

# Project proposal

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## 1 Project topic list

### 1.1 Slice interpolation based data augmentation for pretraining transformers on volumetric brain imaging data

In a recent work<sup>1</sup>, they used CNN+Transformer and pretrained on MRI to finetune to different tasks such as brain tumor segmentation, achieving a better accuracy. They treat each slice along  $x, y, z$  axes as a token and do masked token prediction as the pretraining regime to train 3 separate branches of the network, each for one of  $x, y, z$  direction. We propose a unifying extension to this work.

Concretely, we propose to use a single branch and use an arbitrary angled set of slices (obtained via interpolating canonical slices) as input to the network for masked token prediction. This will provide the network with a more robust training regime because it learns to understand the structure of the brain along arbitrary directions, as opposed to only the canonical slices in the original work.

### 1.2 Depression/Schizophrenia detection using ALFF r-fMRI

ALFF<sup>2</sup> amplitude of low-frequency fluctuation pinpoints the spontaneous neural activity of specific regions and physiological states of the brain and may reflect characteristics of the brain. This has been used to examine schizophrenic (SZ) patients. Here<sup>3</sup>, they have used regional homogeneity (the time consistency of the blood oxygenation level dependent signal of local brain tissue) for detecting depression using fmri. We can try the same for SZ using ALFF.

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<sup>1</sup><https://arxiv.org/pdf/2104.13633.pdf>

<sup>2</sup><https://bmcpsy psychiatry.biomedcentral.com/articles/10.1186/s12888-018-1992-4>

<sup>3</sup><https://doi.org/10.1145/3468945.3468953>