



TUCS

TURKU CENTRE *for* COMPUTER SCIENCE

www.tucs.fi

Graduate School



Welcome to...



...a country of early adopters and global trend setters

Finns are active users and innovators of communication technology. Even most of school children have their own cell phones and among students it is rare to find a person without one.

...the most innovative country in the world

Global Summary Innovation Index has ranked countries all over the world and Finland has been placed as the number one. Freedom to think and encouragement to pursue towards your dreams creates extraordinary dynamics in Finnish society.

...a city of technologies for tomorrow

Turku is well-known for biotechnology, medical technology and for active usage of ICT in well-being, culture and education. Furthermore, Turku is the world's leading centre for advanced ship building, hosting new innovative ICT in that segment. The Turku region invests in innovative new business. Both nationally and internationally aimed iICT businesses provide for excellent work opportunities for career prone, active Master's graduates. Turku truly combines one of the oldest European academic traditions dating from 1640's with modern innovations.

...co-operation with global ICT-business

TUCS research centres and laboratories involve their PhD students with global corporations in research projects. Once you've been introduced to the people in these companies and involved in building their new innovations, future work together will seem attractive both for you and them.

...the second biggest campus in Finland

The campus area of TUCS partner universities is the biggest outside the capital area with long reaching academic traditions combined with future technology research and applications. The campus is a multidisciplinary one, giving you the possibility to get acquainted also with the state of art at any application field of ICT. Turku is the only European style university city in Finland.

..one of the partners of MBA in Innovation and Growth for PhD students

MBA in Innovations and Growth offers the postgraduates and doctoral students a unique opportunity to acquire knowledge and business competence in order to enhance their career options or pursue business activities after or along with academic career



Turku Science Park joins together the academic and business experts. Its special focal areas are biotechnology and ICT. It offers a unique growth environment for the commercialisation of research-oriented innovations and for the generation and growth of enterprise activities related to high technology.

The Turku Science Park is an effective and inspiring operating environment in which all of the elements necessary for success are present. The innovation process is like a decathlon: it requires both endurance and the mastery of many skills. Companies need experts' input for product development and growth, scientific innovations need channels for commercialisation, and the business world needs new successful companies. The Turku Science Park advances the realisation of these goals. The genuinely urban science park is one of the largest, oldest and fastest-growing in the country.

www.turkusciencepark.com



TURKU CENTRE *for* COMPUTER SCIENCE

TUCS Graduate School

TUCS Graduate School offers a framework for studying for the doctoral (PhD) degree in science, engineering or economics. It is truly international graduate school and hot-spot for the latest development in ICT. Study time for a full-time student is expected to be 4 years. The Graduate School provides additional instruments and training for preparedness of our students for challenges in working life, like mentorship and internship programmes and MBA programme.



There are more than 100 students at TUCS Graduate School. As the Graduate School is open for students from everywhere and almost half of the students come from abroad, the environment at TUCS Graduate School is highly international. There are no tuition fees at Finnish universities at the moment, since the universities are financed by the Finnish government. Doctoral students are entitled - but not obliged - to join the Student Union of their university, and this involves a minor annual fee.

Each student, who is accepted to the TUCS Graduate School, is placed in one of the TUCS Research Centres, and is assigned a personal supervisor, typically a professor. Also fellow researchers at the centres give guidance to new students.

The students are expected to take advanced level courses from at least two of the TUCS main research areas. The language of instruction is English.

The co-operation between the University of Turku and Åbo Akademi University gives the TUCS students the possibility to participate in courses at both universities. In addition, TUCS Graduate School provides active exchange programmes with other leading European research groups.



Local availability of specialized research and training services

1. United States
2. Switzerland
3. Netherlands
4. Finland
5. Germany
6. Denmark
7. Sweden
8. France

Venture capital availability

1. United States
2. Norway
3. Netherlands
4. Finland
5. Sweden
6. Hong Kong SAR
7. United Kingdom
8. Israel

Accessibility of digital content

1. Sweden
2. Estonia
3. Switzerland
4. Finland
5. Denmark
6. Korea, Rep.
7. United States
8. Iceland

Source: World Economic Forum, Executive Opinion Survey 2007, 2008

Structure of the PhD degree

Doctoral studies can be adapted according to each doctoral student's individual needs. After admission to the university, students will make a plan for their postgraduate studies together with the appointed supervisor, specifying the studies to be included in the degree, as well as their scope. The study plan includes also a research plan, a plan for the funding and schedule for the studies. The plan and the progress the student has made are monitored and revised annually. The aim is that it should be possible to complete the doctorate degree in approximately four years' full-time study at post-Master's level.

The doctoral study right is granted by the relevant Faculties in each university and the study details follows then the guidelines given by the Faculty.

The degree consists of 240 credits. To achieve a PhD degree, students must:

- Complete a total of 60 credits of studies specified in the study plan.
- Complete and publish a doctoral thesis (180 credits) accepted by the faculty after a public disputation.

Studies

The studies may comprise courses from the departments from another institution or organisation; reading on the topic; field trips or attendance at scientific conferences; and publications not included in the thesis. Studies may also include general training events for researchers, as well as courses or course work from other subjects that are related to the field of research or the thesis. Basic-level studies may only be included in exceptional, well-justified cases. The courses can be taken at any moment during the four year period of PhD studies

The co-operation agreements between the University of Turku and Åbo Akademi University, together with the TUCS co-operation between the departments, give the TUCS students the possibility to participate in courses at all four participating departments, with some minor restrictions.

Doctoral thesis

The thesis may be either a monograph or a collection of several scientific publications supplemented by a review of the publications (detailing the objectives, methods and outcomes of the research).

When the dissertation is finished, the Faculty decides on the pre-examination of the doctoral thesis, on granting permission to publish it, on appointing the opponent(s) and custos, and on accepting the thesis. The thesis is then subject to a public defence, where the doctoral candidate will defence his/hers research presented in the dissertation.

Student positions at TUCS

TUCS funding

TUCS can provide full economic support up to 4 years for full-time graduate studies and research via employment at one of the participating universities. Doctoral students who get a salary are entitled to all the benefits of the Finnish employment relationship, including occupational health care. The final salary level is determined according to the principles of the new salary system in the Finnish universities and relates to qualifications and study progress of the student.

TUCS status

Students with other sources of funding can also be accepted to Graduate School. Students with TUCS status are entitled to all the benefits that come with the student position, excluding salary. Typically, they are funded directly by the laboratories via employment to a research project or various scholarship arrangements with external funding agencies



Benefits for students

In addition to providing the students with a laboratory, a supervisor, and funding, the students at TUCS Graduate School have a number of other benefits. The participating university departments have the employer responsibility of TUCS PhD students, and arrange a working room and other necessary facilities for the research and studies. Due to strong external funding, TUCS facilities are excellent.

The Graduate School monitors both the progress of studying and the quality of supervision that PhD students receive from their supervisors. The TUCS Graduate School emphasizes the interaction between students and research groups and cooperative multidisciplinary research. All students at the Graduate School are entitled to publish within the TUCS publication series and are encouraged to present their work in international conferences and workshops. Students are entitled to apply for travel grants for participation in conferences.



How to apply

Prerequisites to the Graduate School

Master's degree

A Master's degree is expected in Computer Science, Mathematics, Information Systems, Computer and Software Engineering, or in a related field. The degree should be equivalent to a Master's degree awarded by a Finnish university.

Knowledge of English

A language test is not required from applicants who have already obtained the right for doctoral studies at one of the universities in Turku. A language test is required from all other applicants. The accepted language tests are TOEFL and IELTS, and the test score must come directly from the testing centre.

The minimum test scores:

- IELTS: Average 6.5; no individual scores below 5.5.
- TOEFL: 575 points (paper based total) or 232 points (computer based total) or 90 points (iBT total).

For more detailed information on language requirements, please see our website.

Application procedure

There are two application rounds per year. The fall application round is for the status only and the spring application round is for the status and the financing.

The application must consist of the Graduate School application form (available online) and the required enclosures. The application form and all the documents, except the language test score and the recommendation letters, must be sent by the applicant.

More information on how to apply and a list of required documents:

<http://tucs.fi/education/graduate/applying>

The application form:

http://tucs.fi/downloads/forms/gs_application.pdf

Contact information

Outi Tuohi, Coordinator
Phone +358-2-215 3364
Mobile +358-50-409 6435
Email outi.tuohi@abo.fi

Partner in Innovation and Growth MBA programme for PhD Students

The new and innovative, multidisciplinary MBA Programme (Master of Business Administration) offers postgraduates and doctoral students a unique opportunity to acquire knowledge and business competence in order to enhance their career options or pursue business activities after or along with academic career.

Participants benefit from the MBA programme in multiple ways:

- Get support for innovation and commercialization activities
- Acquire needed entrepreneurial skills to business start-up and business planning
- Improve one's competitiveness in obtaining managerial positions in existing companies
- Engage in collaboration with enterprises and peers in the academic community
- Expand professional networks

The program provides good preparedness and career booster to work either in corporate environment in top level technical management or senior expert positions as well as provides skills and tools in launching successfully own venture activities. The learning outcomes from the program are highly valued in job market globally.



Build your own training portfolio

The programme combines PhD and MBA studies in an innovative and flexible way increasing diversification of doctoral career options. The MBA programme consists of three study modules, of which the participating students can choose the most fitting courses for their study portfolio depending on their previous studies and individual learning needs.

The three modules together constitute a programme offered jointly by the University of Turku - Turku School of Economics and the Turku Centre for Computer Science. The completion of both doctoral studies and the MBA programme constitute a highly competitive study combination.



Programme content

I Module – Basic studies

The first study module is common to all students despite their discipline. The focus is on the basics and regularities of business competence.

II Module – Innovation and Entrepreneurship studies

The second module consists of study units with special emphasis on practical business cases with reference to the disciplines of the students. They will have an opportunity to prepare a Business Plan and gain understanding and skills in business start-up activities and commercialization of academic research results

III Module – Industry specific activities

In the third module, the students are engaged in close cooperation with partner enterprises in mutually beneficial activities; the students can produce an MBA Thesis that fits to the needs of the partner enterprise, and in return, contribute by providing the partner enterprise with cutting-edge disciplinary specific expertise. The level of the enterprise collaboration depends on the Thesis topic.



Enrollment

MBA programme is coordinated by the Business and Innovation Development BID, Turku School of Economics and TUCS.

For further information, please contact

University of Turku
Turku School of Economics
Business and Innovation Development
www.tse.fi/bid
Sari Stenvall-Virtanen
sari.stenvall@tse.fi

Research

Research at TUCS is organized into centres. Research within centres is often further divided into separate laboratories.

Currently at TUCS there are 5 research centres:

CSBE - The Centre for Software Business and Engineering (CSBE) is a research unit comprising elements from both the University of Turku and Turku School of Economics, with the joint aim of collaborating on research with high-impact goals for both the academic body of knowledge and industrial practice.

CREST - The Centre for Reliable Software Technology (CREST) is a research centre within Åbo Akademi University and TUCS. CREST was a Centre of Excellence for Formal Methods in Programming.

FUNDIM - Fundamentals of Computing and Discrete Mathematics (FUNDIM) is a research centre at University of Turku and Turku Centre for Computer Science (TUCS).

IST - Information Society Technologies is an interdisciplinary research centre at University of Turku and TUCS. Research and education are practiced in interaction with the industry and trade for individual wellness and inclusive information society. Thematic focus areas include biomedicine and health care, safety and security, education and democracy.

IAMSR - The Institute for Advanced Management Systems Research (IAMSR) is a research institute within Åbo Akademi University and TUCS. IAMSR is carrying out theory-driven and applied research in approximate reasoning and fuzzy logic, real options, interdependent multiple criteria optimization, software agents, mobile service methods and technology, industry foresight methods, knowledge mobilisation and fuzzy ontology.

The main research activities at TUCS are carried on TUCS Laboratories:

- Algorithmics
- Bioinformatics
- Biomathematics
- Communication Systems
- Computational Biomodelling
- Data Mining and Knowledge Management
- Discrete Mathematics for Information Technology
- Distributed Systems Design
- Embedded Systems
- Health and Medical Informatics Institute
- High Performance Computing and Communication
- Laboris Information Systems
- Learning and Reasoning
- Mobile Commerce
- Network Economics Institute
- Software Construction
- TUCS Productization Laboratory

University-industry research collaboration

1. United States
2. Switzerland
3. Sweden
4. Finland
5. Singapore
6. Germany
7. Denmark
8. Belgium

Source: The Global Information Technology Report 2008-2009



Availability of latest technologies

1. Iceland
2. Sweden
3. Finland
4. Denmark
5. Finland
6. United States
7. Norway
8. Switzerland

Source: The Global Information Technology Report 2008-2009

Top Ten IT Countries of the World

1. Sweden
2. Denmark
3. Netherlands
4. Norway
5. Finland
6. New Zealand
7. Switzerland
8. United States

Source: IDC/World Times Information Society Index, 2003

Availability of scientists and engineers

1. Finland
2. Japan
3. India
4. Sweden
5. France
6. United States
7. Canada
8. Taiwan

Source: The Global Information Technology Report 2008-2009

Capacity for Innovation

1. Germany
2. Japan
3. Switzerland
4. Sweden
5. Finland
6. United States
7. Denmark
8. France

Source: The Global Information Technology Report 2008-2009

Fundamentals of Computing and Discrete Mathematics Research Centre

FUNDIM (Fundamentals of Computing and Discrete Mathematics) is a research centre in TUCS and Department of Mathematics at Turku University. It constitutes of four professors and their research teams working in discrete mathematics and theoretical computer science.

The roots of the research centre goes to the pioneering work of Academician A. Salomaa and Professor Emeritus A. Tietäväinen going back to 1960's. Currently, the research covers a large spectrum of discrete mathematics connected to foundations of computing.

The centre constitutes one of the central units in TUCS. Discrete mathematics and data security is identified as one of the strongly developing research areas in the strategy of University of Turku

Research topics of the centre are:

- automata theory
- combinatorics on words
- cellular automata
- discrete dynamical systems and tilings
- coding theory
- cryptography (under development)

The centre has strong international flavour. It has organized major conferences of its research topics in recent years: WORDS in 2003, ICALP and LICS in 2004 and DLT in 2007.



The centre is viewed as one of the leading research centres in its fields, e.g. in Combinatorics on Words, as is shown for example in recent evaluations of the Academy of Finland. The members of the unit have published five international monographs and altogether 13 chapters in Handbooks in a broad variety of research topics. Also the professors are in editorial boards of more than ten leading international journals of discrete mathematics and theoretical computer science.

The research of the centre had a central role in recent solutions of several fundamental problems, such as the equivalence problem for multitape automata, Ehrenfeucht's conjecture, Duval's conjecture, Road colouring problem and existence of aperiodic square tiles, as well as played a key role in developing the theory of identifying codes.

The centre has produced 12 PhD's since 2007 in TUCS, five of those being foreign students and also five with the "honorary" label. The funding of the centre is currently based on four research grants, one academy researcher and one postdoctoral researcher project, all this from the academy and on several scholarships from private foundations including a postdoctoral grant from Finnish Cultural Foundation.



Professor Juhani Karhumäki

Research topics:

- combinatorics on words
- automata theory
- decidability questions

<http://www.math.utu.fi/en/home/karhumak>

Professor Jarkko Kari

Research topics:

- cellular automata
- tilings and patterns
- discrete dynamical systems

<http://users.utu.fi/jkari/>

Professor Tero Harju

Research topics:

- combinatorics on words
- automata theory
- biological modelling

<http://users.utu.fi/harju/>

Professor Iiro Honkala

Research topics:

- coding theory
- combinatorics

www.math.utu.fi/en/personnel/?userID=128

Two of the professors of the centre are members of Finnish Academy of Sciences and one a member of Academia Europaea.



Information Systems Science Institute

Information Systems Science approaches information systems from the user's point of view. User can be an individual, a team or other organisational unit, organization, or an industry or the society as a whole. Much of the research is connected to the networked way of organizing activities. A gravity point for work is the support and education of chief information officers for organizations. The institute has wide industry contact area, both to private and public sector. Health care information systems form a specialty area for the institute.

Information Systems Science Institute is located at the crossroads of the more technological issues at the Information Technology Department and the business issues at Turku School of Economics, Department of Management. The institute has some 15 staff members, some 20 active PhD. students and some 40 students yearly graduating at the master level. It runs the master programs on International Management of Information Technology, Global Information Technology Management and Work Informatics.

Gravity points of work in the information systems Science department include issues such as:

- health care information systems
- interorganizational information systems
- IS support for networked and virtual organizations
- computer games and management education
- ethical issues of information systems
- agile IS organizations and methods
- application and innovation support in the field of IS for SMEs



Most important projects during the last years:

- Agile IT organization
- IS support for early childhood education
- Management of medication knowledge
- Assessment of the Finnish rational electronic prescription infrastructure
- IS innovation and application support for SMEs

Professor

Reima Suomi is a professor of Information Systems Science at Turku School of Economics and Business Administration since 1994.



Currently he concentrates on topics around management of telecommunications, including issues such as management of networks, electronic and mobile commerce, virtual organizations, telework and competitive advantage through telecommunication-based information systems. Different governance structures applied to the management of IS and are enabled by IS belong too to his research agenda, as well as application of information systems in health care. Reima Suomi has together over 300 publications, and has published in journals such as Information & Management, Information Services & Use, Technology Analysis & Strategic Management, The Journal of Strategic Information Systems, Behaviour & Information Technology, Journal of Management History and Information Resources Management Journal.

Professor

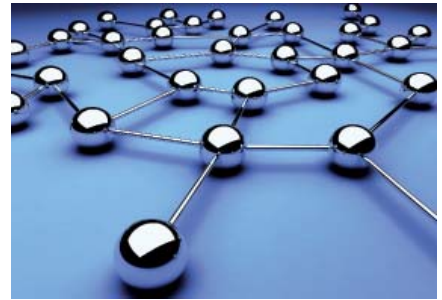
Hannu Salmela is a professor for Information Systems Science and the Vice Director of Turku School of Economics. He holds a PhD.



and a master degree in economics and business administration from the Turku School of Economics with an emphasis on Information Systems Management. His research interests comprise strategic IS management, agility in IS services and the management of IS in partnership networks. He has been researcher in charge for over 10 projects related to IT utilization in private and public organisations. He has published articles in e.g. Journal of Information Technology, European Journal of Information Systems, Journal of Strategic Information Systems, International Journal on Information Management and International Journal on Public Sector Management.

Information Society Technologies Research Centre

The strategic goal of the centre is to apply research and technological development to building the information society. We consider the basic elements for human well-being as the most fundamental drivers for pursuing this strategic goal, in which the technology driven and human driven development directions meet. This is realised with an interdisciplinary approach in selected relevant thematic areas. New innovations create active interaction between scientific areas and research groups. The contribution of the centre is based on interaction and integration of the scientific areas of computer science, communication technology and computer systems. Currently, there are 3 professors, 12 other post doc teachers and researchers and 40 doctoral students.



The IST centre is focused on both basic and applied research, and their interaction. The basic research is goal-driven: strategic research targets are defined to provide potential to new scientific and technological breakthroughs. The research is currently centred within the following three areas and their interaction:

1. *Trusted communication*

Internet technology, cloud computing, self-aware systems, networked embedded systems and information security.

2. *Embedded computing*

Multi-core processing and communication technologies, autonomous systems, fault-tolerance design methods and embedded computing systems modelling, verification and prototyping.

3. *Information management*

Networked information services, health and well-being technology, educational technology, machine learning and language technology.



Joint projects:

- Embedded Media Storage with Integrated Associative Search – MyGoogle-on-Chip
- Embedded Multicore Systems Using Virtual Machine Approach
- Fault Tolerant Self-Timed Communication Platform for Future Nanoscale Systems
- ICT SHOK Future internet: information networking and security
- New Methods and Applications in Speech Technology
- Teaching mathematics and programming in high schools
- Information and language technology for health information and communication (IKITIK)
- Parallel architecture for Information Extraction in the biomedical domain (BioPIE)

Professor Jouni Isoaho

Research topics

- Implementation techniques and system concepts for embedded communication systems
- Self-aware approach for communication system design, interactive applications and information security
- DSP and speech technology for communication systems

Associate professor Seppo Virtanen

Research topics

- Security of embedded communication systems and networks
- Parameterizable platforms for communication systems and applications
- Communication protocol processing

Professor Tapio Salakoski

Research topics

- machine learning methods for bio and medical informatics
- BioNLP: Natural Language Processing for molecular biology, medicine, and health information
- learning mathematics and programming

bionlp.utu.fi, www.ikitik.fi



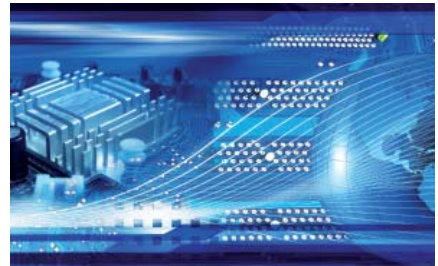
Information Society Technologies Research Centre

Computer Systems Laboratory

Computer Systems Laboratory (computersystems.utu.fi) focuses in its research on new parallel computing platforms and paradigms, and educates experts for design and engineering of contemporary and future embedded systems based on such platforms and paradigms. The field is wide covering the system design flow from specification to implementation, and therefore the laboratory personnel is a heterogeneous, international group of researchers.

Research Topics

- Development of formal approaches for supporting component based correct-by-construction design of embedded multiprocessor systems
- Dependable, reconfigurable Network-on-Chip (NoC) platforms with intelligent control mechanisms and service based operation
- Massively parallel 3D architectures (a stack of multiple 2D integrated circuits) for future multimedia hand-held devices
- Multicore virtual machine development based on an in-house Java co-processor



Professor Dr.h.c Hannu Tenhunen

is professor of nanoelectronics and electronic system design at University of Turku and Royal Institute of Technology (KTH). He has been visiting or invited professor at Cornell University/Ithaca, INPG/ Grenoble, and Fudan University/Shanghai and is Director of Turku Centre for Computer Science. He was one of the originators of the interconnect centric design, globally asynchronous locally synchronous, and network-on-chip (NoC) paradigms. In these areas he has published over 650 articles in journals and conferences. Currently he serves as education director for the European Institute of Innovation and Technology (EIT) ICT Labs. Prof. Tenhunen has actively contributed in all major conferences in his area from TPC member to general chairman.



Communication Systems laboratory

Research and education at the Communication Systems laboratory concentrates on future internet with focus on three viewpoints: information security, interactive applications and embedded/distributed implementations. Communication systems are viewed as whole entities and the three viewpoints are all addressed in our research as we take on the challenges met in future networked multimedia and communication applications found in embedded systems. The cloud computing paradigm is bringing forth completely new challenges to the field both in terms of hand-held embedded communication systems and the distributed processing cloud.

Research in Communication Systems takes advantage of the TUCS information security computer laboratory in modeling the cloud computing environment. The laboratory, managed and maintained by Communication Systems, is isolated from the computer network of the university. This facilitates extensive research and experimentation in computer and network security, for example in the areas of distributed processing, network and system intrusion and intrusion prevention, firewall technologies and wireless LAN security including WLAN encryption studies.

Adjunct Professor Juha Plosila

Research topics:

- Design and verification methods for SoC
- Multiprocessor architectures and Network-on-Chip
- Formal methods in HW/SW design
- Embedded computing systems

Bioinformatics laboratory

Research is focused on developing machine learning methods for bio and medical informatics and, in particular, on BioNLP: Natural Language Processing for molecular biology, medicine, and health information including electronic patient records. Also an International Master's Degree Programme in Bioinformatics is run jointly with Institute of Medical Technology at University of Tampere. The laboratory is lead by professor Salakoski and other seniors include Dr. Jorma Boberg, Dr. Filip Ginter, and Dr. Tapio Pahikkala.



Institute for Advanced Management Systems Research

The Institute for Advanced Management Systems Research at Åbo Akademi University is a research institute with the objective to study and develop the theory and applications of intelligent and knowledge based systems in management. The research focus of IAMSR (strategic plan for 2007-2011) is on supporting people in expanding the limits of the possible in the structures of everyday life, which is guiding both fundamental and applied research and the development and use of soft computing and intelligent systems technologies. IAMSR builds on research traditions in management science and information systems research.

IAMSR has organized its research projects into three main research directions, which all contribute to the IAMSR research core:

- Approximate reasoning, soft computing, knowledge mobilisation, risk assessment, multi-agent systems
- Soft computing, multiple criteria decision making, logistics optimization, real options valuation
- Mobile technology applications, mobile value services, mobile business models

Key contributions to the long-term research of IAMSR are the FIDIPRO professorship for the period 2008-2011 and two associate professors from other universities. Professor Robert Fullér is the FIDIPRO and his main research area is soft computing; the associate professors are Harry Bouwman (Delft University of Technology) working on mobile value services and Mario Fedrizzi (University of Trento) working on fuzzy optimization.

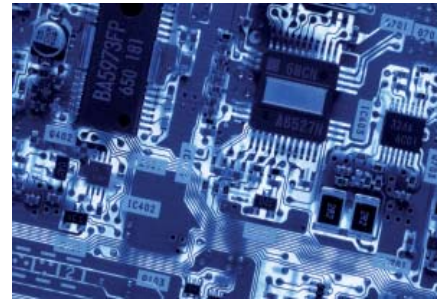
IAMSR is carrying out fundamental and theoretical research in a number of research areas:

- fuzzy logic, fuzzy optimization, soft computing
- knowledge mobilisation and fuzzy ontology
- software agents and approximate reasoning
- mobile value services and mobile support systems
- risk assessment in grid computing
- real options and fuzzy real options modelling
- industry foresight with scanning, scenario agents
- advanced logistics planning and optimization



IAMSR is funding its research through Tekes and the EU-IST programs; some recent projects include:

- Knowledge Mobilisation (KnowMobile) [Tekes]
- Real Option Valuation and Strategic Solutions (OptionsStrat) [Tekes]
- Smart Optimization of Production-Distribution Networks (Smart-Opt) [Tekes]
- Valuation and Management of IPR and New Business Models (Redevelop) [Tekes]
- AssessGrid [EU-IST, FP6]



Professor

Christer Carlsson,

is professor of management science at the Åbo Akademi University. He is a Fellow of the International Fuzzy Systems Association, an Honorary Member of the Austrian Society for Cybernetics and an Honorary Chairman of the Finnish Operations Research Society. He is in the Steering Group of the European Centre for Soft Computing in Oviedo, Spain and has served in the steering groups of two EU-funded networks of excellence. He is/was on the editorial board of 11 journals including the Electronic Commerce Research and Applications, Fuzzy Sets and Systems, ITOR, EJOR and Group Decision and Negotiation. He has published more than 255 papers. His most recent monographs are Fuzzy Reasoning in Decision Making and Optimization (with Robert Fullér), Studies in Fuzziness and Soft Computing Series, Springer-Verlag, Berlin/Heidelberg, 2002, and Fuzzy Logic in Management (with Mario Fedrizzi, Robert Fullér), Kluwer, Dordrecht 2003.



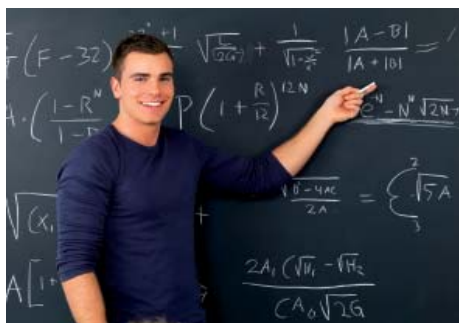
Algorithmics Laboratory

The research of the algorithmics group is centered around techniques and methods for algorithm design and analysis, with the emphasis on both theory and applications. The foundation of the research is discrete mathematics and theoretical computer science

Recent research topics include combinatorial algorithms, algorithms for controlling automated manufacturing systems, signal analysis in biomedical applications, source coding, theory of rough sets, theory and practice of computer games, parallel algorithms, and software metrics. The laboratory is based on the long tradition of active co-operation with Finnish companies, as well as other research groups in the University of Turku. The group solves real-life problems by the use of combinatorial optimization, soft computing, advanced problem solving and latest techniques of software development.

Examples of specific research topics include:

- Control of printed circuit board assembly processes
- Text, dictionary and image compression
- Analysis software for mass spectrometry systems
- Analysis of PET and MRI images
- Constraint programming
- Multi-core programming
- Algorithms and networking for computer games
- Many-valued logics for rough sets



Recent monographs:

- K. Salonen: Setup Optimization in High-Mix Surface Mount PCB Assembly, PhD thesis, 2008.
- O. Luoma: Efficient Methods for Storing and Querying XML Data with Relational Databases, PhD thesis, 2007.
- J. Smed, H. Hakonen: Algorithms and Networking for Computer Games, Wiley, 2006.
- J. Salmi: Improving Data Analysis in Proteomics, PhD thesis, 2006.
- J. Arvo: Efficient Algorithms for Hardware-Accelerated Shadow Computation, PhD thesis, 2005.



Professors:

Jukka Heikkonen
Risto Lahdelma
Timo Knuutila
Olli Nevalainen

Senior researchers:

Jouni Järvinen
Ville Leppänen
Jussi Salmi
Jouni Smed
Jukka Teuhola



Embedded Systems Laboratory

Embedded systems

In embedded systems, the design is constrained by many requirements, including physical attributes like size, weight and cost, more functional attributes like memory consumption, energy efficiency, and even business-like constraints such as design and construction costs, and time-to-market. Embedded systems design could also be characterized as “design under constraints”. The Embedded Systems laboratory performs research on methods and techniques for designing systems meeting these requirements.

Sustainability

We have to ensure that also future generations can meet their needs. As embedded systems are used for controlling almost all technical devices, proper design of embedded systems enhance the sustainability of our technical environment. Examples relevant to the lab are:

- energy efficiency technology developed for mobile phones is now being exploited to develop server farms for cloud computing that are more energy efficient
- multi-core techniques are exploited to implement more complex and efficient control algorithms in engines to lower emission rates
- smart grids that deliver electricity from suppliers to consumers using two-way digital technology to control appliances at consumers’ homes to save energy, rely on embedded systems for the control, measurement and distribution of the grid

Vision

The future embedded systems provide sustainability to all parts of our life. At the embedded systems lab, we develop tools and techniques for reaching this vision. Our activities go hand in hand with the idea of Green-IT, where the goal is to reduce energy consumption and other forms of waste of IT systems.

The vision is pursued through basic research focusing on the methodological issues, and applied research where methods and techniques are used in different application areas. Research topics include:

- System design on multi-core processors
- Streaming languages as a new paradigm for energy efficient computing
- Software systems for wireless communication



Cooperation with industry

Global embedded software revenues are growing annually by 16% (2004-2009). At the embedded systems laboratory, we want to ensure that our tools and methods are applicable to current and future embedded systems both nationally and internationally. We emphasize strong connections with the industry using embedded systems in their business.



Professor

Johan Lilius is full professor of Embedded Systems at Åbo Akademi since 2001. His research interests include Energy-efficient Software, Programming Models for Multi-cores, System-Level Design, Performance Engineering and Models of Concurrency. Prof. Lilius is the author of over 80 publications, has supervised 4 PhD theses and over 40 M.Sc. theses. He serves on Editorial boards and is a regular member of Program Committees of the relevant conferences in the Embedded systems area. He has co-organised several workshops, summer schools and conferences in the area. Prof. Lilius is also actively participating in the Finnish Strategic Centers for Science, Technology and Innovation in the ICT area, is an associate member of the ARTIST network, and the AAU representative in ARTEMISIA.



Relevant Projects:

- B21C - Broadcasting for the 21st Century
- ECUUS – Energy Efficient Computing in Ubicom System
- Embedded Media Storage with Integrated Associative Search
- D-MINT - Deployment of Model-based technologies to Industrial Testing (ITEA2 project)
- Reduced Certification Costs Using Trusted Multi-core Platforms (ARTEMIS project)



Learning and Reasoning Laboratory

The learning and reasoning laboratory is a joint research laboratory between the IT departments at Åbo Akademi University and University of Turku. It is also a part of CREST (Centre for Reliable Software Construction) and TUCS. The laboratory focuses on two main areas of work: (1) developing and improving methods for teaching mathematics and computer science (programming in particular), and (2) studying the use of these methods in education at schools and universities. The educational aspects of the research involve, for instance, tool development and empirical teaching studies. The research is based on continuous evaluations, where the methods, tools and modifications are empirically tested with end users in authentic situations. Currently, 2 professors, 4 senior researchers and 5 PhD students work within the laboratory.

The work in the laboratory is cross-disciplinary, involving researchers with a background in computer science, software engineering, mathematics, physics and education. Some of the areas of current research are as follows:

- Evaluating the use of a logic-based approach when teaching mathematics (structured derivations)
- Studying the use of different programming languages in introductory programming education
- Evaluating the use of a visual invariant based approach (invariant based programming) to teach practicable formal methods
- Development of innovative learning environments for mathematics and computer science (e.g. LyX, Socos, ViLLE, web based mathematics)
- Developing tool support for automatic assessment of mathematical proofs and solutions



The laboratory is involved in several projects where the new teaching methods and learning environments are empirically evaluated in educational settings:

- OPTEK is a large TEKES project involving 10 universities and more than 50 industrial partners. The focus of the project is studying the use of computers in education at the final years of comprehensive school (students aged 13-16).
- MATO is a joint project with the Finnish National Board of Education, the City of Turku, Nokia and the Finnish Broadcasting Corporation (YLE). Within MATO, the laboratory is involved in studying the use of computers to write mathematical text in the classroom.
- The laboratory organizes extensive teachers' training, aiming at introducing mathematics teachers at comprehensive and upper secondary school to structured derivations, and giving them sufficient skills to use the method in their own teaching. The initiative is supported by the National Board of Education.



Professor Ralph-Johan Back

Research topics:

- formal methods (programming logics, programming methods, semantics and mechanized reasoning)
- distributed and parallel systems
- multiprocessor technology
- software engineering

Professor

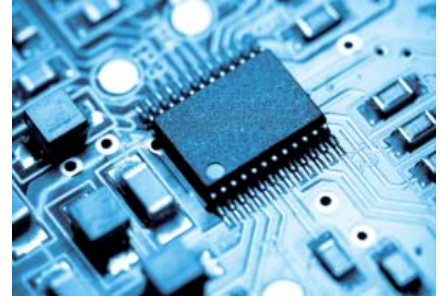
Tapio Salakoski is Professor of Computer Science in Bioinformatics, Head of the Department of Information Technology at University of Turku, Vice Director of Turku Centre for Computer Science, and Director of the International Master's Degree Program in Bioinformatics at University of Turku. His research focus is on machine learning and language and learning technology for bio-health and educational domains.



He has authored 150 scientific publications, supervised eight PhDs, and leads a large research group. He has organized and chaired international conferences, served in scientific editorial boards and program committees, lead research projects involving both academia and industry, and held executive positions of trust at, for example, Finnish Association for Computer Science, Kites Association of Finnish Language Technology Industry, Nokia Foundation, and SOCBIN Society for Bioinformatics.

Software Construction Laboratory

The Software Construction Laboratory is a research laboratory at the Department of Information Technologies at Åbo Akademi University. It is also a part of CREST (Centre for Reliable Software Construction) and TUCS. The laboratory conducts research in techniques and methods for software construction both in the small and in the large. Research topics include software analysis and design methods, programming methodology, languages and environments, and software processes. Particular emphasis is put on the construction of highly reliable and functionally correct software systems. The research group consists at the present of one professor, two senior researchers, three PhD students and a number of master students.



The laboratory conducts both basic and applied research in the area of software construction. The basic research is concerned with formal methods, program correctness, semantics, and the verification of programs. The focus is on programming logics, in particular refinement calculus, action systems and separation logic. The applied research is concerned with the integration of formal techniques into software development, method and tool development, software processes, as well as empirical evaluation of new methods and tools.

The laboratory is currently or has recently been involved in projects with the following objectives:

- Building a mathematically rigorous framework for programming with visual formalisms.
- Developing a programming environment for applying rigorous mathematical and logical reasoning in the development of reliable, industrial-strength software-based products.
- Improving the design of an existing large software system for analysis and visualization of multidimensional biomedical images.
- Formal development and verification of the business logic for database-driven applications.
- Defining, empirically evaluating and developing agile processes for software development in an academic environment.



Professor

Ralph-Johan Back

is professor of Computer Science at Åbo Akademi University. He received his PhD from University of Helsinki in 1978, and has worked at the Mathematical Center (now CWI) in Amsterdam (1979-80), the University of Tampere (1982-83), Caltech (1991-92) and University of Utrecht (1994). He held an Academy professor position at the Academy of Finland 2002 - 2007. He is the founder of TUCS and its first director, 1993 - 2000. He has been the director of two Academy of Finland Centers of Excellence in Research (Turku Centre for Computer Science 1995 - 1999, Center for Formal Methods in Programming 2002 - 2007). He is the inventor of the Refinement Calculus (1978) and the co-inventor of the Action system formalism (1982, together with Reino Kurki-Suonio). He has written two books on the Refinement Calculus, one published in 1980 and the second (jointly with Joakim von Wright) in 1998. His main interests are formal methods (in particular programming logics, programming methods, semantics and mechanized reasoning), distributed and parallel systems, multiprocessor technology, software engineering and teaching of mathematics. He is a member of IFIP WG 2.3 and Academia Europea.



The laboratory regularly publishes its results in journals and high profile international symposia. The laboratory has also built a number of software tools, including the Socos environment for the formal verification of invariant based programs, a meeting scheduler with verified business logic, as well as structural editors for programs and mathematical derivations. The Gaudi software factory has since 2001 employed student programmers for the development of research software, and provides an environment in which controlled experiments in software development can be carried out.



Software Engineering Laboratory

Software Engineering

The mission of the Software Engineering Laboratory is to research, develop and evaluate processes, methods and tools to engineer high quality software-intensive systems.

From Software Products to Software Services

The software business is transitioning from a product based industry, where software is licensed, deployed and maintained by each user or organization, to a service based industry, where software is offered as a service over the Internet. One single service provider can then reach thousands or even millions of users simultaneously around the globe.

The challenge is to offer high quality software services in a cost effective way. Dependability and sustainability are then two important attributes of such services. A more efficient development cycle combined with reduced deployment time and costs also allows constant evolution of services to adapt them to new user requirements.

We research methods and tools to design software service interfaces and to engineering new reliable software services. Service implementations should have a high availability and scale up and down dynamically to varying number of users, using as few hardware resources as possible while providing the agreed quality of service.

Research Topics

- Software Modeling: metamodeling languages, domain-specific languages Model repositories, model transformation, model editors
- Software testing: Modeling requirements and modeling for test generation Model-based testing of web services and telecommunication software.
- Lean Software Development: Lean processes and software metrics for project management
- Web Applications and Web Services: Service interfaces and scalable implementation. The semantic web.



Current Projects:

- VAMOLA Validation of Modelling Languages (Academy of Finland)
- DIEM Device Interoperability (TIVI SHOK project)
- D-MINT - Deployment of Model-Based Technologies to Industrial Testing (ITEA2 project)
- Reduced Certification Costs Using Trusted Multi-core Platforms (ARTEMIS project)



Professor

Ivan Porres (born 1973) holds a PhD in Computer Engineering from Åbo Akademi University (2001) and he has been professor of Software Engineering at this university since 2008. He is a member of the Turku Centre for Computer Science, the SoSE Graduate School on Software Systems and Engineering, and the CONES Centre Of Nordic Excellence in Software Engineering. He is currently supervising 7 PhD students (supervision of one student completed) and he has published more than 55 refereed articles, including the MODELS 2009 10-year most influential article. He has lead numerous research projects, often in close collaboration with the software industry, including international projects and national projects that are part of the ICT cluster of the Finnish Strategic Centres for Science, Technology and Innovation (ICT SHOK). He is actively engaged in the software engineering research community participating in review assignments and organization of events. Recently, he was the local chair of the International conference on Software Process Improvement and Capability Determination SPICE09, held in Turku.



Student testimonials

ETHIOPIA, Ethiopia
PhD student, Communication Systems



The research here is high standard and related to real life applications. It is interdisciplinary and covers international dimension. You have freedom of doing your research independently and in a team. Research and education resources are available from worldwide top technology industries and vendors. Professors are friendly and have very good respect for students.

SATU, Finland
PhD student, Bioinformatics



I think TUCS is a great place to study and work. The professors, staff and the fellow students have been encouraging. Even though we are expected to work hard, the atmosphere is still relaxed. The ICT-Building and the facilities are modern and conveniently located within a walking distance from the downtown. Multidisciplinary research, new initiatives and cooperation with different universities both in Turku, Finland and abroad are encouraged. The universities within TUCS community can offer a nice variety of courses in the ICT field, as well as in Innovation and Entrepreneurship.

JEANETTE, Finland
PhD student, Software Engineering

Studying at TUCS gives me the opportunity to further myself in a wide area of topics, ranging from the purely academical to applied research in cooperation with industry partners. My supervisor is there for me when I need support, but I am also given the freedom to pursue the topics I find the most interesting. I especially appreciate the international and friendly atmosphere, and I have made good friends studying here.



KHALID, Pakistan
PhD student, Computer Systems

Proper guidance and discussion is the key to success for research that fellow and senior TuCS members provide. The environment is very friendly, flexible, multicultural and supportive that gives me the motivation to proceed towards my goals. Apart from research, TUCS cares for the people working here and the MBA programme for PhD started recently with focus on high-tech development is one of such examples.



ANTTI, Finland
PhD student, Computer Science

For me TUCS has been ideal for conducting my studies. I have been offered the chance to conduct cutting edge research with an international group of researchers. TUCS funding allows me to fully concentrate on my research, and international collaboration including participation in conferences is well supported. The staff is very friendly and helpful, libraries well stocked and a wide range of advanced courses are available for participation from several universities.



KRISTIAN, Finland
PhD student, Information Systems

I am very glad to be part of the TUCS graduate school. The research environment is very awarding and flexible, and the teaching of high quality in a large range of up-to-date courses in different subjects, hence truly inter-disciplinary. I especially appreciate all the help and support I receive daily from all experienced, knowledgeable and helpful co-workers.



MATTEO, Italy
PhD Student, Information Systems



Studying in TUCS is a great opportunity. Docents are very friendly and helpful. What I have liked the most is that I have always been encouraged to cultivate my own ideas and, at the same time, I have also never lacked their support and trust. Moreover, the international and the foreign students are very numerous.

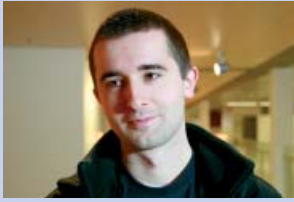
MARYAM, Iran
PhD student, Distributed Systems

The PhD program here offers a supportive environment that strikes the right balance between autonomous work and guidance. The courses provide an important base from which I am able to develop my research protocol, and the professors are always available for either feedback or to receive comments and questions. This level of support and opportunity is a clear reason why I would recommend TUCS to those considering postgraduate work.



Alumni testimonials

MIKOLAJ, Poland
PhD, Computing Science, software architectures



Coming to Nordic countries to study offers really good chances for future career within IT. I have been for example involved with two commercial projects and I was also able to do research of my own in various topics. My wife has done her research here also.

MARTA, Poland
PhD, Distributed Systems Design



I had a great opportunity to gain more knowledge and learn more about my study subject. People were really friendly and helpful in TUCS. There were also a lot of foreign students. We also had really good studying resources like books, computers and so on. In TUCS I was able to select courses from a very large variety.

TOMI, Finland
PhD, Embedded Computing
Senior Researcher

TUCS has an international atmosphere with students and professors coming from several different countries. The cooperation between students from different backgrounds and research areas creates an inspirational research environment. Most importantly, professors always had time during my PhD studies keeping me on course for completing my doctorate in technology. If you have a thirst for knowledge and would like to pursue a doctoral degree in technology, TUCS is the right place for you.



HANNA, Finland
PhD, Machine learning
Senior Researcher

At TUCS I received internationally unique capabilities for 4 years of academic freedom with competitive salary, infrastructure, administrative services, social benefits and no term fees. My supervisors and their groups provided me an excellent environment to grow as a researcher and develop my skills in theory and applications of computer science. They taught me crucial academic and managerial skills, while encouraging innovation and interdisciplinary approaches. Currently, I am working as a researcher at NICTA, Australia that belongs to the international top 10 in ICT research institutes.



JOHANNA, Finland,
PhD, Computer Systems
Senior Researcher

I had a great opportunity to do my PhD studies here. TUCS offers an international working environment containing a wide range of research fields. The educational facilities are also very good. For me the best part in my PhD research was that I had the possibility to express and implement my own ideas. Furthermore, I had always the possibility to discuss about my research with my colleagues and supervisors.



VILLE, Finland
MSc (Econ), Information Systems Management
Employed with Nokia



In TUCS I learned how IT and processes can be reengineered to suit business and customer needs. I believe people who master the big picture of IT, processes and business are the ones who can expect rewarding career paths in the future. At least I have taken great advantage of these skills in all positions I have worked during my 10 years in managing different teams and change initiatives.

JUSSI, Finland
PhD, Information Systems
Professor & Entrepreneur

After graduating I worked almost ten years as an assistant professor and professor in TSE. Now I am working for myself after setting up a consultancy company.

I have witnessed how TUCS has changed during the past ten years. In my time as a student, TUCS was largely classic doctoral school providing classic services. Today's TUCS is truly dynamic, cross scientific school where students can combine various disciplines to maximize their potential.



TIBERIU, Romania
PhD, Distributed Systems
Principal Scientist at ABB Corporate Research

The PhD program provided at TUCS gave me the opportunity to combine relevant aspects from my own electronics background with topics in formal methods, exposing me to concepts and methods from disciplines that were new to me. Thus, it supported me to both deepen my knowledge and to pursue new research directions. This all combined in a very successful and pleasant approach, during which I enjoyed working with colleagues coming from a variety of cultures, and with various professional backgrounds. It was fairly easy for me to follow next an academic career, and then smoothly move towards industry.



Finland

Finland is a Nordic EU Country that lies between Russia and Sweden. Finland's area is 338.000 square kilometres, being the fifth largest country in Europe. Ten per cent of the total area is covered by lakes and 69 per cent by forests. Nature is very important part of daily life of Finns.

The population of Finland is about 5,1 million with an annual growth rate of 0.3 per cent. After Iceland and Norway, Finland is the most sparsely populated country in Europe, with 17 inhabitants per square kilometre. Therefore, the towns are quite small according to the European scale. Most of the inhabitants (76 per cent) live in urban areas. About 56 per cent have completed post-primary education, 43 % have a secondary level degree and 13 % have a higher level degree.

Finland is a bilingual country, both Finnish and Swedish being the official languages. Around 6 per cent of the population speak Swedish as their native language. Finland participates in the Schengen cooperation, which means that people are able to move freely between member countries. Almost everyone in Finland can also speak English making the daily life for foreigners very easy and accessible.

Finland is a Nordic country with four distinct seasons. The climate is milder than in many other areas of the same latitude partly because of the warming influence of the Gulf Stream. In the far north of the country the sun does not set about 73 days, producing the white nights of summer. In winter, on the other hand, the sun remains below the horizon for 51 days in the far north. In summer the temperature quite often rises to +20 Celsius or more and in the winter, temperatures of -20 Celsius are not uncommon in many areas. And you can truly enjoy the world's most beautiful archipelago in four seasons in Turku.

Finland is world leading centre for innovations and technologies changing the global business and technologies especially in information technology. Finland has very positive climate for new enterprises and venturing supporting the continuous flow of research originated innovations to global market.

Turku

Turku is the oldest city in Finland and was the country's first capital. Known for its cathedral, medieval castle, river and market place, it is now the regional capital of Southwest Finland. The university system and academic traditions were started and originated in Turku. Today Turku is the main European style university city in Finland and hosting the 2nd largest amount of students and teachers in Finland. The student life is very vibrant and visible in Turku.

The two official languages of Finland, Finnish and Swedish, are represented in the city with around five per cent of the 174,000 inhabitants being Swedish speaking Finns. For advanced studies at master or PhD level the most used study language is already English.

In November 2007, the EU Council of Ministers of Culture in Brussels officially named Turku as European Capital of Culture for 2011. The year 2011 provides an unequalled opportunity to introduce Finnish culture and academic traditions in Turku to the world.

Turku is a centre for the ICT and BIO technology industries as well as for education. With around 30,000 students, among them around 1,700 international students, it is home to two universities: Åbo Akademi University and University of Turku (Turku School of Economics and Business Administration joined University of Turku in January 2010) and several professional advanced training schools.



For more information about Finland, please visit: www.finland.fi



For more information about Turku, please visit: www.turku.fi



Studying in Finland

Finland offers excellent opportunities in higher education in every field of study. Teachers provide their students with ongoing support throughout their studies and they are happy to discuss any problems the students may encounter. PhD students are also fully funded through individual or research grants.

Finland's education is highly regarded worldwide. Finland has been regarded to be one of the best places in the world for education with many thousands of students from all over the world going to study each year in Finland. Not only that, in Finland you are immersed and learn in an environment that has advanced technologies and advanced teaching methodologies.

Finns are great believers in equal rights for all and this, naturally extends to higher education. As a general rule, there are no tuition fees at Finnish universities and polytechnics for students enrolled on regular degree programmes. Although there are no tuition fees at Finnish universities, there is a legal requirement that all university undergraduate students are members of the Student Union, for which the annual fee is about 100 Euros. Student Union provides many services for students.

The cost of living in Finland is about the same as in other EU countries. Students admitted to a degree programme have to pay for food, accommodation, study materials, clothing, transportation and social activities. The minimum living expenses for a single student amounts to about 600-800 Euros / month depending on cost of accommodation as well as for example health care expenses.



Studying in Turku

Turku is an idyllic, modern and international city by the Baltic Sea. Long history, friendly people and modern technology all come together in this European Culture Capital of 2011. Academic traditions date back to 1640, when the Royal Academy of Turku was founded. Today Turku hosts two universities: University of Turku (Turku School of Economics and Business Administration joined University of Turku in January 2010) and Åbo Akademi University. Turku has a long track **of academic excellence in Europe and is currently highly ranked** in various ranking lists for universities. Thanks to the two universities and other educational institutes, around 20% of the population are students, which creates a youthful and fresh atmosphere. Leading one's life is easy in a compact city. The whole campus area lies within 10 minutes walking distance from the market place – the heart of the city. Prices are generally low and all you need is available.

Turku is well-known for biotechnology, medical technology and for active usage of ICT in well-being, culture and education. Furthermore, Turku is the world's leading centre for advanced ship building, hosting new innovative ICT in that segment. The Turku region invests in innovative new business. Both nationally and internationally aimed iICT businesses provide for excellent work opportunities for career prone, active Master's graduates.

The local innovation centre in Turku is Turku Science Park. Their coordinating force of collaboration in the ICT field is ICT Turku, a cluster focused on information and communications technology and digital content production. The network of ICT Turku is comprised of more than 1,400 Southwest Finnish companies and units of the ICT field. ICT Turku relies on local universities, in joint operation coordinated by TUCS, to provide the cluster with MSc and PhD level professional workforce. Innovation and entrepreneurship aspects both in master and PhD level education are already well and tightly integrated in Turku.



High education in Turku

University of Turku

The new University of Turku, formed when the University of Turku and Turku School of Economics merged as of 1 Jan 2010, is an internationally competitive research university whose operation is based on high-level multidisciplinary research. The mission of the University is to promote free research and scientific civilization and provide the highest research-based education.

The University of Turku recognises areas of strength in research. Molecular biosciences form the widest strength area of the University. Other recognised areas of strength are cardiovascular and metabolic research, ecological interactions and ecological genetics research, learning and education research, future studies and research on institutional design and social mechanisms.

As one of the leading universities in Finland, the University of Turku offers study and research opportunities in seven faculties: Humanities, Mathematics and Natural Sciences, Medicine, Law, Social Science, Education and Turku School of Economics. The University is a member of the Coimbra Group, a network of prestigious universities in Europe.

Total enrolment of students is 21,000 and each year about 1,000 international students study at the University. Most of them participate in English-language programmes or at the doctoral level in research projects. Even though the main language of instruction is Finnish, 15 International Master's Degree Programmes are available in English and each Faculty offers courses in English to both non-degree and degree students.

The aim and ambition of the University of Turku is to provide students with a high-standard, multidisciplinary education which enables them to creative problem-solving and thinking out-of-the-box. Students are able to tailor their personal study plans according to their future ambitions - whether they are in business or in research. Thanks to the friendly atmosphere, outstanding student services and an active student union, students feel at home from the very beginning of their stay.

Åbo Akademi University

The present Åbo Akademi University is a medium-size, multidisciplinary and Swedish-language university, celebrating its establishment in 1918. The first Academy in Åbo was founded in 1640. The re-established University was greatly influenced by the model from the Swedish period and its aim was to strengthen Swedish culture in Finland. Åbo Akademi University offers both undergraduate and graduate studies and extensive research opportunities to some 7000 students on three campuses. Our university is located in Åbo (Turku in Finnish), on the south west coast of Finland and in Vasa (Vaasa in Finnish).

Leading research in many areas

Åbo Akademi University has an acknowledged position at the forefront of research in such areas as biosciences, computer science, democracy, human rights, material sciences, process chemistry and psychology.



TUCS in a nutshell

Turku Centre for Computer Science (TUCS) is a joint research and education centre between the University of Turku (Turku School of Economics and Business Administration joined University of Turku in January 2010), Åbo Akademi University and Turun ammattikorkeakoulu, all located in the same campus area in Turku, Finland. TUCS coordinates university research and education in South-West Finland in the field of Information Technology.



The **activities** are carried out in the TUCS Master's and Graduate Schools and in the TUCS Research Centres and joint research laboratories. TUCS Graduate School was the pioneer for the Finnish Graduate School system. At the TUCS Research Centres, there are presently about 35 professors, 70 PhD level researchers, 120 doctoral students and 2000 Master's students. The research groups at TUCS are well recognized world-wide. Well-established research areas include Algorithmics, Bioinformatics, Communication Systems, Discrete Mathematics, Embedded Systems, Information Systems, Mathematical Modelling, Computer Engineering, and Software Engineering.

The **mission** of TUCS is to actively encourage formation of new multi- and interdisciplinary strategic centres for fostering new academic excellence, coordinate international innovative large-scale MSc and PhD education, and to act as a catalyst for joint research between the participating laboratories and for the interaction with the society.

The **international role** of TUCS has been further strengthened by developing and increasing the number of joint actions with different partners. TUCS has especially developed co-operation within the Nordic countries, with other EU countries and with China. TUCS is, together with Turku School of Economics, developing the Turku Innovation Platform – a science and technology transfer and innovation system including integrating innovation and entrepreneurship to ICT education at MSc and PhD levels.



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