VRIJE UNIVERSITEIT BRUSSEL

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 **Selene De Sutter**

The public defense will take place on **Monday 24th March 2025 at 4pm** in room **D.2.01** (Building D, VUB Main Campus)

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SEGMENTATION OF GLIOBLASTOMA FROM MULTI-MODAL MEDICAL IMAGING – Towards revealing tumor infiltration

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Abstract of the PhD research

Glioblastoma is the most aggressive type of primary brain tumor, and its treatment relies on accurately identifying the tumor's boundaries – a process known as segmentation. However, manually outlining these areas is labor-intensive and can be susceptible to variability between experts.

Tumor boundaries are typically defined using magnetic resonance imaging (MRI), but glioblastoma cells often spread beyond what is visible on these scans, further complicating the segmentation process. These hidden, infiltrating cells are difficult to detect, often going untreated and contributing to tumor relapse. Detecting them is therefore crucial for improving treatment outcomes. Positron emission tomography (PET) with amino acid tracers may provide additional information about these infiltrating cells, but automated segmentation on these images remains underexplored.

This work investigates how image analysis and artificial intelligence techniques can enable accurate and automated segmentation of glioblastoma from medical images. The proposed contributions are initially focused on segmentation of the known tumor boundaries on MRI, while examining how different types of MRI scans contribute to this task. The focus then shifts towards segmentation using PET imaging, where we highlight its current limitations. Finally, we combine information from both MRI and PET scans to achieve a more comprehensive and accurate tumor segmentation, which may contribute to improved treatment planning and outcomes.