### lmu_blakCourse Submission Cover Sheet Module: CT7160 Computer Vision

### Assignment no: 001

### Weighting: 30% of module mark

### Deadline: Monday 5th May 2023

**Module Leader: Dr Pawel Gasiorowski**

**Student ID:**

PLAGIARISM

You are reminded that there exist regulations concerning plagiarism. Extracts from these regulations are printed below. Please sign below to say that you have read and understand these extracts:

(Signature:) Date:

This header sheet should be attached to the work you submit. No work will be accepted without it.

Extracts from University *Regulations on*

Cheating, Plagiarism and Collusion

Section 2.3: "The following broad types of offence can be identified and are provided as indicative examples …..

1. **Cheating: including taking unauthorised material into an examination; consulting unauthorised material outside the examination hall during the examination; obtaining an unseen examination paper in advance of the examination; copying from another examinee; using an unauthorised calculator during the examination or storing unauthorised material in the memory of a programmable calculator which is taken into the examination; copying coursework.**
2. **Falsifying data in experimental results.**
3. Personation, where a substitute takes an examination or test on behalf of the candidate. Both candidate and substitute may be guilty of an offence under these Regulations.
4. **Bribery or attempted bribery of a person thought to have some influence on the candidate's assessment.**
5. Collusion to present joint work as the work solely of one individual.
6. Plagiarism, where the work or ideas of another are presented as the candidate's own.
7. Other conduct calculated to secure an advantage on assessment.
8. Assisting in any of the above.

Some notes on what this means for students:

1. Copying another student's work is an offence, whether from a copy on paper or from a computer file, and in whatever form the intellectual property being copied takes, including text, mathematical notation and computer programs.
2. Taking extracts from published sources *without attribution* is an offence. To quote ideas, sometimes using extracts, is generally to be encouraged. Quoting ideas is achieved by stating an author's argument and attributing it, perhaps by quoting, immediately in the text, his or her name and year of publication, e.g. " e = mc2 (Einstein 1905)". A *references* section at the end of your work should then list all such references in alphabetical order of authors' surnames. (There are variations on this referencing system which your tutors may prefer you to use.) If you wish to quote a paragraph or so from published work then indent the quotation on both left and right margins, using an italic font where practicable, and introduce the quotation with an attribution.

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**Assignment**

This assignment will be marked out of 100 and carries 30% of the overall module weighting. Your python files and report for this part must be compressed **(.zip format)**, uploaded to Weblearn and submitted by **3pm on Friday 5th May 2023**. The assignment must be carried out individually so you must not obtain help from anyone other than the module teaching staff. You must not copy code from any source apart from the module core text and the module Weblearn site. Collusion, plagiarism (unreferenced copying) and other forms of cheating constitute Academic Misconduct, which can lead to failure of the module and suspension from the University.

**Aim**

The aim of this assignment is to develop a model capable of recognizing the rock, paper and scissors hand signs from the given images. You will also need to write a report describing your model and program. You are advised to study the learning aim on reflective practice, which is linked from Weblearn. Your report should be no more than 2500-3000 words in length (excluding the table of contents, diagrams and code listing).

**Deliverables**

When you are ready to submit your solution, zip your python files together with your report in either in Microsoft Word or PDF format, upload it to WebLearn and, when you are absolutely sure that you have uploaded the correct files, press the submit button.

**The program will consist of 3 separate Python scripts in total. The first two scripts are required for a successful submission of the coursework. The third one is optional for those who wish to get an exceptional mark. However, bear in mind that the third script will only be marked if you have submitted the other two.**

**PART 1 (50 Marks)**

1. In the first script you need to perform the following:

1. data pre-processing of any kind that you consider necessary for a successful training (e.g.: resizing, colour space conversions, etc.) **(5 Marks)**
2. data augmentation to enlarge the training dataset **(5 Marks)**
3. visualize samples from the dataset using one of the popular packages (e.g. matplotlib.pyplot) **(5 Marks)**
4. build the Convolutional Neural Network (CNN) architecture. **You are not allowed to build ANN for this assignment. Furthermore, the model must be built with TensorFlow Keras package ONLY**. **(8 Marks)**
5. train the model on the provided dataset **(7 Marks)**

You are allowed to use any of the pre-trained advanced architectures for this assignment. Use your personal judgment in selecting the suitable architecture for completing the coursework. Your trained model should be saved to an external file with **.hdf5** extension as it needs to be used by the second script later on. It is fundamental that the script produces the following:

a) visualized samples from the dataset, i.e.: rock, paper, scissors hand signs with the appropriate labels **(5 Marks)**

b) summary of the model architecture in a form of a plot or text **(5 Marks)**

c) model accuracy evaluation plot after the training concludes **(5 Marks)**

d) model loss evaluation plot after the training concludes **(5 Marks)**

**All the above outputs must be included in the report to receive marks.**

**PART 2 (10 Marks)**

1. The second script should load the trained model and predict the hand sign in the image. It is fundamental that the script can perform the following:
2. The tested image is to be supplied via the arguments list **(5 Marks)**
3. visualisation of the supplied image with the prediction score and predicted label **(5 Marks)**

**The above output (b) must be included in the report to receive marks.**

**PART 3 (10 Marks)**

1. The third, optional script, should be able to perform the following:
2. Read two images of hand signs provided as script arguments **(2 Marks)**
3. Predict the labels of the two images **(5 Marks)**
4. Output which image won the rock, paper, scissor game **(3 Marks)**

**The above output (c) must be included in the report to receive marks. However, bear in mind that the third script will only be marked if you have submitted the other two.**

**PART 4 (30 Marks)**

**Report**

The report should contain:

* A brief description of each of the selected image processing and data augmentation methods and their role in your training pipeline **(3 Marks)**
* Clear justification behind the model architecture along with its summary in a form of a diagram or text.If you decide to use the pre-trained, advanced architecture you need to provide a reasonable explanation why it is suitable for solving the task. **(10 Marks)**
* A detailed description of hyperparameters selection with brief justification. **(3 Marks)**
* You should give evidence (through appropriate screenshots if necessary) that your scripts can generate the following:
  + visualized samples from the dataset, i.e.: rock, paper, scissors hand signs with the appropriate labels
  + summary of the model architecture in a form of a plot or text
  + model accuracy evaluation plot after the training concludes
  + model loss evaluation plot after the training concludes

**Marks for evidence will be given according to the descriptions of PART 1, PART 2 and PART 3.**

The report should contain a section on running different training procedures where you give examples and evidence of at least three different hyperparameters configurations you have tried. The hyperparameters configurations should be distinctive and not the same. **(8 Marks)**

The report should contain a conclusion, where you evaluate your work, reflecting on what you learnt from the assignment. You are advised to study the learning aid on reflective practice, which is linked from the module in WebLearn. **(3 Marks)**

The report should include a title page, a table of contents (with page numbers), and a listing of the code (in an appendix). Marks will also be awarded for the quality of writing and the presentation of the report. **(3 Marks)**

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| **A picture containing text  Description automatically generated**  **School of Computing and Digital Media**  **Marking Criteria for Coursework** | |
| **Marking criteria** | **Mark range** |
| An exceptional submission, with extensive and detailed knowledge based on a high level of additional background research; a high degree of critical analysis, evaluation and original insight; excellent organization and presentation. | 90 – 100 |
| In addition to the requirements for grades of 70-79% (below), an outstanding submission incorporating a high level of originality, depth and critical insight and going well beyond expected work. | 80 – 89 |
| An excellent submission, going beyond expected work; commanding understanding and appreciation of the central points; well-written and effectively structured; evidence-based, critical and logical analysis; comprehensive and correct referencing of sources. | 70 – 79 |
| A very good and comprehensive submission that fulfills the assignment brief; relevance and accuracy; clear structure and evidence-based; a sound grasp of the subject and ability to think about it effectively and critically; correct referencing of sources. | 60 – 69 |
| A solid submission that fulfills most of the assignment brief; adequate structure; mostly accurate, with few errors or omissions; some limitations in scope, critical thinking and argument; a consistent attempt at referencing sources. | 50 – 59 |
| A basic but incomplete submission, with limited relevant information; lacks logical and coherent structure, with some significant errors or omissions; contains sparse and/or irrelevant information and lacks an evidence-based approach; some limitations with referencing of sources; poor grammar and spelling. | 40 – 49 |
| An unsatisfactory submission, with some substantial errors, omissions or irrelevancies; barely acceptable amount of information relevant to the question; poor structure, presentation and expression and referencing of sources. | 30 – 39 |
| An unsatisfactory submission, that doesn’t meet the learning outcomes with many substantial errors, misconceptions, omissions or irrelevancies; little information relevant to the question; very poor structure, presentation and expression. | 1 – 29 |
| Non-submission or submission of work which cannot be given any credit (e.g., blank submission, incorrect assignment). | 0 |