

## **DEGREE: MSc Data Analytics**

### **Module: Computer Vision and Artificial Intelligence**

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**Assignment Title:** Image Classification Project

**Assignment Type:** Set exercise

**Word Limit:** 2000-3000 words

**Weighting:** 50%

**Issue Date:** 06/11/2023

**Submission Date:** 01/02/2024

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**Feedback Date:** 15/02/2024

#### **Plagiarism:**

When submitting work for assessment, students should be aware of the InterActive/Canvas guidance and regulations in concerning plagiarism. All submissions should be your own, original work.

**You must submit an electronic copy of your work. Your submission will be electronically checked.**

#### **Learner declaration**

**I certify that the work submitted for this assignment is my own and research sources are fully acknowledged.**

**Student signature:**

**Date:**

#### **Harvard Referencing:**

The Harvard Referencing System must be used. The Wikipedia, UKEssays.com or similar websites must **not** be used or referenced in your work.

## Introduction

### Learning Outcomes:

**LO1.** Demonstrate the understanding of various techniques for working with images and computer vision using artificial intelligence.

**LO2.** Use deep learning and artificial intelligence to write algorithms and use models for image processing.

**LO3.** Implement Python code for applying computer vision and artificial intelligence for applications like face recognition, feature detection and matching, motion estimation, motion tracking, image classification, and object recognition.

**Assessment Criteria: Weighting 50%**  
**2000-3000 words**

**Task** (the task is related to **LO1**, **LO2**, and **LO3**).

This assignment aligns with the unit's objectives of introducing learners to computer vision and artificial intelligence concepts, focusing on practical implementation using Python and deep learning techniques.

In this practical analysis, you will apply your knowledge of computer vision and artificial intelligence to solve a real-world problem scenario involving image processing and analysis. The assignment emphasizes hands-on exercises to evaluate your understanding and practical skills in computer vision.

### Analysis Scenario:

Imagine you are working with a robotics company that develops autonomous robots for various applications, including healthcare. One of the challenges your team faces is enabling the robot to detect and identify medical equipment and supplies in a hospital room. This involves object recognition and classification using computer vision and artificial intelligence.

### Task Requirements:

#### 1. Problem Formulation (250 words):

- Define the specific problem scenario related to object recognition in a hospital room.
- Explain why solving this problem is crucial for the robot's functionality.

#### 2. Data Preparation (350 words):

- Describe how you collected or generated a dataset of medical equipment and supplies for training and testing.
- Explain any preprocessing steps applied to the data.

3. Model Implementation (400 words):

- Choose and implement a deep learning model for object recognition. You can use pre-trained models or build one from scratch using Python libraries such as TensorFlow or PyTorch.
- Provide code snippets and explanations of model architecture.

4. Model Training and Evaluation (400 words):

- Analyse how you divided the dataset into training and testing sets.
- Present the results of your model's performance, including accuracy and any other relevant metrics.
- Discuss any challenges encountered during model training.

5. Practical Application (300 words):

- Describe how the trained model can be integrated into the autonomous robot's system to enable object recognition in a hospital room.
- Discuss potential use cases and benefits of this technology in healthcare.

6. Conclusion and Reflection (200 words):

- Summarize your findings and the effectiveness of your computer vision solution.
- Reflect on the challenges faced and lessons learned during the practical analysis.

**Submission Instructions:**

- Prepare a practical analysis adhering to the specified word limit (2000 - 3000 words).
- Include Python code snippets, visualizations, and relevant documentation within the analysis where appropriate.
- Ensure that your analysis is clear, organized, and logically presented.
- Prepare a document using the BSBI assignment template available in Canvas.
- Use Harvard referencing style for your bibliography.
- Refer to the Essay-Guide available in Canvas for further instructions.
- Submit your assignment electronically by the specified deadline.

## GUIDANCE ON ASSESSMENT

All materials must be properly referenced under Harvard conventions. The length required is 2500 words with tasks equally weighted. The writing style should be formal academic / report writing style with in-text referencing to support your comments and observations. Originality, quality of argument and good structure are required. The report should demonstrate sound understanding and ability to apply knowledge and theory of Digital Economy and Transformation. Additional marks being awarded for juxtaposition and insight of issues.

## Grading Criteria

|         | Generic Criteria  | 90 - 100  | 80 - 89   | 70 - 79  | 60 - 69  | 50 - 59  | 40 - 49  | 30 - 39   | 0 - 29  |
|---------|---|---|---|--|--|--|--|---|---|
| Level 7 | <b>Knowledge of contexts, concepts, technologies and processes</b><br>The extent to which knowledge is demonstrated:<br><i>relevant contextual or theoretical issues are identified, defined and described</i><br><i>historical or contemporary practices are identified, defined and described</i><br><i>appropriate technologies, methods and processes are identified, defined and described</i> | Exceptional and remarkable critical understanding of current issues and historical contexts demonstrating knowledge at the forefront of the discipline<br><br>Exceptional and highly original understanding of techniques methods and processes   | Excellent and highly sophisticated critical understanding of current issues and historical contexts demonstrating knowledge at the forefront of the discipline<br><br>An excellent and highly impressive understanding of techniques, materials and processes   | Comprehensive critical understanding of current issues and historical contexts much of which is at, or informed by, the forefront of the discipline.<br><br>Comprehensive knowledge of techniques and processes, and a critical understanding of their potential to advance scholarship in the discipline.   | Significant understanding of current issues and historical contexts, much of which is at, or informed by, the forefront of the discipline.<br><br>Significant knowledge of the techniques and processes applicable to understanding research and advanced scholarship in the discipline  | Sound understanding of knowledge of current issues and historical contexts, some of which is at, or informed by, the forefront of the discipline.<br><br>Sound knowledge of the techniques and processes applicable to research and advanced scholarship in the discipline   | Passable understanding of knowledge of current issues and historical contexts, some of which is at, or informed by, the forefront of the discipline.<br><br>Acceptable knowledge of the techniques and processes applicable to research and advanced scholarship in the discipline   | Insufficient understanding of knowledge of the contextual, historical or theoretical issues that inform the discipline.<br><br>Insufficient knowledge of techniques applicable to research and advanced scholarship in the discipline.  | Very poor demonstration of understanding of contextual, historical or theoretical issues that inform the discipline.<br><br>Very weak knowledge of technologies, methods and processes  |
|         | <b>Understanding through application of knowledge</b><br>The degree to which research methods are demonstrated:<br><i>relevant knowledge and information is compared, contrasted, manipulated, translated and interpreted</i><br><i>knowledge and information is selected, analysed, synthesized and evaluated in order to generate creative ideas, solutions, arguments or hypotheses</i>          | Exceptional and remarkable demonstration of research methods which generate highly developed critical insights into existing knowledge<br><br>Exceptional and remarkable critical evaluation of existing knowledge leading directly to new hypotheses<br><br>Exceptional and remarkable judgements made in relation to creative practice, current ideas, arguments and hypotheses | Excellent and highly sophisticated demonstration of research methods leading to impressive critical insights into existing knowledge<br><br>Excellent and highly sophisticated critical evaluation of existing knowledge working towards new hypotheses<br><br>Excellent and highly sophisticated judgements made in relation to creative practice, current ideas, arguments and hypotheses | Rigorous use of established methods of research combined with the ability to generate new concepts or insights into existing knowledge.<br><br>Critical evaluation of current knowledge to evaluate methodological practices and propose new hypotheses.<br><br>Carefully considered judgements on highly complex or 'under-researched' problems showing evidence of systematic analysis and deduction and creative processes to resolve them. | Confident use of established methods of research combined with the ability to recognise new concepts using existing knowledge.<br><br>Critical evaluation of current knowledge to analyse methodological practices and propose hypotheses<br><br>Informed judgements made on highly complex research problems showing evidence of systematic analysis and deduction and creative processes to resolve them | Sound use of established methods of research to develop and interpret existing knowledge.<br><br>Critical evaluation of current knowledge and recognition of methodological practices.<br><br>Sound judgements made on complex research problems showing evidence of systematic analysis and deduction and creative processes to resolve them. | Passable use of established methods of research to develop and interpret existing knowledge.<br><br>Evidence of critical evaluation of current knowledge and recognition of methodological practices.<br><br>Passable judgements made on complex research problems showing evidence of systematic analysis and deduction and creative processes to resolve them. | Insufficient use of existing methodologies to develop knowledge.<br><br>Inability to fully understand or interpret relevant knowledge and methodological practices.<br><br>Research problems are insufficiently complex and require mainly routine analytic and creative processes to resolve them. | Inability to use and interpret existing research methodologies<br><br>Little or no ability to evaluate existing knowledge<br><br>Inability to define a research problem and to generate solutions or hypotheses through research and practice |

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|  | <b>Application of technical and professional skills</b><br>The degree to which:<br><i>appropriate materials and media are selected, tested and utilised to realise and present ideas and solutions appropriate technologies, methods and processes are demonstrated transferable, professional skills are effectively demonstrated self management and independent learning are demonstrated</i> | Exceptional and remarkable critical and evaluative skills utilised leading to highly original solutions to very complex problems<br><br>Outstanding application of advanced technical skills that fundamentally challenges current understanding and practices<br><br>Exceptional and remarkable demonstration of professionalism, self-management and independent learning | Excellent and highly sophisticated critical and evaluative skills utilised leading to impressive solutions to very complex problems<br><br>Highly impressive application of advanced technical skills that challenge current understanding and practices<br><br>Excellent demonstration of professionalism, self-management and independent learning | Evidence of a high level of critical and evaluative skills in order to create original solutions to a range of highly complex problems.<br><br>Application of advanced skills, techniques and processes that challenge knowledge and understanding of the discipline.<br><br>Demonstration of a very high level of professionalism, self-management and independent learning | Evidence of the critical and evaluative skills necessary to construct solutions to a range of complex problems<br><br>Application of advanced skills, techniques and processes that contribute to knowledge and understanding of the discipline.<br><br>Demonstration of a competent level of professionalism, self-management and independent learning | Evidence of the critical and evaluative skills necessary to identify solutions to a range of complex problems.<br><br>Application of advanced skills techniques and processes that sustain independent learning in the discipline.<br><br>Clear demonstration of professionalism, self-management and independent learning | Evidence of the critical and evaluative skills necessary to identify solutions to a range of varied problems.<br><br>Application of advanced skills techniques and processes that sustain independent learning in the discipline.<br><br>Acceptable demonstration of professionalism, self-management and independent learning | Inability to demonstrate the critical and evaluative skills necessary to identify solutions to problems<br><br>Insufficient ability to demonstrate the skills necessary for sustained independent learning<br><br>Insufficient evidence of professional and transferable skills | Very poor ability to apply appropriate materials and media to present ideas and solutions<br><br>Very poor judgement shown in choice of methods and processes<br><br>Inability to manage self, meet deadlines, work professionally and independently |
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