A BRIEF INTRODUCTION TO

VNU University of Engineering & Technology

and

Faculty of Electronics & Telecommunications

VNU-UET
144 Xuan Thuy road, Cau Giay district, Hanoi, Vietnam
Tel.: +84-4-3754 7461; Fax: 84-4-3754 7460
http://www.uet.vnu.edu.vn
Outline

- Vietnam National University, Hanoi (VNU)
- University of Engineering and Technology (UET)
  - Human resource, students and training programs
  - Research activities
- Faculty of Electronics & Telecommunication (FET)
  - Human resource, students and training programs
  - Researching issues
  - International relations
  - KAIST International Collaboration
• A university system with highest autonomy, operating according to special regulations of the Prime Minister.
• 28 institutions (Research/education institutes/centers, service centers...)

• 7 member universities have the same models as any other universities in Vietnam
• 3900 academic and support staffs
• One of the two VNUs in Vietnam

http://www.vnu.edu.vn
Vietnam National University, Hanoi

- **Total number of students:** 7,200
  - Undergraduate: 4,200
  - Graduate (MSc. and Ph.D.): 3,000
  - R – Robotics
  - I – Information & Communications Technology
  - N – Nanotechnology

- **Location:**
  - **Current campus:** 144 Xuan Thuy, Hanoi (10 km far from Hanoi Center)
  - **New campus (under construction):** Hoa Lac Campus with area: 1.000 hectares (30 km far)
VNU New Campus
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Foundation
- **Founded as a VNU member university in 2004** as the College of Technology (Coltech), since 2009 Univ. of Engineering and Technology (UET)

Mandates
- To train qualified high-level human resource
- To research advanced fields of science and technology with strong basic science and IT backgrounds:
  - Information Technology and Telecommunications
  - Electronics Engineering and Automation
  - Novel Materials and Nanotechnology
  - Molecular Biotechnology
University of Engineering and Technology (UET)

- Focus only advanced areas of technology and applied sciences
- Strong links with research institutes and industrial companies
- Profile inspired by World Bank: GRIN
  - G – Genomics
  - R – Robotics
  - I – Information & Communications Technology
  - N – Nanotechnology

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UET Organization

Advising Board for Education and Science

Rector Board

Management & Services Departments

Faculty of Information Technology (FIT)
Faculty of Electronics and Telecom (FET)
Faculty of Engineering Physics & Nanotech (FEPN)
Faculty of Engineering Mechanics & Automation (FEMA)
Key Lab for Micro-Nano Technology (Micro-Nano Lab)
Key Lab for Smart Integrated Systems (SIS Lab)
Center for Field Monitoring (FIMO)
Center for Computer Network and e-Learning (CCNE)
Center for Joint Training Science & Technological Services, and Knowledge Transfers (TSK)
Center for Electronics and Telecoms Research (CETR)

http://www.uet.vnu.edu.vn
Academic staffs and support staffs

- **Total**: 250
  - Full, Assoc. Professors: 50
  - Assist. Professors: 107
  - Researchers (Masters, Ph.Ds): 65
- Part-time staff are staff from partner research, educational and other institutions

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UET Students

- Undergraduate students: 4200
- Master students: 1100
- Ph.D. Students: 130

- Receive lots of Government awards for Undergraduate students’ research projects
- Significant scholarship from Industry: Honda Foundation Young Engineer and Scientist Award (Honda YES Award), Full YES Award; Orange France Telecom …
UET Education Programs

- **Undergraduate Programs** (4 years)
  - Information Technology (accredited by AUN)
  - Computer Science (strategic mission program) (accredited by AUN)
  - Information Systems
  - Computer Networks and Communications
  - Electronics and Telecommunications (strategic mission program) (accredited by AUN)
  - Engineering Physics
  - Engineering Mechanics (4.5 years, engineer degree)
  - Mechatronics Engineering

- **Master Programs** (2 years)
  - Information Technology (4 specializations)
  - Computer Science (strategic mission program) (accredited by AUN)
  - Electronics and Telecommunication Engineering
  - Information Security and Cyber Security
  - Nano Materials and Devices
  - Nano-Biotechnology
  - Mechanics of Fluids, Mechanics of Solids
  - Engineering Mechanics

- **Ph.D. Programs** (~4 years) in the same areas as mentioned
UET Research Activities

- **Computer sciences**: logic and formal methods, algorithms, parallel processing; natural language processing, database & information systems, information security, data mining & KDD, HMI, 3D graphics and applications

- **Software engineering**: software verification, software cost estimation, embedded software and systems

- **Computer networking and communication**: SDR, cognitive radio, optical communication systems, advanced digital transmission systems (ATM+IP, MPLS, CDMA), voice digital modulation and processing, speech processing.

- **Electronics and computer engineering**: VLSI (ASIC/FPGA) systems design, computer architectures, microprocessors in control and measurement, embedded systems, bio-information and image processing, automation and robotics, electromagnetics & microwave engineering;

- **Microelectronics**: Micro-Electro-Mechanical Systems (MEMS) and Microsystems.
UET Research Activities

- **Nano technology:** Nano-structured semiconductor materials and devices, nano-structured magnetic materials and devices, photonics and photonic materials, chemical technology of nanomaterials, modeling and simulation of electronic materials & devices, photonics and photonics materials, multiferroics for information storage (MEMRAM etc.)…

- **Engineering Mechanics:** mechatronics, engineering mechanics of marine structures, industrial & environmental Fluid-Gas mechanics, technical instrument diagnostics…

- **Bio-technology:** Genome technologies (genomics, proteomics), bio-informatics, bio-electronics, nano-biotechnology…
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Faculty of Electronics and Telecommunications (FET)

- **Academic staffs and support staffs:** ~ 60
  - 25 professors (Full prof., Asoc. Prof.)
  - 04 International invited professors
  - Researchers
  - Support staffs

- **Students:** ~ 1220
  - 950 undergraduate students,
  - 220 master students,
  - 45 PhD students
FET Departments & Research Labs

- **Departments**
  - Electronics and Computer Engineering
  - Communication Systems
  - Wireless Communications
  - MEMS & Microsystems

- **Research Labs/Centers**
  - 06 Labs for Electronics and Telecommunications
  - Signals and Systems Research Lab
  - Key Lab for Smart Integrated Systems
  - Center for Electronics and Telecommunications
Telecommunications system Labs
Practical Training Labs on Analog & Digital Circuit Designs

Robocon Contest
Computer and Self-learning Rooms
FET Education Programs

- **Bachelor in Electronics and Telecommunication** (4 years)
  - International standard program (Most courses are taught in English)
  - Honors standard program
  - Standard program

- **Master Programs** (2 years)
  - Electronic engineering
  - Communication engineering

- **Ph.D. Programs** (~4 years)
  - Electronic engineering
  - Communication engineering
FET Researching Issues

- **Electronics and Computer Engineering:**

- **Automation & Robotics System:**
  - Sensor fusion
  - Remote control of robot through the network
  - Networked multi-robot
  - Applications

- **Program Lead:** Prof. T.Q. Vinh (vinhtq@vnu.edu.vn)
Electronics and Computer Engineering:

Automation & Robotics System:

- Sensor fusion

- Fusion 4 sensors (optical encoder + compass + laser range finder + omni-directional camera) to increase the accuracy of position estimation.

- 3D laser image using for obstacle avoidance
FET Researching Issues (Cont.)

- **Electronics and Computer Engineering:**
  - **Automation & Robotics System:**
    - Remote control of robot through the network

The system has the duty to find a location which is highly affected by radioactivity.

![Diagram of experimental configuration with local Internet service providers.](image)

![Diagram of communications in an NRS system using multi-protocol model.](image)

- **Graph of best tracking gbest:**
- **Nuclear contamination distribution in the operation area of robot:**

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* experimental configuration with local Internet service providers.
* Communications in an NRS system using multi-protocol model.
- **Electronics and Computer Engineering:**

  - **Smart Integrated Systems:**
    - VLSI/ASIC systems design (Center Lab)
    - 04 satellite labs: Signal & Image processing, Networks, Knowledge technology, and Embedded systems
      - VLSI (FPGA/ASIC) systems design
      - Design and test of Systems-on-Chip
      - Embedded systems
      - Knowledge Technology
  - **Program Lead:** Prof. T.X. Tu (tutx@vnu.edu.vn)
FET Researching Issues (Cont.)

- **Electronics and Computer Engineering:**
  - **Smart Integrated Systems:**
    - VLSI/ASIC systems design (Center Lab)
    - 04 satellite Labs
Communication Systems:

- Mobile sensing and Communication:
  - Software defined mobile network
  - Cognitive Radio
  - Cooperative Diversity Relay Network – Network Coding
  - MIMO system

Program Lead: Prof. N. Q. Tuan
(tuannq@vnu.edu.vn)
Communication Systems:

- Mobile sensing and Communication:
  - Software defined mobile network

- Software defined networking (SDN) can simplify design and management of mobile networks, while enabling new services.
- Research will investigate how SDN can be applied to 5G systems and hence give operators greater control over their equipment, simplify network management and introduce value-added services.
**Communication Systems:**

- **Next generation networks:**
  - LTE Planning - Macro/Micro/FemtoCell
  - Visible light communication (VLC)

**Program Lead:** Prof. N. N. Hoang

( hoangnn@vnu.edu.vn)
Wireless Communication:

- 4G/5G Mobile Networks
- Multimedia Signal Processing and Communication
- Microwave and Antenna Design, Array Signal Processing
- IoTs
Wireless Communication:

- 4G/5G Mobile Networks
  - High speed, real-time processing and transmission system
  - Massive MIMO
  - Light Fidelity (LiFi) Technology

Program Lead: Prof. T. A. Vu (vuta@vnu.edu.vn)
- **Wireless Communication:**

- **Multimedia Processing & Comm.**
  - **Video Processing:** H.265/HEVC, 3D-HEVC, SHVC, H.264/AVC
  - **More on Video Processing:** Multiple description coding (MDC), Distributed video coding (DVC), Error concealment (EC)
  - **Video streaming & Comm.:** RTP/RCTP, Wireless channel modeling, FEC coding for video streams, Error concealment (EC),
  - **Image/Video quality assessment**

- **Program Lead:** Prof. D.T. Duong (duongdt@vnu.edu.vn)
  Prof. H.V. Xiem (xiemhoang@vnu.edu.vn)
FET Researching Issues (Cont.)

- Multimedia Processing & Communication – Good research approaches with VIC Lab (Prof. Munchurl Kim) in KAIST, EE

<Professor Munchurl Kim’s Lab.>

### Current state of the Lab. (in 2016 Fall Semester)
- Postdoctoral Fellows: 0  
- PhD Students: 6  
- Master’s Student: 6

### Research Areas

The research areas of VIC Lab include Perception and Machine/Deep Learning based 2D/3D Video Coding, Machine/Deep Learning based Image Processing and Understanding, Image Quality Assessment and Modeling, and Pattern Recognition.

#### 2D/3D Perception and Machine/Deep Learning based Video Coding

Based on perception characteristics of Human Visual Systems (HVS), we are carrying out effective 2D/3D video compression methods. From this, the signals of imperception can be removed so that high coding efficiency can be achieved. We look forward the technologies under develop for international standardization. Recently, we were granted “Best HEVC Encoder Optimization” award in 2013 Picture Coding Symposium.

#### Machine/Deep learning based Images/Video Processing

Recently, machine and deep learning has drawn much attention in image/video processing and computer vision areas. In VIC Lab, image super resolution is being studied based...
FET Researching Issues (Cont.)

- **Wireless Communication:**

- **Multimedia Processing & Comm.**
  - **Approaches for Video processing:**
    - Improving SHVC, 3D-HEVC performance
    - Improving inter-layer/view prediction, view synthesis quality
    - Perceptual optimized video compression
    - Low complexity HEVC, SHVC, 3D-HEVC solutions
    - HEVC, SHVC, 3D-HEVC real-time acceleration: Encoder / Decoder parallel processing: e.g., CPU+GPU cooperation

Results from: [Ohm et al., IEEE TCSVT Dec. 2012]
**Wireless Communication:**

- **Multimedia Processing & Comm.**

  - **Distributed Video Coding (DVC):**
    - Less sensitive to channel errors
    - Low encoding complexity
    - **Application:** wireless low power surveillance, visual sensor network

- **Approaches:**
  - Advanced Side information creation
  - Advanced Correlation noise estimation:
    - Laplacian distribution, Mixed Gaussian distribution, …
  - Key frame coding: H.264/AVC, H.265/HEVC
● Wireless Communication:
  ● Image/Video quality assessment:
  ● 3D-HEVC virtual view synthesis
FET Researching Issues (Cont.)

- **Wireless Communication:**
  - **Microwave and Antenna Design**
    - Antenna design and measurement
    - High frequency materials
    - Design and implementation of microwave and millimeter-wave circuits and systems
    - Microwave measurement techniques
    - Linear and non linear device characterization

- **Program Lead:** Prof. T.V.B. Giang (giangtvb@vnu.edu.vn)
  
  Prof. T.T.T. Quynh (quynhttt@vnu.edu.vn)
Wireless Communication:

- Microwave and Antenna Design
  - Antenna design and measurement
  - High frequency materials
  - Microwave measurement techniques
MEMS & Microsystems:

- Researches:
  - AFM and application
  - Sensing actuator/Polymeric microactuator
  - Design and fabrication of the microaccelerometer, gyroscope
  - Microfluidic and microinkjet
  - DSP for Ultrasound Imaging, for Magnetic resonance imaging, for Integration of the INS and GPS, for Communication

Program Lead: Prof. C.D. Trinh (trinhcd@vnu.edu.vn)

Prof. T.D. Tan (tantd@vnu.edu.vn)
MEMS & Microsystems:

- Applications:
  - Patient monitor system
  - Inertial /GPS navigation system
  - Sign language translator
  - Industrial Electronic Systems

Design and fabrication of the microaccelerometer
MEMS & Microsystems:

Circulating Tumor Cells

Detecting Circulating Tumor Cells

Target cell

Electrode

Cytogram

Substrate

MEMS & Microsystems:
International Relations

- **Australia**: New South Wales University (Articulation in IT, ET), Univ. of Technology Sydney, *etc.*
- **France**: Paris-Sud 11 University, Grenoble INP, Rouen University, CNAM, University of Rennes, University CB Lyon 1, CEA-LETI, *etc.*
- **Germany**: Duesseldorf University, Greifswald University, Ilmenau Technical University *etc.*
- **Japan**: JAIST, The Univ. of Tokyo, Kanazawa Univ., Osaka Univ., NII, Tohoku Univ., Toyohashi Univ. of Technology, hiba Institute of Technology
- **Korea**: Postech, Korea Univ., Seoul National Univ. (SNU), KAIST
- **Singapore**: NTU, NUS Univ.
- **USA**: UIUC; Troy University (joint undergraduate program)
- **Overseas Companies** (Human Resource Development, Training, Research Support): Fujitsu, Toshiba, Mitani, Sangyo, Honda (Scholarships to students); Synopsys, NEC, Panasonic, NTT-IT, IBM…
Model 1: Direct-Participation-Based Collaboration

Model 2: Co-Advising-Based Collaboration

Model 3: Annual Workshop Invitation
Model 1: Direct-Participation-Based Collaboration

- Administrative setup
  - Register a student from Party-2 as a research member of a on-going project in Party-1
  - Monthly payment of the participating student from Party-2 covered by the project

- Research collaboration
  - Regular meetings based on teleconference
  - Direct visit by the student and/or the professor of Party-2 if necessary
  - Expense covered by Party-1
International Collaboration: SEE - KAIST and FET-UET

Model 2: Co-Advising-Based Collaboration

- Party-2 recommends students
  - Preferably the students that were involved in the directly participated research
- Party-1 accepts recommended students into the graduate program
- Party-1 sends students back to Party-2, regularly over certain period of time, for the co-advising
- Share the research outputs (papers, patents, etc.)
Thank you for your attention!

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