NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Computer Science and Engineering
College of Engineering

Neurodegenerative Diseases

Detection through Multi-view Learning Approaches

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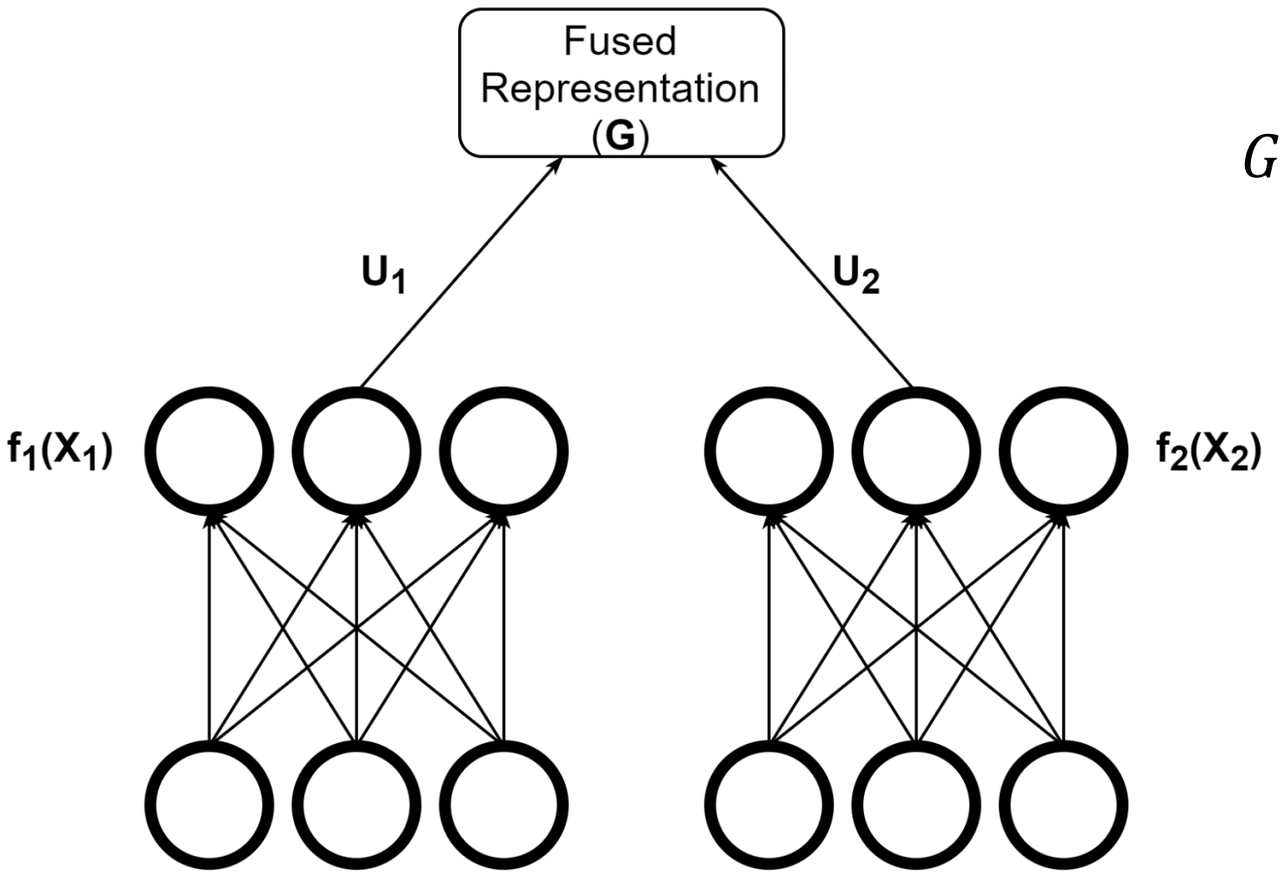

Project Objectives:

Neurodegenerative diseases such as Alzheimer's Disease (AD) and Parkinson's Disease (PD) are common causes of dementia amongst the elderly and early detection of these diseases is crucial. Machine Learning approaches for detection through brain scans suffer from high dimensionality. In this project, we combine the structural and functional brain scans using multi-view learning approaches such as Deep Generalized Canonical Correlation Analysis. We also incorporate Graph Neural Networks into the DGCCA architecture to better encode brain imaging data.

$$\underset{G \in \mathbb{R}^{N \times k}, U_j \in d_j \times k}{argmin} \sum_{j=1}^{J} \left\| G - f_j(X_j) U_j \right\|_F^2$$

DGCCA objective

Results:

Classification results for AD and PD data are shown below.

AD Class Pair	Concatenated	DGCCA
AD-SMC	81.0%	81.28%
AD-CN	60.8%	79.51%
AD-LMCI	65.8%	69.43%
LMCI-CN	52.2%	61.69%

PD Dataset Type	Accuracy
DTI view	59.4%
fMRI view	62.5%
GCCA	50%*
DGCCA (fused)	56.25%*
GGCCA (fused)	53.12%*

*Limited data led to poor model performance

Future Work:

Moving forward, we can use other datasets with a graph structure and multiple views, to compare the performance between DGCCA and Graph Encoded GCCA.