Natural Language Processing (Course outline)

Session1: NLP Introduction and Basics of Text Pre-processing (& web scraping)

- Introduction to Natural Language Processing
  - Need for NLP
  - Applications of NLP
- Introduction to Text Pre-processing
  - Challenges With Text Data
  - Importance of Text Processing
- Common Text Pre-processing /Cleaning Methods
- Brief Introduction to Web Scraping (Beautiful Soup)
- Name Entity Recognition
- Word Cloud
- NLP Essential Libraries : NLTK/Spacy

Session2: Text Processing : Vectorisation & Word Embedding

- Conceptual Text Processing Terminologies
- Elementary text to numeric conversion techniques
  - Count vectorizer
  - TFIDF
- Introduction to Word Embeddings
  - Word2vec -Skip Gram, CBOW
  - Global vector (GloVe)
  - FastText
  - Pre Trained Word Embeddings
- Keras packages/methods for Text Processing
- Use Case : Sentiment Analysis
- Libraries : Genism, Glove, Keras

Session 3 : Sequence to Sequence (Seq2seq) Learning

- NLP Tasks & Challenges
  - Text Classification
  - Machine Translation
  - Text Generation
- Introduction to Seq2Seq learning
  - Encoder -Decoder
- Pre Transformer Architecture & their drawbacks
  - Brief Introduction to RNN & Its drawbacks
  - Overcoming RNN drawbacks through LSTM, Bi-LSTM
  - LSTM, Bi-LSTM drawbacks & need for Transformer

Session 4 : Transformer

- Introduction to Transformer
  - Transformer Model Architecture
  - Transformer's Encoder Decoder
  - Attention Mechanism
  - Self-Attention

    - Multi-Head Attention & Masked Multi-Head Attention
- Transformer Essential Libraries: Hugging face
- BERT (*Self Read)

Session 5: Generative AI and Large Language Models (LLMs)

- Introduction to Generative AI
    - Discriminative AI vs. Generative AI
- Introduction to Large Language Models (LLMs)
- LLMs : Examples
    - GPT-3
    - FLAN-T5
    - LLaMA-2
    - Falcon
- Leveraging LLMs
    - Prompt Engineering
    - Fine-tuning LLM
    - Building LLM
- LLM Application Development tools :LangChain
- Use Cases of Generative AI
- Generative AI Ethical Concerns

Session 6 : Case Study