

Edge Hill University

The Department of Computer Science

**CIS3137**

**Advanced Robotics and Artificial Intelligence**

**Level 6**

Coursework 1 - Assessment

2021/2022

**Module Leader:** Dr Ammar Al Mhdawi

* TBC

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# Coursework 1 - Assessment

**Weighting: 50%**

**Hand in date: 15 Nov 2021 (by midday 12:00)**

**Feedback date:** within 4 weeks after the submission date

Learning Outcomes Assessed:

**LO1.** Critically analyse the applications of human-robot interaction systems, including service, industrial and entertainment applications.

**LO2.** Develop a systematic understanding of key aspects of computer vision and machine learning techniques for designing and implementing software algorithms for a robot vision system and draw conclusions on their efficacy.

# Introduction

This module aims to present an overview about how to model and analyse human and robot behaviour in an algorithmic way. It also focuses on how to tackle the human-robot interaction and collaboration challenges under the framework of AI and robotics. In this module you will assessed on developing an understanding of the basic principles about how to design user-friendly human-robot interaction systems, be able to apply AI and robotics that best suit their interests and that can be found useful in our daily life, and develop the skills in individual thinking, algorithm implementation, and teamwork through exercises and project work

You will be tested on a set of individually assessed exercises covering the AI and robotics techniques. You will be required to analyse the requirements for a given exercise, design and implement a solution by adopting selected programming paradigms/languages. The students also required to implement a testing strategy for some elements of the portfolio to ensure that the software meets the requirements presented. This may include the use of software test tools to automate the process. The aim of this assessment exercise is to enhance student's programming skills and to further their understanding of AI and robotics techniques.

You will be provided with additional resources and directed reading. Laboratory sessions will enable students to explore paradigms in software development through the creation of applications using a chosen programming language and styles which will assist in reinforcing understanding of the techniques and issues involved in the design and implementation of applications. These activities will be supported by quizzes and group discussions/seminars.

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| Background |

You are required to prepare a full report about 4 industry robots from your choice. Make sure to add all supplementary information, code, and screenshots of the systems. The sections of the report are indicated in the assessment’s questions below. Moreover, you are required to develop a computer vision for robotic system and draw conclusions with full source code. The students are required to submit a single individual report.

Graphical user interface, text, application, email

Description automatically generated

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| Initial Planning |

This section briefly describes the tasks that make up a typical portfolio report. The main purpose of this coursework is to analyse the human-robot interaction by discussing industrial systems from your choice. You must submit your report with supplementary pictures, design and screenshots as indicated on the assignment-1 question guidelines. The assignment-2 covers the computer vision system development for robotic system. This will enable you to develop a computer vision algorithm and testing it with a specific dataset. Make sure to follows the guidelines in assignment 2 and add all supplementary information with source code screenshots and details in the report.

Read through the questions above and anything you are unsure about, read and re-visit the lecture notes until you are clear in your understanding. Check the submission guidelines that will be on your black board course website.

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| **Tutor Details** |

| **Module Leader**: Dr Ammar Al Mhdawi | |
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| **Location:** Tech Hub **Office: THG10**  **Direct line:** TBD | **e-mail:ammar.al-mhdawi@edgehill.ac.uk** |

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| What you should submit |

* **Deadline**: **15 Nov 2021**
* **File name**: CW1\_studentID.pdf
* Submit your response as an individual report in a single PDF file (approx. 2500 words)
* Include source code with necessary comments
* Include screenshots of output if there are any
* Provide evidence for your answer wherever is applicable
* Academic sources include research articles and books written by and for academics. Use a referencing tool to ensure that you use correct British Harvard style:

<https://www.edgehill.ac.uk/ls/uni-skills/referencing/>

**Academic Writing**

The report should be a description of what you have achieved, not a story. The report should be written in the third person, so ‘I’ should not be used. Use a spellchecker to ensure that the spelling and grammar are correct.

<https://www.edgehill.ac.uk/ls/uni-skills/?tab=academic-writing>

## What will be assessed

1. Understanding of the robotic systems and AI algorithms, validity and justification of design and implementation choices of the developed solution.
2. Adherence to an academic writing style
3. The developed source code and other assets such as figures to summarise analysis results
4. Quality of the report
   * 1. Complete description
     2. Documentation of the developed algorithm and referencing
     3. Screenshots of output and implementation
     4. Evaluation
     5. Wider reading and references

| **Learning outcomes**  **assessed for**  **Coursework 1** | **Fail (0-29)** | **Narrow Fail (30-39)** | **Pass (40-49)** | **Good**  **(50-59)** | **Very Good (60-69)** | **Excellent (70-84)** | **Outstanding (85-100)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***LO1 -*** Critically analyse the applications of human-robot interaction systems, including service, industrial and entertainment applications.  *LO2:* Develop a systematic understanding of key aspects of computer vision and machine learning techniques for designing and implementing software algorithms for a robot vision system and draw conclusions on their efficacy. | Work has no structure or direction, very poor subject knowledge, serious and fundamental factual errors.  Mostly irrelevant material and/or very superficial.  No grasp of material Writing style is very poor and/or is substantially plagiarised.  No working system Learning outcomes have not been met. | Report shows some understanding of analysis of industrial robot-human interaction.    Report shows minimal understanding of the relevant areas of machine vision and lack of efficient programming for the task    Much of what is presented is irrelevant  or incoherent, there are some  misunderstandings in the work and no attempt has been made to construct a logical discussion.    No working system is provided.    Writing style is poor with many errors and not in correct format.    No alternative options have been considered. | Evidence of some research carried out. Work shows some identification and evaluation of current robotic and human interaction for industrial systems.  Report shows well understanding of the relevant areas of machine vision and well programming skills      Writing style may show a number of errors, poor expression, or passages that are sometimes difficult to comprehend. Poor referencing.    Demonstrates understanding of key  principles of implementing robotic theory in robotic and AI but does not identify advanced concepts.    Robotic and AI system is functional in part but is not complete.    Drafts submitted on time. | Discusses key components of Robotic and human interaction with real-world implementation such efficiency, ease of implementation, suitability etc.  Few sources listed and a reliance on a limited range of literature sources.  Report shows good understanding of the relevant areas of machine vision and good programming skills  Satisfactory identification and evaluation of current technologies demonstrated by relevant literature. Satisfactory analysis, evaluation and critique of technologies.    Writing style is fairly clear but may include some errors of spelling and grammar.    Robotic and AI system is functional and complete.    Referencing methods are not always | As very well but work shows evidence of a good understanding of the critical analysis of robot-human interaction, compiled in a way that is mostly clearly argued and relevant to the set task.    Report shows very well understanding of the relevant areas of machine vision and good programming skills  Good research carried out demonstrated by the use of a range of appropriate literature sources with little or no  superfluous information.    Good identification and critical evaluation of current technical factors demonstrated by the wide range of research.    Robotic and AI system is fully functional and complete.    Writing style is clear and largely free from errors of spelling and grammar as well as | As very good but excellent in-depth research conducted demonstrated by the use of a very wide range of appropriate literature sources with little or no superfluous information.    Report shows very good understanding of the relevant areas of machine vision and good programming skills  Identifying a wide range of potential robotic and AI solutions techniques.    Excellent identification and critical evaluation of current technologies demonstrated by the analysis, evaluation and critique of said technologies supported by inclusion of a range of appropriate situation observations.    Some evidence of independent thought but not necessarily originality. | As Excellent but outstanding in-depth research demonstrated by the use of an extremely wide range of appropriate literature sources with no concise presentation.    Report shows excellent understanding of the relevant areas of machine vision and excellent programming skills  As excellent and discusses & demonstrates areas of solution that have implemented initiative and work correctly.    Outstanding identification and critical evaluation of current technologies, demonstrated by the extremely broad range of technologies contrasted, and supported by outstanding analysis, evaluation and critique. |