Summer School in Asian Language Processing

1st June – 12th August, 2006

Course: **Speech Processing**
Course Instructor(s): Dr. Muhammad Akmal Butt, Dr. Sarmad Hussain, Dr. Chai Wutiwiwatchai
Teaching Assistant(s): Rafia Bokhari
Text Book(s): Jurafsky, D. & Martin, J. H. Speech and Language Processing
Rabiner, L., Juang, B. H. (1993). Fundamentals of Speech Recognition. New Jersey, Prentice Hall
Grades: Quizzes 10%, Labs 40%, Mid-term Exam 25%, Final Exam 25%
Reference Book(s):

Furui, S. (2001). Digital Speech Processing, Synthesis, and Recognition, 2nd Edition, Revised and Expanded. New York, Marcel Dekker
Dutoit, T. (1997). An Introduction to Text-To-Speech Synthesis, Kluwer Academic Publishers
Quatieri, T.F. Discrete-time Speech Signal Processing
Witten, I. H. Principles of Computer Speech

Schedule of Lectures		Reading	Schedule of Lab Sessions
1	Introduction to Speech Signal Processing		
2	Characteristics of Signals. Amplitude, Frequency, Spectrum		Introduction to MATLAB
3-5	Frequency Domain Analysis of Periodic Signals. Fourier Series and Fourier Transform		Generation and Display of Simple Signals
6	Digitization of Signals. A/D conversion. Sampling Theorem		
7	Quantization Noise. Companding		Quantization Noise. Signal to Noise Ratio
8	Time-domain Speech Analysis. Energy. Zero crossing rate. Segmentation		Zero Crossing Rate
9	Frequency-domain Speech Analysis. DFT and FFT. Cepstral Analysis		
10	Frequency-domain Speech Analysis. DFT and FFT. Cepstral Analysis		
11	Speech Modeling, Autocorrelation		Spectrum Estimation using FFT
12	Pitch Extraction, Formant Tracking		Autocorrelation and Pitch Extraction
13	Applications of Speech Processing		

14-15	Review of Material. Optional Topic		Midterm Exam
16	Introduction to TTS		
17	Document Analysis		Document Analysis
18	NLP Architecture		
19	Text and Morpho-Syntactic Analysis		
20	Phonological Analysis		Letter to Sound Conversion
21	Intonation Analysis and Modeling		
22	Synthesis Strategies		Introduction to Festival Synthesis System
23	Concatenative Synthesis		Diphone Synthesis using Festival
24	Pitch and Duration Modeling		
25	Conclusions and Future Perspectives		
26	Introduction to ASR and front-end parameterization		Introduction to lab and tools
27	Isolated speech recognition, HMM, and other pattern matching algorithms		Corpus development
28	Overview of continuous speech recognition and Language modeling		Preparing components, training acoustic and language models
29	Acoustic modeling, pronunciation modeling, and speech decoders		Evaluating ASR
30	Robustness in ASR and conclusion		Final Exam