# University College London

## MRes Project Plan

# Differential Diagnosis of Alzheimer subtypes through disease progression modelling


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# Aims of the project

We are planning on modelling PCA using an *event-based model* (EBM), which models the progression of the disease as a sequence of events, where each event corresponds to a biomarker becoming abnormal. Such events could be: (1) a new area of the brain got affected, (2) the patient shows a drop in cognitive test scores. The EBM can calculate the most common progression of the events in the patient cohort and can be used to classify individual patients into the three main groups: cognitively normal, mild cognitive impairment and Alzheimer's disease. The EBM can also be used for longitudinal studies; for instance, it can stage patients after a predefined follow-up period.

# Project Background

Dementia and other related neurodegenerative disorders cost the UK approximatelly £26 billion a year. Developing a clear understanding of how thse disorders operate and progress over time could help us find more effective treatment. This project is investigating the progression of Posterior Cortical Atrophy (PCA), which is an early onset variant of Alzheimer's disease that causes atropy of the posterior part of the cerebral cortex, resulting in disruption of the visual system.

# Motivation

The EBM has already been used to study familiar and sporadic Alzheimer's disease and Huntington's disease, and this project aims to apply these techniques in the study of PCA. We will be interested to find the most common event progression, use it to classify patients into several groups according to their disease stage. We will also do some longitudinal studies, such as finding the probability of a patient converting from cognitively normal to mild cognitive impairment or from mild cognitive impairment to PCA over time. If time permits, we can also investigate possible extensions of the EBM, such as allowing for multiple progression sequences (Alex, IPMI).

| List of tasks | Deadline |
|---|---|
| **Data collection and processing** | **7 April** |
| **Read literature and implement the EBM** | **23 April** |
| **Initial results:** | **30 April** |
| **Analyse follow-up data** | **7 May** |
| **Build disease stage classifier** | **14 May** |
| **Simoultaneous MCMC sampling** | **27 May** |
| **Differential Diagnosis of PCA vs other AD subtypes** | **8 July** |
| **Validation of the results** | **20 July** |
| **Write the Mres project report** | **14 August** |

## Summary of progress to date

I have so far experimented with the EBM by trying to reproduce some of the results of A. Young, 2012. We cannot start writing the EBM for the PCA yet, as we are still waiting to receive the dataset from the Dementia Research Center.