dfir brief
NR. 41
27-10-2023

Artificial Intelligence in Research and innovation

Artificial intelligence has the potential to revolutionize the way we conduct research and innovation. It can enhance the quality, scope, and relevance of our investments in research and innovation. However, the technology can also radically change the framework for research and innovation. These changes involve risks and pitfalls. Therefore, Denmark must ensure that its research and innovation environments seize the new opportunities while also navigating ethical and security considerations.

In 2023/24, the Danish Council for Research and Innovation Policy (DFiR) invites you to a series of debates on the potentials and risks of artificial intelligence for the Danish research and innovation ecosystem. The debate series is held in collaboration with the Ministry of Digitalization, the Pioneer Centre for Artificial Intelligence, and the Knowledge Center for Foundations.

Why More Debate About Artificial Intelligence?
The perspectives on artificial intelligence are fascinating and at times concerning. It is a technology that is on many people's minds and is eagerly discussed around lunch tables and in various expert groups. DFiR follows the discussions in the Digitalization Council, ADD - Algorithms, Data and Democracy, the Data Ethics Council, and ATV's Digital Wise Men's Council, as well as in the OECD and the European Commission. All these forums provide valuable contributions to the debate.

Despite the good work already underway, DFiR and its partners believe that there is still a need to discuss the structural challenges and potentials for Danish research and innovation. The research and innovation system is particularly important when it comes to artificial intelligence. It is entrepreneurs and researchers who push the boundaries of what artificial intelligence is and can do, and who are the first to experience the blind spots and risks in the application of artificial intelligence. China and the USA have invested massively in the strategic development of AI environments, and the results are clear. In Denmark, there have also been a few significant investments, and several universities have developed educational programs in this area. It is crucial for Denmark's security and competitiveness to have environments that can drive and understand the development of artificial intelligence.

The OECD estimates that the application of artificial intelligence in research and development could become the most economically and socially valuable of all uses of artificial intelligence.[1] The great potential is due to the fact that research uses methods based on the collection, categorization, analysis, and interpretation of large amounts of data. This provides an exceptional basis for streamlining research and innovation processes through the use of artificial intelligence. Research and innovation are designated to play a key role in developing solutions to major global societal challenges such as climate change and adaptation, security, and health. Artificial intelligence has the potential to accelerate the processes of research and innovation environments and enable them to deliver solutions, but this must be done with care.

It is against this backdrop that DFiR and its partners invite you to a debate on artificial intelligence.

The Danish Ecosystem – Balances and Barriers
The first debate focuses more on the potential of the technology than on its risks. It will address the balances and barriers in the Danish ecosystem. In DFiR's view, a healthy ecosystem for artificial intelligence in research and innovation consists of competencies and capacity within four pillars:

- Data (e.g., public data on datavejviser.dk)
- Competencies (e.g., computer scientists who can develop data-based algorithms, as well as lawyers and ethicists who can ensure a responsible approach)
- Infrastructure (e.g., DeiC and private providers of computing infrastructure that can process the algorithms)
- Application (e.g., researchers or entrepreneurs with insights into relevant issues within health or climate, but also privacy protection and the

[1] Artificial Intelligence in Science: Challenges, Opportunities and the Future of Research | OECD iLibrary (oecd-ilibrary.org)

legal and societal implications of artificial intelligence)

The first debate focuses on the balances between the four pillars. It is crucial to have sufficient capacity within each pillar as well as processes that connect them.

A central question is whether we are investing correctly and if there is a balance in our investments across the pillars. Should we invest more in computing power, or are the funds better spent on research projects that can finance more PhD students in computer science? Are there specific barriers within each pillar, and can they be addressed through political initiatives or regulation? Another question relates to the balance between the research areas where artificial intelligence is applied. Are there greater potentials within some research areas than others, and are there areas that are overlooked in the current funding landscape? Additionally, there will be questions about private actors' access to the ecosystem. Are we sufficiently supporting a private market that utilizes research in artificial intelligence? We are not fully exploiting the potential if only publicly funded research environments have satisfactory access.

What About Risks – From Plagiarism to Geopolitics
In the second debate, we focus on the risks and pitfalls associated with the increased use of artificial intelligence in Danish research and innovation. This involves concrete challenges from everyday life in laboratories and research libraries, where large language models like ChatGPT have made it easier to fabricate false references and plagiarize others' work. In the debate, we will discuss how these new challenges should be addressed. Should each institution develop its own guidelines, or is there a need for national or European initiatives?

In the second debate, we focus on the risks and pitfalls associated with the increased use of artificial intelligence in Danish research and innovation. This involves concrete challenges from everyday life in laboratories and research libraries, where large language models like ChatGPT have made it easier to fabricate false references and plagiarize others' work. In the debate, we will discuss how these new challenges should be addressed. Should each institution develop its own guidelines, or is there a need for national or European initiatives?

The Framework for Research
The third debate focuses on the framework for research and innovation, asking whether the emergence of artificial intelligence provides a reason to reconsider the organization of the research and innovation system.

In the existing system, researchers spend a lot of resources evaluating and assessing each other, particularly in the context of grant and publication processes. This system was developed at a time when there was much less research, and individual researchers could be expected to have a broad overview of the research front. Today, this is not the reality, as few have deep insight across different areas. The current system is costly, and the many rejections of grant applications are highlighted as a major challenge for the development and retention of staff at public research institutions. This also relates to the discussion about whether the current system is fair and leads to the promotion of the best ideas. In the innovation effort, companies also spend considerable time seeking funds through systems that operate with relatively long processing times. This is a hindrance to a well-functioning innovation promotion system.

The debate invites a discussion on whether artificial intelligence can be used in the future development of frameworks for research activities. This includes considerations of evaluations and publication patterns, as well as application and funding structures. Can artificial intelligence change our traditions of merit and resource allocation by, for example, developing alternatives to inefficient application processes? The discussion will thus focus on the challenges and opportunities facing funding bodies, institutions, and publishers.

Join the Debate
Danish research and innovation policy must address the increased use of artificial intelligence. It is clear that this will lead to changes, and from DFiR's perspective, it is important that a public debate follows to help clarify which changes will be relevant in 2025 and which will take effect by 2050. Based on the three debates, DFiR will consolidate the discussions and provide input to the government and the Parliament.

Read more about the debate series and register for individual sessions here.

Further Information:
Frede Blaabjerg, Chairman of DFiR
Phone:+45 21 29 24 54
E-mail: fbl@et.aau.dk