Detecting Multiple Sclerosis Progression using AI

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Motivation

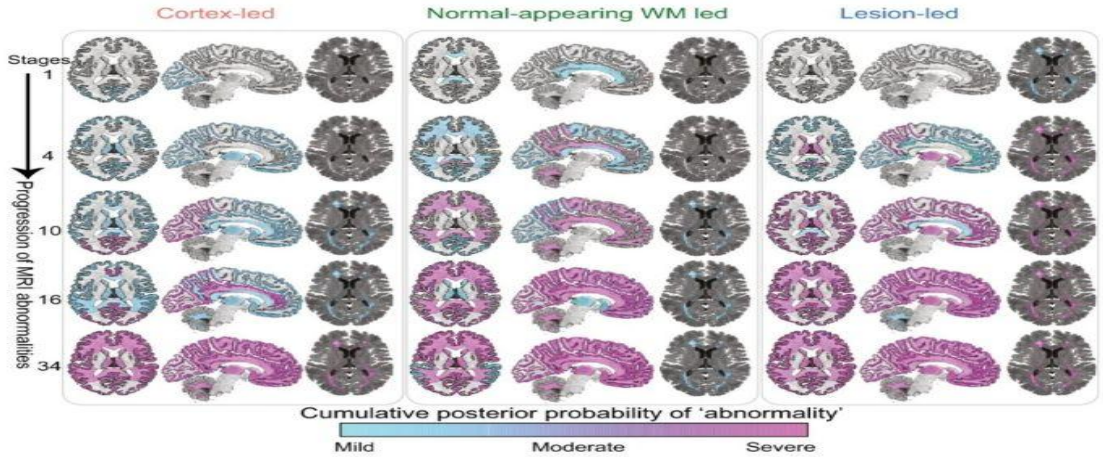
Multiple sclerosis is a chronic central nervous system disease that affects the brain, spinal cord, and optic nerves in the eyes. The cause of M.S. is unknown, and there is currently no cure for this progressive disease. It is the most common progressive neurological disability that affects adolescents.

The motivation behind this project is to use Artificial Intelligence to determine if MS subtypes follow a particular pattern on brain images that can be defined by pathological abnormalities observed on brain images as current practices don't rely on the biology of the disease. This could help classify those most prone to have disease progression and aid in finding better treatment plans for each subtype.

Model

Researchers at UCL worked with the Artificial Intelligence tool SuStain, Subtype and Stage Inference, to determine if AI can find subtypes based pathological abnormalities based on brain images.

On the images below, SuStain distinguished three subtypes that display different stages of progression of MRI abnormalities; Cortex-led, Normal-appearing WM-led, and Lesion-Led.



Results

SuStain was able to identify three subtypes based on pathological abnormalities based on MRI scans rather than the four subtypes used clinically today, based on symptoms. Researchers found out the patient's subtype and stage were associated with an increased risk of disease progression. Sustain revealed the lesion-led subtype was at the highest risk for disease progression. Combining clinical information with the MRI-based three subtypes increased the predictive accuracy of just using the MRI scan information alone.

Conclusion

Multiple sclerosis is a chronic disease that affects the central nervous system. The cause of MS is unknown; however, researchers believe that genetic and environmental factors play a role in those affected. Symptoms vary due to different nerves being affected. There is currently no cure and symptoms focused on slowing the progression of the disease and managing symptoms.

Using the Artificial Intelligence tool, Sustain, three subtypes were identified based on MRI scans. This will help identify those who are more inclined to disease progression and aid in more effective treatment options.

Takeaway from REU experience

I want to thank everyone who has contributed to the REU experience. Due to the pandemic, this has been challenging for everyone, but everyone did their absolute best to give us the most enjoyable experience possible. I've enjoyed doing this internship and can't wait to take the knowledge acquired into my professional career, as I did have any knowledge about data science coming in.

I'd like to specifically thank Victor Adankai, Gregor von Laszewski, Yohn Jairo, and Carlos Theran, as they have all been very helpful and cheerful throughout this entire internship.

Thank you!