Segmentation of the lumbar region

DeepHealth

Low back pain is a prevalent pathology and a frequent cause of disability. The diagnosis of pathologies related to low back pain is made through imaging, but it is a slow process that often leaves unresolved unknowns. DeepHealth can help speed up this process.

Challenge

In order to assess the presence of anatomical or structural changes in the lumbar spine, it is necessary to delimit the different structural elements of the region, such as the vertebrae. This task is known as semantic segmentation. This process enables the assessment of anatomical and spine alignment. It also allows for a wide range of possible causes of low-back pain to be explored, from fractures to inflammation, infection or tumours. However, it is a slow process that requires a specialised professional with a good understanding of the anatomy of the lumbar spine. This can slow down the diagnostic process and overload radiologists.

Automated semantic segmentation could speed up this process, using Deep Learning to analyse the image and classify each of its pixels into an anatomical structure. However, effort is required in image collection and annotation, and a neural network capable of segmenting as accurately as experts needs to be developed.

Medical specialty:
Pathology

Use Case:
Lumbar spine pathology

Site:
Valencia (Spain)

Entity:
Fundació Fisabio
Fundació per al Foment de la Investigació Sanitària i Biomèdica de la Comunitat Valenciana

Solution

Deep Learning is key to solve health research problems in which great amounts of data are available. Within DeepHealth, we are working towards solving the challenge of automated semantic segmentation of lumbar spine with a segmented dataset collected from BIMCV (Medical Imaging Databank from Regional Ministry of Health in Valencia Region). This real-world data is of the same quality as the data radiologists work with, which allows us to train more realistic models than those trained only with high resolution images. We also deliver to the community a neural network capable of performing semantic segmentation of vertebrae comparable to that of experts.

DeepHealth Project

DeepHealth is a H2020 collaborative project which develops new HPC and Deep Learning techniques applied to large and complex biomedical datasets to support new and more efficient ways of diagnosis of diseases. The technologies developed (EDDLL, ECVL, etc.) have been validated by clinicians on 14 Use Cases like this, providing 14 Success Stories ready to scale to other healthcare institutions.

Benefits

The workload of radiologists is high and supporting them on the diagnose with work that can be done automatically will increase the time they can devote to diagnosing pathologies that are more difficult to identify. Designing and implementing deep learning strategies can help free up these resources.

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https://deephealth-project.eu/

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