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AI

DIREC.DK

# *leaning into* the hardest problems

Messy, complex, and deeply human - the hardest problems don't come with easy fixes.

To solve them, we need researchers and industry side by side, exploring, testing and daring to push beyond the known.

Denmark's strengths have always been **collaboration, trust, and ingenuity.**

And we have applied them to build digital solutions that have changed the world before.

The next generation of hard problems are waiting.

Explore 7 DIREC projects at the edge of the future below.

**DIREC**  
Digital Research Centre Denmark

Find all projects at [direc.dk/next-gen-ai](https://direc.dk/next-gen-ai)

# PERSIST

## AUTONOMOUS DRONES TO PROTECT DENMARK'S INFRASTRUCTURE

**Project partners:** SDU, Aalborg University, Robotto, HOFOR, Ørsted



### IMAGINE THIS

High above Denmark's power plants, autonomous drones equipped with advanced AI keep constant watch. They inspect biomass stockpiles, detect potential fires, and monitor the surrounding area. Monitoring and safeguarding critical infrastructure is a complex task – but drones can make it far more efficient. This vision is becoming reality with PERSIST.



### AT THE EDGE OF TOMORROW

The technology is based on edge AI, enabling drones to process data locally – rapidly and with high precision. Using computer vision, drones can measure biomass volumes and detect intrusions. Multi-drone algorithms coordinate tasks across fleets in real time, while language models allow missions to be directed with a simple prompt.



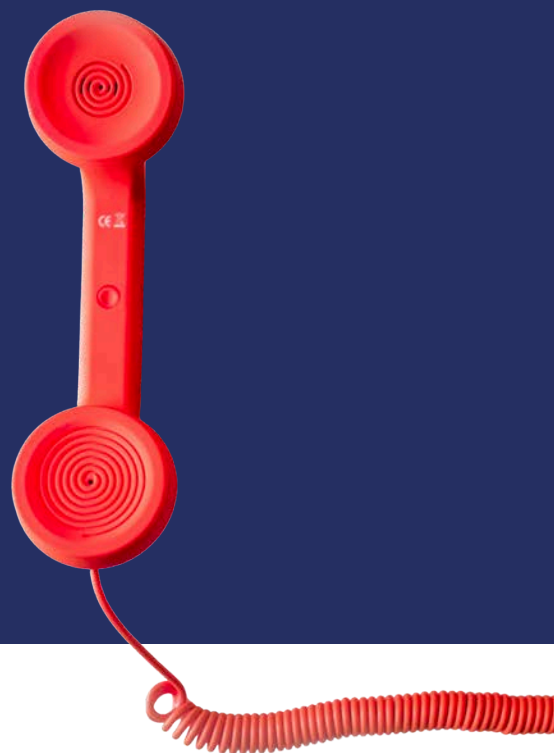
*"You can hire as many guards and install as many surveillance cameras as you like, but often that's not enough. Drones are far more effective at strengthening the security around critical infrastructure."*

**Anders Lyhne Christensen**, Project Manager and Professor at the SDU UAS Center

# 1813AI

## RESPONSIBLE AI FOR THE EMERGENCY HOTLINE

**Project partners:** University of Copenhagen, ITU  
Capital region of Denmark



### HELP FASTER

Every day, thousands of citizens call the 1813 emergency hotline, but a high rate of misdirected calls puts further pressure on an already strained system. 1813AI is developing a citizen-facing, adaptive AI chat solution that, through a new self-service solution, will provide guidance and retrieve information during wait time. This creates faster access to help and contributes to a more equitable and efficient healthcare service.



### A RESPONSIBLE FUTURE WITH AI

By combining Natural Language Processing and Human-Computer Interaction, the system shows how language models can be used responsibly in the public sector. The project is developed using Denmark's largest collection of emergency call data - over 4 million records. Clinicians, developers, and AI researchers work closely together, and citizens help shape the system through ongoing testing and feedback.



*"The opportunities with the 1813AI project are unique and important to us. We always seek to use our data to benefit citizens, and this project especially involves utilizing our very large call dataset and enable us to explore the potential with AI in practice."*

**Mette Bjerg Lindhøj**, Specialist Consultant at Digitalization, Emergency Medical Services



# FAIRFM

## TOWARDS EQUAL ACCESS IN ULTRASOUND SCANS



**Project partners:** DTU, Aarhus University,  
University of Copenhagen, Prenatal



### THE WILL TO DO BETTER

Cold gel, a gentle press, and a beating heart on the screen—an ultrasound seems simple, but it's far from it. Scan quality depends on the operator's experience and the mother's physiology, meaning some women get more accurate results than others. The FairFM project aims to change that.



### WHAT THE FUTURE COULD LOOK LIKE

By developing AI technology that can detect and correct biases, the project aims to ensure that all pregnant women – regardless of background or biological differences – have equal access to early and accurate fetal diagnostics. The result is not only better data but also greater confidence and fairness in care.



*"AI will only be a success in the clinic if clinicians and patients trust it to treat all patients fairly. We therefore strongly welcome this project, which aims to automatically detect and, if possible, mitigate performance disparities across any groups."*

**Martin Grønnebæk Tolsgaard**, MD, PhD, DMSc, Professor, Department of Obstetrics, Copenhagen University Hospital, Rigshospitalet



UNIVERSITY OF  
COPENHAGEN



Prenatal

# MOTUS

## SAFE AND RESPONSIBLE CO-BOTS IN HEALTHCARE AND INDUSTRY

**Project partners:** ITU, SDU,  
Universal Robots, Danfoss Drives, Ropca



### THE POTENTIAL OF AI IN CO-BOTS

In just a few years, co-bots have become trusted helpers in hospitals and factories, performing tasks from assembling electronics to assisting with medical scans. At the same time, AI has moved from theory to everyday use - writing emails or generating recipes from a photo. Now, researchers are working to bring advanced AI to co-bots. But there's a challenge: AI often doesn't recognize its own mistakes. A flawed email is harmless; a flawed co-bot could injure workers or damage equipment.



### WHEN IN DOUBT, PAUSE

MOTUS is developing AI tools to monitor, test, and validate the decisions made by co-bots. The objective is to measure and communicate uncertainty - both before and during a co-bot's actions. Through advanced uncertainty quantification, out-of-distribution detection, and real-time monitoring, AI-controlled co-bots will gain the ability to recognize when they are operating in uncertain conditions, enabling them to pause their actions or involve a human operator.

# REINS

## ADAPTIVE AI FOR INDUSTRY – WITHOUT THE CLOUD



**Project partners:** DTU, SDU,

Alexandra Instituttet, Leica Geosystems, B&O



### IMAGINE THE FREEDOM

Imagine AI that can analyze soil in a bucket or filter noise in your headphones - without ever connecting to the internet. That's the goal of REINS, a project developing AI that runs efficiently on devices with limited computing power in dynamic environments. The result: technology that saves energy, reacts instantly, and works anywhere.



### AI WITHOUT THE INTERNET

REINS is pioneering AI that adapts in real time - without relying on internet connectivity or massive data centers. This "runtime reconfigurable embedded AI" brings intelligence to small, resource-constrained devices, enabling them to adjust instantly to changing conditions. By combining techniques like Neural Architecture Search and MAPE-K control loops, REINS delivers cutting-edge performance while advancing responsible, explainable AI.



# GREENSQL

## GREEN DIGITALIZATION STARTS IN THE DATABASE

**Project partners:** Aalborg University, Roskilde University, Software Improvement Group



### WHAT IF?

At the core of every modern IT system lies the database. Databases track information, move it back and forth, and ensure seamless integration across systems – but all of this consumes energy. A lot of energy. What if it could be done more efficiently? Enter the GREENSQL project.



### A STEPPING STONE FOR DENMARK'S GREEN TRANSITION

By optimizing software code and database accesses with AI, GREENSQL has the potential to drastically reduce energy consumption. In doing so, it can become a key driver in Denmark's digital green transition – and a stepping stone toward the EU's ambition of building a sustainable digital infrastructure.



*"Currently there are no tools that can help software developers assess the energy footprint of code for SQL queries. With this gap in our mind, we are highly motivated to join the project that aims at filling this gap by accurate AI-based models for estimating energy consumption of SQL queries."*

**Pepijn van de Kamp**, Director of Innovation, Software Improvement Group

# SECURE AI TOOLS

## IN SOFTWARE DEVELOPMENT TEAMS

**Project partners:** ITU, SDU, Mjølner Informatics  
Clockwork Consulting, CyberJuice



### FAST AI CODING, NEW SECURITY RISKS

AI is reshaping software development as we know it. With just a few clicks, anyone with an idea can now generate advanced applications. However, the rise of “vibe coding” also introduces new security risks. Code suggestions from language models can result in vulnerabilities and data leaks, particularly in small and medium-sized enterprises with limited resources.



### GETTING AHEAD OF THE FUTURE

The project will develop an AI fact-checker that helps developers assess the security of AI-generated code in real time. In addition, the team will produce practical guidelines for software teams integrating AI into their workflows. These outcomes will address both social and technical dimensions – for example, how AI reshapes team dynamics, and how developers can best prevent errors and security breaches.



*“Software development teams have a responsibility to keep code secure and maintain the high standards in the wake of AI assisted code production. Investigating these team dynamics and the potential benefits and challenges is essential for future tech development and AI policies in the companies. Fact-checkers for example will support the maintenance of trust in these teams, which is one of our major goals in the project.”*

**Louise Barkhuus**, Project Manager & Professor at ITU

# next generation AI

## AT THE EDGE OF THE FUTURE

DIREC is Denmark's research and innovation centre for advanced digital technology – a partnership between all Danish universities and the Alexandra Institute. Join our mission to enable world-class research in digital fields that will shape tomorrow's headlines – find all projects at [direc.dk/next-gen-ai](https://direc.dk/next-gen-ai).

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