**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?**  The project should 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 the project will be building and optimising the CNN that will perform the image classification. Additional features may include those that will enable the analysis of the NN’s decision making process, perhaps leveraging open source libraries such as lucid[1]. Another necessary objective will be cleaning and pre-processing the image data. Perhaps artificially growing the dataset by performing translations/rotations/adding noise to the images to make the training data more comprehensive. |

# Section 2: Artefact

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| **2.1 What is the artefact that you intend to produce?**  The 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. The 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. A 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)?**  The CNN will be produced using Python and libraries such as numpy, scipy and pandas with Jupiter notebook being the editor. the backend code will be a REST API hosted on a Linux server.  For the front-end interface, React may be utilized, if the solution after further consideration looks large enough to warrant its usage. There is potential is to use JavaScript to visualize the JSON data served by the API, however an 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, were the aims and objectives met? This can be evaluated through observation of a working and stable artefact that has the features mentioned in the proposal. This will be formalised by comparing the final software artefact with a list of requirements that will be iteratively created during the SDL, ensuring inclusion the features mentioned in my initial proposal.  **3.2 Why is this project honours worthy?**  The project is honours worthy as it will be a clear demonstration of one’s ability to carry out the production of a piece of software, start to finish, back-end and UI. Which will show one’s planning and problem-solving skills as well as the domain knowledge one has acquired during their years of academic study and additional year in industry. The 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?**  With the degree title being Computing, the main degree title outcomes I will be covering are computer algorithms, software development and some amount of creating a web application. The project will also be strongly building upon one’s final year units, being; machine intelligence, deep learning and data mining. With the creation of a CNN being a direct extension of the deep learning module and an example of employing complex computer algorithms. The need to pre-process data being an extension of the data mining module. Creating a REST API will further build upon the web development skills of lvl5. The coupling and design of the front/back end will be a demonstration of one’s software development ability.  **3.4 How does your project meet the BCS Undergraduate Project Requirements?**  The project builds upon one’s final year modules, it contains objectives for the creation of a relevant software artefact, it will highlight one’s main skills under the computing remit. Furthermore, the project will be created using current technologies and methodologies to show current best practice as determined by existing successful software applications and literature.  **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)