



**Propuesta de Trabajo Fin de Máster**

Año académico 2024-2025

**MÁSTER EN MÉTODOS COMPUTACIONALES EN CIENCIAS**

<b>Proyecto Nº 06</b>
<b>Título:</b> The role of Machine Learning in Radiopharmaceutical Therapy
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<b>Resumen:</b> Radiopharmaceutical therapy (RPT) is a type of cancer treatment that uses radioactive drugs to target and destroy cancer cells. These compounds comprise an active targeting molecule and a radioactive isotope to find and attach to specific cancerous cells in the body, particularly in metastatic settings. Once attached, they deliver radiation to them, aiming at killing the cancer cells while sparing the surrounding healthy tissue. To maximize the benefit of RPT in the clinic, the current clinical guidelines recommend moving from a population-based to a patient-specific individualized dosimetry paradigm. However, several hurdles hinder this goal; in particular, (i) segmenting anatomical areas, including metastatic tumors; and (ii) calculating the absorbed dose and biological effect from the radiation delivered in those areas. Regarding (i), CT/MR scans might be performed to identify areas of interest in the patient where the radiation dose is delivered, such as tumors and organs at risk. However, segmentation could be a very labor-intensive task, since this procedure is typically done manually by physicians. Moreover, segmented areas usually show significant variability among experts. Related to (ii), Monte Carlo methods for radiation transport are the gold standard to translate the radiation delivered into absorbed dose and predict radiobiological effects. Nevertheless, it requires computational resources and time to achieve high accuracy, being very intense for its clinical use. Developing quantitative tools capable of optimizing these processes is essential to improve the current standard of care for RPT. The goal of this project is to investigate the use of machine learning models in this regard.

**Presupuesto solicitado (máximo 1500€) y breve justificación**

El presupuesto que se estima necesario para este TFM es de 1500 euros, que será destinado a un ordenador de sobremesa de altas capacidades de cálculo, necesario para abordar las tareas de aprendizaje automático.

**OPTATIVAS RECOMENDADAS**

1. Programación avanzada
2. Machine Learning I
3. Machine Learning II
4. Procesamiento de imágenes