# 3D Reconstructions of Brain from Magnetic Resonance Imaging (MRI) Scans Using Neural Radiance Fields (NERF)

Khadija Iddrisu, Sylwia Malec, Alessandro Crimi
khadija.iddrisu2@mail.dcu.ie

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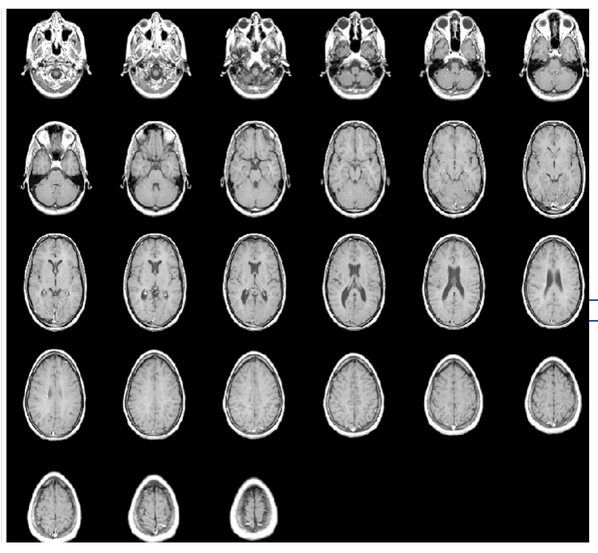
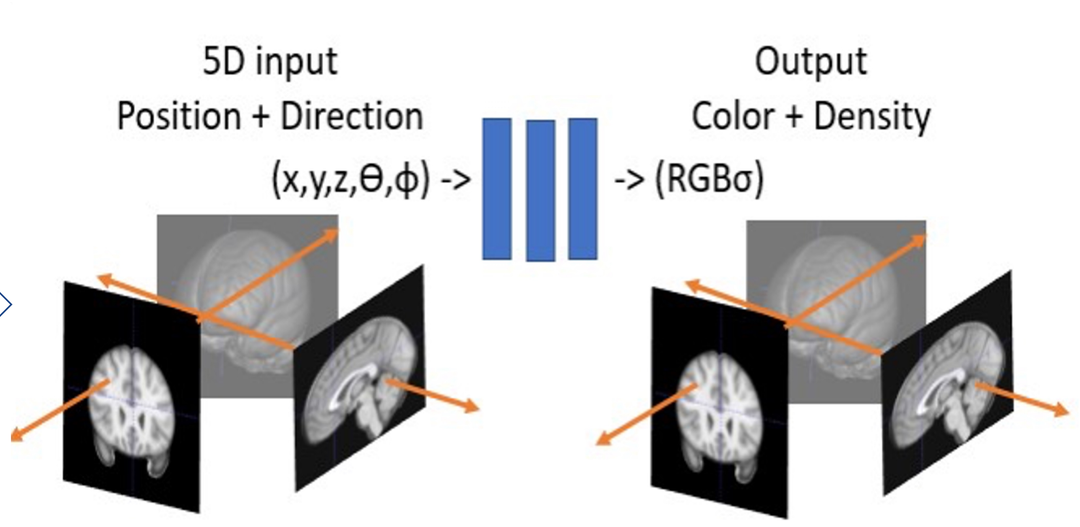
## 1 PROBLEM AND MOTIVATION





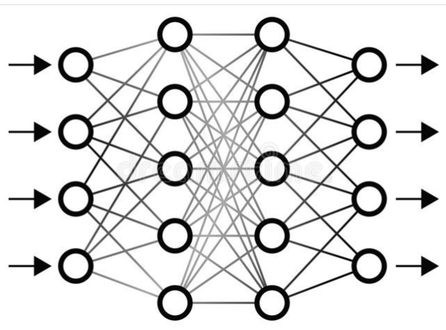

3D imaging allows for visualization of internal structures of the body

Current approaches requires lots of images from different views

Our approach performs reconstruction from a few or single MRI slice

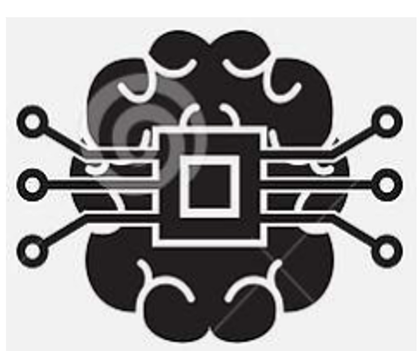
## 2 METHODOLOGY

### PRE-PROCESSING



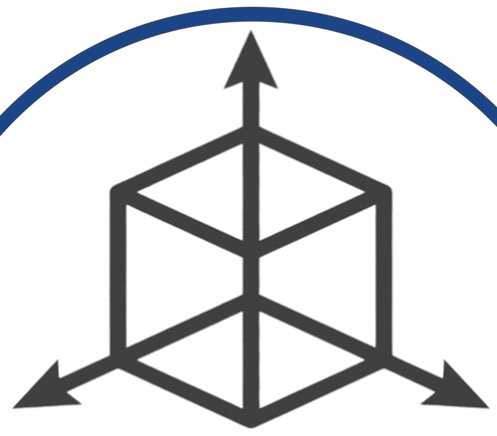
Detect patterns in MRI slices with 3D Convolutional Neural Network

### DATA AUGMENTATION



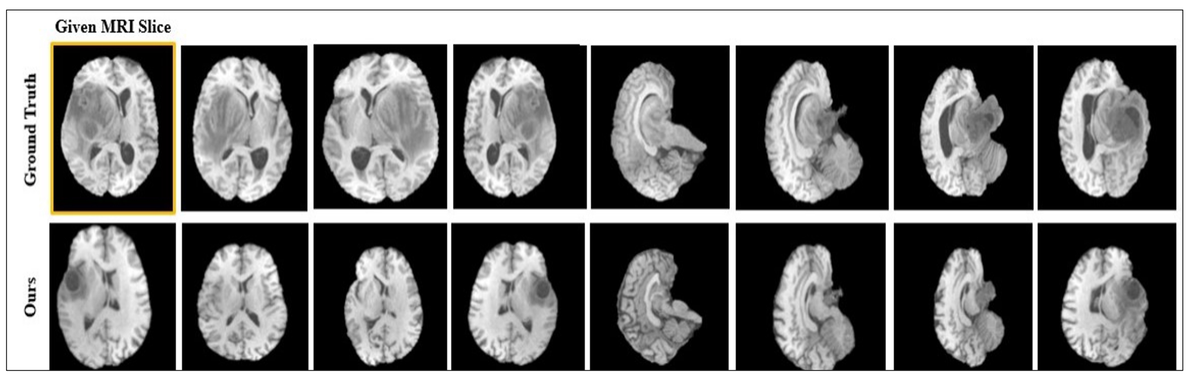
Extend with data augmentation to generate 3D reconstruction

### 3D RECONSTRUCTION



Learn 3D structure from 2D slices to create synthesis from novel viewpoints using NERF.

## 3 RESULTS




- Peak Signal-to-Noise Ratio (PSNR)
  **25.01**
- Structural Similarity Index Measure (SSIM)
  **0.87**
- VIDEO RESULT

## 4 CONCLUSIONS

- Our model was trained on 40 slices of one patient and produces a complete projection from a single slice (55% less than NERF)
- This reconstruction from a single slice provides a faster and less expensive approach to 3D reconstruction since it eliminates the need for multiple input and camera poses for training NERF
- Complete 3D visualization of the internal structure of the brain leads to faster diagnosis of related diseases

This project was carried out at the African Institute For Mathematical Sciences in Collaboration with Sano Centre For Computational Medicine

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