Introduction to Digital Speech Processing, Final Exam

Jan. 11, 2017, 10:00-12:00

- OPEN Lecture Power Point (Printed Version) and Personal Notes
- You have to use CHINESE sentences to answer all the questions, but you can use English terminologies
- Total points: 165

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1. (a) (10) Explain how Deep Neural Networks can be integrated with HMMs in a hybrid system.
   (b) (5) Do you think Gaussian mixture model is still needed for such a hybrid system?
2. (15) What is a Long Short-term Memory (LSTM) unit?
3. (20) Explain the four transducers in Weighted Finite State Transducer (WFST) for automatic speech recognition (ASR): what they are, and how they operate?
4. (5) In spoken content retrieval, why lattices are useful? (5) What is the OOV problem and why subword units are useful? (5) What is the expected term frequency?
5. (5)What is semantic retrieval? (5)Why and how it can be achieved by query expansion and (5)document expansion?
6. (10) What is the maximum margin relevance (MMR) approach for document summarization? Explain how it works.
7. (3) What is the major limitation of the maximum a posterior (MAP) approach for speaker adaptation? (7) Why and how the maximum likelihood linear regression (MLLR) can handle this problem?
8. (15) What is Principal Componenet Analysis (PCA)?
9. (10) Show how to construct a word-document matrix in LSA and how the dimensionality can be reduced.
10. (10) What is Matrix Factorization (MF)? how to train it?
11. (10) What is Parallel Model Combination? Please explain how it works.
12. (10) What is HEQ and how it works? Please explain it.
13. (10) Explain what EM algorithm is.