INFOTECH OULU DOCTORAL PROGRAM

The Infotech Oulu Doctoral Program develops and fosters doctoral education and training in the general area of information technology. It is cross-disciplinary across the faculty borders covering research groups within the Faculties of Information Technology and Electrical Engineering, Medicine, and Biochemistry and Molecular Medicine. The training covers the related main subjects of doctoral training, in particular, communications engineering, computer science and engineering, electrical engineering, and information processing science.

All the doctoral student positions granted by the Ministry of Education and Culture and the Academy of Finland will cease nationally by the end of 2015. All such positions obtained by the Infotech Oulu Doctoral Program ended at the close of 2013, like positions of other doctoral programs where the research groups of Infotech Oulu were involved. The continuation for the funding of the doctoral student positions was secured by a successful application to University of Oulu.

The Infotech Oulu Doctoral Program is one of programs of the University of Oulu Graduate School (UniOGS). During the period 2010-2013 the program operated in three areas, corresponding to the major research fields of Infotech Oulu. These are electronics, communications engineering, and computer science and information engineering.

The Electronics section consists of electronic circuit and system design, microelectronics, electronics manufacturing technology, physical electronics, electronic and optoelectronic measurement technology, and testing and disturbance techniques in electronics.

Communications engineering covers telecommunication systems from the architectures and implementations of transceivers to telecommunication networks, systems and services. The main research themes include broadband wireless access, short range communications and sensor networks.

Computer science and information engineering emphasizes information processing methods, ubiquitous systems and human-computer interaction. The topics include machine vision, bio-signal analysis, data mining, intelligent robots, software security, mobile computing, urban computing and ubiquitous internet.

The Doctoral Program Board

Each of the main research areas was represented on the Infotech Oulu Doctoral Program Board, and the Technical Research Centre of Finland, VTT, had its own representative too. Professor Markku Juntti was the Director of the program and the Chair of the Board. The representatives of the main areas on the Board were Professors Juha Kostamovaara (electronics), Matti Latva-aho (communications engineering), Juha Röning and Kari Kuutti (both computer science and information engineering). Professor Pentti Karioja was the representative of VTT.

For the years 2014–2017, the following persons were appointed to the Infotech Oulu Doctoral Program Board: Professors Timo Rahkonen, Netta Ivasti, Heli Jantunen, Timo Jämsä, Matti Latva-aho, Matti Pietikäinen and Juha Röning, Adjunct Professor Antti Tölli and doctoral student representative Mikko Hintikka. Professor Timo Rahkonen is the Doctoral Program Director from the beginning of 2014. At the same time, the former Director, Professor Markku Juntti begins his position as the new Dean of the University of Oulu Graduate School.

Funding

The Academy of Finland and the Ministry of Education and Culture granted 25 doctoral student posts for the Infotech Oulu Doctoral Program for the years 2010–2013. The posts were for doctoral students working in the research groups that are full or associate members of Infotech Oulu. These doctoral student posts altogether represented EUR 750 000 in salary costs in 2013. The funding for coordination was granted by the University of Oulu to the sum of EUR 38 000. Additional funding was obtained from the Academy of Finland for arranging doctoral courses and for other costs. The Academy granted EUR 430 000 for the years 2010–2013. EUR 107 500 were designated for 2013. Together with the annual direct financial support of EUR 20 000 from Infotech Oulu, the total budget of the doctoral program was EUR 915 500. In addition, Infotech Oulu supports its doctoral program by financing international workshops and researcher visits that include doctoral education, and also through the work of the staff in the research groups.

The Infotech Oulu Doctoral Program obtained 20 four-year and 14 two-year doctoral student positions funded by the University of Oulu starting from the beginning of 2014. From these 34 positions, 25 are allocated only for research groups selected to Infotech Oulu for 2014–2017, and the rest for all in the research fields of Infotech Oulu.

Students and Doctoral Theses

The Infotech Oulu Doctoral Program had 177 students at the end of 2013. This includes all the doctoral students in our research area working in the full and associate member groups of Infotech Oulu.

The output was 21 doctoral theses. Funding from the Infotech Oulu Doctoral Program positions was used for 12 of them: Mikko Määttä, Pekka Sangi, Guo Yimo, Francesco Pantisano, Pedro Nardelli, Adrian Kotelba, Jarmo Kukkola, Guoyong Duan, Jari Hannu, Marko Sonkki, Carlos Hércules Morais de Lima and Petri Komulainen defended their theses in 2013. The last five theses were funded only for a few months through our short-term posts that are used specifically for completing doctoral theses. The theses can be found in electronic format on the web from http://www.infotech.oulu.fi/dissertations.
Strong research contacts with other universities and research institutes are utilized in arranging lecturers for the courses. In each of the three major areas covered by the doctoral program, several lectures (the Infotech Oulu Lecture Series) and intensive courses are held annually. These all provide a valuable extension to the other doctoral courses in information technology provided by the university. The extent of the courses below is expressed in ECTS credits.

The Infotech Oulu Lecture Series

To gain two credits, a graduate student must follow 20 hours of lectures and make a written summary of one lecture. The following lectures were held in 2013.

- Dr. Elena Volkova, Saratov State University, Saratov, Russia - Impact of environment and temperature on the luminescent properties of ZnCdS nanoparticles
- Dr. Shirish Nagaraj, Nokia Solutions and Networks (NSN) - Distributed co-operative interference cancellation and power allocation strategies for enhancing small-cell cluster capacity
- Professor Laszlo Nanai, University of Szeged, Hungary - Nanophotonics
- Professor Saikat Talapatra, Southern Illinois University Carbondale, USA - 2D layered materials and applications: graphene and beyond graphene
- Associate Professor Huseyin Sari, Ankara University, Turkey - Introduction to optoelectronics
- Professor Marcus Foth, Queensland University of Technology, Brisbane, Australia - From smart city to smart citizens
- Dr. Mark C. Reed, Australian National University, and UNSW, Canberra - Heterogeneous networks and self-organising networks: new results and future challenges
- Professor Michael L. Honig, Northwestern University, USA - Power and beam optimization in interference networks
- Professor Roberto Verdone, University of Bologna, Italy - From smart lighting to smart city applications: field trials and research trends
- Professor Hamid Sharif, University of Nebraska-Lincoln, USA - Covert communication

- Assistant Professor Zhu Han, University of Houston, USA - Bad data injection in smart grid: attack and defense mechanism
- Dr. Chathuranga Weeraddana, Royal Institute of Technology (KTH), Sweden - On the application of optimization methods for secured multiparty computations & Optimizing client association in 60 GHz wireless access networks
- Professor Stan Z. Li, Chinese Academy of Sciences, China - New advances and applications of face recognition and video analysis
- Dr. Sander L. Jansen, ADVA Optical Networking, Munich, Germany - Introduction to fiber-optic communication systems
- Dr. Ian Oppermann, Director of CSIRO Digital Productivity and Services Flagship, Australia - Advances in Wireless Backhaul - more than just plumbing
- Dr. Ilya Fine, Elfi-Tech, Israel - Assessment of the vascular age by using DLS & Non-invasive optical measurement of hemoglobin: why it’s possible?

Intensive courses and workshops

- BioNanoElectronics in ICT, biomedicine & development
  - Dr. Antony George, Rice University, USA - Nanofabrication
  - Dr. Akos Kukovecz, University of Szeged, Hungary - Introduction to ceramic materials and silicate technology
  - Associate Professor Andrei Schukarev, Umeå University, Sweden - Electron spectroscopy
  - Dr. Vassil Palankovski, Vienna University of Technology, Austria - Advanced semiconductor devices, and Photovoltaic and thermoelectric devices for renewable energy harnessing
  - Infotech Oulu Workshop 2013 on Optoelectronics Devices and Instrumentation XIII; Dr. Sumeet Mahajan, University of Southampton, United Kingdom - Raman spectroscopy; Dr. Björn Kemper, Center for Biomedical Optics and Photonics, Muenster, Germany - Digital holographic microscopy and speckle interferometry
  - Dr. Bilge Saruhan-Brings, German Aerospace Center - Functional materials for high temperature energy and aerospace applications
  - Professor A.E. Hill, Salford University, UK - Thin film solar cells, 2 credits
  - Professor José C. Pedro, University of Aveiro, Portugal - Behavioral modeling and digital pre-distortion of RF PAs and wireless transmitters, 4 credits
  - Dr. Evgeny Avrutin, University of York, UK - Photonic integration and nanophotonics, 4 credits
  - Professor Jana Zaumseil, Friedrich-Alexander University, Erlangen-Nürnberg, Germany - Organic light emitting transistors, 2 credits

Communications engineering

- Professor Dominic O’Brien, University of Oxford, UK - Visible light communications
• Professor Geert Deconinck, KU Leuven, Belgium - Smart grids
• Dr. Murilo da Silva Baptista, University of Aberdeen, UK - Information, topology and synchronization in complex networks: Theory and applications
• Professor Ekram Hossain, University of Manitoba, Winnipeg, Canada - Modeling, analysis, and design of multi-tier and cognitive cellular wireless networks; Interference modeling in random carrier-sense multiple access wireless networks; Dynamic spectrum access in cognitive radio networks
• Professor Babak Khalaj, Sharif University of Technology, Teheran, Iran - Stochastic geometry and random graphs in wireless networks
• Professor Merouane Debbah, Supelec, France - Random matrix theory for wireless communications
• The 1st International Summer School on Nanocommunications

**Computer science and information engineering**

• The Seventh International Crisis Management Workshop (CrIM’13) and the Oulu Winter School: Trends in cyber security after Snowden: Is cyber security still relevant? Lecturers: Professor Juha Röning, University of Oulu - Opening session and Closing session; Professor Gerald Quirchmayr, University of Vienna, Austria - A privacy perspective on social media analysis; Greg Soukiassian, IBM, Paris, France - Are your data safe and operations resilient in the clouds?; Assistant Professor Tiago Cruz, University of Coimbra, Portugal - CockpitCI cyber analysis and detection layer; Assistant Professor Filipe Caldeira, University of Coimbra, Portugal - Trust and reputation for critical infrastructure protection; Kari Jussila, Aalto University - Trade-off between privacy and security; Juhani Anttila, independent international expert - Pitfalls in the management system standardization for information security; Simona Samardjiska, Norwegian University of Science and Technology (NTNU), Norway - McEliece in the world of Escher; Professor Christos Xenakis, University of Piraeus, Greece - Compromising users’ privacy from stolen/lost mobile devices: the Android case; Antti Evesti, VTT Oulu - Case report on the NSA PRISM program
• Professor Iasonas Kokkinos, Ecole Centrale Paris, France - From motion analysis to deformable part models: representations and algorithms for shape analysis, registration, and detection
• Professor Alan FT Winfield, University of the West of England, Bristol, UK - Future directions in intelligent mobile robots
• Dr. Andrea Vedaldi, University of Oxford, UK - Large scale visual recognition of object instances and categories
• Dr. Jacques Richalet, independent consultant, Louveciennes, France - Algorithms with focus on PFC (Predictive Functional Control), tutorial, 18th Nordic process Control Workshop
• Associate Professor Magnus Bergquist, University of Gothenburg, Sweden - Open source and mobile phones: perspectives on open innovation and generativity, 4 credits
• 4th International UBI Summer School 2013 (2 credits; Professor Albrecht Schmidt, University of Stuttgart, Germany - Developing ubiquitous computing devices; Professor Kaisa Väinänen-Vainio-Mattila, Tampere University of Technology, Finland - Experience-driven design of ubiquitous interactions in urban spaces; Professor Malcolm McCullough, University of Michigan, USA - Urban resource networks; Professor Mark Billinghurst, University of Canterbury, New Zealand - Augmented reality technologies in ubicomp

**Co-operation**

The following external organizations have provided co-financing or other support for the courses and workshops:

• Biocenter Oulu
• UrBan Interactions program, Center for Internet Excellence (CIE)

**Course Information**

Information about the courses is distributed through our web-pages and by email. The web address for the doctoral program is [http://www.infotech.oulu.fi/doctoral_program](http://www.infotech.oulu.fi/doctoral_program), where students can also register to the doctoral student mailing list.

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76 students from 18 countries attended UBISS 2013 (4th International UBI Summer School 2013) held in Oulu on June 10-15, 2013.