Testing

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| Member Name | 8th May Goals | 15 th May Goals | 22nd May Goals | | 29th May Goals | | |
| Anish | | Part 1 code | |  | |  |  |
| Ren | | Part 2 code | |  | |  |  |
| Charlie | | Technical details on part 2 | |  | |  |  |
| Amber | | Introduction | |  | |  |  |

A technical report in PDF format of no more than 10 pages. The report must contain an introduction, separate sections for Parts I and II (details below), conclusions, and references. You may use whatever software you wish to write the report, provided it is submitted in PDF form. This deliverable accounts for 10% of the project mark.

**Details on Part I:**

MRI Diffusion Tensor Imaging Input Data Recall from the Background Reading document that the following data are available following the scan: • The signal s\_0 that was recorded for each voxel before any gradient pulses were applied. • The single b-value that was used for all gradient pulses. • The directions g\_i that were used for each gradient pulse. • For each gradient direction g\_i , the signal S that was recorded for each voxel.

1. Report: Present the mathematical problem of fitting the diffusion tensor, which should reference

Jiang, et al. [1] and the Background Reading document where appropriate (~1 page).

1. Report: Describe what issues arise due to bad or invalid data at any step of the process, and explain

how this is handled, with justification (~1/2 -- 1 page).

1. Code: Implement your algorithm in MATLAB to calculate the mean diffusivity, fractional anisotropy

and principal diffusion direction for each voxel, including handling bad data.

1. Code/Report: Produce mean diffusivity map, fractional anisotropy map and principal diffusion

direction map resembling those in the Project Description. Include these figures in your report.

1. Video: Present your group's capabilities at producing high quality MRI images, and propose how you

would take this further if awarded the contract (~1 minute). A template MATLAB script partI\_template.m has been provided. You are strongly encouraged to use this code as your starting point

**Details on Part II:**

Feature Extraction Input Data The directory faces contains the 1000 image files you will need for Part II. They are portable grey map (PGM) files, which can be read into MATLAB using the code provided in the template.

1. Report: Present the mathematical explanation of eigenfaces, including how to generate the

eigenfaces from the data set. (~1 page).

1. Report: Present the mathematical explanation of how to build a rudimentary moustache detector by

projecting onto -dimensional "eigenface space". (~1/2 -- 1 page).

1. Code/Report: Implement code in MATLAB to produce the mean face and eigenfaces figures from the

Background Reading document. Include these figures in the report.

1. Code: Implement the moustache detector in MATLAB and demonstrate it in operation for a

representative sample of at least 30 images from the sample set. Your detector should be able to take each face from the data set as input and return a yes or no answer as to whether it likely has a moustache. Give a numerical value for the percentage accuracy of the detector (it does not need to be perfect!).

1. Video: Present your group's capabilities at moustache detection, and propose how you would adapt

your work to form part of a digital health system that uses MRI data (~ 1 minute).

Jiang, et al. <https://pmc.ncbi.nlm.nih.gov/articles/PMC5293685/>

# Introduction

# Part I

# Part II

# Conclusion

# References