# QUAD Chart 6-8

Your QUAD chart is a summary of your project. Before reviewing detailed slides the QUAD chart allows judges and others to quickly see a summary of your project. A "quad chart" is a single page divided into four quadrants providing a high-level summary of the project. It is intended to be more visual than detailed to quickly introduce your judges to what is important about your project. Follow the model below that corresponds to the Project Presentation template you selected.

1. In order to provide sufficient space, please use 8½"X11" and arranged in Landscape orientation.
2. The page background color must be a light color and text color must be predominantly dark to support readability.
3. The minimum allowable font size is 13 pt. *Exception*: You may use a smaller font size, down to 9 pt., for figure captions or photo credits.
4. All four quadrants of your Quad Chart should each be the same size with a single border line delimiting each, as in the examples below. The Title section should be only as tall as necessary to include your project title and other identifying information (see section on Quad Chart Title).
5. The Quad Chart should not include a bibliography, references, or acknowledgments.

## Quad Chart Title:

- In the upper right-hand corner, list the Project ID (You will receive this after registering.)
- Line one is the title of your project

## Quadrant 1: Research Question/Engineering Objectives

- This should reflect material in #2 of the Slide Requirements.
- Please state the research question or engineering problem being addressed
- A leading core graphic or visual is encouraged, but not required.

## Quadrant 2: Methodology/Project Design

- This should reflect material in #3 of the Slide Requirements.
- Please provide a succinct, bulleted summary of the methodology/project design

## Quadrant 3: Data Analysis & Results

- This should reflect material in #4 and 5 of the Slide Requirements.
- It is advised that this quadrant should primarily be a graphic representation of relevant data and results.
- Text should be kept to a minimum.

## Quadrant 4: Interpretation & Conclusions

- This should reflect material in #5 and # 6 of the Slide Requirements

## Science Project Quad Chart

| Q1: Research Question | Q3: Data Analysis & Results |
| --- | --- |
| Q2: Methodology | Q4: Interpretation & Conclusions |

## Engineering Project Quad Chart

| Q1: Engineering Problem & Objectives | Q3: Data Analysis & Results |
| --- | --- |
| Q2: Project Design | Q4: Interpretation & Conclusions |

| Math/Computer Science Project Quad Chart | |
|---|---|
| Q1: Problem or Question | Q3: Findings |
| Q2: Framework | Q4: Interpretation & Conclusions |

## Example Below

Project ID: ROBO057

# Phytoplankton detection using machine learning and a mobile application

## Q1: Problem

Plankton are the world's largest oxygen producers and first level of all marine food chains, making quantification a measurement for Earth's health. Currently, manual microscopic plankton analysis is a laborious process, but with the rise of artificial intelligence and its implementations in the past decade, automated data collection for plankton has been attempted.

This study set out to create a neural network, programmed in Python, to identify phytoplankton on the characteristics of shape.

## Q2: Framework

Plankton collection required to create the dataset.

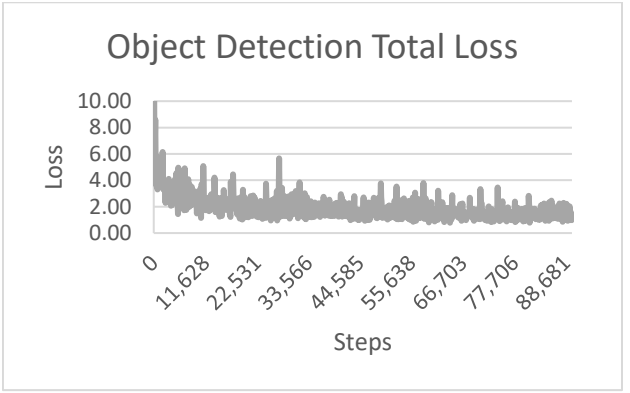
Data augmentation was used to increase the dataset by a factor of 3.

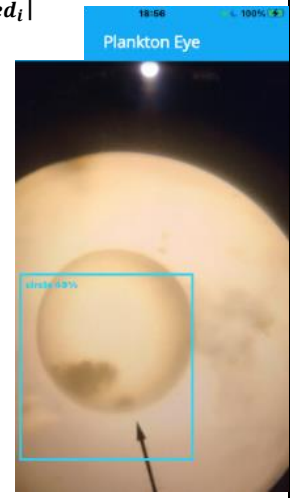
Two models were developed: image classification and object detection.

```
model = Sequential()

model.add(Conv2D(8, (3,3), input_shape = X.shape[1:]))
model.add(Activation("relu"))
model.add(MaxPooling2D(pool_size = (2,2)))

model.add(Conv2D(16, (3,3)))
model.add(Activation("relu"))
model.add(MaxPooling2D(pool_size = (2,2)))

model.add(Conv2D(32, (3,3)))
model.add(Activation("relu"))
model.add(MaxPooling2D(pool_size = (2,2)))

model.add(Dropout(.2))
model.add(Flatten())
model.add(Dense(32))
model.add(Activation("relu"))

model.add(Dense(3))
model.add(Activation('sigmoid'))
```

## Q3: Findings

$$Loss = \sum_{i=1}^{n} |y_{actual_i} - y_{predicted_i}|$$




## Q4: Interpretations and Conclusions

The machine learning model worked as expected, producing the correct outputs for each shape. Object detection proved to be a more valuable format as having multiple plankton in the frame is quite common allowing for more than one output.

There were limitations caused by the size of the dataset/training data, reduction of image pixel ratio, and training hardware.

Continued research could include expanding the dataset to train a higher caliber model, species-specific classification, and developing an automated quantification feature for the application.

10-1-2021