**Project Proposal Form**

Please refer to the **Project Handbook Section 4** when completing this form

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| **Degree Title:**  Computing | **Student’s Name:**  Ryan Syme |
| **Supervisor’s Name:** |
| **Project Title/Area:**  What’s wrong with my crop? Using convolutional neural networks to detect crop defects. |

# Section 1: Project Overview

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| **1.1 Problem definition - use one sentence to summarise the problem:**  Crop defect identification with recourse information, to give greater crop yield to food producers.  **1.2 Project description - briefly explain your project:**  Creating a REST API to allow crop pictures to be uploaded and analysed by a convolutional neural network. Which will feed back percentage likelihood of each kind of crop defect and images that the network sees as a good match to the input.  **1.3 Background - please provide brief background information, e.g., client, problem domain:**  This web service could be of aid to small scale gardeners/farmers for identifying problems that may arise with their crop. For example, diseases, pest infestation, lack of water, lack of nitrogen, too hot/cold, humid/dry. With global food security becoming a growing concern, more individuals that are not expert horticulturalists are taking to producing food. Therefore, having a quick way to get an idea of what is causing crop failure/defects and information on what is appropriate recourse, will allow producers to act against the problem and as a result, improve their yield.  **1.4 Aims and objectives – what are the aims and objectives of your project?**  I aim to have a working REST API connected to a python backend that will deal with the image classification. And a simple UI that will allow the user to upload an image to be analysed and display information regarding the likelihood of each kind of possible defect. Along with relevant images that fit the description of the most likely defects and recourse information to rectify the defect. The main focus of my project will be building and optimising the CNN that will perform the image classification. I also wish to implement features that will allow me to analyse the NN’s decision making process, perhaps leveraging open source libraries such as lucid[1] |

# Section 2: Artefact

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| **2.1 What is the artefact that you intend to produce?**  My artefact will consist of two main parts. Firstly, a REST API integrated with a CNN (convolutional neural network) that will perform image classification of crop defects. My CNN will be built from scratch and will include regularization techniques to prevent overfitting, likely, dropout and a regularisation term when performing back-propagation. Secondly, a web interface that sends/receives relevant parameters from the user/client in the form of a REST API and visualise the returned data with the help of JavaScript. My stretch goal would be to containerise the back-end to allow it to be run as a docker image.  **2.2 How is your artefact actionable (i.e., routes to exploitation in the technology domain)?**  I will produce my CNN using Python and libraries such as numpy, scipy and pandas with Jupiter notebook being my editor. My backend code will be a REST API hosted on a Linux server.  For the front-end interface, I may utilize React, if the solution after further consideration looks large enough to warrant its usage. I plan to use JavaScript to visualize the JSON data served by the API, however my alternative solution would be to have the images, of graphs for instance, rendered by the back-end and stored on the server so that the JSON can contain a link to the image, however this would have the drawback of preventing the visualization from being real-time interactive. |

# Section 3: Evaluation

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| **3.1 How are you going to evaluate your work?**  Firstly, did I meet my aims and objectives? I can evaluate this through observation of a working and stable artefact that has the features I intended to include. This will be formalised by comparing my final software artefact with a list requirements that will be iteratively created during the SDL, ensuring I include the features mentioned in my initial proposal.  **3.2 Why is this project honours worthy?**  My project is honours worthy as it will be a clear demonstration of my ability to carry out the production of a piece of software, start to finish, back-end and UI. Which will show my planning and problem-solving skills as well as the domain knowledge I have acquired during my 4 years of academic study and additional year in industry. My project will be an addition to a growing body of research into image classification and how it’s usefulness can be incorporated into the domain of food production.  **3.3 How does this project relate to your degree title outcomes?**  **3.4 How does your project meet the BCS Undergraduate Project Requirements?**  **3.5 What are the risks in this project and how are you going to manage them?** |

**Section 4: References**

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| **4.1 Please provide references if you have used any.**  [1] https://github.com/tensorflow/lucid |

# Section 5: Ethics (please delete as appropriate)

**5.1 Have you submitted online ethics checklist to your supervisor? Yes / No**

**5.2 Has the checklist been approved by your supervisor? Yes / No**

# Section 6: Proposed Plan (please attach your Gantt chart below)