Applicant: Yu-Ying Liu (1980/08/23)

Course Information

(all courses are in dept. of computer science and information engineering, National Taiwan University)

(I) Artificial Intelligence

Pattern Analysis and Classification by Prof. Yi-Ping Hung (2003)
Topics: Bayesian decision theory, supervised learning using parametric and non-parametric approaches, PCA, LDA, unsupervised learning and clustering. Hand-on project: face verification
Textbook: R. Duda et al., "Pattern Classification"

Digital Speech Processing by Prof. Lin-Shan Lee (2002)
Topics: acoustic and language modeling, speech recognition (HMM and Viterbi search), speech signals front-end processing, speaker adaptation and recognition, latent semantic analysis, robustness for acoustic environment, spoken document understanding, dialog system
Textbook: (1) X. Huang, A. Acero, H. Hon, "Spoken Language Processing" (2) L. Rabiner, B.H. Juang, "Fundamentals of Speech Recognition"

Natural Language Processing by Prof. Hsin-Hsi Chen (2002)
Topics: linguistic essentials, corpus-based work, collocations, statistical inference, word sense disambiguation, lexical acquisition, POS tagging, PCFG, parsing, clustering, categorization
Textbook: Christopher D. Manning et al., “Foundations of Statistical Natural Language Processing”

Information Retrieval and Extraction by Prof. Hsin-Hsi Chen (2003)
Topics: modeling, retrieval evaluation, query language and operations, indexing and searching, text and multimedia IR, Chinese and cross-Language information retrieval, information extraction
Textbook: Ricardo Baeza-Yates et al., “Modern Information Retrieval”

Neural Networks by Prof. Cheng-Yuan Liou (2001)
Topics: single-layer and multi-layer perception, Hopfield model, recurrent network, associative memory, self-organizing networks, reinforcement learning
Textbook: Simon Haykin, “Neural Network, A Comprehensive Foundation”

Brain Theory by Prof. Cheng-Yuan Liou (2002)
Topics: computational mental process, mental process, neurobiological modeling, perception and associative memory, manifold learning, LLE, ISOMAP
Textbook: Simon Haykin, “Neural Network, A Comprehensive Foundation”, selected papers

Special Project (II) —in Neural Network Lab by Prof. Cheng-Yuan Liou (2002)
Topics: automatic music composition, singing synthesis
Textbook: selected papers

(II) Digital Signal Processing

Digital Signal Processing by Prof. Soo-Chang Pei (2002)
Topics: Fourier analysis, z-transform, FFT, FIR/IIR filter design, Wiener filter, Kalman filter, blind de-convolution, application to image processing
Textbook: Oppenheim and Schafer, "**"**Discrete-time Signal Processing"

Digital Image Processing by Prof. Yi-Ping Hung (2003)
Topics: color spaces, image enhancement in spatial/frequency domain, restoration, morphology, segmentation, wavelets and multi-resolution processing. Hand-on project: tri-view morphing
Textbook**:** Gonzalez et al.**, "**Digital Image Processing"

Digital Image Processing by Prof. Soo-Chang Pei (2002)
Topics: image enhancement and restoration, geometrical image modification, edge detection, image compression, medical image processing. Hand-on project: 2D face morphing
Textbook: William K. Pratt, "Digital Image Processing"

Digital Communications and Computing by Prof. Lin-Shan Lee (2001)
Topics: transmitter/receiver theories, quantization and modulation, applications to mobile communication and speech recognition. Hand-on project: speech coding and algorithm analysis
Textbook: Haykin, "Digital Communication"

(III) Computer Graphics

Computer Graphics by Prof. Ming Ohuyoung (2001)
Topics: geometric transformation, projection models, rendering and z-buffer, shading, curves and patches, spatial indexing. Hand-on projects: (1) implement a pure software rendering/shading engine (2) implement a fancy virtual cosmos with realistic nebulas and planets
Textbook: Foley et al., "Introduction Computer Graphics"

Special Project (I) – Computer Graphics Lab by Prof. Ming Ohuyoung (2001)
Topics: study and present papers in SIGGRAPH, EURO GRAPH, etc.

(IV) Network, Multimedia, Security

Wireless Multimedia System Research by Hsiao-Kuang Wu (2003)

Topics: wireless networks, propagation channel model, channel coding, the cellular concept, multiple radio access, multiple division techniques, channel allocation, mobile communication system, satellite system, network protocol, ad hoc and sensor networks, wireless LANs and PANs

Textbook: Dharama et al., “Introduction to Wireless and Mobile Systems”, selected papers

Network and Data Security by Prof. Gregory Tang (2000)

Topics: **s**ymmetric/asymmetric ciphers, key exchange, attacking ciphers, practical issues of data security

Textbook: Schneier, “Applied Cryptography”

(V) Database Management

Database Systems by Prof. Hsin-Hsi Chen (2001)

Topics: entity-relationship model, the relational data models, SQL languages, query evaluation and optimization, storage and indexing, transaction management

Textbook: Elmasri et al., “Fundamentals of Database Systems”

(VI) Mathematics, Algorithms

Advanced Computer Algorithms by Prof. Ferng-Ching Lin (2000)

Topics: greedy algorithm, dynamic programming, graph and network algorithms, amortized algorithms

Textbook: Cormen et al., “Introduction to Algorithm”

Numerical Methods by Prof. Chih-Jen Lin (2001)

Topics: least square, Newton method, conjugate gradient, numerical precision issues

Textbook: no textbook, use slides

Probability by Prof. Cheng-Yuan Liou (1999)

Textbook: Drake, "Fundamentals of Applied Probability Theory"

Discrete Mathematics by Prof. Gen-Huey Chen (2000)

Textbook: Ralph P. Grimaldi, “Discrete and Combinatorial Mathematics”

Linear Algebra by Prof. I-Peng Lin (2000)

Textbook: Friedberg et al., "Linear Algebra"

Engineering Mathematics by Prof. Mu-Shieung Liu (1999)

Textbook: Zill and Cullen, "Differential Equations"

Introduction to Algorithms by Prof. Fern-Ching Lin (1999)
Textbook: Sanguthevar et al., “Computer Algorithms in C++”

Data Structures by Prof. Hsin-Hsi Chen (1999)
Textbook: Horowitz et al., "Fundamental Data Structures in C"

Calculus (I) (II) by Prof. Wen-Ming Yan (1998, 1999)
Textbook: Thomas Finney, "Calculus"

(VII) Theory

Computing Theory by Prof. Yuh-Dauh Lyuu (2002)
Topics: computation models and computability, complexity measures, complexity classes, tackling complexity, applications to security, distributed systems, computational learning theory
Textbook: Papadmitriou, “Computational Complexity”

Formal Language and Automata Theory by Prof. I-Peng Lin (2000)
Topics: regular language, context free languages, Church-Turing thesis, decidability, reducibility advanced topics in computability theory, time complexity
Textbook: Sipser, “Introduction to Theory of Computation”

(VIII) Programming Language, Operation System, Compiler Design

Compiler Design by Prof. Chuen-Liang Chen (2000)
Topics: lexical analysis(scanner), regular expressions, finite state machine, syntax analysis(parser), top-down and bottom-up parsing, symbol tables, intermediate code generation, semantic processing (code generation), control flow. Hand-on project: implement a real C compiler and generate x86 compatible assembly code
Textbook: Fisher et al., “Crafting a Compiler with C”

Operation Systems by Prof. C. C. Hsu (2000)
Textbook: Silberschatz et al., "Operating System Concepts"

Programming Language Structures by Prof. Shun-Chin Hsu (2000)
Textbook: Sethi, "Programming Languages: Concepts and Constructs"

Introduction to Object-Oriented Programming by Prof. Jie-Yong Juang (1999)

Textbook: no textbook, use slides

System Programming by Prof. Shun-Chin Hsu (2000)
Textbook: Beck, "System Software: An Introduction to Systems Programming"

Computer Organization and Assembly Languages by Prof. Wen-Chin Chen (1999)
Textbook: no textbook, use slides

Introduction to Computer Programming by Prof. Hsiu-Hui Lee (1998)
Textbook: Deitel, "C - How to Program"

Introduction to Computer (I)(II) by Prof, Chiou-Shann Fuh and Yung-jen Hsu (1998, 1999)
Textbook: "Peter Norton's Introduction to Computers", “Programming with Scheme”

(VIIII) Architecture

Computer Architecture by Prof. Yen-Jen Oyang (2001)
Topics: cost and performance measurement, instruction set design, pipelining, DLX architecture, memory hierarchy design, cache and virtual memory, I/O system design, multiprocessors, parallel architecture and memory consistence models
Textbook: John L. Hennessy et al., “Computer Architecture A Quantitative Approach”

(X) Digital Electronics, Electric Circuits, Microcomputers, Laboratory

Digital Electronics by Prof. Share-Young Lee (2000)
Topics: digital electronics, solid-state electronics, diodes and diode circuits, field effect transistors, MOS and CMOS logic design, MOS memory and advanced logic circuits
Textbook: "Microelectronics Circuit Design", by Richard C. Jaeger

Logic Design and Theory by Prof. Tsung-Tso Kan (2000)
Textbook: no textbook, use slides

Electric Circuits and Electronics by Prof. Feipei Lai (1999)

Microcomputers Laboratory by Prof. Share-Young Lee (2001)
Digital Circuit Laboratory by Prof. Share-Young Lee (2000)
Electric Circuits and Electronics Laboratory by Prof. Feipei Lai (2000)
Topics: all lab courses have several hand-on experiments and one final large-scale project