4TU+.NIRICT

Netherlands Institute for Research on ICT

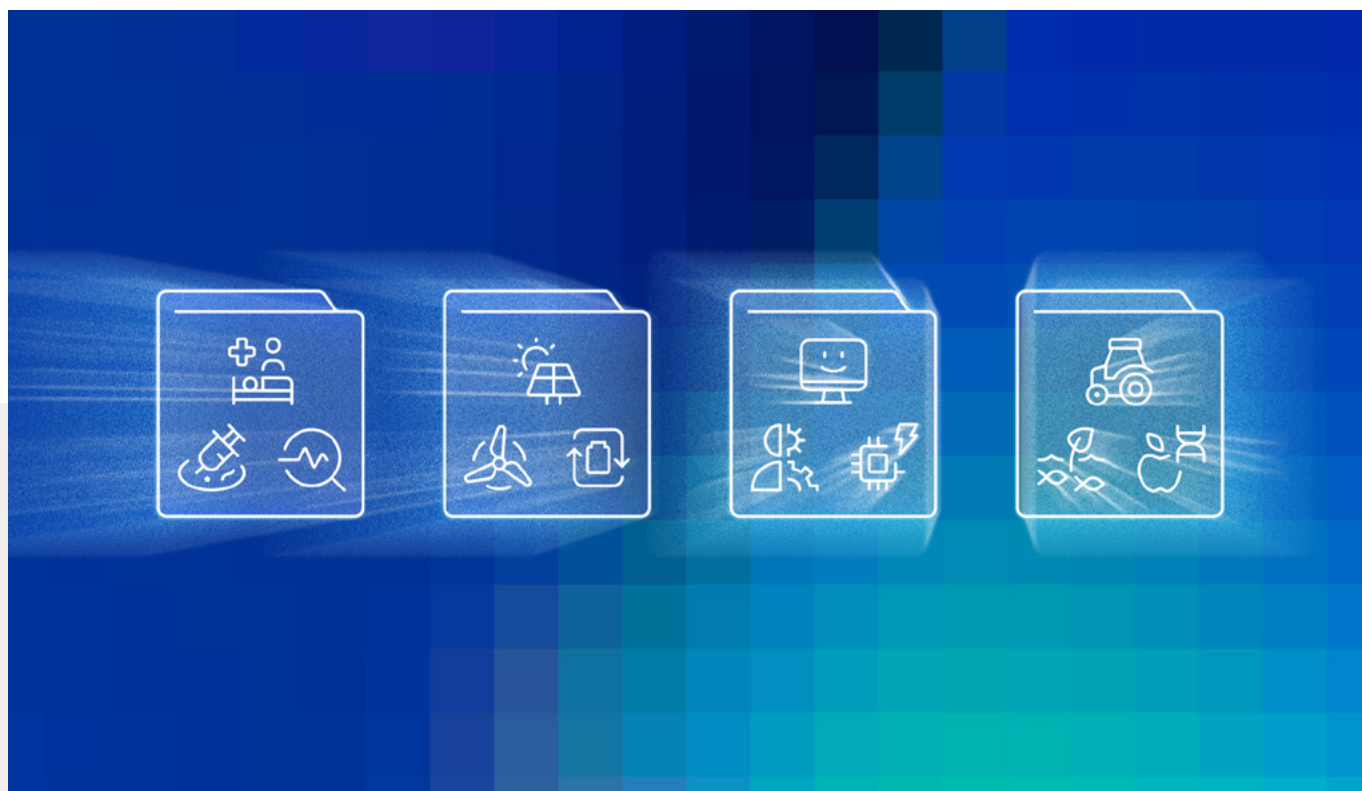# Importance and Impact of ICT

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Information and Communication Technologies (ICT) permeate and enable virtually all modern application domains through communication- and computing platforms and devices. ICT combines hardware and software, exploiting techniques like Artificial Intelligence, Machine Learning, and Cloud and Edge computing. It constitutes a foundational layer that enables potential solutions to some of the world's grand challenges of sustainable development by providing an understanding of the physical world and securely controlling it after smart processing of the information about this physical world. At the European and national levels, ICT is an important driver of innovation, keeping those regions competitive and in the lead in a globalized playing field. It directly and indirectly employs a large number of people and contributes significantly to national prosperity.

For the Netherlands, ICT is a cornerstone ingredient to addressing the challenges that lie ahead. A speedy and affordable energy transition towards autonomous access to sustainable energy sources can only proceed through smart systems building on ICT solutions.

Aging population, labor market and immigration challenges create a prominent need to improve labor efficiency, through automation with ICT solutions[1]. High-tech industry delivers an increasingly large contribution to the Dutch industry and domestic product. Its cross-disciplinary nature of cyber-physical challenges needs innovations from ICT and several neighboring disciplines in alignment and collaboration[2]. Digitalization of society, ensuring availability and accessibility of information and services to all of society crucially relies on ICT innovations.

While the Netherlands continues to rank among the best in Europe in terms of ICT infrastructure and digital literacy (e.g., top 3 in 2022 according to Digital Economy and Society Index of the European Commission), the 2024 Digital Decade Country Report[3] points to a gap of skilled labor in the ICT domain despite the ambitious goal set by the Netherlands to achieve the target of 1 million ICT professionals in 2030 in its Digital Economy Strategy[4]. In 2023, 6.9% of the employed population in the Netherlands are ICT specialists, while women account for less than 25% of the employed ICT workforce (Digital Decade Country Report 2024). Decreasing the skills gap and the gender imbalance in the ICT domain is an important opportunity to reach the goals, which requires a high-quality and inclusive ICT education and research in the Netherlands.

1. A. Heyma, J. van Kesteren, J. Bakens, R. Gerards, I. Klinker, E. Graus. Arbeidsmarktkrapte technici – ontwikkelingen, verklaringen en handelingsperspectieven, Researchcentrum voor Onderwijs en Arbeidsmarkt, Amsterdam, 2022.
2. P. van Kappen, T. van Bree, C. Stolwijk, A. Yagafarova, T. van der Horst. Hightechindustrie 2040 – Nieuwe opgaven voor het verdienvermogen op de lange termijn en de impact voor Nederland, TNO whitepaper, 2023.
3. The Netherlands Country Report, 2024
   https://digital-strategy.ec.europa.eu/en/factpages/netherlands-2024-digital-decade-country-report
4. Rijksoverheid, Strategie Digitale Economie, 2022
   https://www.rijksoverheid.nl/documenten/rapporten/2022/11/18/rapport-strategie-digitale-economie

The Need for 4TU.NIRICT

We stand at a pivotal moment: Artificial Intelligence is expanding at an unprecedented pace, finding its applications in many areas and raising grand challenges in sustainability as well as its ethical and responsible use. For a resilient and sustainable society, novel ICT solutions are no longer optional, but essential. Yet, their introduction is constrained by scalability and energy consumption, from vast datacenters to devices at the edge. Without bold innovation, these limitations will hinder progress. New computing paradigms, such as neuromorphic computing, offer the possibility of transformative leaps in efficiency enabling machine learning that is orders of magnitude more energy efficient. The ethical, legal, and social dimensions of ICT demand equal attention. Privacy, security, and fairness cannot be afterthoughts; they must be built into the very fabric of innovation from the IoT devices collecting human health data to the mobile networks acting as a critical infrastructure for realization of smart mobility solutions for sustainable cities. While ICT also stands at the heart of the energy transition for a sustainable future, its own sustainability should not be overlooked. As ICT extends further into the cyber-physical world and becomes a critical infrastructure, ensuring resiliency along with safety, dependability, and reliability becomes crucial in need of novel solutions. We aim to advance the frontiers of ICT research together, foster cross-disciplinary collaboration, and nurture the talent who will carry these breakthroughs forward. Together, we will shape technologies that are sustainable, ethical, and impactful.

ICT research flourishes from the combined effort of various disciplines, such as computer science and data sciences to manage the safe and secure processing and exploitation of information and (personal) data, and electrical engineering for effective and efficient platforms to deliver increased performance and capabilities at affordable monetary and energy costs with a sustainable footprint. Application domains, such as the energy- and communication infrastructure, health, food supply and safety, all greatly benefit from these advancements. Enriching the existing disciplinary networks and activities with an on outward-looking, cross-disciplinary view creates new opportunities that come from trans-disciplinary collaboration and alignment.

To this end, 4TU.NIRICT as an academic network embedded in 4TU.Federation comprises all ICT-related research of the universities in the Netherlands, maintaining close contact with related disciplines at other research institutes. It emphasizes the intersection between Electrical Engineering and Computer Science.

4TU.NIRICT's vision is a thriving, cross-disciplinary research community that accelerates ICT innovation and unlocks the full potential of ICT to address urgent societal challenges, and that is a strong force for national and European innovation and economic development, unhindered by any disciplinary barriers.

4TU.NIRICT's mission is therefore, to bring together computer science and electrical engineering researchers and educators in the Netherlands and support the development of a healthy, diverse, and productive community, within an international industrial and scientific context, to fully realize the potential of ICT for the benefit of society and industry.

Realizing Its Role

4TU.NIRICT aims to realize its mission through a combination of activities.

- Stimulate the interaction and cooperation between researchers, educators and practitioners in the areas of electrical engineering and computer science and connect with additional neighboring and complementary disciplines.
- Promote Diversity, Equity and Inclusion (DEI) within the Dutch ICT Community.
- Recognize, value, and facilitate young scientists within our institutions.
- Attract and promote interest in ICT research and its research community, disseminate results, and createawareness.
- Promote the education and training of new generations of responsible professionals, aware of ethical and societal implications of new ICT technologies.
- Achieve this by means of community-building activities such as the organization of an annual community day and funding for community building and cross-disciplinary research activities.

4TU⁺.NIRICT

Get involved

4TU.NIRICT welcomes your ideas and contributions towards realizing its role.
Please visit our website www.4tu.nl/nirict for potential funding opportunities
(e.g., for community building, seed funding or supporting DEI activities) and upcoming events.

**Scan to visit
our website**

4TU⁺.

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