

Natural Language Processing

Course Code: CSNL-364

Semester
[BSAI-6]

Credit Hours
[2+0]

Prerequisite
[None]

Course Description

Natural Language Processing course introduces a field of Artificial Intelligence which deals with the automatic processing of natural language. The student will understand the theoretical and practical fundamentals of how to process natural language automatically at the different levels of morphology, part-of-speech tagging, syntax, semantics, discourse and dialogue.

Course Learning Outcomes (CLOs)

The course learning outcome along with domain and taxonomy level are listed below

S. #	CLO Statement	Domain	BT Level	PLO
CLO-1	Identify techniques for information retrieval, language translation, and text classification.	C	C1 Knowledge	2
CLO-2	List the advantages of using standard corpora. Identify examples of current corpora for a variety of NLP tasks.	C	C2 Comprehension	2
CLO-3	Define and contrast deterministic and stochastic grammars, providing examples to show the adequacy of each.	C	C1 Knowledge	2

* BT= Bloom's Taxonomy, C=Cognitive Domain, P=Psychomotor Domain, A= Affective Domain

Course Materials

The course is designed to introduce the core concepts of Natural Language Processing a field of artificial intelligence & Computational Linguistics. Main goal of the course is to introduce the fundamental concepts and techniques in textual natural language processing. Aim of the course is to provide experience in the implementation and evaluation of NLP algorithms and to introduce NLP resources and application areas

Course Weekly Schedule

The course schedule for 16 weeks are detailed below

Week	Topic
1	Introduction to Natural Language Processing.

Week	Topic
2	Introduction to Text Classification
3	Application of Natural Language Processing in various areas.
4	Natural Language Processing Techniques (Tokenization + Part of speech tagging)
5	Natural Language Processing Techniques (Chunking + Parsing)
6	N-gram language Models: smoothing, interpolation, backoff.
7	Syntactic parsing. CYL algorithm
8	Earley's algorithm, statistical and neural techniques.
9	Computational semantics and lexical semantics
10	Computational lexicons: WordNet
11	Multilingual semantic networks: BabelNet
12	Word Sense Disambiguation and Induction; Entity Linking
13	Neural networks, word and sense embeddings and deep learning
14	Neural Semantic role labeling and Semantic parsing
15	Statistical and Neural Machine Translation
16	Revision

Recommended Textbooks

1. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit Latest Edition, Steven Bird, Ewan Klein and Edward Loper Publisher: O'Reilly Media, 2009.
2. Speech and Language Processing, Latest Edition, Daniel Jurafsky and James H. Martin Publisher: Prentice Hall, 2000.
3. Python Machine Learning, Sebastian Raschka. Publisher: Packt Publishing, 2015.

Natural Language Processing Lab

Course Code: CSNL-364L

[BSAI-6]

[0+1]

[None]

Course Description

The Natural Language Processing Lab (NLP-Lab) is focused on theoretical work and implementations of Natural Language Processing (NLP) and Artificial Intelligence (AI) solutions using hybrid approaches, empiricist, neural, probabilistic, and knowledge-driven, with a particular interest in neuro-symbolic modeling.

Course Learning Outcomes (CLOs)

The course learning outcome along with domain and taxonomy level are listed below

S. #	CLO Statement	Domain	BT Level	PLO
CLO-1 (Lab)	Simulate, apply, or implement classic and stochastic algorithms for parsing natural language.	P	P3 Guided Response	2
CLO-2 (Lab)	Apply machine learning algorithms to natural language processing applications such as (phonetics, recognition, synthesis).	P	P6 Adaption	5

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Course Materials

The course is designed to introduce the core concepts of Natural Language Processing a field of artificial intelligence & Computational Linguistics. Main goal of the course is to introduce the fundamental concepts and techniques in textual natural language processing. Aim of the course is to provide experience in the implementation and evaluation of NLP algorithms and to introduce NLP resources and application areas

Course Weekly Schedule

The course schedule for 16 weeks are detailed below

Week	Topic
1	Preprocessing of text (Tokenization, Filtration, Script Validation, Stop Word Removal, Stemming)
2	Morphological Analysis
3	N-gram model
4	POS tagging
5	POS tagging, Chunking

Week	Topic
6	Named Entity Recognition
7	Named Entity Recognition
8	Virtual Lab on Word Generator
9	Computational lexicons: WordNet
10	Computational lexicons: WordNet
11	Mini Project based on NLP Application
12	Mini Project based on NLP Application (Cont)
13	End Term Project
14	End Term Project
15	Revision

Recommended Textbooks

1. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit Latest Edition, Steven Bird, Ewan Klein and Edward Loper Publisher: O'Reilly Media, 2009.
2. Speech and Language Processing, Latest Edition, Daniel Jurafsky and James H. Martin Publisher: Prentice Hall, 2000.
3. Python Machine Learning, Sebastian Raschka. Publisher: Packt Publishing, 2015.