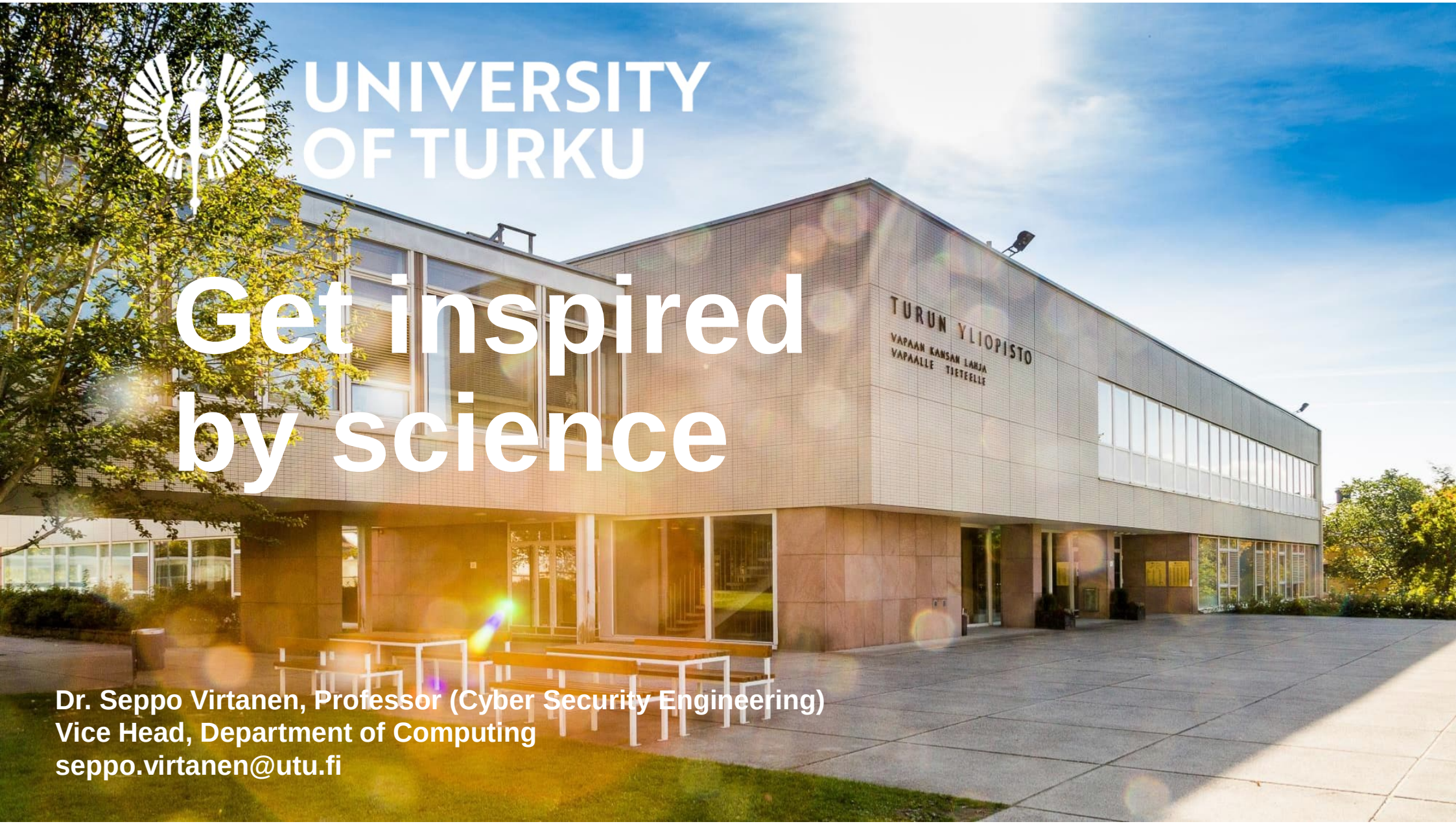
MDP in Information and Communication Technology

UTU Virtual Open Week 2024

19 November 2024

UNIVERSITY OF TURKU



Dr. Seppo Virtanen, Professor (Cyber Security Engineering)
Vice Head, Department of Computing
seppo.virtanen@utu.fi

Agenda of this info webinar

- General about the university and the program
- Introduction of the tracks
  - Cyber Security
  - Cryptography
  - Software Engineering
  - Data Analytics
  - Robotics and Autonomous Systems
- Q&A

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YEARS IN 2020

Founded in 1920 by the initiative of the Finnish people with the support of 22,040 donors.

N°1

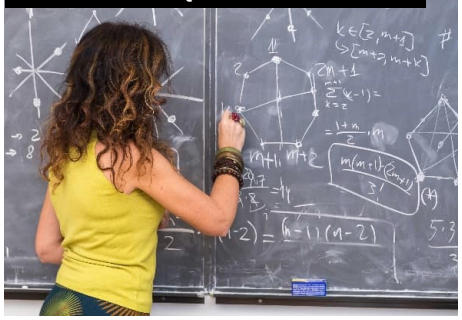
FINNISH-LANGUAGE UNIVERSITY

“From a free people to free science”

ACADEMIC HERITAGE IN TURKU SINCE 1640

The first university in Finland, the Royal Academy of Turku, operated in the city 1640–1828.

INTERNATIONAL DEGREE PROGRAMMES BASED ON HIGH-QUALITY RESEARCH



INSPIRING LEARNING ENVIRONMENTS

THE VIVID AND COSY STUDENT CITY TURKU

22,000
DEGREE STUDENTS

3,200
INTERNATIONAL STUDENTS FROM OVER 100 COUNTRIES

ANNUALLY
550
INCOMING AND
650
OUTGOING EXCHANGE STUDENTS

We reimagine education and career paths

The University of Turku is a popular destination for exchange and degree studies. We collaborate with over 400 universities worldwide and offer a wide selection of courses taught in English.

We educate creative and independent problem solvers who will build a sustainable world. The University offers inspiring learning environments and new study methods to ensure the best learning results.

We meet the needs of professional life with new training and collaboration. We encourage continuous learning and personal development by offering versatile training and courses.

> utu.fi/study

Department of Computing

- Largest of the three departments in the faculty of technology
- Founded 2002
- Staff originates from over 20 different countries
- A community of more than 200 experts and 1200 students

Master’s Degree Programme in Information and Communication Technology (ICT)

- Target Degree: Master of Science (Technology)
- Study time: 2 years (120 ECTS)
- Tuition fee waiver scholarships to top applicants
- Major subjects (Tracks)
  - Cyber Security
    - Offers double degree option in the EIT Digital Master School
  - Robotics and Autonomous Systems
    - Offers double degree option in the EIT Digital Master School
  - Data Analytics
  - Software Engineering
  - Cryptography

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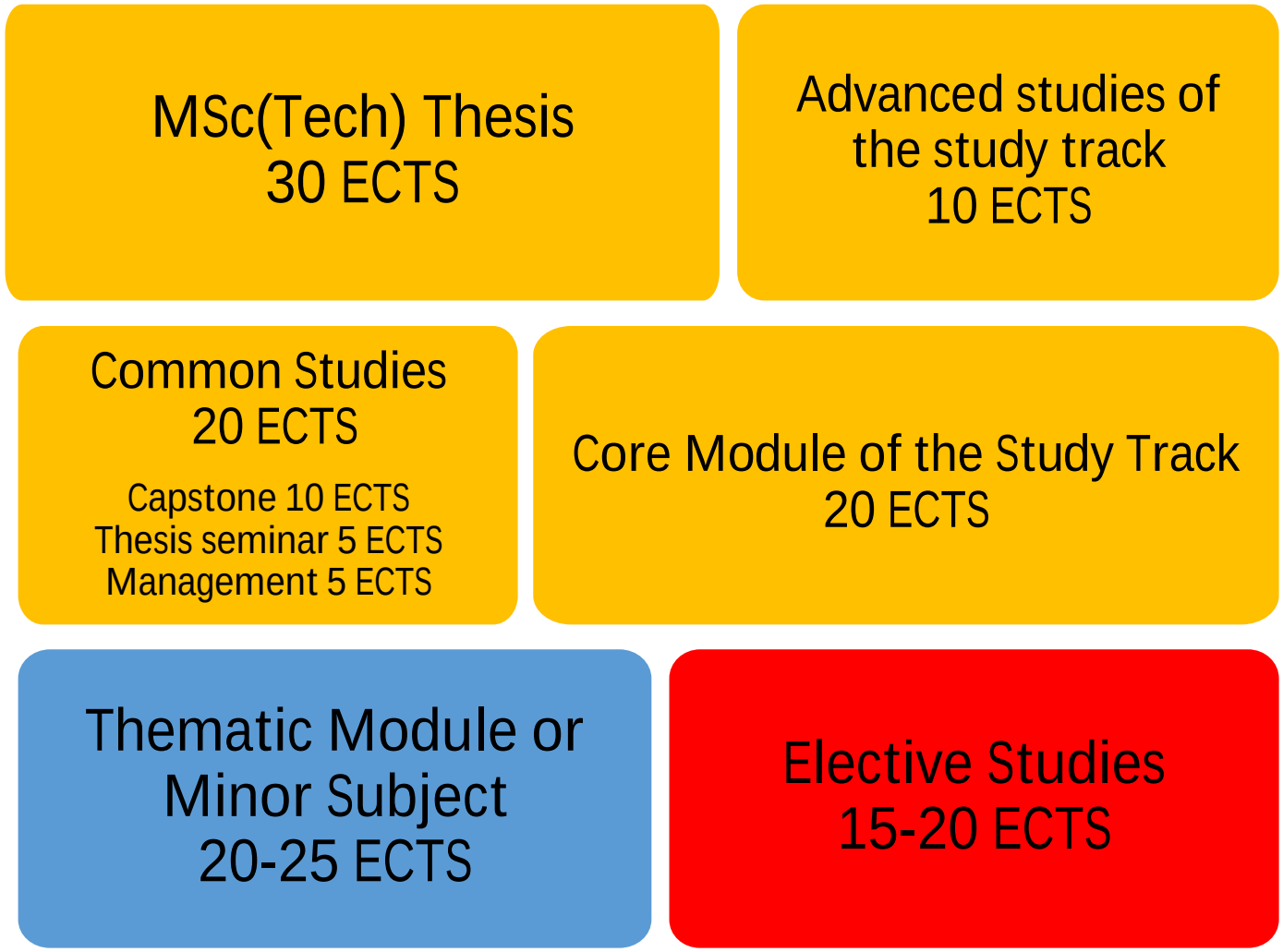
General Degree Structure



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General Admission Info

- The application period is from 8 January to 22 January 2025.
- The application is submitted on the Studyinfo.fi portal (www.studyinfo.fi). A link to the application form will be available on the website of each programme.
- The application must be submitted online by the application deadline. All the relevant enclosures must be attached to the application form within one week of the application deadline.
- More information: https://www.utu.fi/en/study-at-utu/how-when-to-apply
- Questions about admission? admissions@utu.fi

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Language Requirements for Master's Degree Programmes

- Applicants must have excellent English language skills and a certificate that proves those skills.
- Language skills can be indicated by taking one of the internationally recognized English language tests listed on this page: https://www.utu.fi/en/study-at-utu/language-requirements-for-masters-degree-programmes
- When taking the test the applicant should choose the University of Turku as a recipient of the results where possible. The applicant must also attach a scanned copy of the test result to the application for verification purposes.
- The test result must be available and attached to the application form by the end of the supplementation period (29 January 2025).
- The test result must be verifiable for at least one month after the application time has ended.
- Applicants are exempt from an English language test only for reasons listed on this page: https://www.utu.fi/en/study-at-utu/language-requirements-for-masters-degree-programmes

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Cyber Security Track

EIT Digital Cyber Security Double Degree

Head: Professor Seppo Virtanen

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Rapidly changing job market – ICT and Cybersecurity

- According to **2023 (ISC)² Cybersecurity Workforce Study**:
  - Severe shortage of cybersecurity professionals
  - 5.5 million skilled professionals worldwide currently in the field
  - Additional 4.0 million more needed currently:

    the Global Cybersecurity Work Force Gap

  - The gap has increased by 0.6 million (13 %) from 2022
    - By 31 000 (10%) in Europe

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Finland’s Leading University in Cyber Security Education

- M.Sc.(Tech.) since 2010
- Annual output about 30-40 M.Sc.(Tech.) degrees
- Only university in Finland approved to the EIT Digital Master School Cyber Security programme
- Only cyber security university in Finland to participate in the SPECTRO project
  - 10 M€ EU project, advanced digital skills in Cybersecurity and Robotics
  - 12 leading European universities
  - Master’s degree programmes for students
  - Self-standing modules for professionals: up-skilling and re-skilling

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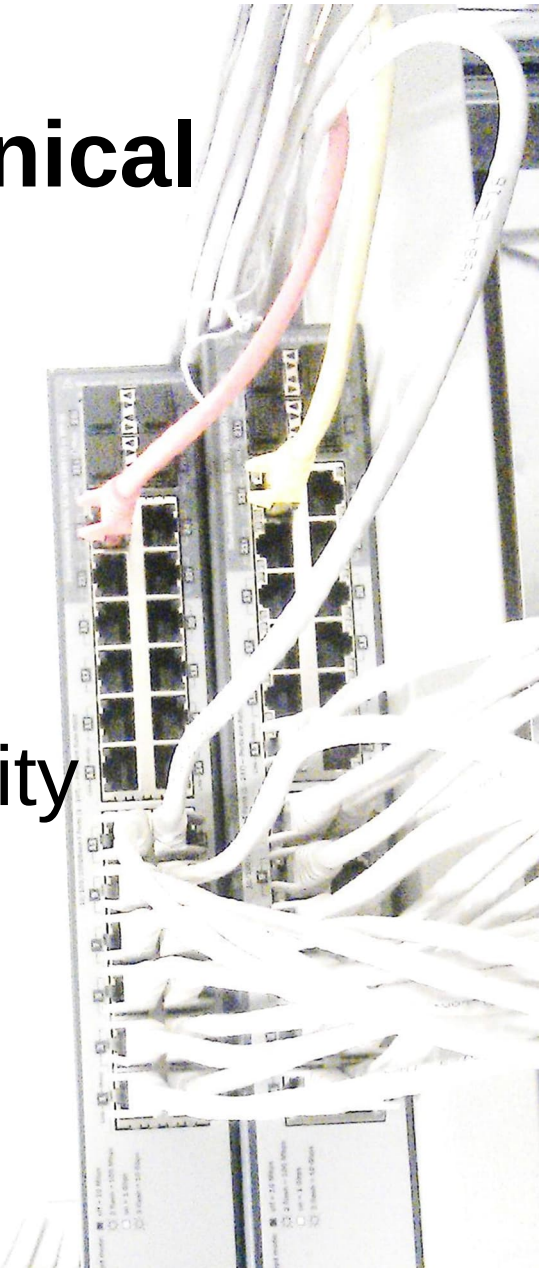
Educational goals and content

- Graduates are cyber security experts, each with a unique expertise profile
  - Cyber Security Analyst, Penetration and Vulnerability Tester, Cyber Security Consultant, Cyber Security Manager, Network Security Specialist, Business Information Security Officer, Cryptography Engineer, Chief Information Officer, Chief Information Security Officer, Head of Information Security, Head of Corporate IT, ...
  - Depending on the choice of thematic and elective studies
- Multi-disciplinary approach
  - Compulsory security technology, mathematical cryptography and IT security management studies
  - All taught by experts in each of the fields, respectively (collaboration with Department of Mathematics and Turku School of Economics)

Current Core and Advanced Technical Topics

- System and Application Security
- Firewall and IPS Technology
- Security Engineering
- Human Element in Information Security
- Ethical Hacking (Penetration Testing)
- Digital Forensics (2025 onwards)



EIT Digital Master School: Cyber Security

- The cyber security track is a member of the EIT digital Master School's Cyber Security double degree programme with leading European universities
- Entry year studies in one of the participating universities, common base
- Exit year studies in another university in another country, specialization
  - Turku: Security Technologies and Intelligence
- Get degree from both universities

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CYBER SECURITY (CSE)

Year 1
Entry University

- Eötvös Loránd University HUNGARY
- Babeș-Bolyai University (UBB) ROMANIA
- University of Trento ITALY
- University of Twente THE NETHERLANDS
- University of Rennes FRANCE
- University of Turku FINLAND

Year 2
Exit University

- Eötvös Loránd University HUNGARY
- Babeș-Bolyai University (UBB) ROMANIA
- University of Trento ITALY
- University of Twente THE NETHERLANDS
- EURECOM FRANCE
- University of Turku FINLAND

Students must choose a different country and university for entry AND exit years

eit Digital MASTER SCHOOL

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Some Recent Master's theses in Cyber Security

- Application of Machine Learning-Based Classifier for AS-Sets to Enhance the Security within the Border Gateway Protocol
- Application Security Verification Standard Compliance Analysis of a Low Code Development Platform
- Secure migration of WebAssembly-based mobile agents between secure enclaves
- Deployment of Next Generation Intrusion Detection Systems against Internal Threats
- Securing Communication Channels in IoT using an Android Smart Phone
- Developing a Systematic Process for Mobile Surveying and Analysis of WLAN security
- On the Effects of Forced Trust on Implementations of Small Smart Cities
- Systematic approach towards Analysis and Mitigation of Advanced Evasion Techniques
- Evaluation of Machine Learning Classifiers for Mobile Network Intrusion Detection Systems
- Design and implementation of data ingestion extensions for threat intelligence platforms
- OSINT-based Email Analyzer for Phishing Detection"

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Cryptography Track

Head: Dr. Ville Junnila

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Cryptography

- Focus on the mathematical foundations of various cryptosystems applied in cyber security
- **Mathematical previous degree required**
- Offers a solid background on classical and modern aspects of mathematical cryptography
- A deep understanding is developed on modern symmetric and asymmetric cryptosystems

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Software Engineering track

Head: Associate Professor Tuomas Mäkilä

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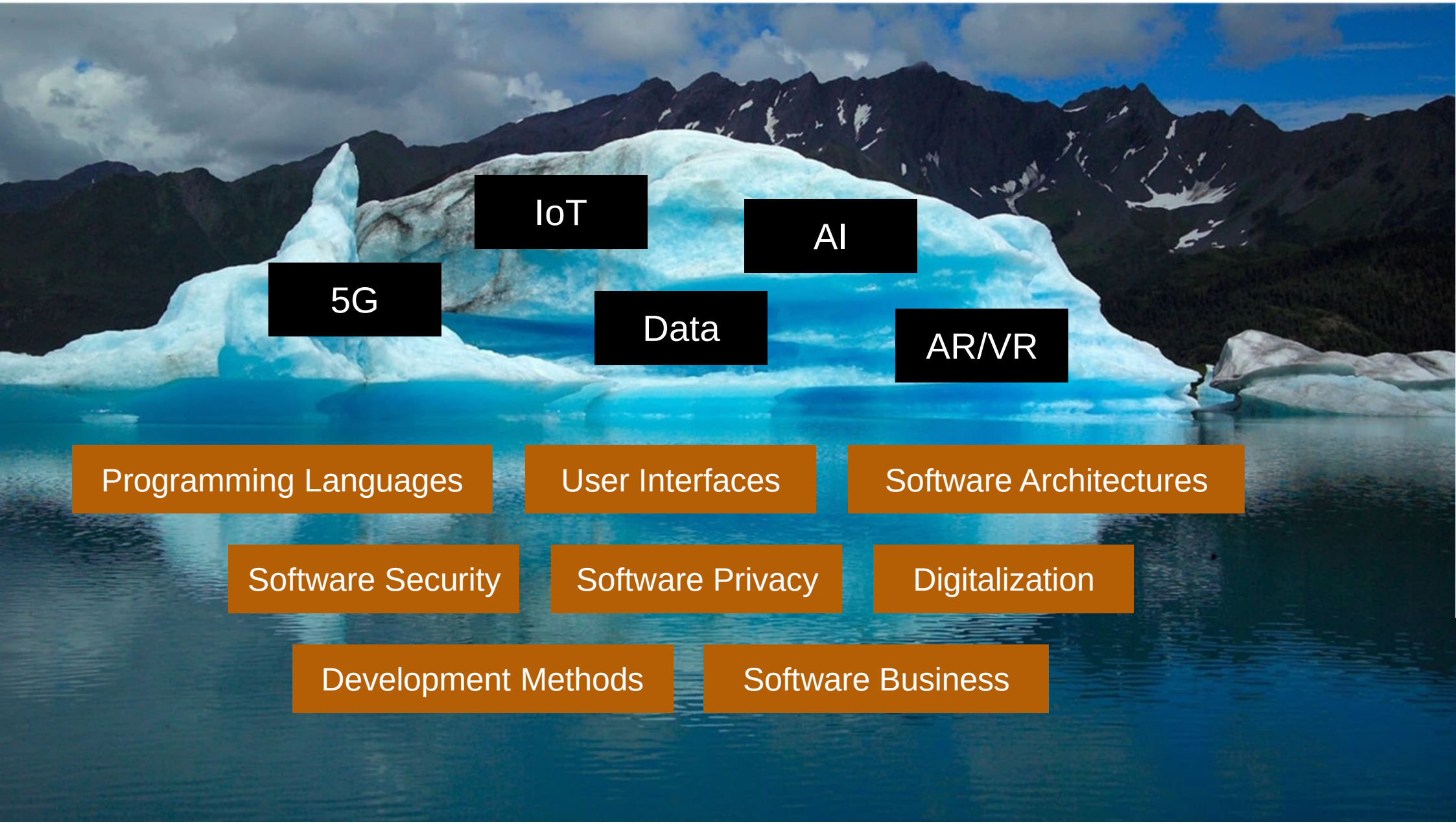
IoT
AI
5G
Data
AR/VR
Programming Languages
User Interfaces
Software Architectures
Software Security
Software Privacy
Digitalization
Development Methods
Software Business

Core and Advanced Topics in the track

Software Engineering Core Module 20 ECTS

DTEK2089 Requirements Engineering, 5 ECTS
DTEK0072 Software Design and Architecture, 5 ECTS
DTEK0073 Software Testing and Quality Assurance, 5 ECTS
DTEK0069 Usability, User Experience and Analytics, 5 ECTS

Advanced Studies in Software Engineering 10 ECTS

DTEK8102 Privacy and Security for Software Systems, 5 ECTS
DTEK2090 Modern User Interfaces, 5 ECTS

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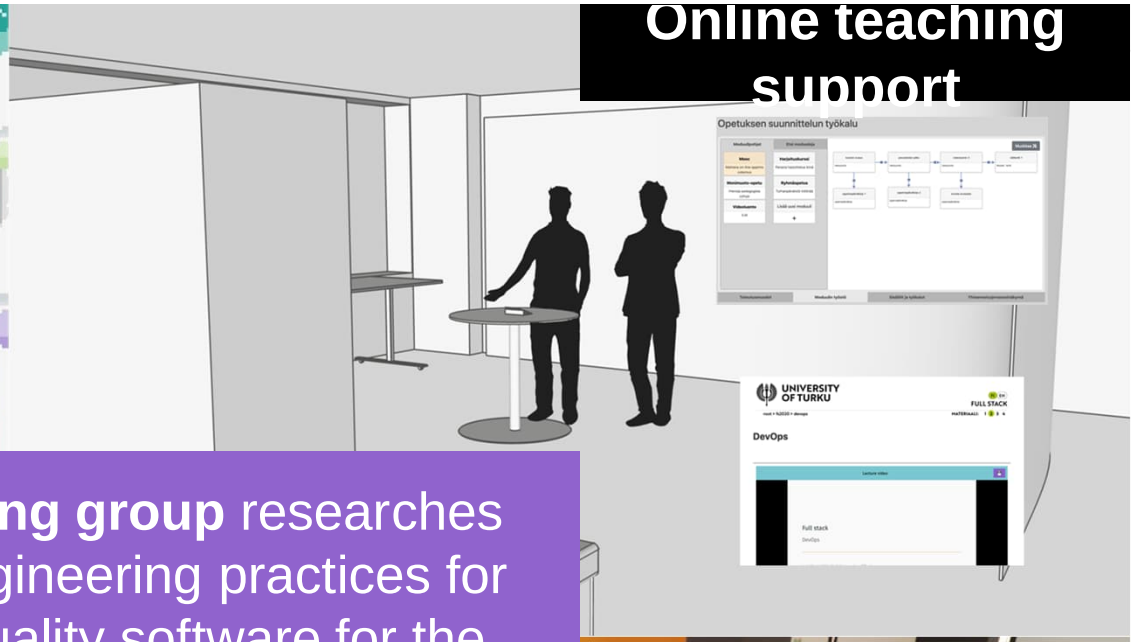
Online teaching support



Software Engineering group researches technologies and engineering practices for constructing high-quality software for the increasingly complex systems of the digitalising society and industry

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GeoICT4
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Previous M.Sc.(Tech.) Theses

- Structuring a Modern Web Service for Users and Search Engines
- A Case Study on Cloud Migration and Improvement of Twelve-Factor App
- Connecting RPA Development and Business : A Tool for Process Definition, Agile RPA Development and Maintenance
- AI-assisted Software Development Effort Estimation
- CUSTOMTOOLS as general integration platform for SOLIDWORKS - ERP data exchange
- Monitoring of a Cloud-Based IT Infrastructure
- Utilising web analytics in the agile development of e-commerce sites : a software developer's perspective
- Secrets Management in a Multi-Cloud Kubernetes Environment
- Migrating microservices to graph database
- Cloud migration
- Framework change for modernization of webservice
- Implementing web accessibility to an existing web application

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Data analytics track

Head: Professor Timo Knuutila

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Core and Advanced Topics in the track

Data Analytics	**20**
Data Analysis and Knowledge Discovery (in English)	5
Machine Learning and Pattern Recognition (in English)	5
Statistical Data Analysis (in English)	5
Evaluation of Machine Learning Methods (in English)	5
Data Analytics, Advanced Module	**10**
Introduction to Deep Learning (in English)	5
Exercise Project (in English)	5

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Application Sectors

Biomedical

- Prostate cancer recognition
- Medical image analysis (MRI, PET)
- Drug-protein, protein-protein, drug combination and multi-way interaction prediction
- Proteomics based on mass-spectroscopy
- Synthesis patent data

Autonomous systems

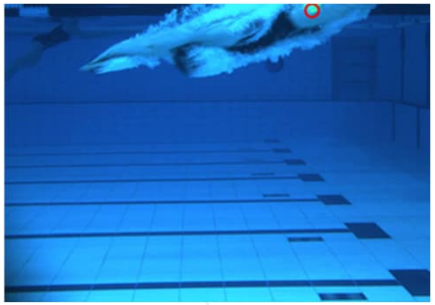
- Ships, forest machines
- Situational awareness
- Sensor-fusion (RGB+IR+lidar+radar+GNSS+IMU)
- Decision making and navigation

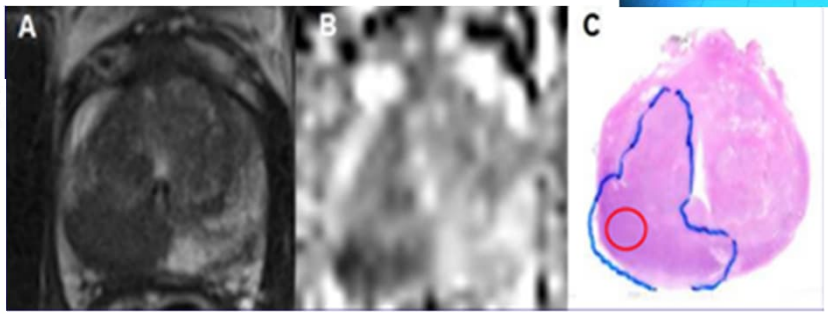
Geoinformatics

- Forest trafficability estimation
- Soil type estimation
- Forest inventory method development

Other

- Sport analytics (swimming, pole fault, hurdles)
- Mobile game data analysis
- Industrial process optimization and control: scheduling, assembly line balancing
- Censor data analysis





Robotics and Autonomous Systems Track

EIT Digital Embedded Systems double degree

Head: Professor Tomi Westerlund

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Key Courses

Core Module (20 ects)

- DTEK0078 ***System Modelling and Synthesis with HDL*** (5 ects)
- DTEK2080 ***Hardware Accelerators for AI*** (5 ects)
- DTEK2081 ***Algorithmic Foundations of Robotic and AI Systems*** (5 ects)
- DTEK2083 ***Perception and Navigation in Mobile Robotics*** (5 ects)

Advanced Module (10 ects)

- DTEK8085 ***Autonomous Systems Architectures*** (5 ects)
- DTEK2084 ***Aerial Robotics and Multi-robot Systems*** (5 ects)

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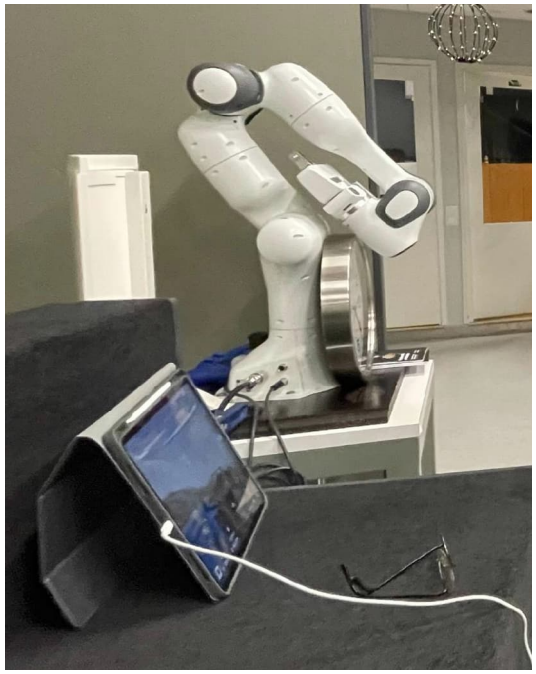
Equipment and Facilities

- Aerial, ground, and collaborative robots
- Sensor systems
  - Lidars
  - Depth, event, and RGB cameras
- Computing platforms
  - AI accelerators
  - Onboard computers
- Large indoor testing arena







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Year 1
Entry University

EMBEDDED SYSTEMS (ES)

Year 2
Exit University

- KTH Royal Institute of Technology SWEDEN
- University of Bologna ITALY
- University of Turku FINLAND

- KTH Royal Institute of Technology SWEDEN
- University of Trento ITALY
- Budapest University of Technology and Economics HUNGARY
- University of Turku FINLAND
- Tallinn University of Technology ESTONIA

Students must choose a different country and university for entry AND exit years

eit Digital

Co-funded by the European Union

eit Digital MASTER SCHOOL

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Build your future career with us

Get inspired by future! Our aim is to provide our students with skills for innovative problem solving and for meeting the challenges of working life.

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infoscitech@utu.fi