RESEARCH TOPIC DASME5
Development of Machine Learning and Deep Learning Algorithms for Brain and Spine Radiological Image

Curriculum DASME standard

Research Area
Neuro

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Abstract
Over the last century, the Radiology departments have experienced a rapid and transformative evolution propelled by advancements in engineering innovation, particularly in the domain of medical imaging, driven by the introduction of AI-based algorithms.
In the Neuroradiology field, notable challenges for patients include enhancing clinical assessment of brain tumors, predicting recurrence, and conducting comprehensive analyses of tumor invasiveness in adjacent tissues.
Nevertheless, the current limitations of the application in the clinical practice relies on the different acquisition protocols due to different vendors and/or MRI parameters.

The objective of this project is to develop novel algorithms for standardizing sequences in routinely acquired Brain MRI scans, with the aim of foster the integration and advancement of deep learning-based algorithms for multi-centric studies.

The candidate will have the opportunity of:

1. Curating medical image data pertinent to the INNOVA project.
2. Imaging data harmonization
3. Develop a specialized pipeline for medical imaging analysis, encompassing pre-processing and prediction models, leveraging contemporary data science methodologies.
4. Incorporating data science models for medical images into investigations conducted by the Neuroradiology Research Unit.

Main technical approaches
Statistics, Machine Learning, Computer Vision algorithm, Deep Learning Neural Networks, Generative Models (GAN, VAE,...), XNAT. Programming language: Python.

Scientific references
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Isensee, F., Jaeger, P. F., Kohl, S. A. A., Petersen, J., & Maier-Hein, K. H. (2021). nnU-Net: a self-configuring method for deep learning-based biomedical image segmentation. Nature Methods, 18(2), 203–211. https://doi.org/10.1038/s41592-020-01008-z

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