PolEval 2024
Emotion and sentiment recognition task

Emotion and Sentiment Recognition using Ensemble Models

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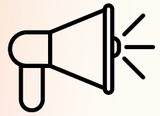
Model Overview

Proposed Solution

- Use an **ensemble** of **five classical machine learning algorithms** to enhance accuracy and robustness

Key Model Features

- Input is transformed into **76 numerical features** for training
- Features include both discrete and continuous variables



Ensemble Strategy

- Combine predictions from diverse models
- Final decision made via **majority voting mechanism**

Numerical Dataset Transformation

Purpose of Numerical Transformation

- Prepare text reviews for machine learning by converting them into **numerical features**

Overview of Transformation Process

- Each dataset is represented by **76 features per example**
- Features are **scaled to the range [0, 1]**
- Features include both discrete and continuous values

Building Blocks for Features

- **4 text variants** from preprocessing and correction
- **19 features extracted per variant** using NLP models

Key Motivation

- Diverse numerical representation captures multiple perspectives, enabling robust predictions

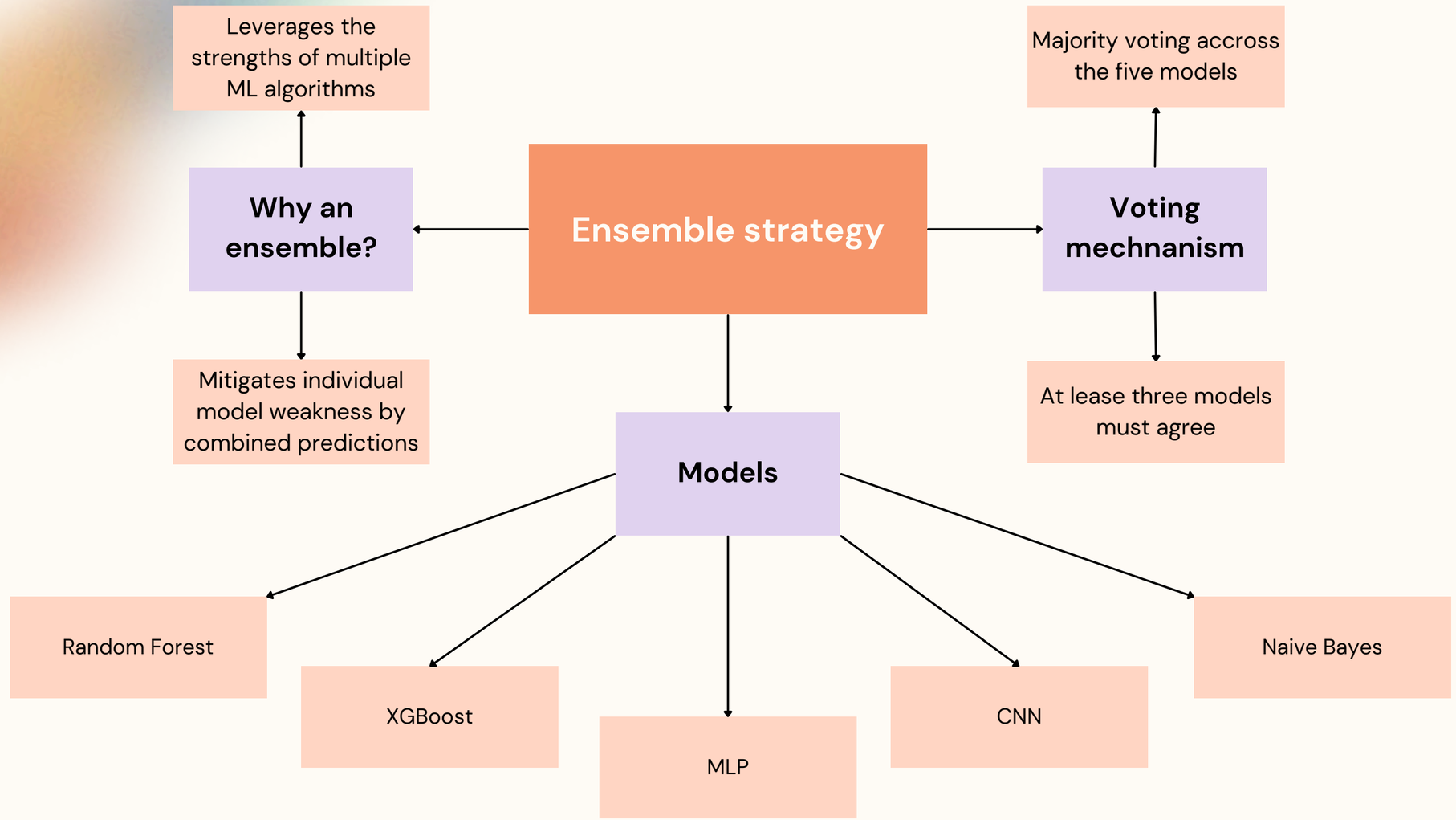
4 Text Dataset Variants

- **Baseline**: original dataset provided by the organizers
- **GPT Corrected**: corrected by GPT-3.5 for proper Polish language
- **Preprocessed Baseline**: baseline dataset with preprocessing applied:
  - lowercasing
  - removing non-word characters
  - stripping extra spaces
- **Preprocessed GPT**: *preprocessed* version of the GPT-corrected dataset.

19 Features per Dataset Variant

Feature Breakdown	• Each text variant contributes **19 features**, resulting in **76 features per review** • Capture emotional and sentiment nuances to feed into ensemble models
LSTM Model	• Extract **11 features** per emotion / sentiment • Embedding layer (128 dimensions); LSTM layer (64 units); Activation: sigmoid
Herbert	• __ *dkleczek/Polish-Hate-Speech-Detection-Herbert-Large* • Provides **2 features** (binary label + score)
XLM-RoBERTa	• __ *cardiffnlp/twitter-xlm-roberta-base-sentiment* • Provides **4 features** (sentiment categories + confidence score)
Multilingual BERT	• __ *nlptown/bert-base-multilingual-uncased-sentiment* • Provides **2 features** (label + score)

Ensemble strategy



Paths to Improvement

Feature Reduction	Apply dimensionality reduction techniques (e.g., PCA)
Data Augmentation	Generate synthetic data to increase training size and diversity
Fine-Tuning Pretrained Models	Optimize Hugging Face models for task-specific nuances
Advanced Voting Mechanisms	Use weighted voting based on model confidence scores
Regularization Techniques	Employ methods e.g., dropout, weight decay, to reduce overfitting
Explainable AI Integration	Implement tools e.g., SHAP, LIME, to better understand and refine

Thank You :)

GitHub repository

Any questions?