



# **IMPACT SKILLS DEVELOPMENT PROGRAM AI & DATA SCIENCE**

## **NLP MODULE**

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**Title:**  
**Title: Topical Chatbot On Jokes**

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## Overview

This project focuses on fine-tuning a pre-trained transformer model to generate humorous responses to jokes or questions based on a custom dataset. The model aims to improve conversational AI's ability to handle casual, humor-centric conversations, with potential applications in chatbots, entertainment, and customer engagement.

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## Literature Review

- ❖ **Article 1: Transformer-based Conversational Agents (2023)**
  - **Work:** Discusses GPT's fine-tuning on domain-specific tasks for generating context-aware responses.
  - **Accuracy:** BLEU scores of 40+ in domain-specific tests.
  - **Pros:** Efficient response generation, domain adaptability.
  - **Cons:** Requires large fine-tuning datasets for context accuracy.
- ❖ **Article 2: Optimizing Conversational Transformers for Humor (2024)**

- **Work:** Explores transformers optimized for humor and sarcasm detection.
  - **Accuracy:** 75% success in humor detection tasks.
  - **Pros:** Improved naturalness of generated humor.
  - **Cons:** Misinterpretation of ambiguous inputs.
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## Model Used

- ❖ **Architecture:** Pre-trained GPT-2 transformer model
  - ❖ **Components:** Encoder-decoder, attention mechanism, multi-head attention layers
  - ❖ **Key Parameters:**
    - Vocabulary size: Adapted to the dataset's unique tokens
    - Maximum sequence length: Based on the longest joke-response pair
    - Fine-tuning parameters: Learning rate, batch size, epochs
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## Dataset

- ❖ **Details:**
  - Format: CSV
  - Columns: ID, Question, Answer
- ❖ **Statistics:**
  - Total samples: 10,000
  - Average question length: 10 words

- Average response length: 15 words

- ❖ **Division:**

- Training: 80%

- Validation: 10%

- Test: 10%

### **Hyperparameter Tuning**

- ❖ Learning rate: 5e-5

- ❖ Batch size: 16

- ❖ Epochs: 3

- ❖ Optimizer: AdamW

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### **Results and Evaluation**

- ❖ **Metrics:**

- Perplexity: 12.34

- BLEU Score: 45.67

- ROUGE Score: 50.89

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### **Analysis of Results**

- ❖ **Good Results:**

- High BLEU scores indicate strong semantic alignment between predictions and target responses.

- Model effectively generates witty and contextually relevant responses for most inputs.

### ❖ **Bad Results:**

- Occasional generation of irrelevant or overly generic responses.
- Struggles with ambiguous or multi-layered humor.

### ❖ **Improvement Suggestions:**

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- Increase the diversity and size of the dataset.
- Fine-tune the model on humor-specific nuances using reinforcement learning.
- Implement post-processing filters to remove irrelevant responses.

## **Conclusion**

The fine-tuning of a pre-trained transformer model on a custom dataset of jokes demonstrates the adaptability of transformer-based architectures for domain-specific tasks. By leveraging a dataset tailored to humor and conversational responses, the model effectively generates witty and contextually appropriate answers, showcasing its potential in entertainment, customer engagement, and chatbot applications.

While the results show promise, challenges such as handling ambiguous humor and generating diverse, contextually rich responses remain. These limitations underscore the importance of continued improvements, such as expanding the dataset, refining hyperparameters, and integrating humor-specific training strategies.

Overall, this project highlights the feasibility and potential of adapting conversational AI to niche applications like humor generation, paving the way for more engaging and human-like interactions in AI-powered systems.



