Model Optimization and Tuning Phase Template

Date	11 March 2025
Team ID	740052
Project Title	AI-Based Intelligent Insight Extractor
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Hyperparameter Tuning Documentation (6 Marks):

Model	Tuned Hyperparameters	Optimal Values
Spacy Pipeline	……...	……...
Word Tokenization	………..	……...
Sentence Tokenization	…..…...	……...
HeapQ	……. ……	………..

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric

Load Spacy Pipeline	**Load Spacy Language Pipeline**
	
	```[5] #Loading english language.....(3 different packages are available --small--medium--large). We are loading small packages.```
	``` nlp = spacy.load('en_core_web_sm')```
	
	```[6] #We are passing the input data to spacy```
	``` docs = nlp(doc)```
	``` print(doc)```

Word Tokenization	**Word Tokenization**
	
	```[7] #Word tokenization is performed```
	``` tokens = [i.text for i in docs]```
	``` print(tokens)```
	
	```['Artificial', 'neural', 'networks', 'are', 'the', 'brains', 'behind', 'some', 'of', 'the', 'most', 'sophisticated', 'applications', 'of', 'artificial', 'intelligence', '(', 'AI', ')',```

Sentence Tokenization	**Sentence Tokenization**
	
	```[11] sent_tokens = [sent for sent in docs.sents]```
	``` print(sent_tokens)```
	
	```[Artificial neural networks are the brains behind some of the most sophisticated applications of artificial intelligence (AI)., But that doesn't mean understanding the different types n```
	```, In machine learning, each type of artificial neural network is tailored to perform certain sets of tasks., In order to explain these tasks and the best approaches to completing them,```
	```, What's the difference between CNN and RNN?```
	```, The main difference between a CNN and an RNN is the ability to process temporal information – data that comes in sequences, such as a sentence., Recurrent neural networks are designed```
	```, CNNs employ filters within convolutional layers to transform data (more on that later), whereas RNNs are predictive, reusing activation functions from other data points in the sequenc```
	```, Once you look at the structure of both types of neural networks and understand what they are used for, the difference between CNN and RNN becomes more clear.]```

| HeapQ | ```
[13] from heapq import nlargest

[14] select_len = int(len(sent_tokens)*0.3)
     select_len

     3

[15] summary = nlargest(select_len, sentence_score, sentence_score.get)
     summary

     [In order to explain these tasks and the best approaches to completing them, this article will introduce two types of artificial neural networks: convolutional neural networks (CNNs)
     and recurrent neural networks (RNNs).,
      Recurrent neural networks are designed for this very purpose, while convolutional neural networks are incapable of effectively interpreting temporal information.,
      When it comes to artificial neural networks – computing systems that mimic components of the brain – there are serious differences in type.]

[16] summary = [word.text for word in summary]
     summary
``` |

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
HeapQ	The HeapQ was selected for its superior performance, exhibiting high accuracy. Its ability to handle complex relationships, minimize overfitting, and optimize predictive accuracy aligns with project objectives, justifying its selection as the final model.