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AI experts explore the ethical use of video technology to support patients at risk of falls

Video-enabled glasses have the potential to support patients at risk of falls by allowing medical staff to monitor how they move around their homes and their community. However, with privacy concerns at the forefront of this new technology, academics at Northumbria University have carried out a cutting-edge study into the ethical use of AI to ensure video footage can be obscured to ensure patient privacy.

Traditionally patients at risk of falls have been assessed based on information

they provide themselves in diaries or during short in-clinic observation appointments. However, these do not provide clinical teams with objective, digital data on how patients move around outdoors and in their home environments – the areas in which they are most likely to have a fall.

Trials of inertial wearable technology worn on the lower back – similar to that used in a smart watch – to track patients' walking movements, known as gait, are proving valuable but there are still pitfalls due to a lack of contextual information around where a patient is, who they are walking with and what activities they are carrying out.

In a bid to both improve, and personalise, patient care for those at risk of falls through illness or age, experts have been keen to explore how they can improve assessments and gain a fuller picture of what might be contributing to any abnormal gait data captured by the wearable devices.

Asking patients to also wear video-enabled glasses will provide much more accurate information on how they move depending on their surroundings, including obstacles and other hazards, where they are at the time and what might be putting them at increased risk of falls.

However, although the use of video technology has many potential benefits, patients wearing these video-enabled glasses – and their families – must be able to maintain their privacy.

In a bid to test how these privacy concerns could be overcome, a group of computing and digital health experts ran a technology pilot to test the application of new AI software that can blur personal data and information captured by video glasses - for example photographs around the home, footage of children or confidential paperwork.

They found that the AI software could successfully analyse the raw video footage and detect and blur details such as faces, letters and laptop or phone screens, ensuring patient privacy could be maintained.

Their research has now been published in [Nature Digital Medicine](#).

Dr Alan Godfrey, Associate Professor in Computer and Information Sciences at Northumbria University, said: "As you can imagine the variability in how

people move when they're completing different tasks is enormous.

"The data or information provided from an inertial wearable device attached to someone when they're wandering around their house will inevitably differ from the same person when they're outdoors or walking more quickly to get somewhere or to keep up with someone. This means that while the use of an inertial wearable alone is helpful, it tells us nothing about the context in which a fall may occur.

"Having absolute clarity about the environment and what people are doing is key."

He added: "We wanted to assess how new developments in AI would allow us to provide video-enabled glasses that would allow medical staff to observe patients' movements in real environments over a longer time period without invading their privacy."

The paper demonstrates that by combining information from the wearable device that records gait data with footage captured by video glasses which is obscured where necessary thanks to the ethical use of AI, clinicians have a much more comprehensive picture of how patients' move in their own surroundings.

This could lead to significant improvements in the accuracy of patient fall risk assessment and in the decision-making process around patient care.

Speaking on the study, lead researcher and PhD student Jason Moore, from the Department of Computer and Information Sciences at Northumbria University, said: "Traditionally the use of video within the home has caused some apprehension among patient populations as a result of privacy concerns owing to what else may be captured on camera.

"However, through the use of AI software that can identify and obscure personal or sensitive information we can effectively capture the contextual information that will allow us to better understand abnormal gait data, whilst overcoming the concerns patients may have around the use of video technology in their own homes.

"The benefit of providing this contextual information is that clinicians will

have a fuller picture for each individual patient which could ultimately allow them to provide more informed care plans and potentially keep more patients in their own homes for longer."

The research involved experts from Northumbria's departments of Computer and Information Sciences; Nursing, Midwifery and Health; and Sport, Exercise and Rehabilitation, as well as representatives from Northumbria Healthcare NHS Foundation Trust, and the Cumbria, Northumberland and Tyne & Wear NHS Trust.

Dr Godfrey continued: "The suggested application of this technology is unique. The way it works means that the raw footage would never be seen by clinicians, however the contextual information it could provide when it comes to identifying potential reasoning for abnormal variability or asymmetry in gait – effectively the way patients carry themselves and move around which are signs of elevated fall risk – is invaluable.

"Without this context patients with numerous clinical conditions, for example, Parkinsons, those who've suffered strokes or even just those who are suffering from frailty, could find themselves being classed as high risk for falls and ultimately face difficult decisions around moving out of their own environment earlier than necessary. It also alleviates the pressures on patients to travel to bespoke clinics for monitoring replacing this with a community-based approach."

"It could go a long way to help us truly understand the fall risk of a patient and to provide personalised care solutions that are most appropriate to the individual and their needs."

Northumbria University has a global reputation for research and teaching in AI and was recently awarded £9.5 million by UK Research and Innovation to establish a Centre for Doctoral Training in the field of AI. The centre will focus on the inclusion of citizens in the design and evaluation of AI – helping to make the rapidly advancing technology work for ordinary people.

Following on from this initial research paper, the team will examine habitual fall risk in people with Parkinson's disease and are now recruiting people with Parkinson's to wear the technology in their homes and local communities. This will enable the research team to refine and improve their AI algorithms and in the future help inform personalised approaches to

reduce fall risk in those living with Parkinson's.

Anyone who is interested in taking park in the study please contact Dr Alan Godfrey (alan.godfrey@northumbria.ac.uk) or Jason Moore (jason.moore@northumbria.ac.uk) for more information.

Speaking on the project, co-author and Consultant Physician at Northumbria Healthcare NHS Foundation Trust, Professor Richard Walker, said: "People with Parkinson's have increasing mobility issues as their Parkinson's progresses. Falls can lead to major injuries, such as hip fractures, so anything we can do to try and prevent them would be of great benefit.

"This new technology will hopefully provide us with unique information around the circumstances of falls in order to help us advise on the most appropriate preventive measures."

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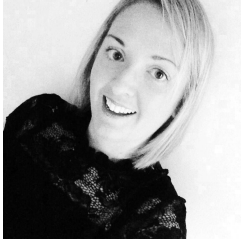Student Communications Manager
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