Training Course on Advanced Natural Language Processing

Professional Development Training Course Outline

Category	Data Science	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Training Course on Advanced Natural Language Processing (NLP) provides a **comprehensive deep dive** into the cutting-edge of **Natural Language Processing (NLP)**, equipping participants with the theoretical foundations and practical skills to tackle complex language-related challenges. In today's data-driven world, the ability to **understand, interpret, and generate human language** is paramount for **AI innovation, business intelligence, and enhanced user experiences**. This program moves beyond foundational NLP, focusing on **advanced deep learning architectures, transformer models, and large language models (LLMs)** that are revolutionizing industries from **healthcare to finance, and marketing to customer service.**

Participants will gain hands-on experience with **state-of-the-art NLP frameworks and tools**, learning to implement sophisticated solutions for real-world problems. We will explore the intricacies of **text generation, sentiment analysis, machine translation, information extraction, and conversational AI**, with a strong emphasis on **practical application, model fine-tuning, and performance optimization**. This course is designed to empower professionals to **design, develop, and deploy robust NLP systems**, driving significant impact and competitive advantage within their organizations.

Programme Curriculum

Training Course on Advanced Natural Language Processing (NLP)

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Course Objectives

1. Master Deep Learning Architectures for NLP, including RNNs, LSTMs, and GRUs.
2. Gain expertise in Transformer Models, particularly BERT, GPT, and their variants.
3. Implement Large Language Models (LLMs) for diverse Generative AI tasks.
4. Develop advanced skills in Sentiment Analysis for nuanced emotion detection and opinion mining.
5. Construct robust Named Entity Recognition (NER) systems for information extraction.
6. Build and optimize Machine Translation models using cutting-edge techniques.
7. Design and deploy sophisticated Conversational AI and Chatbot solutions.
8. Apply Transfer Learning and Fine-tuning strategies to pre-trained NLP models.
9. Address Bias and Fairness in NLP models and datasets.
10. Explore Multimodal NLP, integrating text with other data types (e.g., images, audio).
11. Implement Real-time NLP applications for dynamic data processing.
12. Utilize Reinforcement Learning for NLP (RLHF) to improve model alignment and performance.
13. Conduct Advanced Text Summarization (abstractive and extractive).

Organizational Benefits

- Unlocking valuable intelligence from vast amounts of unstructured text data, leading to better decision-making and strategic planning.
- Streamlining operations through automated content generation, customer support, and document analysis, boosting efficiency and reducing manual effort.
- Deploying intelligent chatbots and personalized communication tools to enhance customer satisfaction and engagement.
- Staying at the forefront of AI innovation by leveraging advanced NLP capabilities for new product development and service offerings.
- Detecting fraud, identifying compliance issues, and moderating content effectively through sophisticated language analysis.
- Empowering teams with tools that automate repetitive tasks and provide quick access to relevant information.
- Gaining deeper insights into customer sentiment and market trends to inform targeted campaigns and improve conversion rates.

- Building intelligent systems for information retrieval and knowledge organization, making organizational knowledge more accessible.

Target Audience

1. Data Scientists and Machine Learning Engineers.
2. AI/ML Researchers
3. Software Developers.
4. Data Analysts.
5. Product Managers.
6. Academics and Students.
7. NLP Practitioners
8. Anyone with a strong programming background in Python and foundational NLP knowledge.

Course Outline

Module 1: Advanced NLP Foundations & Neural Networks Refresher

- Review of core NLP concepts: Tokenization, Embeddings, Language Models.
- Recap of Neural Network architectures: Feedforward, CNNs for text.
- Deep dive into Recurrent Neural Networks (RNNs), LSTMs, and GRUs for sequence modeling.
- Attention Mechanisms: Understanding their role in capturing long-range dependencies.
- **Case Study:** Analyzing financial news sentiment using advanced RNNs for early market trend detection.

Module 2: Transformer Architecture Explained

- The revolutionary Transformer architecture: Encoder-Decoder stacks.
- Self-Attention and Multi-Head Attention: Mechanics and computations.
- Positional Encoding and its significance.
- Layer Normalization and Residual Connections in Transformers.
- **Case Study:** Building a custom NMT (Neural Machine Translation) system using a basic Transformer for a domain-specific language pair.

Module 3: Pre-trained Language Models (PLMs)

- Introduction to the concept of pre-training and fine-tuning.
- Understanding BERT: Bidirectional Transformers for Language Understanding.
- Exploring BERT variants: RoBERTa, ALBERT, DistilBERT.
- Practical fine-tuning strategies for downstream NLP tasks.
- **Case Study:** Fine-tuning BERT for highly accurate customer service ticket classification.

Module 4: Generative Pre-trained Transformers (GPT & LLMs)

- The evolution of GPT models: GPT-2, GPT-3, and beyond.
- Understanding the decoder-only architecture for text generation.
- Prompt engineering and few-shot/zero-shot learning with LLMs.
- Parameter-efficient fine-tuning (PEFT) techniques for LLMs.
- **Case Study:** Developing an AI assistant for content creation, generating marketing copy and blog posts.

Module 5: Advanced Text Classification & Sentiment Analysis

- Multi-label and hierarchical text classification.
- Aspect-based sentiment analysis for granular insights.
- Emotion detection and sarcasm detection using deep learning.
- Adversarial attacks on text classification models and defenses.
- **Case Study:** Building an advanced sentiment analysis system for social media monitoring of brand reputation.

Module 6: Information Extraction: NER & Relation Extraction

- Advanced Named Entity Recognition (NER) with sequence labeling models (CRF, Bi-LSTM-CRF, Transformers).
- Relation Extraction: Identifying relationships between entities.
- Event Extraction: Recognizing and structuring real-world events from text.
- Knowledge Graph construction from unstructured text.
- **Case Study:** Automating the extraction of key facts and relationships from legal documents for contract analysis.

Module 7: Machine Translation & Cross-Lingual NLP

- Neural Machine Translation (NMT) architectures: Encoder-Decoder with Attention.
- Advanced techniques for NMT: Beam Search, Coverage Mechanisms.
- Low-resource machine translation and multilingual models.
- Cross-lingual word embeddings and transfer learning.
- **Case Study:** Developing a real-time translation system for multinational customer support.

Module 8: Conversational AI & Dialogue Systems

- Architecture of conversational AI systems: NLU, Dialogue Management, NLG.
- Intent recognition and slot filling using deep learning.
- Contextual understanding and dialogue state tracking.
- Building robust chatbots and virtual assistants.
- **Case Study:** Designing an intelligent chatbot for an e-commerce platform that handles complex queries and product recommendations.

Module 9: Text Summarization & Generation

- Extractive vs. Abstractive Text Summarization.
- Sequence-to-sequence models for abstractive summarization.
- Controllable text generation: Style transfer, persona-based generation.
- Evaluation metrics for text generation and summarization.
- **Case Study:** Creating an automated news summarization tool for quick content digestion and information retrieval.

Module 10: Responsible AI in NLP: Bias, Fairness, and Explainability

- Identifying and mitigating bias in NLP models (e.g., gender, racial bias).
- Fairness metrics and ethical considerations in NLP applications.
- Explainable AI (XAI) techniques for understanding NLP model decisions (e.g., LIME, SHAP).
- Privacy-preserving NLP techniques.
- **Case Study:** Analyzing and reducing gender bias in a job description generation system.

Module 11: Multimodal NLP

- Integrating text with images for captioning and visual question answering.
- Speech recognition and Text-to-Speech (TTS) with deep learning.
- Multimodal sentiment analysis.
- Cross-modal retrieval systems.
- **Case Study:** Building a multimodal system that generates descriptive captions for images in an e-commerce catalog.

Module 12: NLP for Specific Domains & Advanced Applications

- Clinical NLP for medical text analysis and electronic health records.
- Financial NLP for market prediction and fraud detection.
- Legal NLP for document review and compliance.
- Social media NLP for trend analysis and content moderation.
- **Case Study:** Developing a system to analyze medical reports for automated disease diagnosis assistance.

Module 13: Reinforcement Learning for NLP (RLHF)

- Introduction to Reinforcement Learning (RL) concepts.
- Applying RL for fine-tuning LLMs with human feedback (RLHF).
- Optimizing dialogue policies using RL.
- Challenges and future directions of RL in NLP.
- **Case Study:** Improving the conversational coherence and helpfulness of a large language model using RLHF.

Module 14: Deployment and Scalability of NLP Models

- Containerization (Docker) and orchestration (Kubernetes) for NLP services.
- Cloud platforms for NLP deployment (AWS SageMaker, Google AI Platform, Azure ML).
- Model serving and API development for NLP applications.
- Monitoring and maintaining NLP models in production.
- **Case Study:** Deploying a real-time sentiment analysis API for monitoring customer feedback streams at scale.

Module 15: Future Trends & Research in Advanced NLP

- Beyond Transformers: New architectures and research frontiers.
- Ethical AI and the societal impact of powerful LLMs.
- Quantum computing's potential in NLP.
- The role of explainability and interpretability in next-gen NLP.
- **Case Study:** Discussion and brainstorming session on emerging NLP challenges and potential solutions for future industry applications.

Training Methodology

This course employs a **blended learning approach** combining theoretical lectures with extensive **hands-on coding exercises** using Python, PyTorch/TensorFlow, and Hugging Face Transformers. Each module will feature:

- **Interactive Lectures:** Deep dives into concepts, algorithms, and model architectures.
- **Live Coding Sessions:** Demonstrations of model implementation and practical application.
- **Jupyter Notebooks:** Provided for all exercises and case studies, allowing participants to follow along and experiment.

- **Practical Labs:** Dedicated time for participants to apply learned concepts to real datasets.
- **Case Study Driven Learning:** Each module concludes with a relevant industry case study, demonstrating real-world applications and challenges.
- **Q&A and Discussion Forums:** Encouraging collaborative learning and problem-solving.
- **Project-Based Learning:** A culminating project where participants design and implement an advanced NLP solution.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Ready to enroll or request a customized program? Book online or contact us:

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