



PB INSTITUTE OF RESEARCH AND TECHNOLOGY

P.O Box 21457-00100

Nairobi - Kenya

Mobile: +254 721 214 795

Email: info@pebblesinstitute.org

Natural Language Processing (nlp) With Transformers: Ai For Understanding Language

Duration: 10 days

On-Site

01 Who Should Attend

- This course is designed for professionals seeking to apply transformer-based NLP techniques, including
- AI/ML Engineers
- Data Scientists
- NLP Developers
- Software Engineers
- Content Analysts
- Anyone interested in building AI-powered language applications

02 About the Course

Transformers have revolutionized Natural Language Processing (NLP), enabling AI to understand and generate human language with unprecedented accuracy. This course on NLP with Transformers equips participants with the specialized knowledge and skills to build and deploy AI models for advanced text and language processing tasks. Participants will learn how to utilize transformer architectures, fine-tune pre-trained models, and apply NLP for various real-world applications. This course bridges the gap between traditional NLP methods and cutting-edge transformer-based techniques, empowering professionals to harness the power of AI for language understanding..



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03 Workshop Objectives

- Understand the architecture and principles of transformer models.
- Fine-tune pre-trained transformer models for specific NLP tasks.
- Implement NLP tasks such as sentiment analysis, text summarization, and machine translation.
- Utilize transformer models for question answering and information retrieval.
- Understand the challenges and limitations of transformer-based NLP.
- Apply NLP for text classification, named entity recognition, and language generation.
- Develop strategies for deploying NLP models in real-world applications.

04 Module Topics

Module 1: Introduction to Natural Language Processing (NLP) and Transformers

- Understanding the evolution of NLP and its applications.
- Limitations of traditional NLP methods and the rise of transformers.
- Overview of transformer architectures and their impact on NLP.
- Key concepts: attention mechanisms, positional encoding, and self-attention.
- Setting up the development environment (Hugging Face Transformers, PyTorch, TensorFlow).

Module 2: Transformer Architecture and Attention Mechanisms

- Deep dive into the encoder-decoder architecture of transformers.
- Understanding multi-head attention and its significance.
- Exploring different types of attention mechanisms (self-attention, cross-attention).
- Understanding positional encoding and its role in sequential data.
- Implementing and visualizing attention mechanisms.

Module 3: Pre-trained Transformer Models (BERT, GPT, RoBERTa, etc.)



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- Understanding the training objectives and methodologies of pre-trained models.
- Exploring different pre-trained model architectures and their strengths.
- Utilizing pre-trained models for feature extraction and transfer learning.
- Understanding the concept of masked language modeling and next sentence prediction.
- Choosing the right pre-trained model for specific NLP tasks.

Module 4: Tokenization and Text Representation

- Understanding different tokenization techniques (word-level, subword-level, character-level).
- Exploring Byte-Pair Encoding (BPE) and WordPiece tokenization.
- Utilizing tokenizers from Hugging Face Transformers.
- Understanding embeddings and their role in text representation.
- Converting text data into numerical representations for transformer models.

Module 5: Fine-tuning Transformer Models for Text Classification

- Understanding the fine-tuning process and its importance.
- Preparing datasets for text classification tasks.
- Implementing fine-tuning using Hugging Face Transformers.
- Evaluating and visualizing model performance.
- Addressing overfitting and underfitting in fine-tuning.

Module 6: Fine-tuning Transformer Models for Named Entity Recognition (NER)

- Understanding NER and its applications.
- Preparing datasets for NER tasks.
- Implementing fine-tuning for NER using transformer models.
- Utilizing sequence tagging techniques for NER.
- Evaluating NER model performance.

Module 7: Fine-tuning Transformer Models for Question Answering



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- Understanding question answering tasks and datasets (e.g., SQuAD).
- Implementing fine-tuning for extractive question answering.
- Utilizing span prediction techniques for question answering.
- Evaluating question answering model performance.
- Implementing abstractive question answering.

Module 8: Text Summarization with Transformers

- Understanding different approaches to text summarization (extractive, abstractive).
- Implementing fine-tuning for text summarization tasks.
- Utilizing transformer models for abstractive summarization.
- Evaluating summarization model performance (ROUGE scores).
- Generating summaries of different lengths and styles.

Module 9: Machine Translation with Transformers

- Understanding machine translation tasks and datasets.
- Implementing fine-tuning for machine translation using transformer models.
- Utilizing encoder-decoder architectures for translation tasks.
- Evaluating translation model performance (BLEU scores).
- Addressing challenges in low-resource language translation.

Module 10: Language Generation with GPT Models

- Understanding the capabilities and limitations of GPT models.
- Utilizing GPT models for text generation and completion.
- Implementing prompt engineering techniques for controlled generation.
- Exploring different generation strategies (e.g., greedy decoding, beam search).
- Evaluating the quality and coherence of generated text.

Module 11: Sentiment Analysis and Emotion Detection



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- Understanding sentiment analysis and emotion detection tasks.
- Implementing fine-tuning for sentiment analysis and emotion detection.
- Utilizing transformer models for aspect-based sentiment analysis.
- Evaluating sentiment analysis model performance.
- Addressing challenges in handling sarcasm and irony.

Module 12: Information Retrieval and Semantic Search

- Understanding information retrieval and semantic search tasks.
- Utilizing transformer models for semantic similarity and relevance ranking.
- Implementing dense retrieval techniques.
- Building semantic search applications.
- Evaluating information retrieval performance.

Module 13: Advanced NLP Techniques and Applications

- Exploring advanced NLP tasks (e.g., topic modeling, relation extraction).
- Utilizing transformer models for multimodal NLP (text and images).
- Implementing cross-lingual NLP techniques.
- Exploring the use of transformers for code generation and analysis.
- Understanding the applications of transformers in dialogue systems.

Module 14: Ethical Considerations and Bias in NLP

- Understanding the ethical implications of NLP applications.
- Addressing bias and fairness in NLP models.
- Ensuring data privacy and security in NLP.
- Understanding the impact of NLP on society.
- Developing responsible NLP practices.

Module 15: Deploying NLP Models and Building Applications



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- ▶ Deploying NLP models in cloud and edge environments.
- ▶ Utilizing containerization and orchestration for model deployment.
- ▶ Building end-to-end NLP applications.
- ▶ Monitoring and maintaining deployed models.
- ▶ Continuous learning and professional development in NLP with transformers.