CS582: Introduction to Speech Processing

Midterm

(Spring 2015))

Notes:

1. Form as well as content will be graded, so express your answers correctly, clearly and concisely utilizing complete sentences, thoughts and ideas.
2. Submit your answers as an MS-Word document by email to me at: CKonopka@mail.sdsu.edu
3. Please document all references.
4. This test is worth 15% of your total grade for the semester.
5. This test is due on 03/20/2015.

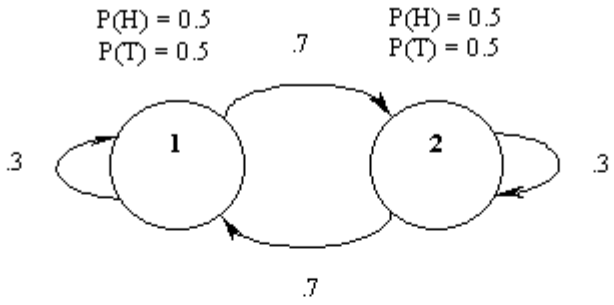
Questions:

1. *(20 points)* Define and provide examples for the following:
   a. Conditional Probability;
   b. Marginal Probability;
   c. Bayes Decision Theory;
   d. The Law of Large Numbers;
   e. The Central Limit Theorem;
   f. Gaussian distributions;
   g. The Scientific Method;
   h. Entropy;
   i. Information Theory;
   j. The Curse of Dimensionality;

2. *(20 points)* Write a two page paper explaining how the physical model of speech perception relates to the computational model of speech recognition. Be sure to:
   a. Describe human speech perception and production;
   b. Review the computational model of speech recognition (please recall the block diagram presented in class, relevant class notes, as well as relevant passages from the text;
   c. Relate a. and b. above.

3. *(20 points)* Write a two page paper which compares and contrasts supervised and unsupervised learning. Be sure to include:
   a. Maximum Likelihood Estimation;
   b. The Neural Network approach;
   c. Clustering;
   d. Hidden Markov Models;
   e. A comparison of techniques a. – d. above.

For the following question, assume the following:
O = (H, T, H, H) $\pi_1 = \pi_2 = 0.5$ and $\lambda =$



Output Probabilities	1	2
P(H)	0.5	0.5
P(T)	0.5	0.5

State Transition Probabilites	1	2
1	0.3	0.7
2	0.7	0.3

4. *(20 points*) Use the Forward probability algorithm to find the likelihood of **O** given λ, show your work;

5. *(20 points*) Use the Viterbi algorithm to find the Viterbi score and the most likely path **'Q'** for the given observation sequence **'O'** and model λ**.** Show your work.