



Thesis Project Form

Title (tentative): Domain Adaptation for medical imaging in Alzheimer's disease

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Description

Motivation and application domain

Millions of people worldwide are impacted by Alzheimer's disease, which is a significant public health issue. Gaining insight into its fundamental mechanisms could result in earlier detection and more successful therapies. Moreover, Alzheimer's research has the potential to increase our knowledge of neurological processes and the workings of the human brain. To achieve these objectives, the use of machine learning methods has enabled the identification of early Alzheimer's signs by analyzing extensive data sets. Nonetheless, a major drawback is limited data accessibility, which could be addressed by adapting statistical modeling to work with heterogeneous data.

General objectives and main activities

The aim of this project is to explore and apply domain adaptation techniques for machine learning models in medical image analysis for Alzheimer's disease. Domain adaptation techniques are utilized to modify a machine learning model to function efficiently with data from a new domain. In this study, the focus is on how domain adaptation techniques can be utilized in medical imaging data for Alzheimer's disease, where data are often obtained from diverse modalities or protocols, e.g. T1/T2 sequences in MRIs or 1.5T/3T magnetic field intensities in MRIs. . The project aims to provide the candidate with an understanding of the benefits and limitations of these techniques in developing effective models for clinical use. The candidate will also design and implement an experiment using publicly available data like the ADNI dataset to validate the effectiveness of domain adaptation techniques. This experimental design will involve data selection, preprocessing, selection, training, and testing of the most suitable statistical model using domain adaptation techniques. The performance of the model on test data from both domains will be compared to evaluate the effectiveness of domain adaptation techniques.

Training Objectives (technical/analytical tools, experimental methodologies)

- data handling and preparation
- medical imaging data preprocessing
- feature extraction
- deep and shallow learning models
- domain adaptation techniques

Place(s) where the thesis work will be carried out: UniGe | MaLGa - Machine Learning Genoa Center

Additional information

Pre-requisite abilities/skills: familiarity with machine learning methods and their application to medical data

Maximum number of students: 1