Natural Language Processing

By: Dr. Darshan Ingle.

About Me

Corporate Trainer

Python, R, Data Analytics, Machine Learning, Natural Language Processing, Artificial Intelligence, Deep Learning, TensorFlow 2.0, Stats, Excel, Tableau, PowerBI, RPA UiPath

Dr. Darshan Ingle

CERTIFICATIONS
- Masters in Data Science
- PhD Computer Science & Engineering
- Published 2 patents

TRAINING
- Conducted 1000+ hours of training in ML, Data Science, Data Analytics
- Conducted workshops at various engineering colleges related to ML

EXPERIENCE
- 11+ years of total experience as IT Trainer

ROLE
- Trainer at Upgrad
- Trainer at INSAID
- Trainer at Eduonix Learning Solutions
- Coach at Board Infinity
- Trainer at “Let’s Upgrade’
- Distinguished Visiting faculty at Birla College.

Agenda

- What is NLP?
- How Machines and Human interact using NLP?
- History of NLP
- Why NLP?
- Need for NLP
- Applications of Natural Language Processing
- Challenges and Scope
- Hands-on Project

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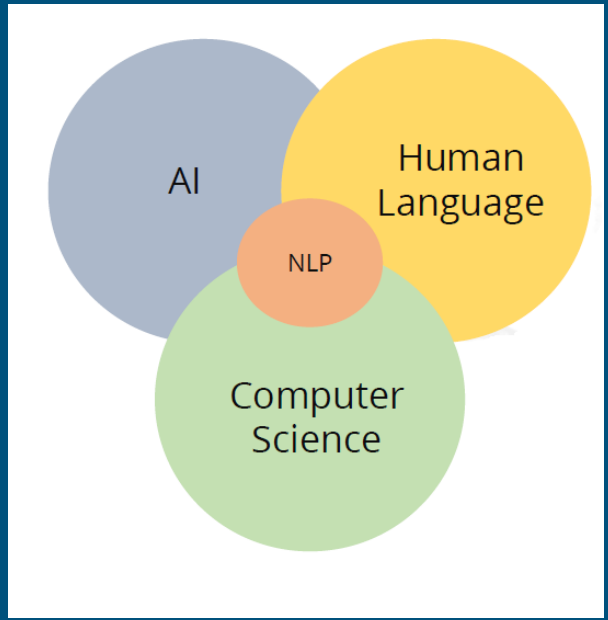
What is NLP?

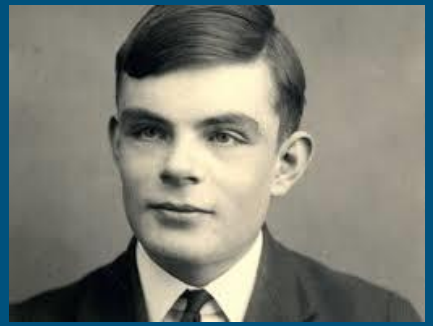
- It is a branch of AI.
- Helps machine to deal with human languages.
- Helps machine to understand, interpret, and manipulate human languages.
- Most of the Natural Language Processing techniques depend on machine learning to derive meaning from human languages.



How Machines and Human interact using NLP?

History of NLP

- 1950: Alan Turing
- 1960: The work of the Linguistic Scientist Chomsky and others
- 1990: Probabilistic and data driven models had become quite normal.
- 2000: A large quantity of spoken and textual data became accessible.
- 2010: Representation of learning and deep neural network in natural language processing started.



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Human Language

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Why NLP?

- NLP is the hallmark of human intelligence
- Text is the largest repository of human knowledge and is growing quickly
- NLP represents computer programs that understand text or speech

Need for NLP

Different Aspects of NLP

- NLP is the ability of a computer to analyze, understand, and generate human languages.
- A language is a system, a set of rules or set of symbols.
- Symbols are combined and used for conveying information or broadcasting the information.
- In NLP, rules of grammar are used for handling symbols.
- NLP is a component of artificial intelligence.

Applications of Natural Language Processing

- Speech Recognition
- Machine Translation
- Chatbot
- Information Retrieval
- Information Extraction
- Spell Check
- Question Answering
- Sentiment Analysis

Challenges and Scope

- Nature of the human language
- Human language is unstructured data
- Tough to extract meaning from text

Challenges and Scope

- Semantic Meaning
- Entity Extraction
- Anaphora Resolution
- Multiple Intents
- Word Sense Disambiguation

Challenges and Scope

- Semantic Meaning
- Ex:
    - There are many good plans available on Vodafone red.
    - I want to purchase a red shirt from Park Avenue.

Challenges and Scope

- Entity Extraction
- Ex:
    - A 5M solution of $CaCl_2$ consists of 250.86 gm of $CaCl_2$ dissolved in enough water to make one liter of solution.

Challenges and Scope

- Anaphora Resolution
- Ex:
    - Rohan and Rehan are friends. He is living in Mumbai.

Challenges and Scope

- Multiple Intents
- Ex:
    - My bank account is functional. Please provide me resolution process and I want to buy mobile from Amazon.

Challenges and Scope

- Word Sense Disambiguation
- Ex:
    - **Lexical Ambiguity:** The fisherman went to the bank.
    - **Syntactic or Grammatical Ambiguity:** Visiting relatives can be boring.
    - **Reference of a pronoun:** The boy told the father about the theft. He was very upset.

Course Contents

1. Introduction to Natural Language Processing

- What is NLP?
- History of NLP
- Working of NLP
- Rule Based NLP vs Statistical NLP
- Techniques used in NLP
- Components of NLP
- Uses of NLP
- Challenges and Scope
- NLP Pipeline
- NLTK

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Course Contents

2. Feature Engineering on Text Data

- Feature Extraction Techniques: N-Gram, Bag of Words, TF-IDF, Levenshtein Distance, One Hot Encoding, Word Embedding, Word2Vec, Doc2Vec
- Topic Modeling
- PCA
- Latent Dirichlet Allocation
- Word Analogies
- Gensim
- Text Summarization

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3. Natural Language Understanding Techniques

- Parts of Speech Tagging: Advantages, Challenges
- Dependency Parsing
- Constituency Parsing
- Morphological Techniques: Inflection, Derivation, Cliticization, Semi Affixes and Combining Forms
- Named Entity Recognition
- Word Sense Disambiguation
- Document Indexing
- Sentiment Analysis: Spacy

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4. Natural Language Generation

- Natural Language Generation (NLG)
- Stages in NLG: Content Determination, Document Structuring, Lexical Selection, Expression Generation, Aggregation and Realization
- Retrieval Based Model
- Generative Based Model
- Language Modeling: Next word prediction, sentence correction and more

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5. NLP Libraries

- TextBlob: TextBlob: Word and Phrase Frequencies, Lemmatization, Tokenization, Word Inflection, Part of Speech Tagging, Pluralization, Sentiment Analysis, Spelling Correction, Translation and Language Detection, N-Gram, Vocabulary, Polyglot
- LUIS
- NLTK
- Spacy
- Gensim

Course Contents

6. NLP with Machine Learning and Deep Learning

- What is Machine Translation?
- Types of Machine Translation
- Neural Machine Translation
- Components of Encoder Decoder Architecture
- Text Classification
- Text Summarization
- Document Clustering
- Attention Mechanism
- Question Answering Engine
- Summarization of News

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Course Contents

7. Speech Recognition Techniques

- What is Speech Recognition?
- Acoustic and Language Models
- Word Formation
- Speech Recognition System
- Reading, Loading, and Processing the Voice Data
- Creating Speech Model
- Use Cases
- Speech Libraries: Pyaudio, Speech Recognition, Google Speech API
- Speech to Text

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Thank You

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