PhD grant at Ghent University

Scope:
Augmenting Learning Environments Using Generative AI and Neuroadaptive Systems
This PhD project focuses on the **augmentation of learning environments** through **generative AI**, with the goal of enhancing **cognitive efficiency, engagement, and flow** in learners. The central aim is to design intelligent systems that dynamically adapt the environment to support **optimal learning conditions**, based on **real-time neurophysiological feedback**.
Key principles guiding the research include:

- **Cognitive Load Optimization**: The environment should foster an optimal cognitive load — enough to challenge without overwhelming. Properly tuned cognitive demand helps reduce distraction and improves focus, while overload leads to inefficiency and cognitive fatigue.
- **Novelty and Engagement**: Generative AI will be used to introduce a controlled level of **novelty** in learning content and environmental cues, as novelty is a known driver of curiosity and deeper engagement. However, novelty must be balanced to prevent disorientation.
- **Closed-Loop Neuroadaptive System**: Because learners may not visibly express confusion or cognitive strain, **EEG signals** will be used to assess cognitive state, such as workload and attention, in real time. These signals will feed back into the system, enabling **adaptive modification of the environment and content** — creating a closed-loop learning system.
- **Human-Robot Interaction (HRI)**: The learning environment may include robotic agents that interact with the learner. Here, maintaining **engagement and flow** is critical. The robot's behavior, appearance, and interaction style will be adapted to the learner's mental state and task progress.

This interdisciplinary project draws on principles from **engineering, cognitive neuroscience, artificial intelligence, and human-computer interaction**. It has potential applications in education, training, and cognitive rehabilitation, and contributes to the development of **neuroadaptive learning technologies** grounded in real-time human feedback.

Your profile:
We are looking for a highly motivated PhD candidate with a recent Master's degree in engineering and a strong curiosity about the human sciences — especially human learning, environmental influences on learning, artificial intelligence, and human-robot interaction. Preference will be given to applicants who graduated in the top 10% of their cohort.
You should be a native speaker of English or Dutch, or provide proof of English proficiency. To be eligible, all criteria must be met, and your research must begin before **October 1st 2025**..

Supervision:
The PhD will be supervised by Prof. Dr. ir Dick Botteldooren ([Dick Botteldooren - Google Scholar](#)) and Prof. Dr. ir. Tony Belpaeme ([Tony Belpaeme - Google Scholar](#)).

Offer:
We offer a PhD grant for a period of up to 4 years embedded in the Flanders AI initiative and the Soundstreams project. The student will be embedded in existing teams working on related topics and can benefit from all facilities offered by Ghent University.