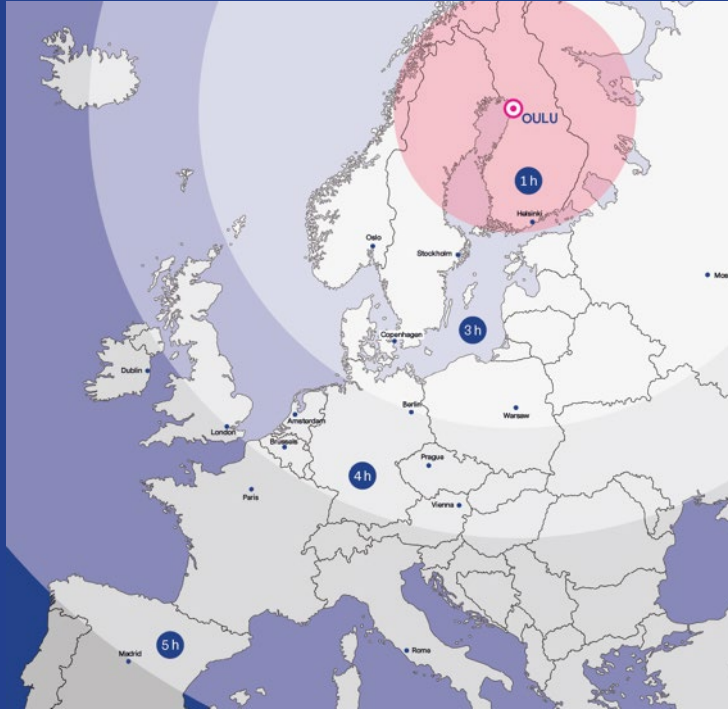# Science with Arctic Attitude

Terveyden 5G/6G sovellukset –
Pohjoisesta puhaltaa

Rovaniemi, 24.11.2022

The University of Oulu in brief

Natural Sciences and Mathematics

Biosciences

Medicine and Health

Economics and Business Administration

Engineering and Architecture

Information and Communication Technologies

Education
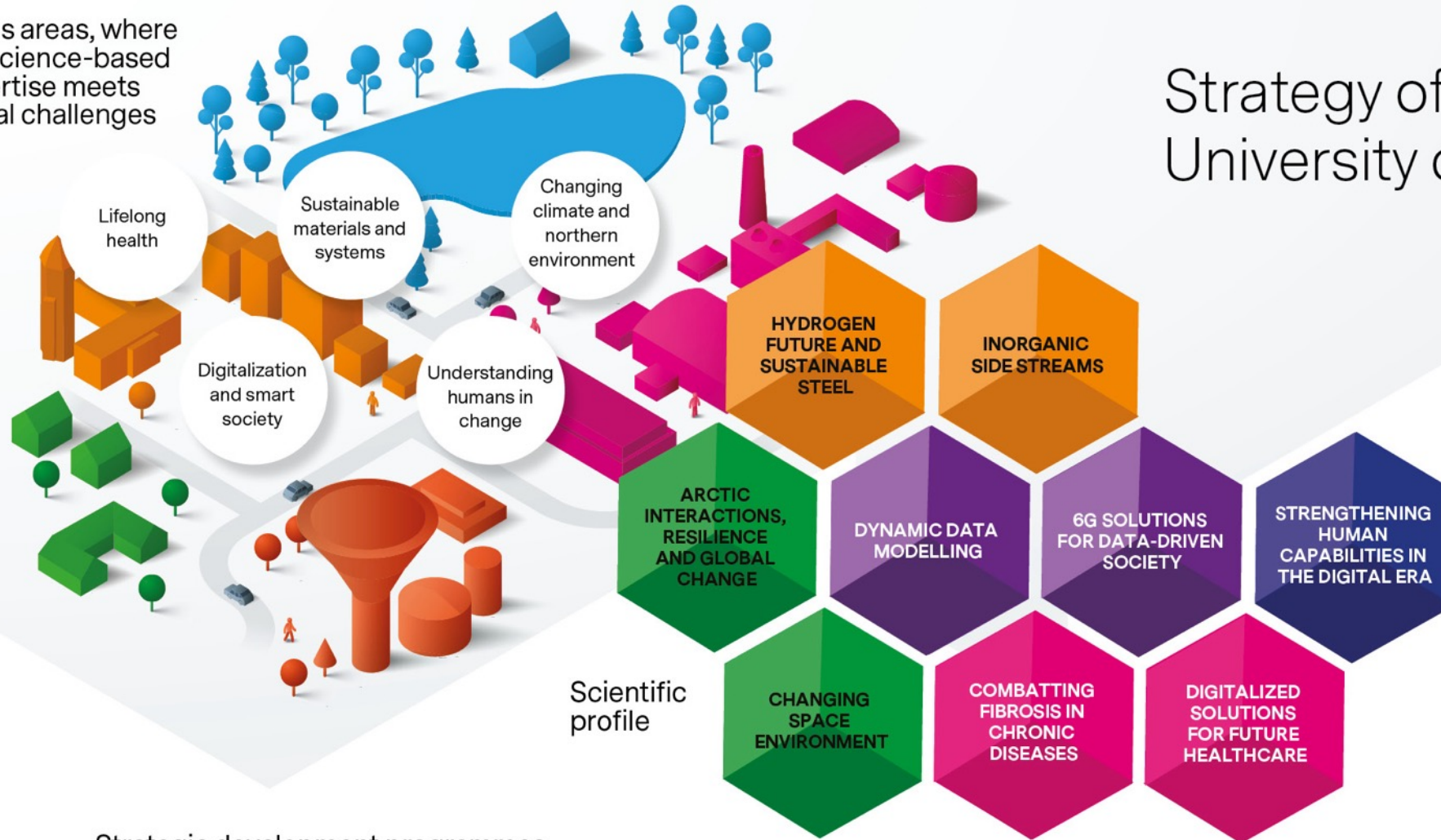
Humanities

13 800
Students

3 700
Staff

65 000+
Alumni

University of Oulu

Strategy of the University of Oulu 2020–

Focus areas, where our science-based expertise meets global challenges

- Lifelong health
- Sustainable materials and systems
- Changing climate and northern environment
- Digitalization and smart society
- Understanding humans in change

Scientific profile

- HYDROGEN FUTURE AND SUSTAINABLE STEEL
- INORGANIC SIDE STREAMS
- ARCTIC INTERACTIONS, RESILIENCE AND GLOBAL CHANGE
- DYNAMIC DATA MODELLING
- 6G SOLUTIONS FOR DATA-DRIVEN SOCIETY
- STRENGTHENING HUMAN CAPABILITIES IN THE DIGITAL ERA
- CHANGING SPACE ENVIRONMENT
- COMBATTING FIBROSIS IN CHRONIC DISEASES
- DIGITALIZED SOLUTIONS FOR FUTURE HEALTHCARE

THE UNIVERSITY COMMUNITY'S VALUES

- Creating new
- Taking responsibility
- Succeeding together

Strategic development programmes

RESEARCH
High-level impactful research

EDUCATION
Quality education for different parts of life

INNOVATIONS AND ENTREPRENEURSHIP
Entrepreneurial source for research-based innovations

COMMUNITY
Skillful, adaptable, diverse and international community

DIGITALIZATION
High-quality online studies and user-centred digital services

CAMPUSES AND SUSTAINABLE DEVELOPMENT
Inspiring working and studying environment at resource-efficient, green campuses

Digitalized Solutions for Future Healthcare (DigiHealth)

Leader: Professor Simo Saarakkala

Vice-leader: Professor of Practice Jarmo Reponen

Coordinator: Docent Tuire Salonurmi

Digitalized Solutions for Future Healthcare (DigiHealth)

- Global megatrend; Accumulation of data; Finland's growing health information exchange system (KANTA services)
- Role-models: USA strong in research, strong biobanks *e.g.* in UK and Austria

OULU´s Achievements and Current Strengths	Goals – How to get there – What is needed
Research: 6G Flagship/ICT linking with health; eHealth professors & printed biosensor professorships; ERC grantee in biomedical eng. & previous CoEs; facilitation of multidisciplinarity **Infrastructure & data:** 5G Test Network in Hospital; OYS TestLab; Biocenter core facilities; patient and population cohorts **Nationally:** Digital Health Revolution project; Finnish Coordinating Centre for Health Technology Assessment, 2017-; OULU-coordinated national Digital Health Knowledge Hub (proposed); contributing to AI and robotics in health care	**Goal:** a world-class multidisciplinary research-based hub of digital technologies for data-driven health applications **How:** to valorize OULU´s strong research expertise in medicine, wireless sensors and business combined with outstanding regional co-creation **Measures:** 4 tenure track packages + visiting program + new research initiatives + co-creation workshops **HiDyn** study groups, *e.g.,* AI in fibrotic diseases, image and biosensor data mining

Collaboration

UH (FinnGen, AI in mammography and back disorders, cancer research), **UEF** (co-creating novel medical solutions, metabolomics), **Aalto**-lead AI Flagship; **Oulu University Hospital** (Future Hospital), **OuluHealth ecosystem**; **Biocenter Finland** and **Biobank Finland**; **VTT** (printed biowearables, joint new professorship); **National** DigiSote Oy project (Health care data systems development) **International:** European Digital Innovation Hubs & other European eHealth networks; FET OPEN Gladiator and MindGap

Digitalized Solutions for Future Healthcare (DigiHealth)

1) **Next-generation data for digital healthcare**
   - University of Oulu has strong research on translational and predictive biomedicine, lifelong health data and biosensor development from materials to electronics, yielding significant results in ==understanding genetic and molecular mechanisms of disease, identifying risk factors for several diseases threatening lifelong health and implementing novel wireless biosensors.==

2) **System level architectures for future digital healthcare**
   - University of Oulu has an impressive track record on wireless systems research, including significant results from communications, positioning, signal processing, big data and security. University of Oulu is working on cutting-edge 5G/6G network development (6Genesis is one of the six national Flagships of the Academy of Finland Flagship programme) for dependable communications from heterogeneous environments (home, hospital, etc.), ==problems related to the protocols used with large amount of simultaneously connected wearables and other devices, and development of secure and reliable ways to integrate heterogeneous medical and environmental data sources with hospital's electronic data records. This also entails development of evidence-based approaches for ICT-based health interventions which utilize data analytics of user behaviours.==

Digitalized Solutions for Future Healthcare (DigiHealth)

3) **Medical AI to support clinical decisions**
   - University of Oulu has strong competence and tradition in using Medical AI to support clinical decisions, especially in using machine learning methods to analyze physiological signals and medical images to derive novel quantitative indices for diagnosing and predicting disease progression. Strong areas include neurology, cardiology and musculoskeletal diseases, in which the research has received a prestigious European Research Council (ERC) Grant. This research integrates "omics" data and on-body measurements for improved decision making at hospitals and in remote monitoring applications. Development of deep learning approaches for discovery of novel pathways, associations of aetiology and progression of diseases, and new personalized therapies are ongoing.

4) **Impact and business solutions**
   - University of Oulu has strong competence to assess the impact of digital health solutions and to evaluate novel health data management approaches and system level implications of these developments towards personalized medicine. This expertise offers a unique foundation for studying emerging data driven futures, dependent on analytics, AI, machine learning and 5G/6G, to develop and deploy insights for improving outcomes and reducing costs in health care.

New recruitments in DigiHealth consortium 1/2

5 tenure-track professors

DigiHealth 1: *Next generation data for digital healthcare*
1. Professor **Caglar Elbuken** in the field of ***"Biosensors"***
2. Assistant Professor **Jian-An Huang** in the field of ***"Biosensors"***
3. Associate Professor **Valerio Izzi** in the field of ***"Bioinformatics"***

DigiHealth 2: *Wireless system level architectures for future digital healthcare*
3. Assistant Professor **Erkki Harjula** in the field of ***"Wireless system level architectures for future digital healthcare"***

DigiHealth 3: *Medical AI to support clinical decisions*
4. Associate Professor Mourad Oussalah in the field of ***"AI for medical decision support systems"***

2 post-doc fellows

DigiHealth 4: *Impact and business solutions*
1. Post-doctoral Fellow Irina Atkova in the field of ***"Systematic Impact Creation in Digital Health"***
2. Post-doctoral Fellow Miia Jansson in the field of ***"Health Technology Assessment in Digital Health"***

New recruitments in DigiHealth consortium 2/2

- Four tenure-track positions included start-up packages:
  - ✓ **4 Post-doc Fellows**
  - ✓ **4 Ph.D. students**

- Total budget of DigiHealth project is **5 000 000 €** for 2020-2024

Conducted major activities in DigiHealth consortium

- **Kick-off seminar for DigiHealth** was organized remotely in spring 2021

  - ✓ Invited national external speakers

- **New Research Initiative Program** was launched in 2021

  - ✓ Financial support for five new research initiatives (40 000 € for each)
  - ✓ New call just opening in November-December 2022

- **Visitor Program** was launched at the beginning of 2022

  - ✓ Financial support for: 1) inviting researchers to Oulu for short visits, or 2) short research visits of University of Oulu researchers to other research organisations (or even companies)

  - ✓ Directed for post-docs and early-career group leaders

Planned major DigiHealth activities in the future

- **Benchmarking visits** to Nordic Digital Health Centers (Trondheim & Tromssa) in 2022

- **International DigiHealth conference** in Oulu in 2024

THANK YOU !