Practical Project  
Emotion Detection in Romanian

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**1.Problem Statement**

The goal of this project is to develop an NLP model that can classify **emotions in Romanian-language sentences**. Given a text input, the model predicts one of the predefined emotion classes.

**2.Proposed Solution**

**2.1 Theoretical aspects**

The solution leverages a pre-trained transformer-based model, **XLM-RoBERTa**, which is fine-tuned for the emotion classification task.

The model is trained using **CrossEntropyLoss** and optimized with the **AdamW** optimizer. A learning rate scheduler is used to adjust the learning rate dynamically during training.

**2.2 Dataset**

The dataset on which the model was trained is a Romanian Emotion Detection dataset created from Twitter messages. It contains three CSV files: train.csv, val.csv, and test.csv, each containing tweets labeled with one of five emotion categories. These categories are "Bucurie", "Furie”, "Frica”, "Tristete", and "Neutru". The primary columns of interest are Tweet and Emotion, with additional metadata possibly present.

The dataset consists of three parts:

* **Training Set**: Used to train the model. (3237 tweets)
* **Validation Set**: Used to tune hyperparameters and prevent overfitting. (405 tweets)
* **Test Set**: Used to evaluate the model's performance. (405 tweets)

| **Class Name** | **No. of labelled tweets** |
| --- | --- |
| Anger | 807 |
| Fear | 778 |
| Joy | 876 |
| Sadness | 781 |
| Neutral | 805 |

**2.3 Application**

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**3.Implementation**

Libraries/Functions Used

* Transformers: For the XLM-RoBERTa model and tokenizer.
* PyTorch: For model training and evaluation.
* Scikit-learn: For label encoding and evaluation metrics.
* Matplotlib/Seaborn: For visualizing results (e.g., confusion matrix).
* Joblib: For saving and loading the LabelEncoder.

The project is organized on more directories. Inside, the data folder holds the dataset CSVs. There are also Python scripts such as train\_bert\_model.py for training the model, torch\_dataset\_creator.py, custom dataset loader (CustomDataset) for tokenizing and batching data, BERT\_EmotionClassifier.py for defining the model architecture. After training, the best model is saved in best\_model.bin.

Upon completion of training, the project outputs a trained model capable of classifying Romanian text into emotional categories. Accuracy metrics for both training and validation are tracked and plotted using Matplotlib inside the evaluate.py script. The final model is saved in a .bin file for later use. Implementation of a testing script to evaluate the model on sentences in the test.py file.

**4.Experiments and results**

Some statistics of the model:

Training accuracy:  
Epoch 1/5

Training loss 1.0631 accuracy 0.5922

Validation loss 0.5771 accuracy 0.8320

Epoch 2/5

Training loss 0.4266 accuracy 0.8736

Validation loss 0.4442 accuracy 0.8839

Epoch 3/5

Training loss 0.2744 accuracy 0.9345

Validation loss 0.5197 accuracy 0.9012

Epoch 4/5

Training loss 0.1831 accuracy 0.9604

Validation loss 0.5398 accuracy 0.9111

Epoch 5/5

Training loss 0.1161 accuracy 0.9740

Validation loss 0.5608 accuracy 0.9160

F1 score:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Emotion | Precision | Recall | F1-score | Support |
| Bucurie | 0.96 | 0.96 | 0.96 | 94 |
| Furie | 0.91 | 0.94 | 0.92 | 77 |
| Frica | 0.94 | 0.92 | 0.93 | 63 |
| Tristete | 0.96 | 0.90 | 0.93 | 87 |
| Neutru | 0.92 | 0.98 | 0.95 | 84 |

Weighted F1 Score: 0.9382

Confusion Matrix:

A screenshot of a graph

AI-generated content may be incorrect.

A graph of a line

AI-generated content may be incorrect.

Tests:

Input Text: Ma simt fericit ca am terminat proiectul, dar sunt si putin stresat pentru prezentare.

Predicted Emotion: Bucurie (Confidence: 0.98)

Input Text: Am castigat un premiu, dar ma simt ciudat pentru ca prietenul meu nu a castigat.

Predicted Emotion: Frica (Confidence: 0.89)

Input Text: Astazi este o zi obisnuita, nimic special.

Predicted Emotion: Neutru (Confidence: 0.71)

References:

[RED: A Novel Dataset for Romanian Emotion Detection from Tweets](https://aclanthology.org/2021.ranlp-1.34/) (Ciobotaru & Dinu, RANLP 2021)