NLP & CHATBOT DEVELOPMENT PROFESSIONAL PROGRAM– 2025 EDITION

"Turn conversations into intelligent experiences."

Market Demand Note

NLP powers applications from search engines and chatbots to sentiment analysis and translation tools. Conversational AI is becoming a business necessity across e-commerce, healthcare, finance, and customer service.

Duration: 12 Weeks | Mode: Online/Offline

📘 NLP & Chatbot Development Professional Program— 2025 Edition

Key Tools & Technologies:
Python, NLTK, spaCy, Hugging Face Transformers, OpenAI API, Rasa, LangChain, FastAPI, Flask, TensorFlow, PyTorch, Dialogflow, AWS Lex, Azure Bot Service.

Learning Objectives

By the end of this program, learners will be able to:

1. Understand and implement core NLP preprocessing techniques.
2. Build and fine-tune transformer-based models for NLP tasks.
3. Design, train, and deploy chatbots for real-world scenarios.
4. Integrate NLP models with APIs and messaging platforms.
5. Monitor and improve chatbot performance using analytics.

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Detailed Content

Week 1: NLP Fundamentals

- NLP Tasks: Text classification, sentiment analysis, translation, summarization, question answering.
- Tokenization: Word, sentence, subword (Byte Pair Encoding, WordPiece).
- Stemming/Lemmatization: Reducing words to base forms, handling morphology.
- Hands-on: Implement tokenizers, stemmers, lemmatizers on real text (news, social media).

Industry Trend: Focus on subword tokenization for multilingual and domain-specific models.

Week 2: Text Preprocessing & Feature Engineering

- Stopword Removal: Filtering common, non-informative words.
- n-grams: Capturing local context (bigrams, trigrams).
- TF-IDF: Weighting terms by importance across documents.
- Word Embeddings: Word2Vec, GloVe, FastText—training and using pre-trained vectors.
- Hands-on: Clean and featurize a corpus (e.g., product reviews, tweets).

Market Relevance: Contextual embeddings (from transformers) are now standard, but classic methods remain for lightweight applications and baseline systems.

Week 3: Classical NLP Models

- Naive Bayes: Simple, fast baseline for text classification.
- SVM: Effective for high-dimensional, sparse text data.
- Logistic Regression: Interpretable, quick to train.
- Hands-on: Train, evaluate, and interpret models on labeled datasets (e.g., spam detection).

Current Use: Rule-based and classical ML are still used in production for low-latency, explainable systems and as baselines for deep learning.

Week 4: Deep Learning for NLP

- RNNs: Modeling sequences, vanishing gradient problem.

- LSTMs/GRUs: Long-term dependencies, gating mechanisms.
- Hands-on: Build and train sequence models for tasks like text generation or named entity recognition.

Industry Shift: Transformers have largely replaced RNNs/LSTMs for most tasks, but these architectures are still taught for foundational understanding.

Week 5: Transformer Architectures

- BERT: Bidirectional, masked language modeling.
- GPT: Autoregressive, generative pre-training.
- T5: Text-to-text transfer transformer.
- Hugging Face Transformers: Load, fine-tune, and deploy state-of-the-art models.
- Hands-on: Fine-tune BERT/GPT on a custom dataset (e.g., FAQ classification).

Job Market: Fine-tuning pretrained models is a core skill. Hugging Face ecosystem is industry standard.

Week 6: Named Entity Recognition & Sentiment Analysis

- NER: Identifying persons, organizations, locations in text.
- Sentiment Analysis: Detecting polarity (positive, negative, neutral).
- Hands-on: Build NER and sentiment pipelines using SpaCy or Hugging Face.

Live Trend: Multilingual and domain-specific NER is in high demand for global SaaS and enterprise products.

Week 7: Introduction to Chatbot Development

- Rule-Based Bots: Simple pattern matching, decision trees.
- Rasa Framework: Open-source, customizable conversational AI.
- Hands-on: Build a basic FAQ bot with Rasa.

Tooling: Rasa is widely adopted for customizable, on-premise chatbot solutions.

Week 8: Conversational AI with LLMs

- LangChain: Orchestrate multi-step, tool-using chatbots.
- Prompt Engineering: Crafting inputs for GPT-4, Claude, LLaMA.
- Hands-on: Create a chatbot that answers questions using LangChain + OpenAI API.

Market Demand: LLM-powered chatbots are rapidly replacing rule-based systems in customer service, edtech, and healthcare.

Week 9: Multi-turn Conversations & Context Handling

- Memory: Retaining user context across turns.
- State Management: Tracking conversation flow, slots, and entities.
- Hands-on: Enhance your chatbot to handle follow-up questions and contextual replies.

Emerging Trend: Context-aware, multi-modal chatbots (text + voice + image) are the next frontier.

Week 10: Deployment & API Integration

- FastAPI/Flask: Serve your chatbot as a REST API.
- Messaging Platforms: Integrate with Slack, WhatsApp, Messenger via webhooks or official APIs.
- Hands-on: Deploy your bot to a cloud VM, containerize with Docker, and connect to a chat platform.

Production Reality: API-first, containerized, cloud-hosted deployment is the baseline for enterprise chatbots.

Week 11: Analytics, Monitoring & Improvement

- Conversation Analytics: Track user queries, bot responses, drop-off points.
- Feedback Loops: Collect user ratings, retrain models on new data.
- Monitoring: Latency, error rates, data/model drift.
- Hands-on: Instrument your bot with logging and analytics (e.g., Prometheus, Grafana).

Industry Practice: Continuous improvement via analytics and A/B testing is standard in product teams.

Week 12: Capstone & Final Assessment

- Project Scope: Design, build, and deploy a fully functional chatbot (e.g., e-commerce FAQ, healthcare symptom checker, sentiment-driven customer service).
- Deliverables: Code, documentation, deployed API, analytics dashboard, presentation.
- Assessment: Technical quality, scalability, monitoring, user experience.

Portfolio Value: A live, deployed chatbot with analytics is a standout differentiator for job interviews.

Capstone Project Ideas

- AI-Powered FAQ Chatbot: For e-commerce, handles product queries, returns, and recommendations.
- Healthcare Symptom Checker: Asks questions, suggests possible conditions, recommends next steps.
- Sentiment-Driven Customer Service: Routes conversations based on sentiment, escalates negative cases.

Tools & Frameworks (2025 Industry Standard)

- Python: Core language for NLP and deployment.
- Libraries: Hugging Face Transformers, SpaCy, NLTK, Gensim.
- Chatbot Frameworks: Rasa, LangChain, Dialogflow, Microsoft Bot Framework.
- LLM Providers: OpenAI GPT, Anthropic Claude, LLaMA 2, Mistral.
- Deployment: FastAPI, Flask, Docker, Kubernetes, AWS/GCP/Azure.
- Monitoring: Prometheus, Grafana, Evidently, Arize.
- Analytics: ELK Stack, OpenSearch, custom dashboards.

Industry Trends & Job Market Alignment

- Architectures: Transformers (BERT, GPT, T5) dominate; rule-based systems remain for simple, low-cost use cases.
- Techniques: Prompt engineering, fine-tuning, multi-modal NLP, reinforcement learning for dialogue.
- Deployment: Cloud-native, API-first, containerized, with real-time analytics.
- Ethics: Bias, fairness, explainability, and compliance (GDPR, HIPAA) are now baseline expectations.
- Portfolio: Deployed, monitored, analytics-driven projects get you hired.