

Module Code	CN7023
Module Title	Artificial Intelligence and Machine Vision
UEL Module Leader	Dr Preethi Kesavan
LSBF Coursework Instructor	Mr Alvin Yeo (PT) & Ms Sharanya (FT)
Coursework Title	Neural Network & Image Processing Classification Project (3000 words) Certificates related to AI and Machine Vision Group presentation based on approach to the main project.
Coursework Number	1
Weighting	100%
Handout Date	02 OCTOBER 2023
Coursework Submission Date	21 December 2023
Learning Outcomes Assessed by this Coursework.	<p>Knowledge</p> <ol style="list-style-type: none"> 1. Relate and describe the various digital image processing and analysis methodologies, methods and tools used for the modelling, design and development of AI system. (DP) 2. Explain the concepts behind computer-based recognition and the extraction of features. (DP) <p>Thinking skills</p> <ol style="list-style-type: none"> 3. Analyse problems associated with modelling and designing digital vision-based AI Systems (COI) 4. Examine the ethical, legal, social and economic issues involved within vision-based AI systems development. (CI) 5. Analyse the suitable digital vision methods for a specific AI problem (COI). <p>Subject-based practical skills</p> <ol style="list-style-type: none"> 6. Design and build an AI information system using digital vision models and tools. (DP) <p>Skills for life and work (general skills)</p> <ol style="list-style-type: none"> 7. Work effectively as a member of a team in developing a prototype application for a given scenario. (SEI) 8. Assimilate new knowledge through research and be able to describe this in a written report. (SEI)
Turnitin Submission Requirement	YES
Additional Information	<p>Please read the entire coursework brief to ensure you understand all the requirements before you begin.</p> <p>Neural Network & Image Processing Classification Project (3000 words) is a group project.</p>

	ASSESSMENT FEEDBACK - Feedback on your coursework assessment will be available in four working weeks from the submission date. Please refer to the module pages on Canvas for assessment specific details. Summative examination assessment result will be released.
--	---

Form of assessment:

☐ Individual work ☒ Group work

For **group work** assessment which requires members to submit both individual and group work aspects for the coursework should be submitted as:

☒ Consolidated single document ☐ Separately by each member.

Number of coursework copies required:

☒ 1 ☐ 2 ☐ Other

coursework to be presented in the following format:

- ☒ On-line submission
- ☐ Stapled once in the top left-hand corner.
- ☐ Glue bound.
- ☐ Spiral bound.
- ☐ Placed in a A4 ring bound folder (not lever arch)

Note: To students submitting work on A3/A2 boards, work must be contained in suitable protective case to ensure any damage to work is avoided.

Note to all students:

- i. **Assignment cover sheets** can be downloaded from UEL Plus via the following pathway.

Home Page → LSBF CANVAS_Information → **Assignment Front Sheets**

- ii. **Plagiarism** is a serious offence, please do not jeopardise your degree and please submit your coursework before the due date.

iii. **Backup**

- ✓ All coursework submitted will not be returned to learners.
- ✓ Please ensure that backup copies are kept on different devices.
- ✓ Learners are responsible for their own work and must perform the necessary backups.

Neural Network & Image Processing Classification Project (3000 WORDS) 100%

GROUP WORK

Please read the entire coursework brief to ensure you understand all the requirements before you begin.

1. GROUP FORMATION

This assessment should be attempted in groups of **minimum 2 to maximum 4 students**. Group work can facilitate your learning, improve relationships among your classmates and teammates and prepare you to work in groups in their future careers.

Computer Science graduates need to be able to demonstrate effective teamwork which can be achieved by working in student groups to develop collaborative skills, communication skills, presentation skills as well as responsible behaviour to be effective global citizens, critical and creative scholars.

- i. Please give list of your group members to your lecturer.
- ii. A brief description (a line or two) of each team member's primary role in the project.
- iii. You must keep regular minutes of any meetings that you have while undertaking this course work as they will be required if there is a dispute about any members' contribution. Your minutes should:
 - be planned with relevant dates.
 - include a list of all group members present and apologies for any absences.
 - include allocation of work to be achieved by each member by the next meeting.
 - include the time, date, and venue of the next meeting.
 - be signed to indicate the agreement of all group members, present or not.
- iv. You are required to submit with your coursework, a statement signed by each member of the group stating that you have all participated and that the mark awarded should be shared equally. The original of this agreement goes to your lecturer and an electronic copy goes in your coursework. Refer to the template included in **ANNEX A** and without this statement marks cannot be allocated.
- v. All individuals will receive the group grade for this coursework unless clear evidence is provided of unequal contributions. The marking criterion for the Coursework is based on the assessment marking scheme IN **ANNEX B** and assessment criteria included in the last page of this assessment brief in **ANNEX C**.

You must complete the coursework using the following approaches:

- i. **Neural Network & Image Processing Classification Project**
- ii. **Certificates related to AI and Machine Vision**

Students can explore any free virtual courses related to Deep learning, AI, computer vision and insert the screen capture of the badge earned or the e-certificate received.

For example:

- Free artificial intelligence courses on edX
- Asynchronous e-Learning Self-directed Learning course offered by LSBF on Artificial Intelligence (send an email to pkasavan@lsbf.edu.sg)
- <https://aws.amazon.com/training/learn-about/machine-learning/>
- <https://www.edx.org/learn/computer-programming/massachusetts-institute-of-technology-introduction-to-computer-science-and-programming>

iii. Group presentation based on approach to the main project.

A. Task 1: Select a suitable Dataset

Choose one of the following or any other source for image datasets for your coursework:

- i. honeybees – simplified, <https://www.kaggle.com/unsunnedsnow/honeybees-simplified>
- ii. 7,000 Labeled Pokémon, <https://www.kaggle.com/lantian773030/pokemonclassification>
- iii. Fruits 360, <https://www.kaggle.com/moltean/fruits>
- iv. Medical MNIST, <https://www.kaggle.com/andrewmvd/medical-mnist>
- v. Comic Books Images, <https://www.kaggle.com/cenkbircanoglu/comic-books-classification>
- vi. Cheetah, Hyena, Jaguar, and Tiger, <https://www.kaggle.com/iluvchicken/cheetah-jaguar-and-tiger>
- vii. Simpsons Main Characters, <https://www.kaggle.com/mlwhiz/simpsons-main-characters>

B. Task 2: Design, implement and report on neural network-based techniques for classification of a dataset of images.

Write a 3000 words research report, in the style of a research paper, including the following:

- i. The research question(s) you are exploring and the experiments you designed to address the question(s).
 - a. Artificial Neural Network Implementation using a Classification of choice of any image Dataset
 - b. Neural Network Models for Combined Classification and Regression
 - c. Image Classification Model using Python
 - d. Image processing techniques in Python.

- ii. A clear presentation of the methods (neural network implementation, network architectures, training regime, etc.) that were used, an outline of how they were implemented, and a discussion of why these methods were chosen.
- iii. A clear presentation of results, discussion and interpretation of results and conclusions.
- iv. Produce a pre-recorded video presentation demonstrating your code, output, results and analytics.
- v. Please follow the marking scheme in **ANNEX B**, and assessment criteria in **ANNEX C, D** to ensure your report includes all required sections.

Format of the research paper:

COURSEWORK TITLE IN 16 POINT TIMES NEW ROMAN, FULLY CAPITALISED AND CENTRED AND ONE BLANK LINE AFTER THE TITLE

Student Number in 14-point Times New Roman & Centred

Abstract: Type abstract in, 11-point times New Roman, single-spaced type with zero spacing before and after and the word abstract in bold. All manuscripts must be in English. All text after Abstract must be in a two-column format. Give two blank lines before starting introduction.

1. Formatting your page:

Top & Bottom Margins: 2.5cm

Left & Right Margins: 2.5cm

All text after Abstract must be in a two-column format, single spaced in 12-point times New Roman.

Please do not place any additional blank lines between paragraphs.

Columns are to be 7.6 cm wide, with a 0.8cm space between them. Text must be fully justified.

2. First-order headings:

For example, "1. Introduction", should be 14 Times New Roman boldface, initially capitalised, flush left, with one blank line before, and one blank line after. Use a

period (".") after the heading number, not a colon.

2.1. Second-order headings:

As in this heading, they should be 12 Point Times New Roman boldface, initially capitalised, flush left, with one blank line before, and one after.

2.1.1. Third-order headings. Third-order headings, as in this paragraph, are discouraged. However, if you must use them, use 12 Points Times New Roman boldface, boldface, initially capitalised, flush left, preceded by one blank line, followed by a period and your text on the same line.

3. Page numbering and Footnotes:

No page numbering and Do not use any footnotes.

4. Illustrations, Figures, photographs, and tables:

All should have captions below and centred 11 Points Times New Roman within TWO

columns at the top or bottom of the page with NO Bold face or Italics

paper. When referenced in the text, enclose the citation like for example, (Smith, 2004).

5. References:

List all bibliographical references alphabetically in 12-point Times New Roman, single-spaced and one blank line after each reference at the end of your

Smith S., Smith A., Roberts A., "Article Title", Journal, Publisher, Location, Date, pp. 1-10.

Smith S., Smith A., Roberts A., Book Title, Publisher, Location, Date

-END OF COURSEWORK TASK BRIEF-

ANNEX A: Agreement of Participation - Group Coursework CN7023

Please complete this agreement and keep a copy for each member of your group. The original of this agreement goes to your Tutor and the Electronic copy goes in your coursework.

We agree to work as a group (**a group of minimum 2-max 4**) to complete the coursework for CN7023 and understand that the grade awarded will be the grade allocated to us individually because of our group work.

Student No.	Name (block letters) and email Address	Signature

Instructor's Name: _____

Date of agreement _____ 2022/2023

Students to fill this information. Examiners will not be liable for any mistakes in student ids.

Group No:

Group Member (Student No):

All students agree to equal distribution of marks.

Yes/No

IF No, then marker decides the individual marks based on the individual contribution by each member.

- Your tasks completed in the assignment.
- Your team member's task contribution to the assignment work.
- Favorable Collaborative Experience.

- d. Unfavorable Collaborative Experience and how you resolved.
e. Lessons Learnt -Learning Reflection.

The following is a checklist of things that **MUST** be present in order that this assessment point may go ahead. If any of the items are missing the student is deemed to have **FAILED**. It is the group's responsibility to have brought the items on the checklist with them.

Item	Present	Not Present
ALL Group Members		
Necessary resources		
All students agreed distribution of marks		

ANNEX B ASSESSMENT MARKING SCHEME

Coursework is marked for **100 marks** and contributes **100%** to the overall assessment component.

No:	Coursework Content	Marks Allocated	Marks Awarded	Marks Awarded	Marks Awarded
1	Artificial Neural Network Implementation using a Classification of choice of any image Dataset	10			
2	Neural Network Models for Combined Classification and Regression	10			
3	Image Classification Model using Python	10			
4	Image processing techniques in Python.	10			
5	Abstract -Maximum number of words: 120 words	5			
6	Introduction <ul style="list-style-type: none"> Objective of the coursework (Research questions(s) you are exploring) An overview of the report content 	5			
7	Methodology - Discuss neural network classification for image datasets. This should include references from at least <u>5 conference papers</u> .	5			
8	Simulations - Provide a description of the dataset, including sample images Explain the network architecture that you used, how you trained, validated, and tested the network, explain the learning algorithm used. How did you encode the dataset so that you could use the images as input to the neural network.	10			
9	Certificates related to AI and Machine Vision	8			
10	Results Obtained - Critical Analysis of results - Detailed analysis of the results. Describe your results in the three different ways: <ul style="list-style-type: none"> i. As a percentage (%), i.e., the test set achieved 95% accuracy. 	5			

	<p>ii. Include an accuracy curve figure for the training, testing, and validation results. The x-axis will represent the number of epochs and the y-axis will represent the percentage accuracy.</p> <p>iii. Include a confusion matrix figure as a visual representation of the accuracy you achieve.</p>				
11	Conclusions -Conclusions and comments	5			
	References and Formatting				
12	Prepare the report in the format of the research paper template. Use reference format as outlined in the research paper template.	5			
13	Recorded Video Presentation GROUP (see Annex B)	12			
TOTAL		100			
Lecturer's Feedback					

ANNEX C ASSESSMENT CRITERIA

Each of contents in the coursework report will be marked using the following scale:

Report contents – Assessment Criteria	Grade Band
<ul style="list-style-type: none"> Excellent coverage of issues with good exemplification and a complete list of references along with Turnitin report. Clear signs of excellent understanding of the theme. Excellent articulation of points/views/comments, - Suggests optimization of research methods for optimal incorporation. Independent analysis, observations, and comments, final report clearly represent a development of the research. 	<p>70-100%</p> <p>Excellent</p>
<ul style="list-style-type: none"> Very good coverage of issues with some relevant exemplification with adequate references. Very good in terms of comprehensiveness and clarity. Very good use of external sources to support points brought up. Very good signs of independent analysis, shows how each requirement fits together. 	<p>60-69%</p> <p>Good to Very Good</p>
<ul style="list-style-type: none"> Adequate coverage of issues with little exemplification. Good effort. builds reasonable scale presentation of research. Clear and covers the obvious points coherently. Some effort at use of independent judgement and external sources of information. 	<p>50-59%</p> <p>Satisfactory to Good</p>
<ul style="list-style-type: none"> Unclear coverage of issues but little exemplification, provides brief outline of approach to design problem. Effort in covering important points mostly gathered from textbook and lecture notes. 	<p>40-49%</p> <p>Pass standard</p>

<ul style="list-style-type: none"> Scattered efforts at using information gathered from external sources. mostly with a purpose and sometimes with no clear purpose. Simplistic or slightly unstructured /confused presentation. 	
<ul style="list-style-type: none"> No relevant material or very little relevant material. Fails to present relevant points satisfactorily to answer the specific questions. Confused presentation and unclear language. Produces chunks of information from the sources with no signs of having assimilated the information. 	<p>0-39</p> <p>Unsuccessful</p>

ANNEX D Grading Criteria for Recorded Video Presentation

3 Minute Video Presentation Rubric				
Criteria Description	0 mark	1 mark	2 marks	3 marks
Intro, & organization of presentation – Does your video begin and end with information to help focus the viewer's attention.	The video either has an intro and is of low quality. The video does not use credits/citations at all. Difficult to follow. Poor quality shows poor effort.	The video has an intro and it is of moderate quality. Credits/citations may or may not be present. Portions may be poorly documented and/or organized. Hard to follow the progressions of the video. Explanation shows some effort.	The video has an intro and is consistent with the rest of the video. Credit/citations is given to appropriate sources. Fairly well documented and organized. Format is easy to follow. Good explanation shows good effort.	Intro add to the high level attained by this video. Credits/citations are given to appropriate sources. Program shows a continuous progression of ideas and tells a complete, easily followed story. Well organized.
Information – Does your video stay focused on the assignment questions? Does your video provide easy to understand information? Does your video demonstrate the depth of knowledge of the presenter?	Project's usefulness is in question. Does not inform; does not stay focused on the topic.	Project has problems staying focused on topic. Information is incoherent at times. The video shows a shallow depth of knowledge on the topic.	Video is focused on an informative topic. Video makes understanding the topic fairly accessible and easy. Video demonstrates a depth of knowledge on the topic.	Video is laser focused on the topic. The topic is very easy to understand. The video demonstrates an obvious depth of knowledge on the topic. Student went beyond the scope of the assignment and the hard work shows.
Data Structure Algorithm Design & Coding – Is your video interesting	Too many or too gaudy graphics; transitions, too many clips, backgrounds and/or sounds detract from content of the actual assignment question.	Minimal use of data structure and Python libraries.	Good use of Python libraries and relevant data structure algorithms.	Excellent sense of design and correct use of data structures and algorithms. Smooth transitions are appropriate and aid in delivery of the presentation.
Voice – Does the audio flow well? Is it of high quality?	The audio or video is garbled and hard to decipher. Too much background interference and/or the video is of low quality.	The audio and/or video effects are of moderate quality. Some background noises not related to the presentation are heard.	The audio and video effects are of acceptable quality. There are few distracting aspects to the audio/video.	Audio/video effects flow exceedingly well and are of high quality.

*****End of Coursework Brief*****