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

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

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

(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

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

(IV) Network, Multimedia, Security
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: symmetric/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

(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)

**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)

**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”

(VIII) 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

(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

**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