



## **Professional Natural Language Processing Course**

10 – 14 May 2027  
Rome (Italy)





## Professional Natural Language Processing Course

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### Introduction

This Professional Natural Language Processing course explores the field, focusing on both theoretical foundations and structured analytical thinking in language-based AI systems. It introduces learners to how machines interpret, process, and generate human language using modern computational techniques. Participants will examine core concepts such as tokenization, semantic representation, and linguistic pattern recognition. The program explores advanced architectures, including transformer models that power modern AI systems and large language models. It emphasizes the integration of classical linguistic theory with contemporary machine learning approaches in NLP applications. Learners will understand how to apply natural language processing across industries such as automation, analytics, and intelligent systems.

### Targeted Groups

This Professional Natural Language Processing training targets professionals seeking knowledge and skills:

- Data analysts working with text-heavy datasets.
- AI and machine learning beginners in language technologies.
- Software developers interested in intelligent applications.
- Business analysts exploring automated insights from text.
- Content specialists aiming for semantic optimization tools.
- Researchers in computational linguistics and AI systems.
- Technical writers focusing on structured language models.
- Automation engineers designing chatbot systems.

### Course Objectives

Participants will achieve the following objectives by completing the Professional Natural Language Processing course:

- Develop a strong understanding of natural language processing fundamentals, including tokenization, parsing, and semantic representation of text data.
- Build knowledge of machine learning workflows used in NLP systems.
- Understand how to implement text classification and sentiment analysis in real-world applications.
- Explore deep learning architectures such as recurrent networks and transformer models for language understanding tasks.
- Gain the ability to evaluate language models and understand how embeddings transform text into numerical representations.
- Learn how modern AI systems, such as GPT and BERT frameworks, process and generate human language effectively.
- Understand how to apply NLP solutions in chatbots, search engines, and automated decision systems across industries.

## Targeted Competencies

Participants will gain the following competencies during the Professional Natural Language Processing program:

- Ability to preprocess and structure textual data for analytical modeling and AI applications.
- Competence in applying text mining techniques, including entity extraction and sentiment evaluation.
- Understanding of vector embeddings and semantic similarity for language modeling tasks.
- Skills in designing and interpreting NLP pipelines using machine learning approaches.
- Ability to analyze transformer-based architectures for contextual language understanding.
- Proficiency in evaluating performance metrics for NLP systems and language models.

## Studying Scenarios

In this Professional Natural Language Processing training, participants develop skills through the following scenarios:

- Analyzing customer feedback data to extract sentiment patterns and actionable insights.
- Designing chatbot systems capable of understanding and responding to user queries effectively.
- Building text classification models for organizing large-scale document repositories.
- Applying transformer-based models to improve contextual language understanding in search engines.

## Course Content

### Unit 1: Foundations of Natural Language Processing

- Introduction to Professional Natural Language Processing concepts and the scope of language AI systems.
- Overview of NLP course structure and its role in modern artificial intelligence ecosystems.
- Understanding human language structure and the computational representation of text data.
- Basics of tokenization, normalization, and text preprocessing techniques.
- Introduction to linguistic rules and statistical approaches in language modeling.
- Overview of natural language processing training applications in real-world industries.
- Key challenges in text ambiguity, syntax, and semantic interpretation.
- Evolution of NLP from rule-based systems to machine learning-driven models.

### Unit 2: Text Processing and Linguistic Representation

- Text cleaning methods for structured and unstructured language datasets.
- Sentence segmentation and word-level tokenization strategies in NLP systems.
- Part-of-speech tagging for grammatical structure identification.
- Named entity recognition for extracting meaningful information from text.
- Introduction to text classification and categorization techniques.
- Word embeddings and vector space representation of language data.
- Semantic similarity measurement using mathematical language models.
- Handling multilingual text and normalization across different languages.
- Feature engineering techniques for machine learning NLP pipelines.

### Unit 3: Machine Learning in NLP Systems

- Introduction to machine learning, NLP workflows, and predictive modeling structures.
- Supervised learning techniques for text classification and sentiment analysis.
- Unsupervised learning approaches for clustering and topic modeling.
- Feature extraction techniques for structured text representation.
- Naïve Bayes and logistic regression models in language processing.
- Model evaluation metrics for NLP performance assessment.
- Overfitting and generalization challenges in text-based models.
- Optimization strategies for improving NLP system accuracy.
- Integration of classical ML with modern NLP pipelines.

## Unit 4: Deep Learning and Transformer Architectures

- Introduction to deep learning for NLP and neural network fundamentals.
- Recurrent neural networks for sequential language modeling.
- Long short-term memory networks for contextual understanding of text.
- Attention mechanisms in language processing systems.
- Transformer architecture and its role in modern NLP applications.
- Pretrained language models such as BERT for contextual embeddings.
- Generative AI models, including GPT, for text generation tasks.
- Fine-tuning techniques for domain-specific NLP applications.
- Scalability challenges in deep learning-based language systems.

## Unit 5: Advanced Applications and NLP Systems

- Chatbot development and conversational AI system design principles.
- Sentiment analysis systems for business intelligence and customer insights.
- Information retrieval systems powered by semantic search techniques.
- Document summarization using extractive and abstractive methods.
- Real-world applications of NLP in healthcare, finance, and education.
- Language model deployment in production environments.
- Ethical considerations in AI language processing systems.
- Bias detection and mitigation in NLP models.
- Future trends in artificial intelligence language technologies.

## Final Insights & Key Takeaways

Professional Natural Language Processing equips learners with a structured understanding of how machines interpret and generate human language using advanced computational methods. The course builds a strong bridge between linguistic theory, machine learning, and deep learning systems to prepare learners for modern AI-driven environments.