alignment models using Expectation-Maximization (EM) technique.
- CO4 Compare different types of polymerization reactions, mechanism of lubrication for utilizing in industries.
- CO5 Utilize binary predicates for expressing relationships with Universal networking Language (UNL).
- CO6 Develop the relations between source and target language words using word Matching algorithms.

IV. COURSE CONTENT:

MODULE – I: DATA DRIVEN MACHINE TRANSLATION (09)

Introduction: Data-Driven Machine Translation (MT), MT Approaches – Ascending Transfer and Descending Transfer, syntactic Divergence, Lexical-Semantic Divergence, Paradigms of Machine Translation, MT Evaluation.

MODULE – II: WORD MAPPING AND ALIGNMENT (09)

Learning Bilingual Word Mappings: Combinatorial Argument, One-to-One Alignment, Heuristics-Based Computation, Iterative Computation and Derivation of Alignment Probabilities.

MODULE – III: EXPECTATION MAXIMIZATION MODEL (10)

Model of Alignment: Influencing Factors, Problem of Summation over Product in IBM Model 1, EM for Computing, Alignment in New Input Sentence Pair.

Phrase-Based Machine Translation: Need for Phrase Alignment, Phrase Alignment Techniques – Two Way Alignments, Summarization, Principles of Phrase Construction.

MODULE – IV: RULE-BASED MACHINE TRANSLATION (10)

Rule-Based Machine Translation (RBM): Interlingua, Transfer, Universal Networking Language, UNL Expressions as Binary Predicates, Interlingua and Word Knowledge.

MODULE – V: EXAMPLE BASED TRANSLATION (10)

Example-Based Machine Translation (EMBT): Essentials Steps of EMBT, Word Matching, EMBT and Case Reasoning, Text Similarity Computation.

V. TEXTBOOKS:

1. Machine Translation, Pushpak Bhatt CRC Press.Dhanpat Rai Publishing Company, 16th Edition, 2017.
2. Prashanthrath, B. Rama Devi, Ch. Venkata Ramana Reddy, Subhendu Chakroborty, Cengage Learning Publishers, 1st Edition, 2018.

VI. REFERENCE BOOKS:

1. Alan K. Melby, Terry Warner, “The Possibility of language”, John Benjamins Publishing Company 1995.
2. Philipp Koehn, “Statistical machine translation”, Cambridge University Press, 1st Edition, 2010.
3. Philip M. Parker, “Machine Translation Technologies”, S.Chand & Co, New Delhi, 12th Edition, 2019.

VII. WEB REFERENCES

1. Machine Translation(NPTEL Web-book by <https://doi.org/10.7551/mitpress/11043.001.0001>
2. Statistical Translation (NPTEL Web book), by Prof. M. S. Subramanian <https://nptel.ac.in/courses>

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes

10. PowerPoint presentation

11. E-Learning Readiness Videos (ELRV)