**Detailed Project Proposal**

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* **Defining your Project**

**1.1 Project title**

***Help:*** *a brief statement about what you are actually going to do.*

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| Mobile application used to detect the correct facemask wearing based on image segmentation. |

**1.2 Background**

***Help:*** *Provide the background to your project. This section should highlight the main topics in the area you are going to research. Essentially what is the project about, what has been done before and why is this project important? ~500 words*

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| During the covid19 pandemic (that is still on-going until these days) we have to wear a facemask in public places. One of the main questions that rises is how to wear a facemask properly. Improper wearing of a face mask (or not wearing it at all) during flu season, a pandemic, or in areas with high air pollution, can have a negative impact on our health. Even if we wear one, someone else might not be wearing it, and may spread the disease to more vulnerable people. Therefore, we need a tool to analyse facemask wearing, compare similar models and identify their shortcomings. Based on these shortcomings, I need to find an appropriate data sets for training and testing. Automated face recognition was pioneered back in the 1960s, so in principle, I just need to adapt existing methods and models so that these are able to recognise if a person is wearing a mask or not. Afterwards, if a person is wearing a facemask, the system should analyse the overlap of the facemask over the face region to decide whether the mask is properly being worn. |

**1.3 Motivation**

***Help:*** *To whom is this project important? A project must address a question/problem that generates a small piece of new knowledge/solution. This new knowledge/solution must be important to a named group or to a specific client (such as a company, an academic audience, policy makers, people with disabilities) to make it worthwhile carrying out. This is the* ***motivation*** *for your project. In this section you should address who will benefit from your findings and how they will benefit. ~300 words*

**Example** 1: If you intend to demonstrate that a mobile application that automates class registers at RGU will be more efficient than paper-based registers - the group who would be interested in knowing/applying these findings would be both academic and administrative staff at RGU and they would benefit by time saved and a reduction in their administrative workload.

**Example** 2: You are demonstrating that a particular 3D model design increases realism in 3D environments. The group that would be interested would be games designers or developers of 3D virtual environment applications. The would benefit from producing more realistic environments that could increase sales of their products.

**Example** 3: You have designed a new network topology for IrishOil plc’s new Aberdeen headquarters. The interested group would clearly be IrishOil. They would benefit from easier maintenance and improved security of their computer network.

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| This project is motivated around preserving public health. This project would be important for all companies which have places that have public areas where people gather, from attractions to workplaces. This project is to make sure that customers, workers or in general people, would wear the face covering masks and make sure that they are wearing it correct way. For example, shops, cinemas, offices, schools and etc. This project would reduce the potential of diseases spreading. |

**1.4 Aim & Objectives**

***Help:*** *Outline what are the main things your project is going to do and what steps or milestones will be used to achieve this aim. The Aim is unlikely to change throughout your project; however, the objectives are likely to adapt to your ongoing research and development. In particular it is highly likely that you may wish to split objectives into sub-objectives as work progresses. A good clear set of objectives give you something to evaluate your final project against.*

**Example**: For the timetable app outlined above

Aim: To create a functioning attendance application that efficiently automates the taking of class registers.

Objective 1: study existing register system in place at RGU and identify weaknesses

Objective 2: research existing automation technology’s and identify and evaluate those that may be appropriate to taking in class registers

Objective 3: Implement chosen technologies to create prototype application

Objective 4: Conduct user trials to evaluate capabilities of prototype application

Objective 5: Create a refined application incorporating feedback from user trials

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| Objective 1: To train and test a machine learning algorithm that detects if a person is wearing a mask.  Objective 2: Once the system has identified the mask, to detect if the person is wearing it correctly.  Objective 3: Deploy the model in a mobile application. |

**1.5 Key Techniques**

***Help:*** *Perform some initial research into the area and outline what techniques you my research in further detail here. The techniques you cover here should include references to the papers where you have sourced the information. The techniques mentioned here are very likely to become the section headers in your literature review.*

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| After doing some initial researching for working with Artificial Intelligence (AI), it is important to choose which programming language to use. "Python" is high level programming language which is similar to pseudocode, that is why it is easy to understand [1]. "Python" libraries are one of the most important reasons why it is used for AI. Libraries such as "NumPy" [2], "OpenCV" [3], "Kivy" [4] lets users to spend less time on programming and more time for improving efficiency to get more accurate results. Another reason, to choose "Python" because "Python" exceeds on effective compatibility with lower level programming languages, which gives more time for algorithm optimisation [1]. "Pandas"[5] is one of the "Python" libraries that lets user create fast, flexible and eloquent tables, also called "Data frames"[6], as well as create charts to display results.  References:   1. Poole, D. L., & Mackworth, A. K. (2017). Python code for Artificial Intelligence: Foundations of Computational Agents. Version 0.7, 6. 2. Harris, C. R., Millman, K. J., van der Walt, S. J., Gommers, R., Virtanen, P., Cournapeau, D., ... & Oliphant, T. E. (2020). Array programming with NumPy. Nature, 585(7825), 357-362. 3. "OpenCV About". Link <https://opencv.org/about/> 4. "Kivy Documentation". link <https://buildmedia.readthedocs.org/media/pdf/kivy/latest/kivy.pdf> 5. McKinney, W., & Team, P. D. (2015). Pandas-powerful Python data analysis toolkit. Pandas - Powerful Python Data Analysis Toolkit, 1625. 6. "Intro to pandas". Link <https://pandas.pydata.org/pandas-docs/stable/getting_started/index.html> |
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**1.6 Legal, Social, Ethical, Professional and Security issues**

***Help:*** *Here you should discuss any legal, social, profession and security issues that you believe may occur during the course of your project. It is not acceptable to write none in this box, all projects, regardless of focus will have to address issues in one, or more, of these categories. This is an extremely important part of your honours project to which there is no correct answer, this section must be fully discussed with your Honours Supervisor.*

**Example 1**: In the class register example above – there would be a Legal and Security issue with the gathering and storage of student data. There may be a social constraint as you may be relying on a user to have access to a specific technology. There will need to be consideration of user accessibility.

**Example 2**: A 3D model design may have ethical considerations in its evaluation. What if your model made users feel nauseous. Social constrains may again be access to technology or accessibility issues.

**Example 3**: You network design need to adhere to specific company policies. You would need to consider the possibility that your design could be wrong, compromising the company’s security.

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| I am going to use public databases which contains people photos, however since there photos already are publicly available, people have already agreed that these databases will be used for scientific research. |

**1.7 Project Plan**

***Help:*** *This is the project plan as to how you will go about achieving the objectives of the project.*

**Example**: In the class register example above the research plan may involve:

Collecting and analysing paper-based registers in a given class on five occasions.

Identifying the error rate average on these occasions

Researching existing automation techniques

Designing and implementing a mobile application that automatically records attendance in class.

Deploying the application in the class on five occasions.

Identifying the error rate average of the mobile application on these occasions.

Comparison of data and summary of findings.

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| I will find datasets that are appropriate to my project, which is photos with people wearing masks, photos with people without masks and photos with drawn masks on top of the people faces (artificial databases).  Research and analyse face masks wearing detection methods, compare similar models and identify their shortcomings.  Designing and implementing a mobile application that real-time (live) detects if a person is wearing a mask and if person wearing it correctly.  Identify the most efficient and accurate method to be used for face mask wearing detection.  Identify average error rate of the mobile application.  Comparison of data and summary of findings. |

**1.8 Ethics Form**

***You must include in your signed ethics form in this submission or you will not be able to continue the project.***