

DAFT.punk

**DeBERTa for Analysis of Feelings in
Italian Texts**

Natural Language Processing
a.y. 2024/25

Coccorullo David
0522501816

Project Summary

There is a **lack** of effective tools for **sentiment analysis of Italian** song lyrics. Songs often use rhetorical devices, metaphors, and cultural references that make it challenging for traditional methods to capture true emotional meaning.

Project Goals

Build a high-quality dataset of Italian song lyrics with detailed emotional labels.

Develop a DeBERTa-based model capable of recognizing seven distinct emotions.

Provide an intuitive web tool for real-time emotion analysis, accessible to both technical and non-technical users.

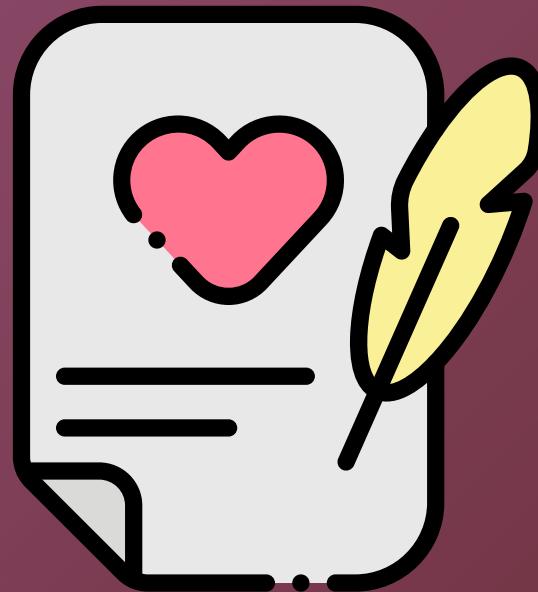
Demonstrate the effectiveness of transformer architectures for analyzing poetic and artistic Italian texts.

Sentiment Analysis

It is a branch of **NLP** that automatically detects and classifies emotions, opinions, or attitudes expressed in text.

Traditional sentiment analysis, like those tasks involved in analyzing reviews, monitoring opinions etc. often uses simple polarity classification, while **emotion detection** is a more **advanced task**.

Problems in Lyrics Analysis



**Metaphors, allegories
etc.**



**Cultural and historical
references**



**Heavy style and
register variety**

Standard Approach Limitations



**Binary Classification
Inadequacy**



**Italian Language
Resources Scarcity**



**Domain Adaptation Issues
for General Models**

Standard Approach Limitations



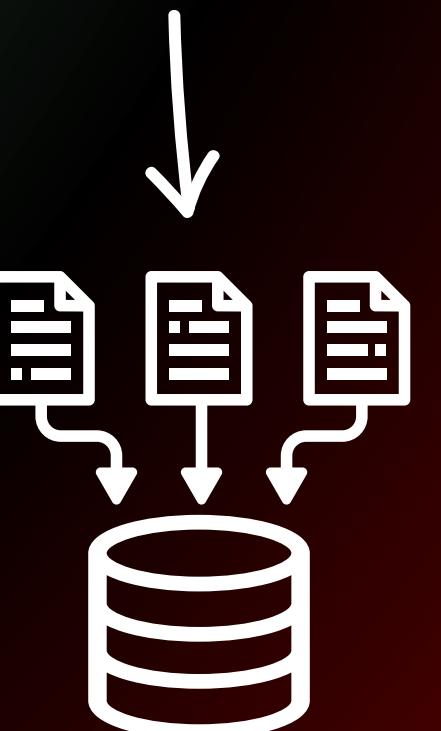
**Binary Classification
Inadequacy**



**Fine-grain Multiclass
Classification**



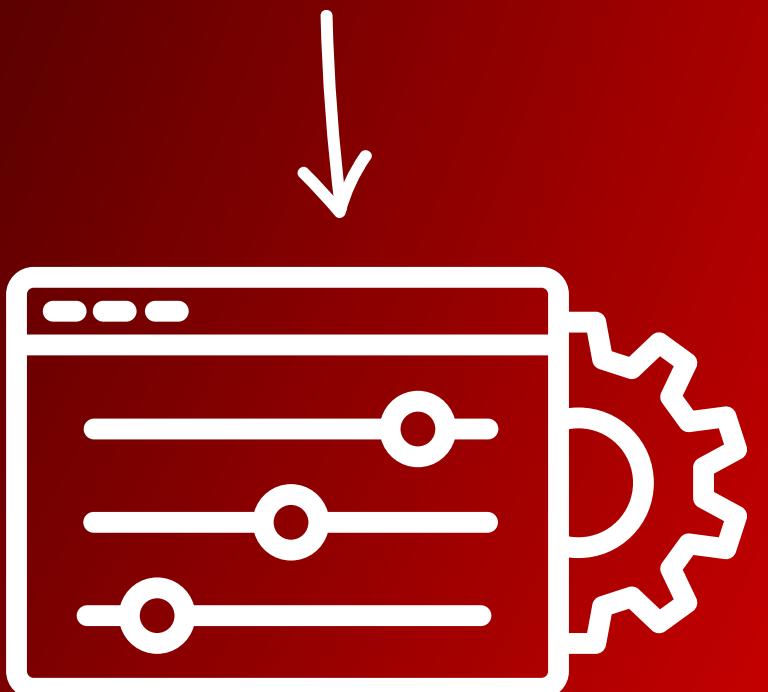
**Italian Language
Resources Scarcity**



**Custom Dataset
Creation**

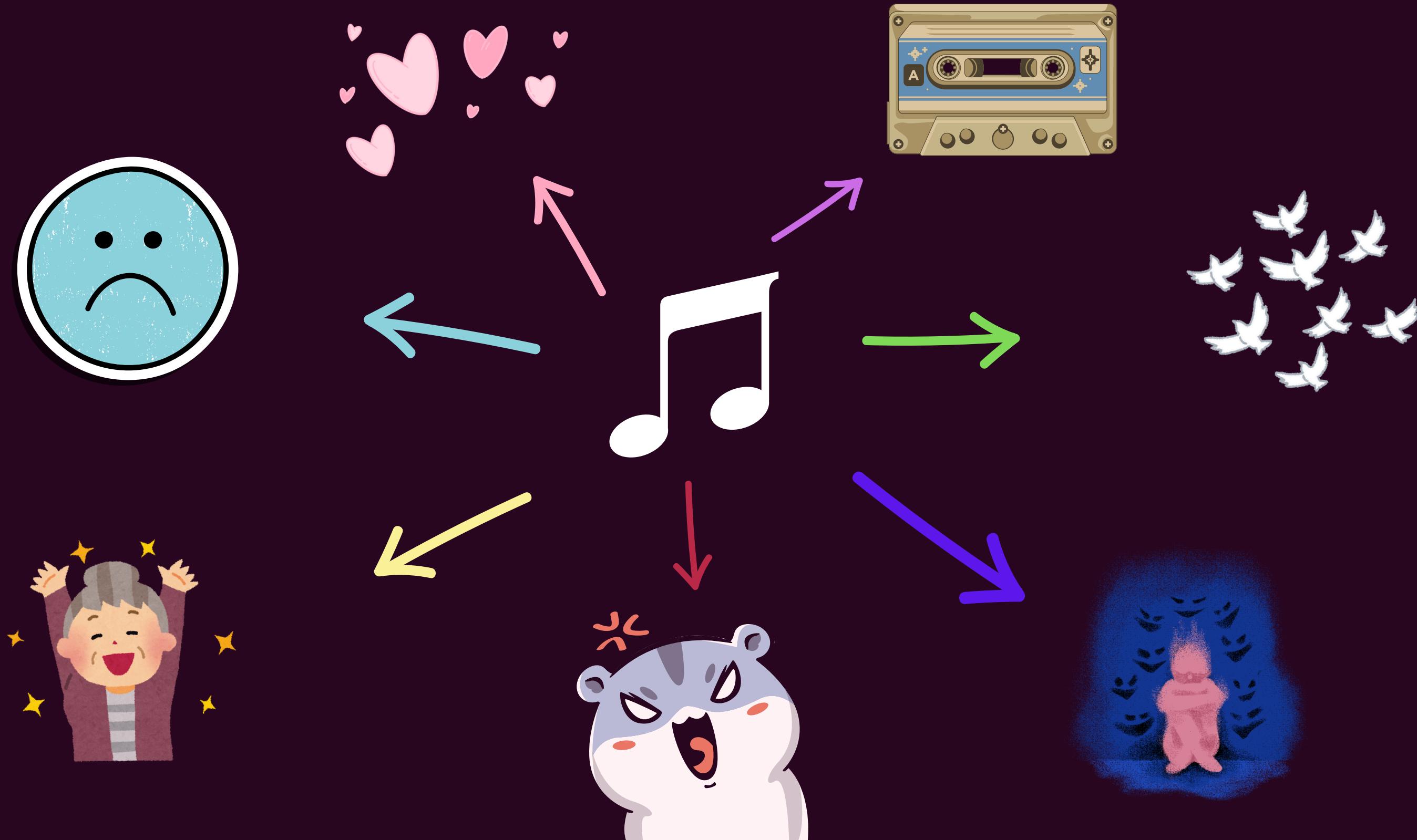


**Domain Adaptation Issues
for General Models**



**Fine Tuning of
DeBERTa**

A seven-class emotion framework has been realized to capture the primary emotional labels prevalent in Italian music.



Dataset Creation

Lyrics Scraping

The screenshot shows a Genius.com page for the song "Forse non è la felicità" by Fast Animals and Slow Kids. The page has a blue header with the title and artist name. Below the header, there are three tabs: "Lyrics" (which is selected), "Q&A", and "Comments". A "Edit Lyrics" button is visible above the lyrics. The lyrics are presented in two sections: "[Strofa 1]" and "[Ritornello]".

[Testo di "Forse non è la felicità"]

[Strofa 1]

Adesso elaboro una scusa
Che mi preservi dal piacere
Di aver guardato quella volta e quella sola
Negli occhi di chi avevo accanto
Se il giorno è tenero, la notte mi consuma
E sfonda gli argini del vino in questa bocca

[Ritornello]

Perché ho ancora la tua lingua
Incastrata fra i miei denti
Sì, ho ancora la tua lingua
Incastrata qui fra i denti miei

Scraping from **Genius.com**
through use of their developer API

Removal of metadata
annotations has been
necessary ("[Strofa 1]",
"[Ritornello]"...)

~10000 lyrics excerpts have been
saved, divided in ~6-8 verses,
which has been a good balancing
value for the training.

Dataset Creation

Annotating through GPT-4

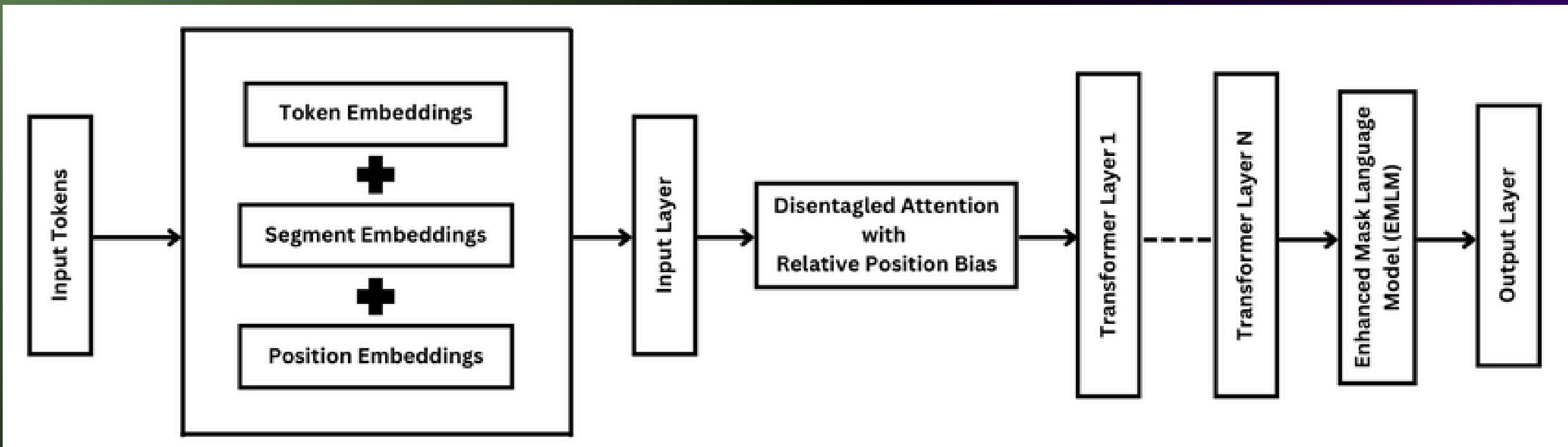
```
def build_prompt(entry):
    lyrics = entry["lyrics"]
    return [
        {"role": "system", "content": "You are an expert in Italian literature and emotion analysis"},
        {"role": "user", "content": (
            "Analyze the emotional sentiment of this Italian song excerpt.\n\n"
            f"Excerpt: \"{lyrics}\"\n\n"
            "Choose ONLY ONE label from: joy, sadness, rage, love, nostalgia, hope, fear.\n\n"
            "Consider the context, word choice, imagery, and emotional tone.\n\n"
            "Format your reply as JSON:\n"
            '{ \"sentiment\": \"nostalgia\" }'
        )}
    ]
```

GPT-4 has been employed as the primary annotation engine,
powered by a carefully crafted prompt.

Outputs have been manually checked as much as possible, but it's
possible that mistakes may have been unnoticed, for economic costs
and time constraints reasons.

Fine-tuning Procedure

Model Architecture



DeBERTa is a disentangled attention version of BERT models, which Italian version has been selected for its performance in this kind of tasks.

Fine-tuning Procedure

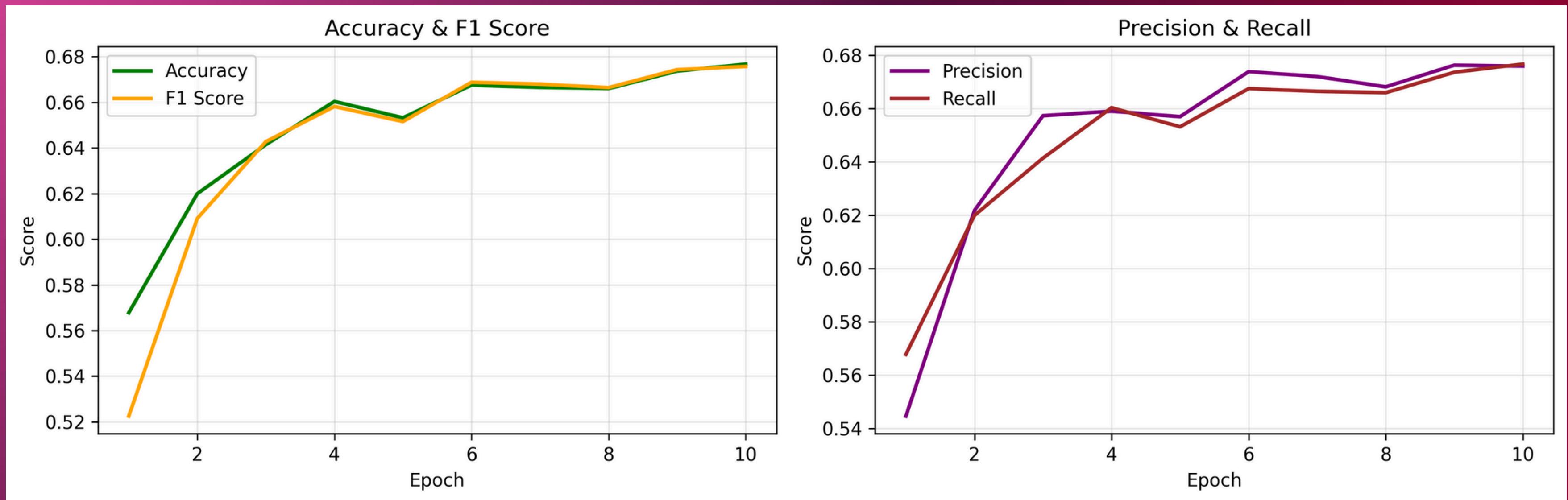
Model Architecture

```
logger.info("Configurazione training...")
training_args = TrainingArguments(
    output_dir=OUTPUT_DIR,
    eval_strategy="epoch",
    save_strategy="epoch",
    learning_rate=3e-5,
    per_device_train_batch_size=16,
    per_device_eval_batch_size=16,
    num_train_epochs=10,
    weight_decay=0.01,
    logging_steps=50,
    seed=71,
    warmup_steps=100,
    fp16=True,
)
```

Temperature Scaling is a technique that helps reducing prediction overconfidence, providing more realistic distributions by dividing the **pre-softmax logits** with a **T parameter** (2.0) **before activating the softmax layer**.

Its introduction is justified by a need of improving the interpretability of the model's emotional classifications and reducing the likelihood of overly confident incorrect predictions.

Results



Accuracy: 67.67%

Joy: 0.551

Rage: 0.619

Nostalgia: 0.691

Sadness: 0.725

Love: 0.718

Hope: 0.645

Fear: 0.500

Web Interface Demo

The screenshot displays the DAFT.punk web interface. At the top center, the logo "DAFT.punk" is shown above the subtitle "DeBERTa for Analysis of Feeling in Italian lyrical Texts". Below the logo, there are two main sections: "Input" on the left and "Results" on the right.

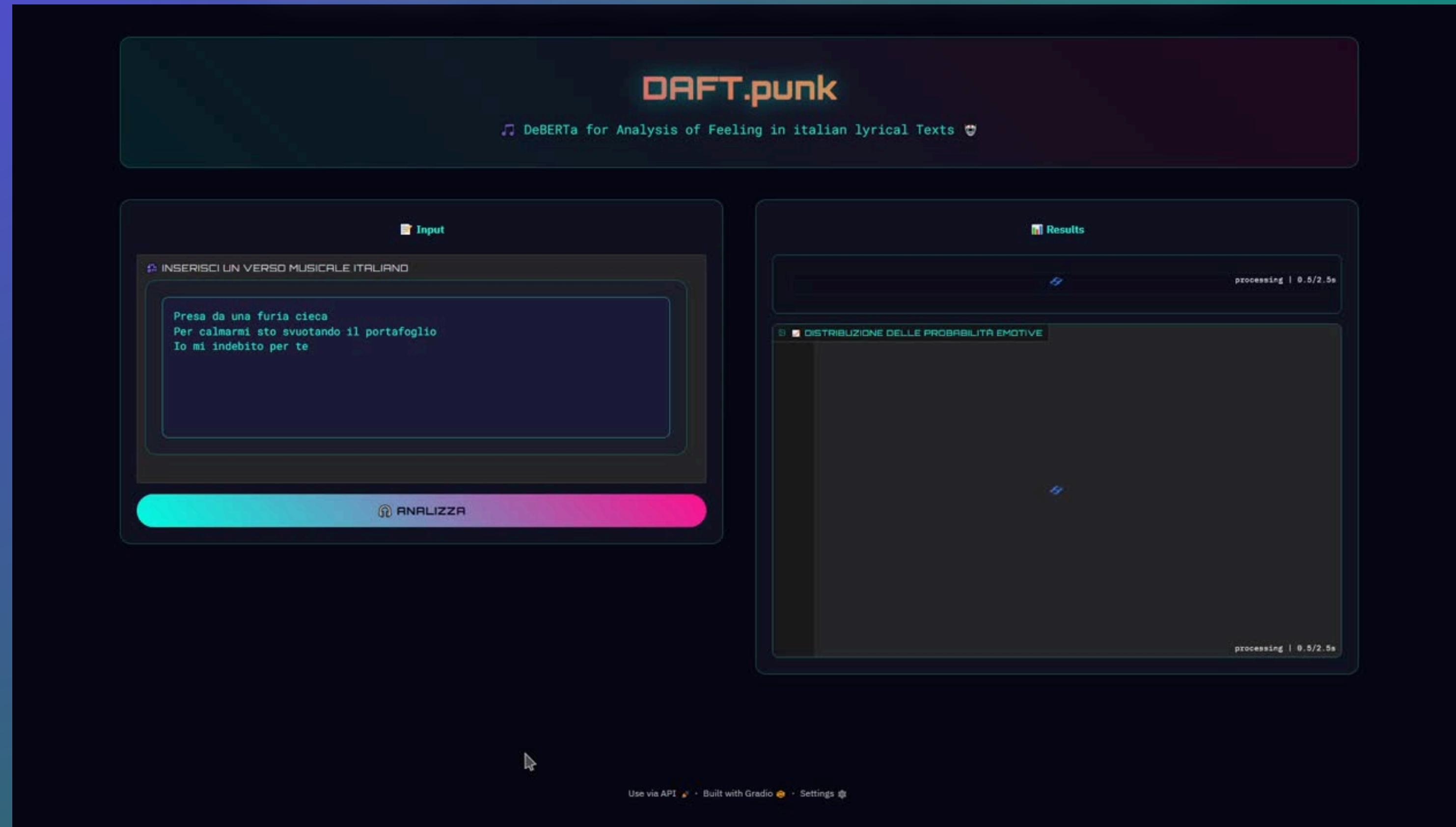
Input Section: This section is titled "Inserisci un verso musicale italiano" (Insert a musical verse in Italian). It contains a text input field with the placeholder text "Fiorivi, sfiorivano le viole...". Below the input field is a button labeled "ANALIZZA" (ANALYZE).

Results Section: This section is titled "DISTRIBUZIONE DELLE PROBABILITÀ EMOTIVE" (EMOTION PROBABILITY DISTRIBUTION). It features a large, dark rectangular area where the analysis results would be displayed.

At the bottom of the interface, there are links: "Use via API" with a gear icon, "Built with Gradio" with a play icon, and "Settings" with a gear icon.

Estratto da “Volare” di Domenico Modugno, 1958

Web Interface Demo



Estratto da “MASCHIO” di Annalisa, 2025

Future Work



Improve Dataset Size
and Annotation



Multi-modal analysis

Thank You

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