EXTRACTION OF SIGNATURES FROM MRI DATA IN EARLY PARKINSON'S DISEASE

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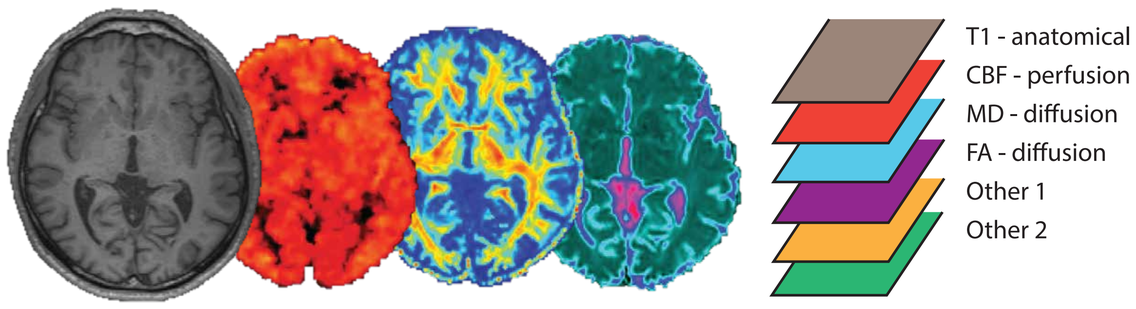
I. Abstract

The putative delay between the onset of neurodegeneration and the manifestation of clinical symptoms of Parkinson's disease drives the quest to find biomarkers present in the pre-motor stages of PD that can lead to earlier diagnosis and more tailored treatments to slow down the disease process.

In this context, our project employs Magnetic Resonance neuroimaging and unsupervised classification methods to study the interaction of several functional and structural brain characteristics and ultimately, to draw out specific signatures in newly diagnosed Parkinson patients.

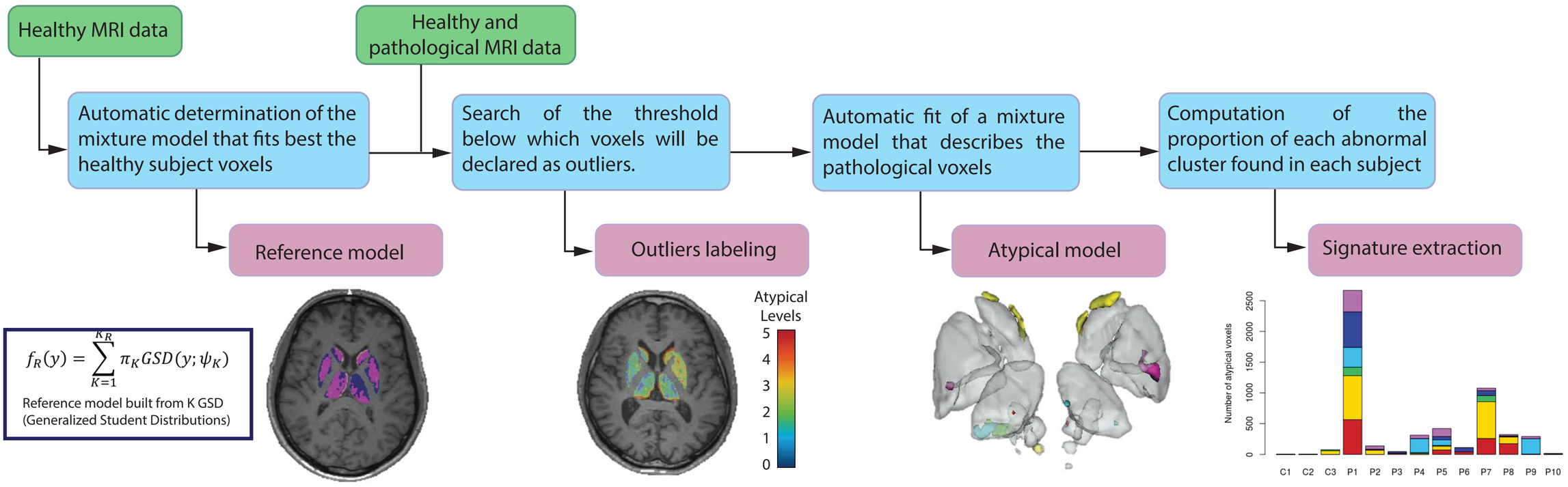
II. MRI parameters extraction

Quantitative features from different MR modalities are extracted and coregistered to an anatomical T1-weigthed scan for each subject.



These features currently come from diffusion imaging (FA, MD) and perfusion imaging (CBF).

III. Signatures extraction

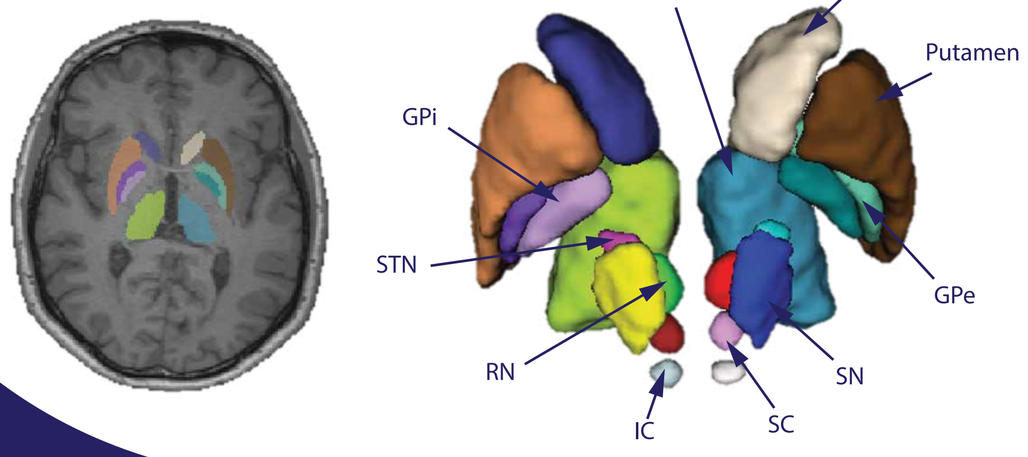


This method was previously validated by Arnaud & al. (2017) to characterize different kinds of brain tumors in rats. The mixture models are built from generalized Student distributions as they provide a larger variety of distributional shapes compared to the mode standard Gaussian distributions (Forbes & Wraith,2015)

IV. Focus on basal ganglia

Post-mortem and neuroimaging studies suggest that degeneration within the basal ganglia may begin up to 7 years prior to diagnosis.

That is why we modified the MNI PD 25 altas to segment these structures in our subjects and seek interesting signatures present in the newly diagnosed population.



V. Conclusion & Perspectives

Our method allows the classification of tissues in the basal ganglia of healthy subjects, as well as the identification of atypical and thus potentially pathological tissues in the basal ganglia of newly diagnosed Parkinsonian patients.

Further work must be done to provide a physio pathological explanation to the signatures found based on their clusters location and characteristics.
In addition, we will include more patients and other imaging modalities to our study to have a more complete picture of the changes undergone by the Parkinsonian brain.

References :

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