NTUEE
Computer Science (CS) Group
Summary

Graduate Institute of Electrical Engineering
Department of Electrical Engineering
National Taiwan University

October 2009

CS Group Brief

• Current status
  – 18 professors
  – 88 M.S. and 128 Ph.D. students (as of 10/2009)
  – Covers all areas of computer science and engineering
• The strongest CS program in Taiwan, though not the largest
• Strong ties with computer and semiconductor industry
• High international visibility
### CS組特色

- **規模最大**
  - 成立逾35年，目前計有200名以上碩博士生，規模為台大電機研究所各組中最大

- **師資多樣化**
  - 師資結合計算機、電信、電子等跨領域專長，選擇多樣化

- **研究經費充裕**
  - 來自公家、業界研究經費充裕，年度研究經費逾6500萬

- **兼顧各層面**
  - 教師團隊間合作關係密切，整合軟硬體專長，研發前瞻性系統
  - 以SOC及嵌入式系統為例，結合電子設計自動化、驗證、網路、中介軟體、資料庫、多媒體應用、資訊安全及相關理論專才，兼顧系統建構各層面

### CS組的教授們

![教授們的照片](image)
研究領域
結合計算機，電信，電子等跨領域專長

人工智慧
資料庫		多媒體
嵌入式系統
演算法與理論
系統安全
通信與網路
VLSI &電子設計自動化

10 Fastest-Growing Jobs (now~2014)
1. Network systems and data communications analyst
2. Physician assistant
3. Computer software engineer, applications
4. Computer software engineer, systems software
5. Network and computer systems administrator
6. Database administrator
7. Physical therapist
8. Medical scientist
9. Occupational therapist
10. College instructor

http://money.cnn.com/2006/05/02/technology/business2_nextjobboom_hotjobs/index.htm
Industrial & Governmental Sponsorship

- More than 15 industrial & governmental sponsors for students’ fellowships, research projects, and donation.
- Average number of projects: about 4 projects/person-year
- Average research grant: about 120K/person-year

International Visibility

- Many professors are on the technical program committees of top CS conferences and/or editorial boards of top journals
CS Jobs in Taiwan

- Academia, software companies, EDA companies, IC design houses, Foundry, etc.

Vision

- Cultivate foremost SW/HW human resource
- Pursue research excellence
- Forge industry-CS group collaboration
Selected Research Slides

Spoken Language Processing under Network Environment

- Lin-shan Lee (李琳山; lslee@cc.ee.ntu.edu.tw)

  - User Interface
    - speech recognition, acoustic signal processing, language modeling
    - when keyboards/mice inadequate

  - Content Analysis
    - spoken document understanding and organization
    - help in browsing/retrieval of multimedia content

  - User-Content Interaction
    - spoken document retrieval, spoken and multi-modal dialogues
    - all text-based interaction can be accomplished by spoken language
Computer Music, Artificial Intelligence & Multimedia

Shyh-Kang Jeng (鄭士康；skjeng@cc.ee.ntu.edu.tw)

Computer music
- Perception, performance, personalization, retrieval and composition of music using computer
- Combination of musical signal processing, artificial intelligence, musicology, and psychology

Artificial Intelligence and Multimedia
- Exploration of brain mechanism and development of intelligent/interactive multimedia signal processing systems
- Combination of computational neuroscience, multimedia signal processing, and artificial intelligence

Embedded System HW/SW Co-Design

Sheng-De Wang (王勝德；sdwang@ntu.edu.tw)

Hardware Packet Classification and Pattern Matching for Intrusion detection

[Diagram of embedded system HW/SW Co-Design]
Graph Drawing and Information Visualization

Hsu-Chun Yen (顏嗣鈞; yen@cc.ee.ntu.edu.tw)

Research Items

• Algorithm design for drawing graphs "nicely," i.e., meeting certain aesthetic criteria.
• Complexity analysis of various graph drawing problems.
• Applications to information visualization, VLSI layout, software engineering ...

Balloon view of a tree

3-D drawing using potential field

3-D symmetric drawing of a tree

Dependable Distributed Computing & Networking

Sy-Yen Kuo (郭斯彥; sykuo@cc.ee.ntu.edu.tw)

• Reliable and Energy-Efficient Wireless Ad Hoc Networks
  — Topology control, data dissemination, and fast deployment
• Human-Centered Intelligent Living Technologies
  — Digital home/library, smart campus tour guide
• Quantum Computing and Communication
  — Cryptography, gates and circuit optimization
• H.264 Video Encode/Decode Techniques
• Intrusion Detection System

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Distributed Computing & Network Security

- Chin-Laung Lei (雷欽隆; lei@cc.ee.ntu.edu.tw)
- Distributed Computing
  - Mobile, ubiquitous, and pervasive computing
  - Distributed operating system and distributed file system
  - Cluster computing
  - Network processors
- Network Security
  - Cryptography
  - Electronic commerce/electronic cash
  - Digital signature
  - IP security and virtual private network
  - Wireless security

Database, Data Mining, Mobile Computing & Multimedia

- Ming-Syan Chen (陳銘憲; mschen@cc.ee.ntu.edu.tw)
- Database Architectures, Query Optimization
- Web Data Mining, Classification, Clustering
- Data Scheduling, Resource Allocation
- Digital TV, 2D Barcode, Video Multicasting
VLSI Physical Design & Manufacturability

- Yao-Wen Chang (張耀文; ywchang@cc.ee.ntu.edu.tw)
- Physical Design Engines
  - Floorplanning, placement, routing
- Power/Signal Integrity
  - Low power, IR drop, Xtalk
- Timing Closure
- Manufacturability
  - RET: OPC, CMP
  - Process variation
- Reliability
  - Antenna effect
  - Redundant via
  - Thermal, ESD
- EDA for biochips

Wireless and Multimedia Networking

- Wanjiun Liao (廖婉君; wjliao@ntu.edu.tw)
  - Protocol design and analysis for wireless multimedia communications
  - Cross layer optimization for radio resource management, QoS, multicasting
- Multi-hop Wireless Networking
  - Wireless mesh networking
  - Automotive networking
- Wireless Multimedia Networking
  - IPTV multicasting
  - Voice over IP (VoIP)
- Wireless Broadband Access
  - WiFi, WiMAX, WiMedia

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Software Testing & Verification Automation

Farn Wang (王凡; farn@cc.ee.ntu.edu.tw)

- Integrated testing environment
  - international standard test language
  - probability of test plans & test cases

- Test plan generation
  - adaptive test control
  - test control programming

- Test case generation
  - GUI for MSC testcase editing
  - Automatic generation based on coverage metrics

- Verification automation
  - embedded systems
  - model-checking
  - simulation-checking
  - Algorithms & theory

Sensor and Peer-to-Peer Networking

Polly Huang (黃寶儀; phuang@cc.ee.ntu.edu.tw)

- Wireless Sensor Networking
  - Real-time sensor data dissemination
  - Indoor localization

- P2P Multimedia Networking
  - P2P content distribution
  - Skype call streaming
  - P2P video broadcasting

- Internet Modeling and Analysis
  - MMORPG virtual treasure pricing
  - MMORPG player mobility modeling
VLSI Self-Test and Repair

- Jiun-Lang Huang (黃俊郎; jhuang@cc.ee.ntu.edu.tw)
- VLSI Testing and Design-for-Test
- Fault-tolerant digital systems
- Power-safe VLSI testing
- Flexible electronics design

Formal Verification: Theorem and Applications

- Chung-Yang Huang (黃鐘揚; ric@cc.ee.ntu.edu.tw)
  1. SoC design methodology and verification
  2. HW/SW co-design; Embedded SW synthesis
  3. Intelligent design verification and debugging
  4. Formal-assisted logic optimization
  5. Constraint satisfaction problems
     (SAT, BDD, PB, ILP, SMT, PDA... etc)
**Wireless and Mobile Networking**

- **Hung-Yu Wei** (魏宏宇；hywei@cc.ee.ntu.edu.tw)
- **IEEE 802.16 WiMAX standard**
  - Actively participate in international standard
  - Invention adopted by 802.16 standard
- **Multimedia wireless networks**
  - Cross-layer design
  - Adaptive video streaming and VoIP
- **Game theory for networking**
  - To cooperate or Not to cooperate? This is the question!

**Competent Genetic Algorithm Design**

- **Tian-Li Yu** (于天立：tianliyu@cc.ee.ntu.edu.tw)
- **Genetic algorithms, machine learning, & artificial intelligence**
  - Decomposition & mixing Explicit chunking Niching
  - Theory & design
  - Applications
    - Nurse scheduling (護理排班)
    - Automatic control
    - System tuning
Cryptography and Cryptanalysis

• Chen-Mou Cheng
  (鄭振牟：ccheng@cc.ee.ntu.edu.tw)

• Cryptologic researches
  – Post-quantum public-key cryptography

• Cryptanalytic researches
  – Cryptanalysis of MIFARE (悠遊卡破解)
    – Cryptanalysis of RSA (via integer factorization) using graphics cards and Sony’s PlayStation 3

Thank You!