**Model Architecture**

**1. Overview**

The model is a **Hierarchical Text Classifier** based on roberta-large. It classifies text into two levels:

* **Level 1:** Broad categories
* **Level 2:** Subcategories within Level 1

**2. Base Model: RoBERTa-Large**

* Pretrained Transformer model from Hugging Face.
* Outputs contextualized token embeddings.
* Uses [CLS] token representation for classification.

**3. Model Components**

**3.1 Input Processing**

* Input: [CLS] context [SEP] comment [SEP]
* Tokenized using AutoTokenizer.
* Converts input text into:
  + input\_ids
  + attention\_mask

**3.2 Classification Layers**

* **Dropout Layer:** Prevents overfitting (p=0.3).
* **Two Linear Layers:**
  + classifier\_1: Predicts level\_1 category.
  + classifier\_2: Predicts level\_2 subcategory.

**3.3 Forward Pass**

1. Input passes through RoBERTa.
2. Extract [CLS] token representation.
3. Apply dropout.
4. Pass through classifier\_1 and classifier\_2.
5. Compute logits for both levels.

**4. Loss Function**

* Uses CrossEntropyLoss().
* Computes loss separately for level\_1 and level\_2.
* **Final Loss:** loss\_1 + loss\_2.

**5. Training Configuration**

* **Batch Size:** 8
* **Optimizer:** AdamW with weight decay (0.01)
* **Evaluation Strategy:** Per epoch
* **Metric:** overall\_accuracy
* **Best Model Selection:** Based on highest accuracy

**6. Model Saving & Deployment**

* Saves base model and classifiers.
* Saves config.json with label mappings.
* Can be reloaded for inference.

**7. Next Steps**

* **Fine-tuning on domain-specific data.**
* **Hyperparameter tuning for better accuracy.**
* **Explainability using SHAP visualizations.**