

## Academic Year: 2024/25

### Assessment Introduction:

**Course:** BSc (Hons) Computer Science, Computing, Software Engineering, Cyber Security  
**Module Code:** CO3519  
**Module Title:** Artificial Intelligence  
**Title of the Brief:** Facial emotion recognition  
**Type of assessment:** Report

This assessment is worth [50%] of the overall module mark.

This Assessment Pack consists of a detailed assignment brief, guidance on what you need to prepare, and information on how class sessions support your ability to complete successfully. You'll also find information on this page to guide you on how, where, and when to submit. If you need additional support, please make a note of the services detailed in this document.

#### **How, when, and where to submit:**

Submit via the Turnitin link on Blackboard.

Assessment deadline date and time: **13<sup>th</sup> December 2024, 17:00**

Feedback will be provided by: **15th January 2025**

You should aim to submit your assessment in advance of the deadline.

Note: If you have any valid mitigating circumstances that mean you cannot meet an assessment submission deadline and you wish to request an extension, you will need to apply online, via [MyUCLan](#) with your evidence **prior to the deadline**. Further information on Mitigating Circumstances via [this link](#).

We wish you all success in completing your assessment. Read this guidance carefully, and any questions, please discuss with your Module Leader at [FUMUllah@uclan.ac.uk](mailto:FUMUllah@uclan.ac.uk).

Disclaimer: The information provided in this assessment brief is correct at time of publication. In the unlikely event that any changes are deemed necessary, they will be communicated clearly via e-mail and a new version of this assessment brief will be circulated.

### **Additional Support available:**

All links are available through the online [Student Hub](#)

1. Our **Library resources** link can be found in the library area of the Student Hub or via your subject librarian at [SubjectLibrarians@uclan.ac.uk](mailto:SubjectLibrarians@uclan.ac.uk).
2. Support with your academic skills development (academic writing, critical thinking and referencing) is available through **WISER** on the Study Skills section of the [Student Hub](#).
3. For help with Turnitin, see [Blackboard and Turnitin Support](#) on the Student Hub
4. If you have a disability, specific learning difficulty, long-term health or mental health condition, and not yet advised us, or would like to review your support, **Inclusive Support** can assist with reasonable adjustments and support. To find out more, you can visit the Inclusive Support page of the [Student Hub](#).
5. For mental health and wellbeing support, please complete our online referral form, or email [wellbeing@uclan.ac.uk](mailto:wellbeing@uclan.ac.uk). You can also call 01772 893020, attend a drop-in, or visit our UCLan **Wellbeing Service** [Student Hub pages](#) for more information.
6. For any other support query, please contact **Student Support** via [studentsupport@uclan.ac.uk](mailto:studentsupport@uclan.ac.uk).
7. For consideration of Academic Integrity, please refer to detailed guidelines in our [policy document](#). All assessed work should be genuinely your own work, and all resources fully cited.

### **Preparing for your assignment**

The preparation for this assignment is the weekly lab work that is set. This is provided on Blackboard, completed in class with the lecturer, and opportunities are given to discuss this work in the lecture times.

### **Introduction**

Facial emotion recognition is an intuitive reflection of a human's mental state (Happy, Sad, Surprise, etc.), which contains rich emotional information, and is one of the most important forms of interpersonal communication. These cues can deliver a complete understanding of the desired message. Facial emotion recognition is an effort towards understanding human's personal emotions from their face. Facial emotions have high weightage over the words that are being spoken during our personal exchange of ideas.



You need to implement a machine learning algorithm/model to recognise / classify basic facial expressions (emotions) in an image such as Neutral, Angry, Happy, Surprise, Sad and Fear. (See figure, taken from JAFFE dataset.)

You can use two datasets to evaluate your model performance. The comparison should be performed for datasets results. I have included below some popular datasets below that can be used too.

1. Cohn Kanade
2. MMI facial expression database
3. JAFFE database

### **Submission details**

Submission of one-word processed document (.doc/.pdf) on your "Facial emotion recognition model" is required through Blackboard using Turnitin. University referencing style should be used throughout. The report should be 4-5 pages (excluding references)

### **Detailed assignment brief**

#### **Algorithms and Techniques**

This Course Assessment gives you the opportunity to apply traditional machine learning techniques. You can use Support Vector Machine as a classifier with any features extraction techniques. Please remember, don't use any deep learning or neural network-based methods in this assignment. Some of the suggested machine learning techniques are:

- Support Vector Machine
- Decision tree classifier
- K Neighbours classifier
- Naive bayes classifier

It is important to note that you are not limited to using only the classifier mentioned above. You can implement new models/algorithms or variants of existing models for the given problem.

#### **The Following Components Must Be Considered for Model Development and Validation**

- Class imbalance problem in this dataset
- Data Augmentation may be necessary.
- Choosing the right parameters for feature extraction or fine-tuning
- Metrics to take into account to evaluate if the model is performing well.
- Provide a Confusion matrix, training/testing accuracy and loss graphs.
- Show a figure where faces are classified with three different emotions.

Preparation of the data, training and cross-validation techniques, evaluation of the test sets and model comparisons are all crucial to the success of this type of practical development.

#### **Your report MUST include the following:**

- If you are using any existing implementations, how will you use them and justify the reason of using it to solve the given problem? How have you planned to improve or modify such implementations?

## **Deliverables**

Please submit the assignment as a single Word document (.doc/.pdf) in the Blackboard Assignment Submission link for the module. Please note that all assignments will be checked for plagiarism using computer software (Turnitin) as part of the submission process.

## **Useful Resources**

Here are some sources you can get help from.

1. [Deep Facial Expression Recognition: A Survey | IEEE Journals & Magazine | IEEE Xplore](#)
2. [A comprehensive survey on deep facial expression recognition: challenges, applications, and future guidelines - ScienceDirect](#)
3. [Raspberry Pi assisted facial expression recognition framework for smart security in law-enforcement services - ScienceDirect](#)
4. [Facial Expression Recognition \(FER\) | Papers With Code](#)

## **Formatting Requirements**

Your report should have the following structure:

- **Title, Author(s):** Title of the report. Your Name, and student ID.
- **Introduction (5%):** Describe the problem you are working on, and an overview of your results.
- **Literature review (5%):** Discuss published work that relates to this project. How is your approach similar or different from others? (At least 4 papers should be referenced.)
- **Datasets (10%):** Describe the data you are working with for your project. What type of data is it? Where did it come from? How much data are you working with? Did you have to do any preprocessing, filtering, or other special treatment to use this data in your project? If you are collecting new data, how will you do it and incorporate it into your model?
- **Model Development (30%):** What method or algorithm are you proposing/using? Discuss your approach for solving the given problems. Why is your approach the right thing to do? Did you consider alternative approaches? If you are using any existing implementations, how will you use them and justify the reason for using it to solve the given problem? How have you planned to improve or modify such implementations? Explain the inner workings of your developed/used model and justify why and how the model works to solve the given problem. You should demonstrate that you have applied ideas and skills

built up during the semester to tackling the given problem. It may be helpful to include *figures, diagrams, or tables* to describe your method.

- **Model Evaluation (30%):** How will you evaluate your results? Discuss the results obtained from your model. Qualitatively, what kind of results do you expect (e.g., plots or figures)? Quantitatively, what kind of analysis will you use to evaluate and/or compare your results (e.g., what performance metrics or statistical tests)? Discuss the experiments that you performed to demonstrate that your approach solves the problem. You might compare with previously published methods, perform an ablation study to determine the impact of various components of your system, experiment with different hyperparameters or architectural choices, use visualization techniques to gain insight into how your model works, discuss common failure modes of your model, etc. You should include graphs, tables, or other figures to illustrate your experimental results.
- **Demo (10%):** Add a Link to a demo video of your work/code, interactive visualizations, showing training progress, and output, etc.
- **Conclusion (10%):** Summarize your key results - what have you learned? Suggest ideas for future extensions or new applications of your ideas.
- **Supplementary Material:** Not counted toward your 4-5-page limit. Your supplementary material must include:
  - Source code of your projectUpload your Supplementary Material in a Cloud Source Repository and include the URL in your final report after the conclusion section.

The practical development must be individual work. This cannot be completed as a group. Students must write and submit their own individual final report. You can discuss solutions with other students and ask for help from your lecturer if needed.

### **Sample of successful assignment**

Sample assignments will be discussed in lectures and practical sessions but will not be available on Blackboard.

### **Learning outcomes**

- Apply the theoretical underpinnings of algorithms and techniques specific to artificial intelligence.
- Critically evaluate the principles and algorithms of artificial intelligence.
- Evaluate the theoretical foundations of artificial intelligence.
- Understand some of theoretical underpinnings of computing and apply them to given scenarios

**NOTES: USING CHATGPT IS STRICTLY PROHIBITED.**

## Marking grid/marketing rubric

Grade band	Marks available	A description of work example
3 <sup>rd</sup> class	42	The report lists all tasks undertaken. There may be a few inaccuracies but most will be correct. Writing may be brief, or poorly presented. Some items might be in bullet points rather than full sentences.
	45	As above, but nearly all descriptions will be correct, though perhaps only explained briefly.
	48	As above, but all descriptions will be correct.
2:2	52	The report lists all tasks undertaken, using the correct technical terms to explain the techniques used and why. At least most of the tasks will be correctly explained, although some parts may be incomplete.
	55	As above, but nearly all descriptions will be explained using technical details.
	58	As above, but all descriptions will be explained using correct technical details
2:1	62	The report lists all tasks undertaken, explaining in detail the technique used and why. At least most of the tasks will have a detailed and clear explanation, demonstrating understanding of the topics. The work will be presented in a professional, structured manner and may include simple references
	65	As above, but nearly all of the tasks will have a detailed and clear explanation.
	68	As above, but all of the tasks will have a detailed and clear explanation
1 <sup>st</sup> class	74	All tasks will have a detailed and clear explanation which demonstrates full understanding of the topic. There may be a few slight errors or minor missing details
	80	As above, but of good quality throughout, without obvious errors or missing details
	87	As above, but showing evidence of background reading through appropriate citing of sources. Discussed the result obtained from the model. Explained why it worked and what alternatives can be taken in the future to solve the given problem.
	94	As above, but ensuring that sources are of a good quality and used throughout the work.
	100	provides evidence of thorough independent research and development. Algorithms and techniques are tailored to the use case, and explanation of how and why this was done is provided. The submitted material makes it easy for a developer or user with a disciplinary background in computing to validate, test, employ, and further develop the code

## **Feedback Guidance:**

### **Reflecting on Feedback: how to improve.**

From the feedback you receive, you should understand:

- The grade you achieved.
- The best features of your work.
- Areas you may not have fully understood.
- Areas you are doing well but could develop your understanding.
- What you can do to improve in the future - feedforward.

Use the [WISER](#): Academic Skills Development service. WISER can review feedback and help you understand your feedback. You can also use the WISER [Feedback Glossary](#)

Next Steps:

- List the steps have you taken to respond to previous feedback.
- Summarise your achievements
- Evaluate where you need to improve here (keep handy for future work):