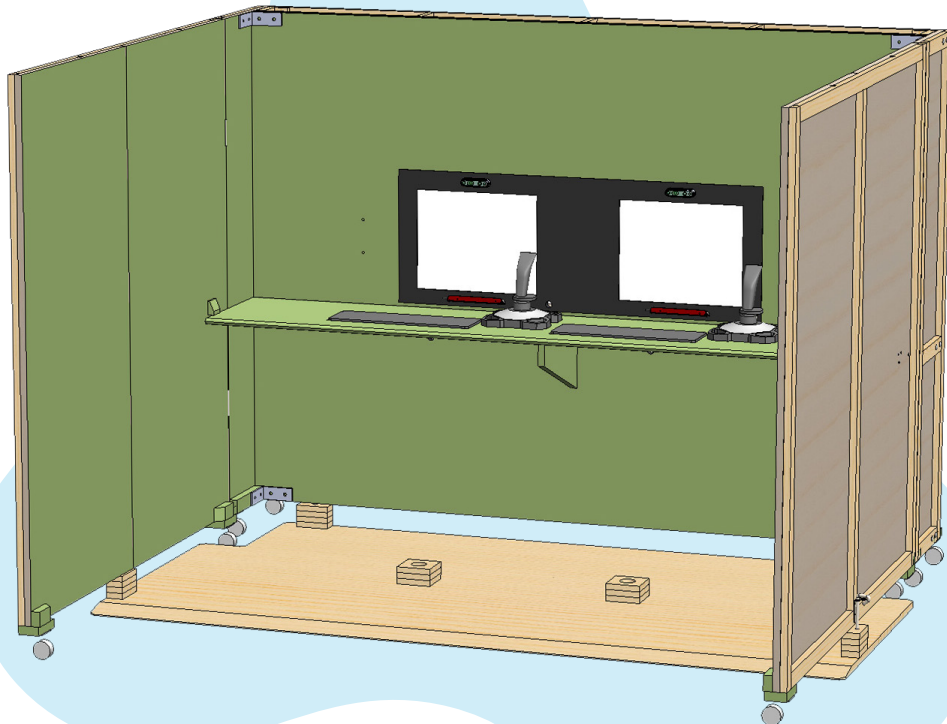# CLAAS: Smarter support for human vigilance

Introduction

In high-stakes environments such as cyber security, defence, and health care, human vigilance is critical. Yet attention fatigue, boredom, and cognitive overload can lead to costly errors. CLAAS – the Cognitive Load Autonomous Advisory System – is a new technology designed to help individuals stay alert and self-manage their performance.

CLAAS was developed through a five-year research grant by a multidisciplinary team of researchers* at the University of NSW. In collaboration with the UNSW Institute for Cyber Security and Australian Army 20th Regiment, Royal Australia Artillery, CLAAS is now being explored for broader applications in civilian industries.

The real-world problem

Human error is often the weakest link in security and operational systems. Whether it's a drone pilot, air traffic controller, hospital coordinator, or cyber security analyst, long hours and repetitive tasks can reduce vigilance. Traditional human–computer monitoring systems often miss subtle signs of human cognitive strain, especially when individuals are bored or mentally overloaded but not physically tired. CLAAS* aims to fill this gap by providing real-time, non-contact feedback to help users stay focused and make better decisions.

What is CLAAS?

CLAAS stands for Cognitive Load Autonomous Advisory System. It's a non-contact, assistive technology that monitors subtle indicators of cognitive strain and provides real-time feedback to users. Originally developed for drone pilots in the Australian Army, the system is now being adapted for broader use in industries where vigilance is key.

How it works

CLAAS uses three key sensors to monitor signs of cognitive strain:

Eye tracking

Monitors gaze patterns and wandering eyes.

Facial expression

Combination of eyebrows, mouth and cheeks.

Speech tone

Detects emotional shifts based on speed and tone of speech.

These inputs are processed by an AI system that learns and advises in real time. Users receive feedback via a small screen that shows whether they're in a high, medium or low alert zone. This empowers individuals to self-regulate without feeling monitored or judged.
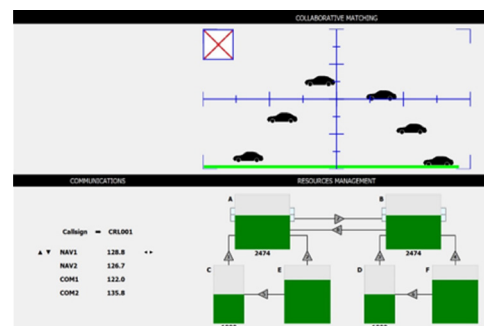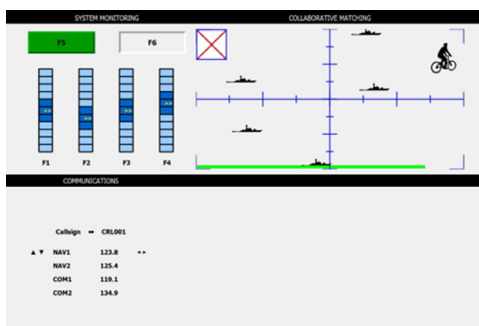
What makes it different?

Unlike wearable fatigue trackers or invasive monitoring systems, CLAAS is:

- Non-contact: No physical sensors or wearables required
- Assistive: Designed to support users, not replace them.
- Adaptable: Can be customised for different environments.
- Affordable: Uses low-cost sensors and simple hardware.
- Secure: Operates independently from sensitive systems.

It's also suitable for long-term use, making it ideal for environments where continuous vigilance is required.

What else is happening in the space?

Situation awareness monitoring is common in industries like transport and automotive, but most systems focus on physical tiredness. CLAAS is unique in its ability to detect cognitive strain over time – including boredom, mental overload, and subtle fatigue. Few technologies offer long-term, non-intrusive monitoring that empowers users rather than surveilling them.
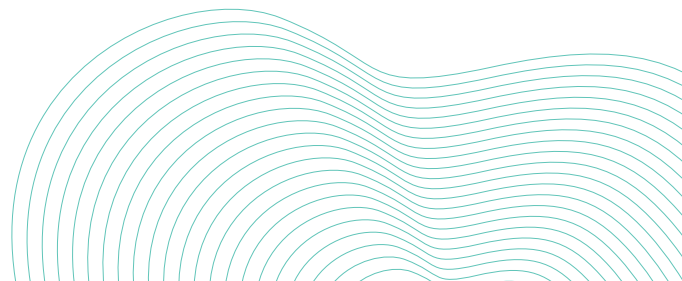
Real-world applications

CLAAS has potential in a wide range of industries:

- Defence and cyber security

- Hospitals and healthcare coordination

- Air traffic control

- Train and transport control centres

- HR departments and government agencies

- Firefighter and emergency response teams

In each case, the system helps individuals to stay alert, manage fatigue, and improve decision-making – without interfering with sensitive operations.

Why it matters

CLAAS addresses a critical gap in human performance support. By helping users self-monitor and manage their cognitive load, it reduces the risk of errors and enhances safety. It's not just a tool for defence – it's a scalable, ethical technology that can improve outcomes across industries. As vigilance becomes more important in our daily work, CLAAS offers a smarter way to stay focused and safe.
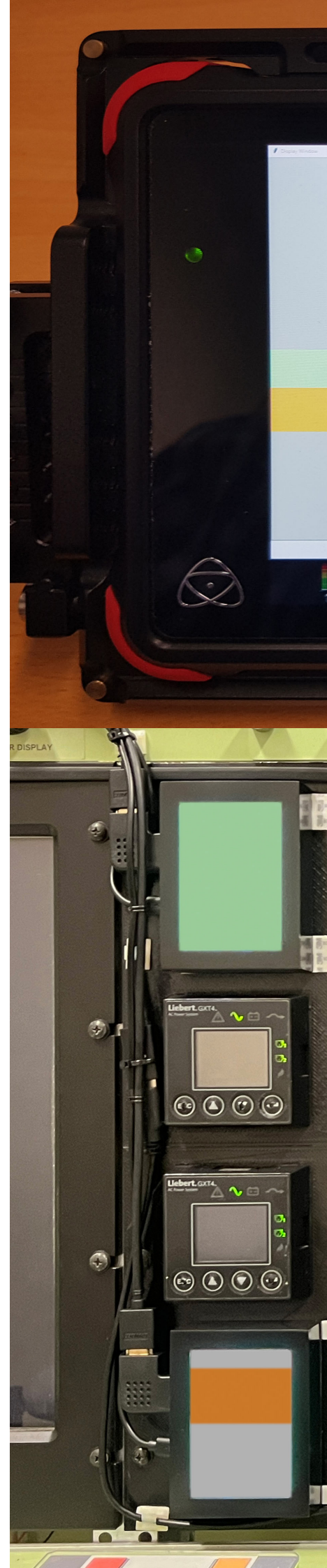
UNSW Researchers

Professor Mari Velonaki is a pioneer in the field of Human-Machine Interaction and Social Robotics. She the founder and director of the ARC National Facility for Human Robot Interaction Research (UNSW, USYD, UTS, St Vincent's Hospital) and the Creative Robotics Lab (ADA UNSW). Velonaki's innovations include interactive robots that are of human scale, and novel multimodal interfaces that improve the communication between people and technological systems.

Professor David Rye co-founded the Australian Centre for Field Robotics at the University of Sydney in 1999. He is an Adjunct Professor at the Creative Robotics Lab and the National Facility for Human Robot Interaction Research at UNSW. Rye has conducted extensive research and is an expert in the automation and control of machines, including robots and autonomous vehicles.

Dr Teresa Crea is a narrative and simulation researcher and academic passionate about emerging technologies and how they are impacting our narrative understandings from a neuroscientific perspective. Her background on narrative intelligence and sensemaking has also seen her examine the role of narrative in information warfare.

Dr Ethan Jones is a Research Officer at UNSW's Creative Robotics Lab with extensive expertise in AI and human-computer interaction. He designed and implemented the machine learning and supporting software components of the CLAAS.

Further enquiries

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