

Qualifying Report

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1 Overview of Problem

Dementia has been identified as one of those fast growing difficulties facing the world. A recent report suggests that in 2015 there were 46 million people with a diagnosis of dementia and that number is expected to hit 131.5 million by 2050(CITE). The report also states that the worldwide cost of dementia in 2018 is estimated to be in the region of one trillion US dollars.

A lot of work has gone into trying to find ways of improving the early diagnosis of Alzheimer's Disease (AD) and Mild Cognitive Impairment (MCI). As described above, the numbers of those suffering from AD and MCI are going to increase as the population ages and thus it is important that we utilise technology wherever possible to aid clinicians. At the present time diagnosis is typically conducted at memory clinics by trained clinicians. I theorise that we might be able to use diagnose patients in their own homes utilising smart-home technology.

Language analysis is an important part of assessing those suspected of suffering with AD or MCI and this language analysis in part informs an official clinical diagnosis. This analysis often takes the form of tasks such as Free Cued Selective Recall Task, the Boston Cognitive Assessment, and the Mini Mental State Examination which are all quite targeted in the language required of the person being assessed.

A step towards the ambient detection of AD and/or MCI in population requires that we look for similar features in language used naturally as part of every day conversation. Part of this work therefore is to see whether non prescriptive tasks (that is, tasks that do not have a pre-determined right answer), can elicit the same or comparable features in language such that a this can be detected without need for specialised equipment or tests and have a similar effect in the classification of whether someone has a diagnosis of Dementia and/or MCI. The next part of this work looks at how technology, particularly the use of smart home devices such as the Amazon Echo and Google Home families of devices can be used to capture data that can then be analysed.

The potential impact of this research is immense. Research has shown that early diagnosis of people with AD or MCI improves sufferers quality of life and can slow the progress of the disease. Equally, early diagnosis can increase the number of research opportunities for understanding the early stages of dementia and how the disease progresses so that more research can be conducted which may, in the future, lead to new treatments and other interventions.

2 Literature Review

3 Work already carried out

3.1 Literature Review - April 2018 to July 2018

A literature review was carried out from several perspectives in order to understand both an applied and theoretical perspective. Thus a search for papers was conducted in both the psychology and computer science domains, as well as papers which intersected these areas and were relevant to this particular problem.

3.2 Skills development - April 2018 to March 2019

IS-4001 Research Skills and Professional Development Module - Aston University - 3rd May, 10th May, 16th May - 40 Hours Summary Here

Alexa Skills Training Day - Amazon - May 9th 2018 - 7 Hours Summary Here

Deep Learning Online Course - deeplearning.ai - Dates - 70 Hours Summary Here

4 Work Plan for the future

4.1 Proposed Experiments

5 Proposed Timetable

5.1 May 2018

Wednesday, 9th May - Alexa Skills Training (All Day)

5.2 June 2018

Friday 15th June - First Draft of Literature Review to be handed in.

Monday 18th June - Monday 25th June - Annual Leave

5.3 January 2019

Friday 11th January - Rough Draft of Qualifying Due Friday 18th January - Complete first rough pass of capturing and processing speech.

5.4 February 2019

Friday, 1st February - Qualifying Report Due

5.5 April 2019

Monday, 1st April - Viva Due by this point.

6 Reflection on my experience so far

7 Provisional Table of Contents

7.1 Chapter 1: Introduction

7.2 Chapter 2: Literature Review

7.3 Chapter 3: New theories, Description of experiments

7.4 Chapter 4: Results

7.5 Chapter 5: Discussion

7.6 Chapter 6: Conclusion

References