Natural Language Processing
LEARN CERTIFY
ENGAGE COMPETE

COURSE OUTLINE

Module 1 **Introduction to NLP**

Module 2 Text Classification and Sentiment Analysis

Module 3 **Word Embeddings and Vector Representations**

Module 4 **Sequence Models and Language Modeling**

Module 5 **Transformers and Attention Mechanisms**

Module 6 **Advanced NLP Topics**

Module 7 **Practical Projects and Case Studies**

Module 8 **Final Project**

Module 01 Introduction to NLP

Lesson 1: What is NLP?

Overview of natural language processing

Key challenges and applications

History and evolution of NLP

Lesson 2: Linguistic Basics

Syntax, semantics, and pragmatics

Tokenization and part-of-speech tagging

Named entity recognition (NER)

Lesson 3: Basic Text Processing

Text preprocessing techniques (cleaning, normalization)

Regular expressions for text processing

Bag of Words and TF-IDF

Module **02 Text Classification and Sentiment Analysis**

Lesson 1: Text Classification Basics

Supervised learning approaches for text classification

Feature extraction and vectorization

Naive Bayes, SVM, and logistic regression for text

Lesson 2: Sentiment Analysis

Understanding sentiment analysis

Lexicon-based approaches

Machine learning approaches for sentiment analysis

Lesson 3: Practical Implementation

Hands-on with Python libraries (NLTK, SpaCy, scikit-learn)

Building and evaluating a text classification model

Sentiment analysis project

Module **03 Word Embeddings and**

Vector Representations
Lesson 1: Introduction to Word Embeddings
Understanding word embeddings
Word2Vec: Skip-gram and CBOW
GloVe (Global Vectors for Word Representation)
Lesson 2: Contextualized Word Embeddings
Introduction to contextual embeddings
ELMo (Embeddings from Language Models)
BERT (Bidirectional Encoder Representations from Transformers)
Lesson 3: Practical Implementation
Using pre-trained embeddings
Training custom word embeddings
Applications of word embeddings in NLP tasks

Module **04 Sequence Models and Language Modeling**
Lesson 1: Introduction to Sequence Models
Recurrent Neural Networks (RNNs)
Long Short-Term Memory (LSTM) networks
Gated Recurrent Units (GRUs)
Lesson 2: Language Modeling
Understanding language models
N-grams and Markov models
Neural language models
Lesson 3: Practical Implementation
Building and training RNNs, LSTMs, and GRUs
Language generation and text completion
Hands-on project: Language modeling

Module **05 Transformers and Attention Mechanisms**
Lesson 1: Introduction to Attention Mechanisms
Understanding attention in neural networks
Self-attention and multi-head attention
Applications of attention mechanisms
Lesson 2: Transformers
The Transformer architecture
Encoder-decoder structure
Applications in NLP (translation, summarization)
Lesson 3: Practical Implementation
Implementing transformers with Python (Hugging Face, TensorFlow)
Building and training a transformer model
Hands-on project: Machine translation

Module **06 Advanced NLP Topics**

Lesson 1: Sequence-to-Sequence Models

Seq2Seq architecture and applications

Training and evaluating Seq2Seq models

Lesson 2: Dialog Systems and Chatbots

Basics of dialog systems

Rule-based vs. learning-based approaches

Building a simple chatbot

Lesson 3: NLP in Production

Deploying NLP models

Scaling and optimization

Real-world case studies

Module **07 Practical Projects and Case Studies**

Implementation

Lesson 1: Project Planning and Dataset Preparation

Choosing a project topic and gathering data

Data preprocessing and feature engineering

Lesson 2: Model Building and Training

Building and tuning models for different NLP applications

Performance evaluation and metrics

Lesson 3: Deployment and Production

Deploying models using cloud services

Monitoring and maintaining models in production

Data collection and preprocessing

Model development and training

Module **08 Final Project**

Project Proposal

Define a problem statement and objectives

Outline the approach and methodology

Evaluation and Presentation

Evaluate model performance

Prepare a presentation and report of the findings

NATURAL LANGUAGE
PROCESSING

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