Introduction

Healthcare’s issues are increasing all around the globe. “Chronic diseases and conditions are on the rise worldwide*. “An ageing population and changes in societal behaviour are contributing to a steady increase in these common and costly long-term health problems.”* (1) . One of the reasons for which such healthcare issues are rising, is the lesser quality of life which common households are facing. The quality of life has decreased because of Social Determinants of Health (SDOH) (2) such as the way we live, work, exercise and learn. Because of these determinants, it could be very difficult to for one to be able to follow a healthy diet whilst also making sure that a good amount of physical activity is met daily. Money also plays a very big factor in this. In Malta, a study which was carried out by Caritas (8) stated that families are spending at least one hundred euros more per month on food (5). With cost of living increasing on the daily (6), many are opting to buy these un-healthy foods to cut down their costs. Such foods are sometimes found cheaper because the main ingredients being used are mass produced (7), therefore it would be possible the sell these foods at a cheaper price point. The COVID-19 pandemic was also a major challenge for people who were stuck at home for months. In March 2021 an article from the American psychological association stated that from undertaken surveys, 42% of Americans gained more weight they what was intended (3). 32% of these individuals gained an average of 29 pounds whilst the rest of gained more than 50, therefore some might have considered the pandemic to be a double-edged sword.

The obesity issue in Malta also proves to be an out-of-control issue in the past years. *“Obesity rates in Malta have risen over the past decade and are now the highest in the EU for both adults and children”* (4). As of 2021, the rate of obese men and women was that of 30.6% and 26.7%, this meant that almost one third of the population is obese. The main reason for this is due to the larger portion sizes which Maltese citizens consume and the large numbers of un-healthy, ready-made foods which many opt to purchase instead of preparing a healthy meal.

This research will focus on classifying a small part of traditional Maltese foods and then generating an estimated calorie value for each of the food items in the image. The proposed solution will make use of “Mask R-CNN” as the classifier, whilst also using simple proportion formulas to estimate the calorie value. Another application for this solution is to raise awareness of how many calories are being consumed from these common traditional foods which might be part of the cause of such obesity rates previously mentioned in Malta. The results for this research are to be compared by manually weighing each item and comparing that value with the one estimated from the algorithm, whilst also identifying how the algorithm performed in both the classification and instance segmentation sections. As part of this research, a custom dataset for the subset of Maltese foods chosen will also be created, whilst also creating an automated process to create annotations for many images. Apart from that, there is also the option of using such algorithm as a steppingstone for tourist applications, where one can easily identify a traditional food item just by taking a single picture, giving them a better understanding and a better experience of Maltese food.

Throughout my years, national food was always something which I appreciated whilst working as a *Commis Chef*, combining this with my passion for learning different programming concepts, the idea of creating an image processing algorithm which estimates the nutritional values for food items, came to mind. My sister is diabetic, therefore calculating nutritional values for her meal is a daily requirement which initially was very challenging, since all the food items used in the cooking process had to be manually noted down and weighed first. Then the food items had to be looked up one by one and their nutritional values had to be calculated from the previously recorded weight.

The general structure of this research is as follows: First section consists of background research on the methods previously used by other researchers, whilst also gaining more knowledge on what algorithms/applications have been used in the past. The second section focuses on how the actual research of this paper was handled and the results from these methods are mentioned and discussed in the third section. Finally, the conclusion is where future works/improvement were mentioned and a decision whether this research was successful, was also mentioned.

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2. <https://www.cdc.gov/obesity/basics/causes.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fobesity%2Fadult%2Fcauses.html>
3. <https://www.apa.org/news/press/releases/2021/03/one-year-pandemic-stress>
4. O. O. on Health Systems and M. Policies, “Country health profile 2019,state of health in the eu, oecd publishing, paris/european observatory on healthsystems and policies, brussels.” 2019.
5. <https://www.maltatoday.com.mt/news/national/116586/watch_families_spending_at_least_100_more_per_month_on_food_new_caritas_study_shows#.Yn6Gt1BBy3A>
6. <https://maltadaily.mt/cost-of-living-is-maltas-biggest-concern-as-global-food-prices-continue-to-surge/>
7. [https://www.telegraph.co.uk/global-health/climate-and-people/eating-healthy-diet-expensive-many-britons-research-finds/#:~:text=“Unhealthy%20food%20is%20so%20cheap,very%20low%20levels%20of%20nutrients](https://www.telegraph.co.uk/global-health/climate-and-people/eating-healthy-diet-expensive-many-britons-research-finds/#:~:text=).
8. https://www.caritasmalta.org