Initial Plan

Analysis of Machine Learning Models for Visual Saliency

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CM3203 : One Semester Individual Project

Total Credits: 40

Project Description

In today's dynamic digital world where we seek to achieve efficiency and precision from every system that we create; machine learning is becoming a vital part for us to utilise in order to explore areas of research and development that would have been too difficult to complete in the past. As it is an application of Artificial intelligence that allows systems to learn and improve with experience, this can be implemented to create visual saliency models that have several technological applications such as medical imaging, image/video compression and robotics, where "salient objects in the environment can be used as navigational landmarks" (Itti, 2007).

Modelling visual saliency refers to predicting where human eyes pay attention to in visual content. This can be achieved through data collection and analysis of eye movement, fixations and saccades. Visual saliency has been an active area of research in both academia and industry within the past few years, leading to several machine learning models being developed for it. This project aims to implement different machine learning models for visual saliency, in order to compare and contrast the differences in performance of predictive visual saliency.

Project Aims and Objectives

1. To gain a strong understanding of neural networks in context to its application in visual saliency.

    1.1. Understand VGG-16 neural networks (Deep convolutional network) for object recognition.

    1.2. Understand ResNet-50 neural network (Residual neural network) for image recognition.

2. To understand the different machine learning models for visual saliency.

    2.1. Explore different models made available through the MIT Saliency Benchmark.

3. To be able to implement the different machine learning models in python programming language.

    3.1. To be able to codify the models that have been researched using software development techniques.

4. To critically assess the results from different machine learning models to extrapolate key information.

    4.1. To be able to perform data analysis on the results from different machine learning models.

Work Plan

Week	Date	Milestones	Progress	Scheduled review meetings
1	28/01/19 - 03/02/19	Research about the project to familiarise with the problem and plan for the project.	Done	
2	04/02/19 - 10/02/19	Understand neural networks in the context of visual saliency.		
3	11/02/19 - 17/02/19	Research and understand models found on MIT Saliency Benchmark based on VGG-16 and ResNet-50 neural network.		
4	18/02/19 - 24/02/19	Begin Implementation of VGG-16 neural network based model.		
5	25/02/19 - 03/03/19	Implementation of VGG-16 neural network based model		Arranged for this week
6	04/03/19 - 10/03/19	Implementation of ResNet-50 neural networks based models. or Implementation of a third model (if time allows).		
7	11/03/19 - 17/03/19	Implementation of ResNet-50 neural networks based models. or Implementation of a fourth model (if time allows).		
8	18/03/19 - 24/03/19	Carry out a test on the Cardiff University Eye-tracking database (provided by Dr. Liu) using implemented models.		
9	25/03/19 - 31/03/19	Carry out a test on the Cardiff University Eye-tracking database (provided by Dr. Liu) using implemented models.		Arranged for this week
10	01/04/19 - 07/04/19	Perform data analysis on the results from the models.		
11	08/04/19 - 14/04/19	Easter break begins after this week. Start writing up the final report. Finish the developing the structure of the report along with introduction, requirement and analysis.		
Easter Break	15/04/19 - 21/04/19	Write up the discussions of different models that are being tested		
Easter Break	22/04/19 - 28/04/19	Write up the implementation and testing sections.		
Easter Break	29/04/19 - 05/05/19	Write up the results, discussions and conclusion. Discussions will focus on the comparison of results from different models.		
12	06/05/19- 10/05/19	Proof read the final report and submit the final deliverable. Final deliverable (Final report) due on the 10/05/19.		

Reaching the Milestones

Week 1 - Research about the project to familiarise with the problem and plan for the project.

Researching about the project in order to familiarise and plan for the project is done through the initial plan which will be submitted and the initial deliverable on 04/02/2019.

Week 2 - Understand neural networks in the context of visual saliency.

To be able to implement the machine learning models and understanding of neural networks is required. This will be researched through, online tutorials, books and videos.

Week 3 - Research and understand models found on MIT Saliency Benchmark based on VGG-16 and ResNet-50 neural network.

In the third week, the two essential models will be researched and documented in notes. Notes will be taken throughout the life cycle of the project in order to help the write up of the final report.

Week 4 to 7 - Implementation phase

During this time the implementation of the models in Python programming language will begin, focusing on the VGG-16 and ResNet-50 based models as they are the most essential models. If the implementation of the two essential models takes less time than expected, more models can be implemented for comparison.

This milestone will be achieved through, the notes from the previous weeks' research and planning for how the model will be developed in Python programming language. The plan, understanding of the model for visual saliency and neural networks will be used to implement these machine learning models for visual saliency.

Week 8&9 - Testing on the Cardiff University Eye-tracking database.

The Eye-tracking database will be provided by Dr Hantao Liu, the access to it will be arranged for these two weeks. Given the database, this milestone will be achieved by testing the implemented models on the database from Cardiff University.

Week 10 - Data Analysis

In this week, the results will be formatted so that it is easier to represent and visualise. This milestone will be achieved by performing data analysis on the results that have been gathered to derive a conclusion. A comparative approach will be taken so that all the models are compared with each other, with each of their advantaged and disadvantages will be outlined and discussed.

Week 11 through Easter Break - Writing up the final report

Report writing will commence from this week, where the steps taken to achieve the findings will be recorded. This milestone will be achieved by completing different sections of the report as the weeks progress.

With the first week of report writing milestone will be completed by developing the structure of the report along with the introduction, requirement and analysis. The second week of report writing milestone will be reached by completing the implementation and testing sections. Finally, the third week of report writing milestone will be achieved by completion of results, discussion and conclusion section, where the discussions section will focus on the in-depth comparison of the different machine learning models for visual saliency, in respect to the results.

Week 12 - Submission week

This week is shorter than the rest of the weeks as the deadline for the final deliverable is on the 10/05/19. Since the exams for the final module will be around this time, it will be used for revision and proofreading the final report. This milestone will be achieved when the final report is submitted for 10/05/19, which will mark the end of the project.

References

1. Itti, L. (2007). *Visual salience*. [online] scholarpedia.org. Available at: http://www.scholarpedia.org/article/Visual_salience [Accessed 1 Feb. 2019].