# Task 1

# Section 1

## Research Design II

# Identifying Strawberry Diseases

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## Introduction

The vibrant red strawberry isn't just a summertime treat. In Malta, it has a distinct growing season, flourishing during the late winter and spring months. This unique window makes the arrival of Maltese strawberries a highly anticipated event for both residents and tourists. The popularity is further underscored by the success of the annual strawberry festival, a celebration where this delectable fruit takes centre stage. From enjoying them fresh off the vine to incorporating them into innovative culinary creations, the festival showcases the versatility of the strawberry.

However, the journey from a humble seed to a juicy, edible berry is far from simple. Cultivating strawberries requires meticulous care and expertise. Unlike other fruits, they are delicate and susceptible to overwatering. Even seemingly beneficial rain can become detrimental if it exceeds the plant's needs. This inherent fragility underscores the dedication and skill required by Maltese strawberry farmers.

## Technological Intervention in Strawberry Production

The rise of technology has permeated every aspect of our lives, and agriculture is no exception. This study aims to leverage advancements in this field to address a crucial challenge in Maltese strawberry production – identifying the optimal harvesting time. By implementing a machine learning-based solution to analyse various datasets, we propose a system that can accurately determine when a strawberry has reached its peak ripeness and is ready to be enjoyed by consumers.

## Purpose Statement

This research proposes a "smart strawberry system" powered by computer vision. By analysing digital details within strawberry images, the system goes beyond appearance to predict the ideal harvest window, minimizing waste and maximizing yield. This early detection system also identifies potential diseases lurking beneath the surface, allowing farmers to take preventative measures and ensure healthy strawberries. Similar to how image processing aids pest management, this technology offers earlier disease detection, benefiting both farmers and consumers. In essence, the study aims to develop a system that detects strawberry growth stages and diseases using computer vision, offering recommendations based on these findings.

## Research questions:

This study investigates the potential of using artificial intelligence (AI) techniques to classify strawberry growth stages and recommend interventions for improved growth. We hypothesize that an AI-based system can be developed to automate this process, leading to more precise and efficient strawberry production.

Specifically, the study aims to develop and evaluate a system that can:

Automatically detect the various strawberry growth stages based on visual or sensor data.

Recommend appropriate interventions such as watering, nutrient application, and temperature adjustments based on the detected growth stage.

To achieve these objectives, the following research questions will be addressed:

How can a robust and comprehensive dataset be constructed that accurately captures the visual and/or sensor-based characteristics of different strawberry maturity stages?

What AI algorithm is most effective for classifying the various growth stages of a strawberry plant?

How do the system's recommendations for growth interventions compare to the advice provided by experienced strawberry growers or established best practices?

## **Research Methodology: Through the Layers of the Research Onion**

Our research methodology follows the structure of the research onion model, a framework that guides researchers through the key decisions involved in developing a research plan. The innermost layer focuses on our **research philosophy**, which in this case is **positivism**. We believe in the existence of an objective reality (the optimal harvest time for strawberries) that can be discovered through scientific methods.

Moving outwards, we consider the **research approach**. We will employ a **deductive approach**, starting with a general hypothesis about AI's ability to optimize harvest time and testing it through specific research questions. The chosen **research strategy** will be **survey-based**, where we will collect data on strawberry growth stages and existing harvesting practices. This data will be used to train a **machine learning algorithm** (the specific choice being a research question). Finally, the outermost layer deals with **data collection methods**. We will utilize **computer vision techniques** to analyze strawberry images and identify optimal ripeness markers.

By systematically working through these layers of the research onion, we aim to develop a robust and effective system for optimizing strawberry harvesting in Malta.