

SCHOOL OF ARCHITECTURE, COMPUTING, & ENGINEERING

Submission instructions

- Cover sheet to be attached to the front of the assignment when submitted
- All pages to be numbered sequentially
- All work has to be presented in a ready to submit state upon arrival at the ACE Helpdesk. Assignment cover sheets or stationery will **NOT** be provided by Helpdesk staff

Module code	CN7023
Module title	Artificial Intelligence & Machine Vision
Module leader	Dr Julie Wall
Assignment tutor	Saeed Sharif, Mustansar Ghazanfar, Nadeem Qazi, Seyed Ali Ghorashi, Mohammad H Amirhosseini, Rajeev Nath, Divya Pithani, Soha Abdallah Nossier, Saranya Natesan, Reena Popat, Mary Augustine
Assignment title	AI & Machine Vision coursework
Assignment number	1
Weighting	Individual Assignment 100%
Handout date	W5
Submission date	14/05/2020 UPDATED FOR ONLINE DELIVERY – 09-02-2021
Learning outcomes assessed by this assignment (see course handbook)	Learning Outcomes: 1-8
Turnitin submission requirement	Yes
Additional information	<ul style="list-style-type: none"> • ASSESSMENT FEEDBACK - Feedback on your assessment will be available in four working weeks from the submission date. Please refer to the module pages on UEL+ for assessment specific details.

Form of assessment:

- ☒ Individual work ☐ Group work

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

- ☐ Consolidated single document ☐ Separately by each member

Number of assignment copies required:

- ☒ 1 ☐ 2 ☐ Other

Assignment 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 has to be contained in suitable protective case to ensure any damage to work is avoided.

Soft copy:

- ☐ CD (to be attached to the work in an envelope or purpose made wallet adhered to the rear)
☐ USB (to be attached to the work in an envelope or purpose made wallet adhered to the rear)
☒ Soft copy not required

Note to all students

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

Home Page → **ACE Information** → **ACE Helpdesk** → **Assignment Front Sheets**

All work has to be presented in a ready to submit state upon arrival at the ACE Helpdesk. Assignment cover sheets or stationery (including staplers) will NOT be provided by Helpdesk staff. This will mean students will not be able to staple cover sheets at the Helpdesk.

CN7023 Assessment: Complete both Task 1 and Task 2.

Task 1: Data Science Skills (20 marks)

Complete four MATLAB Online Courses to learn Data Science skills. Earn a certificate for each course, acquire four certificates to complete this part of the assessment. When completed, upload each certificate to Turnitin.

- **Course 1: MATLAB Onramp** - Get started quickly with the basics of MATLAB. **(5 marks)**
- **Course 2: Machine Learning Onramp** - Learn the basics of practical machine learning methods for classification problems. **(5 marks)**
- **Course 3: Deep Learning Onramp** - Get started quickly using deep learning methods to perform image recognition. **(5 marks)**
- **Course 4: Image Processing Onramp** - Learn the basics of practical image processing techniques in MATLAB. **(5 marks)**

Task 2: Design, implement and report on neural network-based techniques for classification of a dataset of images. (80 marks)

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

- The research question(s) you are exploring and the experiments you designed to address these question(s).
- 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.
- A clear presentation of results, discussion and interpretation of results and conclusions.
- Please follow the marking scheme to ensure your report includes all required sections.

NOTE 1: You can choose to complete the coursework using any one of the following approaches:

1. Mixture of image processing with artificial neural networks (with Matlab or Python)
2. Deep learning only (with Matlab or Python)

Dataset

Please choose one of the following image datasets for your coursework:

1. honeybees – simplified, <https://www.kaggle.com/unsunnedsnow/honeybees-simplified>
2. 7,000 Labeled Pokemon, <https://www.kaggle.com/lantian773030/pokemonclassification>
3. Fruits 360, <https://www.kaggle.com/moltean/fruits>
4. Medical MNIST, <https://www.kaggle.com/andrewmvd/medical-mnist>
5. Comic Books Images, <https://www.kaggle.com/cenkbircanoglu/comic-books-classification>
6. Cheetah, Hyena, Jaguar and Tiger, <https://www.kaggle.com/iluvchicken/cheetah-jaguar-and-tiger>
7. Simpsons Main Characters, <https://www.kaggle.com/mlwhiz/simpsons-main-characters>

Submission

Task 1 – Upload each MATLAB certificate to the correct Turnitin link before the submission deadline.

Task 2 - Prepare the 3000 words research report and upload to correct Turnitin link before the submission deadline.

The marking scheme is as follows:

Abstract (5 Marks) <ul style="list-style-type: none">○ Maximum number of words: 120 words
Introduction (5 Marks) <ul style="list-style-type: none">○ Objective of the coursework (Research questions(s) you are exploring)○ An overview of the report content
Methodology (10 Marks) <ul style="list-style-type: none">○ Discuss neural network classification for image datasets. This should include references from at least <u>5 conference papers</u>
Simulations (30 Marks) <ul style="list-style-type: none">○ Provide a description of the dataset, including sample images○ How did you encode the dataset so that you could use the images as input to the neural network.○ Explain the network architecture that you used, how you trained, validated and tested the network, explain the learning algorithm used.
Results Obtained (10 marks) <p>Describe your results in the three different ways:</p> <ol style="list-style-type: none">1. As a percentage (%), i.e. the test set achieved 95% accuracy.2. 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.3. Include a confusion matrix figure as a visual representation of the accuracy you achieve.
Critical Analysis of results (10 Marks) <ul style="list-style-type: none">○ Detailed analysis of the results.
Conclusions (5 Marks) <ul style="list-style-type: none">○ Conclusions and comments
References and Formatting (5 Marks) <p>Prepare the report in the format of the research paper template. Use reference format as outlined in the research paper template.</p>

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

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

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