MRI / Vertebral Labeling using Deep Learning

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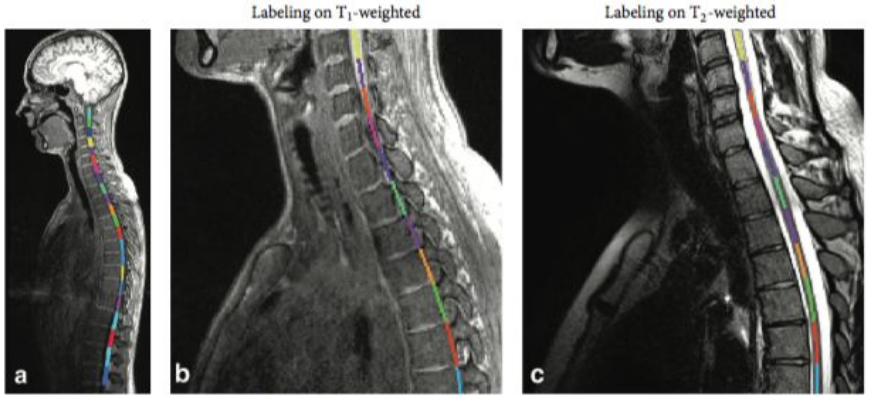
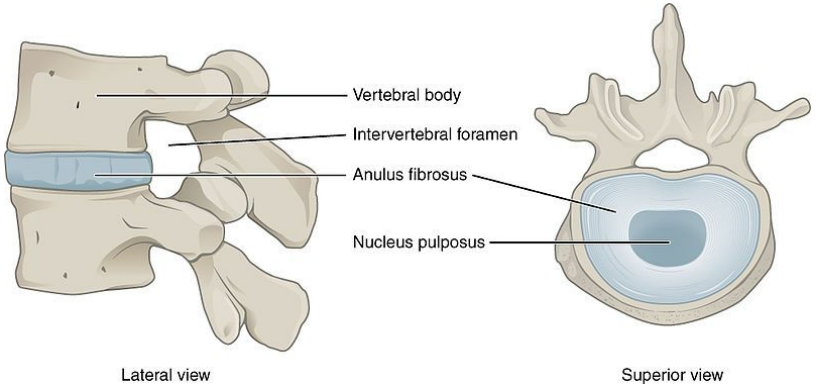
POLYTECHNIQUE MONTRÉAL

MRI / Vertebral Labeling

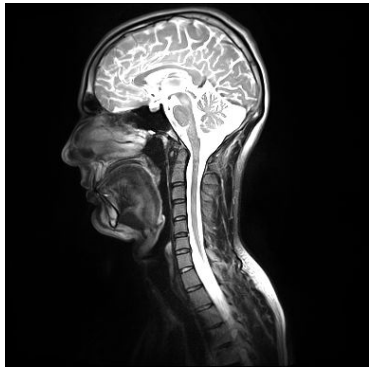
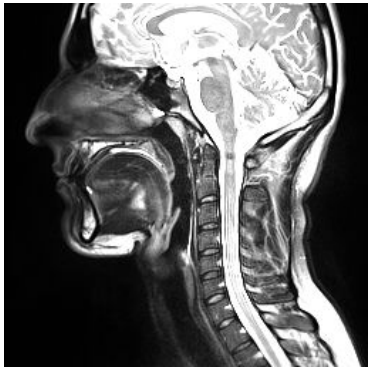
- Vertebral labeling is very important in order to know where a lesion is
- An intervertebral disc (or intervertebral fibrocartilage) lies between adjacent vertebrae in the vertebral column
- The intervertebral disc are natural divisions

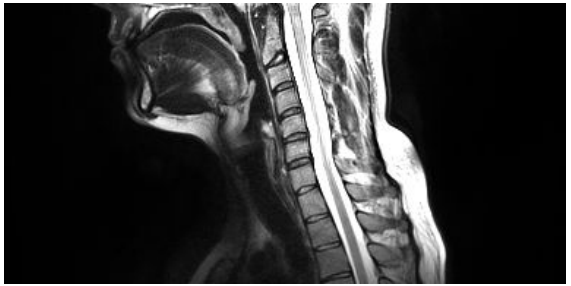




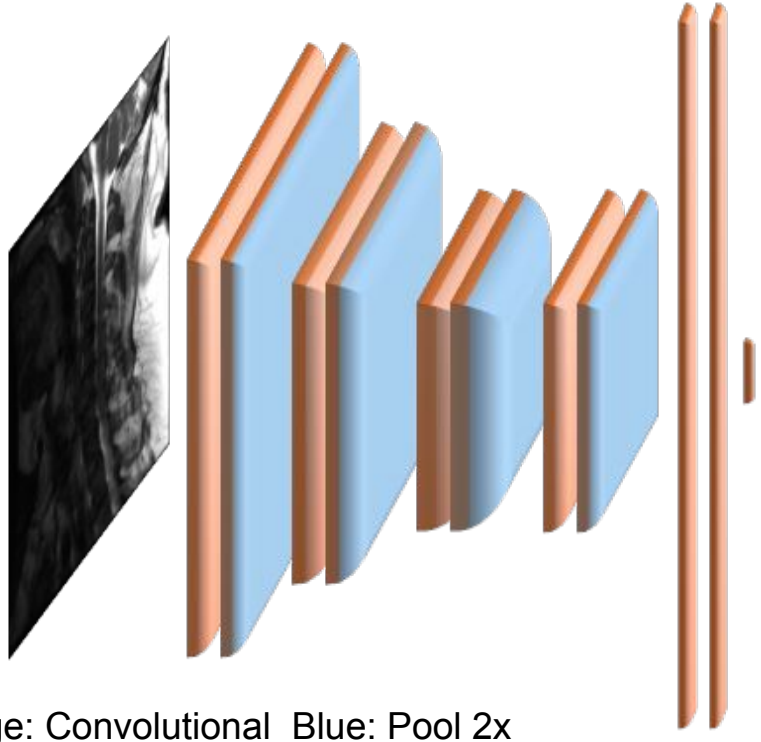
Challenges:

- Variability in acquisitions
- Few standardized datasets available
- Available datasets are usually very small

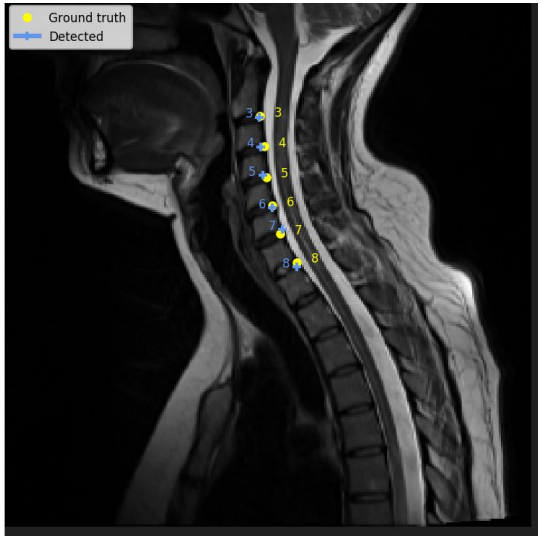


Approach 1: CNN Network (Regression_VL)



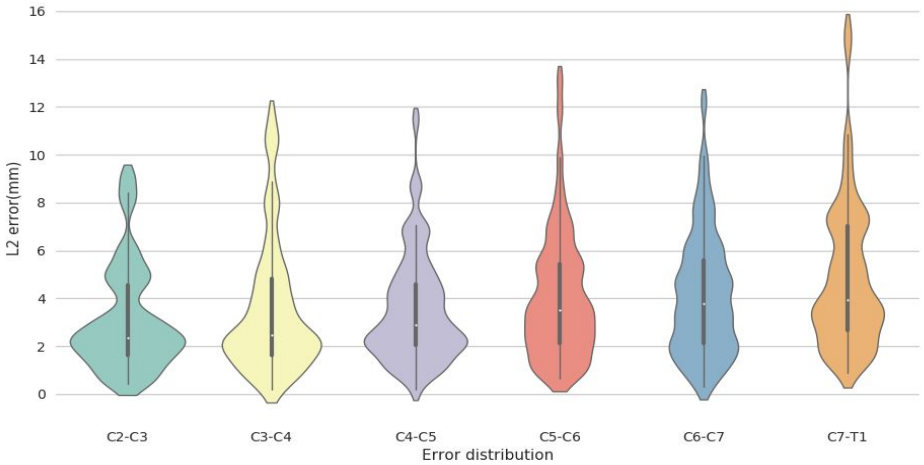
Orange: Convolutional Blue: Pool 2x

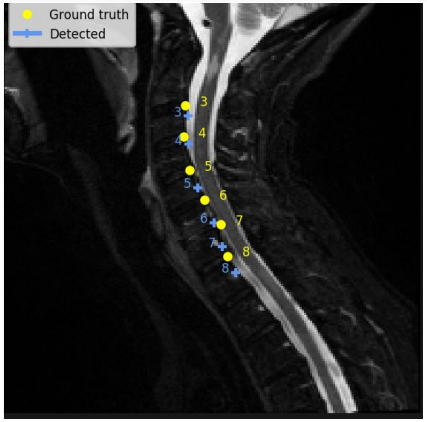
(x,y)

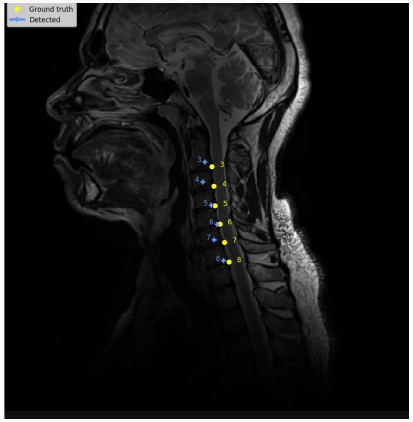


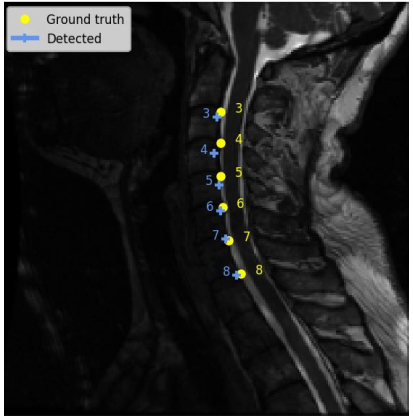
Regression_VL. Some results

- CNN architecture
- Convolutional neural Network
- Low computational requirements









Approach 2: Convolutional Pose Machines

- A winner architecture in challenges
- FCN architecture
- Learn from previous stages
- Learn relations between points
- Under development
- We expect a good key point detection
- High computational requirements

Input Image (a) Stage 1 (b) Stage 2 (c) Stage 3

Figure 1: A Convolutional Pose Machine consists of a sequence of predictors trained to make dense predictions at each image location. Here we show the increasingly refined estimates for the location of the *right elbow* in each stage of the sequence. (a) Predicting from local evidence often causes confusion. (b) Multi-part context helps resolve ambiguity. (c) Additional iterations help converge to a certain solution.

Approach 2: Convolutional Pose Machines