

The faculty of Engineering of the Vrije Universiteit Brussel invites you to attend the public defense leading to the degree of

DOCTOR OF ENGINEERING SCIENCES

of **Christopher Van Vlerken**

The public defense will take place on **Wednesday 14th October 2026 at 6pm** in room **I.2.02** (Building I, VUB Main Campus)

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**ACTIVE & SENSORIZED PHYSICAL INTERFACES TO IMPROVE SAFETY,
COMFORT, AND USABILITY**

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Abstract of the PhD research

Exoskeletons are wearable robots that help stroke survivors move again or support older adults with weak muscles. But putting one on takes strength and precise hand movements that many of these people no longer have, so a caregiver usually straps it on for them. This research explores a different approach: a strap that opens itself to receive the arm, then closes and locks with a small magnet, so a person could attach it without help.

Once attached, the strap must be tight enough without becoming unbearable. It is designed to shift pressure across the arm while keeping the same overall hold, easing discomfort without loosening its grip.

The robot also cannot tell whether it is helping too much or too little: it keeps assisting at the same level even when the muscle it supports is running low on energy. As a first step, a small light sensor, like the one in a fitness watch, was built into a leg band to detect early signs of low muscle oxygen. The robot could one day use this signal to give more support when the muscle tires, and less once it has recovered.

This work is a first step towards wearable devices that users can put on by themselves, that hold the body as carefully as an experienced caregiver would, and that adapt their assistance when the user is running low on energy.