SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

QUESTION BANK

V SEMESTER

AD3563 – TEXT AND SPEECH ANALYSIS

Regulation – 2023

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Prepared by

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SUBJECT : AD3563 & TEXT-AND-SPEECH-ANALYSIS
YEAR/SEM : III Year / V Semester

UNIT I NATURAL LANGUAGE BASICS

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model – Text Similarity (Similarity Metrics used in Text Analytics).

PART – A

Q.No	Questions	BT Level	Competence
1	What are the basic steps of natural language processing?	BTL1	Remember
2	What do you mean by corpus?	BTL1	Remember
3	Mention some applications of NLP.	BTL1	Remember
4	Define the concept of bag of words	BTL2	Understand
5	Define fast text model.	BTL2	Understand
6	List out limitations of RNN.	BTL1	Remember
7	Define Information Retrieval system.	BTL1	Remember
8	Define transformers.	BTL2	Understand
9	What is text tokenization ?	BTL1	Remember
10	What is entity analysis?	BTL2	Understand
11	Define discourse integration.	BTL2	Understand
12	Mention some typical parsing techniques.	BTL1	Remember
13	Define language syntax.	BTL1	Remember
14	What are the common steps involved in text preprocessing?	BTL1	Remember
15	Mention two techniques used in text cleaning.	BTL1	Remember
16	Differentiate between word-level and sentence-level tokenization.	BTL2	Understand
17	Define feature engineering in the context of text data	BTL1	Remember
18	List any two techniques used in feature extraction.	BTL1	Remember
19	Define cosine similarity in the context of text.	BTL1	Remember
20	Why is removing stop words important in NLP?	BTL2	Understand
21	Compare stemming and lemmatization.	BTL2	Understand
22	What is part-of-speech tagging?	BTL1	Remember
23	What are the limitations of Bag of Words model?	BTL2	Understand
24	List any two text similarity metrics used in text analytics.	BTL1	Remember

PART-B

1	Critically analyze the core components of Natural Language Processing and evaluate their interdependence.	BTL5	Evaluate
2	Apply the concepts of language syntax and structure to analyze a given sentence. Identify its syntactic components and explain their role in NLP tasks.	BTL3	Apply
3	Explain about feature engineering for text representation.	BTL3	Apply
4	Compare and contrast the Bag of Words and N-Gram models in terms of contextual understanding and sparsity.	BTL4	Analyze

5	Elaborate the problems associated with ngram model and how these are solved?	BTL3	Apply
6	Illustrate parts of speech tagging and explain different categories of POS tagging	BTL3	Apply
7	Design and explain a workflow for preprocessing a raw corpus of text including normalization, tokenization, and cleaning.	BTL6	Create
8	Explain the importance of removing stop words in text processing. How does it affect text representation models?	BTL3	Apply
9	Evaluate different text similarity measures for short text comparison in a sentiment analysis task.	BTL5	Evaluate
10	Illustrate the use of context-free grammar (CFG) in syntactic analysis of natural language. Give suitable examples.	BTL3	Apply
11	Describe the use of TF-IDF vectors in document classification tasks. What are its benefits and drawbacks?	BTL3	Apply
12	(a) Analyze how text normalization improves NLP model accuracy. (8) (b) Compare normalization techniques. (8)	BTL4	Analyze
13	Describe with examples how similarity measures can be used in question answering systems and search engines.	BTL3	Apply
14	(a) Evaluate impact of removing stop words on sentiment analysis. (8) (b) Justify use of TF-IDF over BoW. (8)	BTL5	Evaluate
15	Analyze the importance of domain-specific corpus selection for text analytics in healthcare or legal NLP applications.	BTL5	Evaluate
16	Evaluate the limitations of Bag of Words for large document collections and suggest improvements.	BTL5	Evaluate
17	Develop a complete pipeline for preprocessing, representing, and comparing documents using similarity metrics. Justify each step.	BTL6	Create

UNIT II TEXT CLASSIFICATION

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model – FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models.

PART – A

Q.No	Questions	BT Level	Competence
1	Give some examples of text classification.	BTL2	Understand
2	What is vector semantics in NLP?	BTL1	Remember
3	Define word embedding.	BTL1	Remember
4	Differentiate between one-hot encoding and word embeddings.	BTL2	Understand
5	Give some merits of deep learning.	BTL1	Remember
6	What is the main objective of the Word2Vec model?	BTL1	Remember
7	What is skip gram?	BTL1	Remember
8	Where is glove used?	BTL2	Understand
9	List the approach on window-based methods.	BTL2	Understand
10	What is the role of self-attention in Transformers?	BTL2	Understand
11	What is multihead attention?	BTL1	Remember
12	List out two types of summarization techniques.	BTL1	Remember
13	Give any two benefits of topic modeling.	BTL2	Understand
14	What is LDA?	BTL2	Understand
15	What is pachinko allocation model?	BTL2	Understand
16	Why is GloVe called a count-based model?	BTL2	Understand
17	Define subword information in FastText.	BTL1	Remember
18	Define Recurrent Neural Network (RNN).	BTL1	Remember
19	Define text summarization.	BTL1	Remember

20	Differentiate between extractive and abstractive summarization.	BTL2	Understand
21	Mention the key innovation introduced by Transformer architecture.	BTL2	Understand
22	What is vanishing gradient problem in RNN?	BTL2	Understand
23	List two applications of FastText.	BTL1	Remember
24	What is the main advantage of FastText over Word2Vec?	BTL2	Understand
	PART-B		
1	Describe how the GloVe and FastText models are used to generate word embeddings and apply them in solving NLP tasks with examples.	BTL3	Apply
2	Illustrate how overview of deep learning models specifies the analysis of RNN?	BTL3	Apply
3	Explain in detail about transformers.	BTL3	Apply
4	Explain how embedding techniques are useful in sentiment analysis with example models.	BTL3	Apply
5	Analyze the structure and functionality of WordNet and evaluate its applications in various NLP tasks with suitable examples	BTL4	Analyze
6	Outline the concepts of feedback modeling with examples.	BTL4	Analyze
7	Describe the working of FastText model. Highlight how it handles out-of-vocabulary (OOV) words.	BTL3	Apply
8	Discuss the architecture and working of the Word2Vec model. Illustrate with suitable diagrams.	BTL3	Apply
9	Explain how the GloVe model is built using a co-occurrence matrix. Derive the objective function.	BTL5	Evaluate
10	Compare RNNs and Transformers in terms of architecture, training efficiency, and performance in NLP tasks.	BTL4	Analyze
11	Describe in detail how Transformers work. Explain the role of self-attention and positional encoding.	BTL3	Apply
12	Explain the architecture of RNN with a focus on sequence modeling. Discuss how vanishing gradient affects it.	BTL4	Analyze
13	Analyze the limitations of traditional word embeddings and explain how context-based models like BERT differ.	BTL5	Evaluate
14	Evaluate the strengths and weaknesses of topic modeling approaches: LDA vs NMF vs LSI.	BTL5	Evaluate
15	Illustrate how attention mechanisms improve NLP performance. Give a case study on its role in translation.	BTL5	Evaluate
16	Explain extractive and abstractive text summarization. Discuss algorithms used for both.	BTL4	Analyze
17	Design a pipeline for topic modeling using Latent Dirichlet Allocation (LDA). Explain each stage clearly.	BTL6	Create

UNIT III QUESTION ANSWERING AND DIALOGUE SYSTEMS

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems -– evaluating dialogue systems.

PART – A

Q.No	Questions	BT Level	Competence
1	Define QA systems and its advantages.	BTL1	Remember
2	What is Information Retreival?	BTL1	Remember
3	What are the aspects of Ad-hoc Retrieval?	BTL2	Understand
4	Mention any two types of Information Retrieval Model?	BTL1	Remember
5	What are some important merits of IR Model?	BTL2	Understand
6	List 3 advantages of Boolean Model.	BTL1	Remember

7	What are the shortcomings of standard Boolean Approach?	BTL2	Understand
8	Why Vector space model is used?	BTL2	Understand
9	What is lexical Scanning?	BTL1	Remember
10	List some disadvantages of Vector Space Model.	BTL2	Understand
11	List two popular pre-trained language models used in QA.	BTL1	Remember
12	Define explicit Feedback.	BTL1	Remember
13	Differentiate between Implicit and Psuedo Feedback.	BTL2	Understand
14	Give some examples for IR-Based QA.	BTL1	Remember
15	What is Query Formulation?	BTL1	Remember
16	What is knowledge-based QA?	BTL1	Remember
17	Differentiate structured and unstructured data in QA.	BTL2	Understand
18	What is a language model in QA?	BTL1	Remember
19	How do language models help improve QA accuracy?	BTL2	Understand
20	State the function of answer ranking in classic QA.	BTL2	Understand
21	What are classic QA systems?	BTL1	Remember
22	Define chatbot.	BTL1	Remember
23	What is the importance of context tracking in dialogue systems?	BTL2	Understand
24	State difference between task-oriented and open-domain chatbots.	BTL2	Understand
	PART-B		
1	Describe the architecture and working of Document and Passage Retrieval systems. Highlight the key differences between them and analyze their applicability in various information retrieval scenarios.	BTL4	Analyze
2	Illustrate about language models for Information Retrieval.	BTL3	Apply
3	Evaluate different types of language models used in information retrieval, comparing their performance, scalability, and contextual capabilities. Support your evaluation with examples.	BTL5	Evaluate
4	Evaluate classic question answering models based on rule-based and IR-based approaches. Assess their relevance and limitations in the context of modern QA systems	BTL5	Evaluate
5	Analyze about the components of BERT in detail with architecture.	BTL4	Analyze
6	Outline the chatbots scenario with real time agents in detail.	BTL4	Analyze
7	Discuss about Vector Space model with derivations and related Formula.	BTL3	Apply
8	(a) Describe different types of knowledge sources used in Knowledge-based QA (8) (b) Explain the role of ontologies and knowledge graphs in QA systems. (8)	BTL3	Apply
9	(a) Analyze the evaluation process of a dialogue system by identifying its key components and their roles. (6) (b) Examine the different evaluation metrics used for assessing task completion and user satisfaction. (10)	BTL4	Analyze
10	Explain classic QA models. Analyze their relevance in the era of neural and transformer-based approaches.	BTL4	Analyze
11	Illustrate IR-based question answering with a suitable workflow diagram. Compare it with knowledge-based QA systems.	BTL3	Apply
12	Describe the structure and functioning of a chatbot. Analyze how task-oriented chatbots differ from open-domain chatbots.	BTL4	Analyze
13	Analyze the structure and flow of a dialogue system. Discuss how Natural Language Understanding (NLU), Dialogue Manager, and NLG interact.	BTL4	Analyze
14	Explain the role of pre-trained models (e.g., BERT, GPT) in improving QA accuracy.	BTL4	Analyze
15	(a) Describe the functioning of a language model in a QA system. (6) (b) Explain the role of pre-trained models (e.g., BERT, GPT) in improving QA accuracy. (10)	BTL3	Apply
16	Design a task-oriented chatbot for a healthcare scenario. Include dialogue flow,	BTL6	Create

	intent recognition, and system response handling.		
17	Design a dialogue system architecture for a customer service application. Highlight the role of NLU, DM, and NLG components.	BTL6	Create

UNIT IV TEXT-TO-SPEECH SYNTHESIS

Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems.

PART – A

Q.No	Questions	BT Level	Competence
1	Define speech recognition.	BTL1	Remember
2	Define autoregressive model in the context of speech synthesis.	BTL1	Remember
3	What is speech synthesis?	BTL1	Remember
4	List some of the applications for announcement systems.	BTL1	Remember
5	What are the 3 stages in which speech synthesis works?	BTL2	Understand
6	Expand ASR.	BTL1	Remember
7	What is case normalization?	BTL1	Remember
8	Why it is difficult for a person to create a letter-to-sound module?	BTL2	Understand
9	List the two types of letter to sound modules.	BTL1	Remember
10	Differentiate between pitch and intensity.	BTL2	Understand
11	Define concatenative synthesis.	BTL1	Remember
12	What kind of databases does unit selection use?	BTL1	Remember
13	What is diphone synthesis?	BTL1	Remember
14	Mention two advantages of deep learning-based TTS over traditional methods.	BTL2	Understand
15	Define Articulatory synthesis.	BTL1	Remember
16	Differentiate between normalization and tokenization.	BTL2	Understand
17	What is a letter-to-sound rule?	BTL1	Remember
18	How does letter-to-sound processing improve pronunciation in TTS?	BTL2	Understand
19	List the main prosodic features in speech.	BTL1	Remember
20	What is the role of signal processing in TTS systems?	BTL2	Understand
21	Define pitch and its significance in speech synthesis.	BTL1	Remember
22	Differentiate between speech rate and pitch modulation.	BTL2	Understand
23	Define concatenative speech synthesis.	BTL1	Remember
24	What is a parametric TTS model?	BTL1	Remember

PART-B

1	Analyze the process of text normalization by breaking down its major steps. How does each step contribute to improving speech synthesis accuracy	BTL4	Analyze
2	Illustrate about PROSODY Analysis and evaluation in detail with examples.	BTL3	Apply
3	Explain about Signal Processing in detail with algorithms.	BTL4	Analyze
4	Analyze the various types of speech synthesis techniques.	BTL4	Analyze
5	Outline the features of RBM with related examples.	BTL3	Apply
6	Analyze about Deep-learning based synthesis in detail.	BTL4	Analyze
7	Analyze the design and functional components of announcement systems. Discuss how TTS modules are integrated and optimized for public communication tasks.	BTL4	Analyze
8	Design a workflow for a complete TTS system from input text to waveform output using deep learning models.	BTL6	Create
9	Evaluate the effectiveness of WaveNet architecture compared to HMM-based parametric TTS systems.	BTL5	Evaluate
10	Analyze the role of pitch tracking, formant synthesis, and signal smoothing in TTS	BTL4	Analyze

	systems.		
11	Show how parametric synthesis controls speech features such as pitch, formant, and spectral envelope using a block diagram.	BTL3	Apply
12	Describe the feature extraction and synthesis flow in Statistical Parametric Speech Synthesis (SPSS) with the help of a suitable example or system workflow.	BTL3	Apply
13	Justify the use of deep learning models in place of traditional signal processing methods for TTS with supporting examples.	BTL5	Evaluate
14	Evaluate the effectiveness of end-to-end neural TTS systems on speech quality and latency.	BTL5	Evaluate
15	Evaluate how prosodic modeling affects the naturalness and intelligibility of synthetic speech.	BTL5	Evaluate
16	Evaluate the performance of WaveNet and Parallel WaveGAN vocoders based on synthesis quality, speed, and deployment feasibility.	BTL6	Create
17	Design a text normalization pipeline suitable for multilingual TTS systems.	BTL6	Create

UNIT V AUTOMATIC SPEECH RECOGNITION

Speech recognition: Feature Extraction - Acoustic modeling – HMM, HMM-DNN systems – Language Models – LSTM – Decoding Strategies – Evaluation of ASR systems – Word Error rate, Recognition accuracy.

PART – A

Q.No	Questions	BT Level	Competence
1	What are the features of speech recognition systems?	BTL1	Remember
2	List different speech recognition algorithms.	BTL1	Remember
3	What is acousting modelling?	BTL1	Remember
4	Define telephony-based speech recognition.	BTL1	Remember
5	How feature extraction is used in speech recognition?	BTL2	Understand
6	Why training data is necessary for acoustic modelling?	BTL2	Understand
7	Expand HMM.	BTL1	Remember
8	What are the hidden states in HMM?	BTL2	Understand
9	How do you label a speaker?	BTL2	Understand
10	What is profanity filtering?	BTL2	Understand
11	Define NLP.	BTL1	Remember
12	List some of the advantages of machine-human communication.	BTL1	Remember
13	Why there is a lack of speed in speech recognition systems?	BTL2	Understand
14	What are the characteristics of speech audio?	BTL1	Remember
15	Give some examples for mobile device speech recognition.	BTL1	Remember
16	Define word error rate (WER).	BTL1	Remember
17	How does a language model support speech recognition?	BTL2	Understand
18	What is the significance of using a deep neural network in HMM-DNN hybrid models?	BTL2	Understand
19	State any two commonly used features in speech recognition.	BTL1	Remember
20	What is the purpose of the HMM in ASR?	BTL2	Understand
21	What is the function of the decoder in ASR systems?	BTL1	Remember
22	How do LSTM models help in speech recognition tasks	BTL2	Understand
23	What is a language model in ASR?	BTL1	Remember
24	Differentiate between WER and recognition accuracy.	BTL2	Understand
PART-B			
1	Explain about Desktop-based speech recognition in detail.	BTL3	Apply
2	Justify the importance of proper feature extraction techniques in achieving high recognition accuracy in speech recognition systems	BTL5	Evaluate

3	Construct and explain the architecture of a Hidden Markov Model (HMM) used in speech recognition systems.	BTL3	Apply
4	Illustrate Deep Neural Network-Hidden Markov Model systems in detail.	BTL3	Apply
5	Analyze the key functional features of machine-human communication in modern speech recognition interfaces (e.g., voice assistants, smart homes).	BTL4	Analyze
6	Analyze the simplicity involved in language weighting with any communication models in detail.	BTL4	Analyze
7	Examine the relationship between word error rate and recognition accuracy in evaluating ASR performance.	BTL4	Analyze
8	Compare HMM-based and DNN-based acoustic modeling techniques in terms of performance and scalability.	BTL4	Analyze
9	Examine the role of LSTM vs traditional RNNs in capturing long-term dependencies in speech sequences.	BTL4	Analyze
10	Demonstrate the step-by-step process of calculating word error rate (WER) with a sample reference and hypothesis transcript.	BTL3	Apply
11	Illustrate the process of MFCC feature extraction from a raw speech signal and explain how each stage contributes to effective speech recognition.	BTL3	Apply
12	Analyze the role of contextual information in decoding strategies of ASR.	BTL4	Analyze
13	Evaluate the role of bidirectional LSTM in enhancing the language modeling capability in speech recognition.	BTL5	Evaluate
14	Evaluate the effectiveness of a hybrid acoustic model architecture that combines CNN, LSTM, and HMM for multilingual speech recognition.	BTL5	Evaluate
15	Evaluate the effectiveness of LSTM models compared to n-gram language models in ASR.	BTL5	Evaluate
16	Design an ASR evaluation framework that combines multiple metrics (WER, Accuracy, Real-Time Factor) for comprehensive performance analysis.	BTL6	Create
17.	Design a complete speech recognition pipeline using HMM-DNN architecture. Include feature extraction, acoustic modeling, language modeling, decoding, and evaluation stages.	BTL6	Create

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