University of Sunderland

CET2001 – Artificial Intelligence

Assessment Brief

Module Code	CET2001
Module Title	Artificial Intelligence
Module Leaders	Ibrahim Alqatawneh Hazem Eissa
Assessment	2 of 2
Title of Assessment	Intelligent Prototype Development
Assessment Value	70%

1. Specification

This assignment is weighted at 70% of the overall module. This assessment requires approximately 60 hours to complete.

The aim of this assessment is to provide you with an opportunity to demonstrate your understanding and practical skills in Artificial Intelligence. You are required to submit a portfolio of evidence from practical exercises undertaken during the course.

1.1. Learning Outcomes

LO2. Utilise appropriate AI/Machine learning methodologies to industry standards

LO3. Design and implement AI/Machine learning models to address real-world problems.

LO4. Critically evaluate and compare a range of machine learning algorithms and interpret the results using appropriate visualisations

1.2. Deadlines

Files submitted via Canvas. Deadline **Refer to Canvas Assignment Submission**

2. Important Information

All work is to be **completed individually**, except where explicitly stated, and you will only be able to receive Marks for your own work. You are responsible for the security and integrity of your own files, and you must not permit others access to your assignment work. **Plagiarism** or paraphrasing without due accreditation will be dealt with severely as set out in the University Infringement of Assessment Regulations and detailed in the Programme Handbook. You can also refer to the AI guidelines in the Canvas Page: Artificial Intelligence Guidance: CET2001 - Artificial Intelligence (2025/6 - Sunderland - ASUND - SEM1)

The students must declare, in their submission, the used tool(s) and how did you use it. Additionally, the students must complete the Assignment Declaration using the link: Assignment Declaration: CET2001 - Artificial Intelligence (2025/6 - Sunderland - ASUND - SEM1) before submitting their work.

You must upload your work via the submission links provided on Canvas assignment page. Submitting links to files saved elsewhere in the cloud will not be considered and will result in a zero mark. The actual files must be loaded to Canvas and readily available to the assessor. After uploading and submitting your files, you must check that you can also retrieve and open them. It is your responsibility to ensure files are not corrupted at the time of submission and to report any issues immediately to the help desk, copying in your lecturer and to seek alternative arrangements when required.

3. Scenario

You are a data analyst working in a healthcare project, and you have been asked to prepare a report that demonstrates how machine learning can be applied to support Alzheimer's disease research or diagnosis. The data provided as part of this project is from the domain of Alzheimer's. The work herein requires the description and analysis of data for the given domain, including pre-process, transform and create classifiers. Skills developed towards this project provide experience on applying machine learning techniques to real world data.

The dataset is available and can be downloaded as a csv file from Assignment Brief. The given data is synthetic, but derived from a real-world data set.

This dataset consists of a collection of 1149 patients aged 60 to 97. Each patient may have been scanned on multiple visits, separated by at least one year. The dataset has the following variables:

- MRI ID – Subject Identification
- Group - Class (i.e. Demented, Nondemented)
- Visit - Number of visits (i.e. 1-5)
- MR Delay - Number of days of delay between visits.
- M/F - Gender (i.e. M, F)
- Age - Age at time of image acquisition (years). (i.e. 60-98)
- EDUC - Years of education (i.e. 6-23)
- NIS - National Insurance Status, classified into categories from 1 (highest status) to 5 (lowest status) (i.e. 1-5)
- MMSE - Mini-Mental State Examination (i.e. 4-30)
- CDR - Clinical Dementia Rating (i.e. $\mathbf{0}$ $(\boldsymbol{nondemented})$, $\mathbf{0.5-2}(\boldsymbol{demented})$)
- eTIV - Estimated total intracranial volume (i.e. 1106-2004)
- nWBV - Normalized whole brain volume: expressed as a percent of all voxels in the atlas-masked image that are labelled as gray or white matter by the automated tissue segmentation process (i.e. 0.64-0.84)
- ASF - Atlas scaling factor (unitless). Computed scaling factor that transforms native-space brain and skull to the atlas target (i.e. the determinant of the transform matrix) (i.e. 0.88-1.59)

You are expected to read the .csv file, preprocess the data, e.g., handling missing values, and prepare the data as appropriate such that it can be used to produce optimal classification for classifying patient either as nondemented or demented.

4. Tasks

You are required to complete two main tasks; the tasks details can be found below:

1. **Development of Prototype (30%)**

Develop a prototype that relates to the scenario project. The prototype should showcase your practical skills and knowledge in AI. Ensure the prototype is functional and aligns with the project objectives. This task requires the submission of a Python Notebook (.ipynb) file for the development of prototype. When marking, code files will be rerun from scratch. Therefore, ensure your protype works prior to submission. For details about the prototype please refer to the scenario section.

2. **Evaluative Report (40%)**

Write an evaluative report that documents your development process, the performance and functionality of the prototype, implement, evaluate and compare a different machine learning algorithms, and the extent to which it meets the project objectives. Your report should critically assess the strengths and weaknesses of your prototype, propose potential improvements, and discuss the implications of your findings.

5. Deliverables

- You must submit a Jupyter notebook for the developed prototype. The Jupyter notebook file should have comments for each part of the code and must show all the results.
- A report explaining each step of the development and containing. The report should be approx. **3000 words.** The report structure is shown in the next section.

6. Report Structure

The evaluative report must include the following sections:

- Cover sheet the cover sheet must be upload filled for the report.
- **Abstract (150 words):** This should provide a high-level overview of the project, including its goals, objectives, and outcomes.
- **Introduction:** This should provide more detailed information about the project, including its background, motivation, and scope.
- **Literature Review:** Short literature review of the most relevant research papers on the project.

- **Methodology:** This should describe the methods and techniques that were used to complete the project.
- **Results and Discussion:** This should present the findings of the project in a clear and concise manner. The results should be interpreted and discuss their implications.
- **References:** This should list all the sources that were cited in the report. Citation and references style must be in Harvard style.

7. Marking Criteria

7.1. Prototype (30%)

Sections	0 – 3 pts Fail (0-39%)	3 – 6 pts Pass (40- 49%)	6 – 9 pts Lower Second-Class (50-59%)	9 – 12 pts Upper Second-Class (60-69%)	12 – 15 pts First Class (70-100%)
Prototype functionality and documentation	The prototype is of a very poor standard and is not an effective solution to problem. The submitted file does not demonstrate the prototype or the student's understanding or is missing.	The prototype is of an adequate standard and is a solution to problem. This has been provided in the submitted file.	The prototype is of a good standard and is an appropriate solution to problem. This has been contextualised and provided in the submitted file.	The prototype is of a very good standard and is an appropriate solution to problem. This has been contextualised and well provided in the submitted file.	The prototype is of an excellent standard and is an appropriate solution to problem. This has been clearly contextualised, demonstrated, and provided in the submitted file.
Self-development – skills	There is little to no connection between what has been researched and the prototype development. Both the prototype and the way it has been developed show the student has not effectively drawn upon elements of the module.	There is an adequate connection between what has been researched and the prototype development. Both the prototype and the way it has been developed show the student has evidenced some elements of the module.	There is a good connection between what has been researched and the prototype development. Both the prototype and the way it has been developed show the student has evidenced elements of the module.	There is a very good connection between what has been researched and the prototype development. Both the prototype and the way it has been developed show the student has systematically evidenced elements of the module.	There is a strong connection between what has been researched and the prototype development. Both the prototype and the way it has been developed show the student has effectively evidenced appropriate elements of the module.

7.2. Report (40%)

Sections	Ratings				
Abstract and Introduction (5 Marks)	0 – 1 pts Fail (0-39%)	1 – 2 pts Pass (40- 49%)	2 – 3 pts Lower Second-Class (50-59%)	3 – 4 pts Upper Second-Class (60-69%)	4 – 5 pts First Class (70-100%)
	Abstract is poor, incomplete or not relevant. Introduction is poor, incomplete or not relevant.	Abstract: Provides a very basic or incomplete overview of the project. Introduction: a very basic or incomplete overview of the project.	Abstract: a basic overview of the project but may be incomplete or unclear. Introduction: a basic overview of the project but may be incomplete or unclear.	Abstract: Provides a generally complete overview of the project but may lack some detail. Introduction: a generally complete overview of the project but may lack some detail or organisation.	Abstract: Provides a clear and concise overview of the project, including its goals, objectives, and outcomes. Introduction: a comprehensive and well-organised overview of the project, including its background, motivation, and scope.
Literature Review (10 Marks)	0 – 2 pts Fail (0-39%)	2 – 4 pts Pass (40- 49%)	4 – 6 pts Lower Second-Class (50-59%)	6 – 8 pts Upper Second-Class (60-69%)	8 – 10 pts First Class (70-100%)
	Literature review is vague, is not evaluative and is poorly understood. Poor or no discussion of links to problem solution. Sources are not up to date, appropriate or referenced.	Literature review is vague, Lacks appropriate evaluative discussion or evidence of understanding. Vague discussion of links to problem solution. Sources are not up to date, appropriate or referenced.	Literature review is focused, could be more evaluative and lacks depth of discussion. Little discussion of links to problem solution. Evidence of some sources are not up to date and not referenced adequately.	Literature review is focused, evaluative and demonstrates a very good understanding of the topic. Some discussion of link from literature to problem solution. Evidence of a range of sources that are up to date and partially referenced.	Literature review is focused, in depth and evaluative, and understood. Well discussed links from literature to problem solution. Evidence of a wide range of appropriate sources that are up to date and referenced very well.

Methodology (10 Marks)	0 – 2 pts Fail (0-39%)	2 – 4 pts Pass (40- 49%)	4 – 6 pts Lower Second-Class (50-59%)	6 – 8 pts Upper Second-Class (60-69%)	8 – 10 pts First Class (70-100%)
	Poorly written discussion of the practical element / artefact. Poor technical detail. No evidence of steps or approach.	Discussion around the practical project elements is vague. Limited technical detail and limited or no evidence of steps and approach.	Some discussion of the practical project which details the work completed, scope for additional detail. Some discussion of steps and approach.	A very good discussion of the practical work completed, demonstrating a clear and appropriate methodology. Clear evidence of steps and approach.	An excellently detailed discussion of the practical work, demonstrating a clear and well executed methodology and nicely detailed description of the steps and approach.
Results and Discussion (10 Marks)	0 – 2 pts Fail (0-39%)	2 – 4 pts Pass (40- 49%)	4 – 6 pts Lower Second-Class (50-59%)	6 – 8 pts Upper Second-Class (60-69%)	8 – 10 pts First Class (70-100%)
	The findings of the project is poor and incomplete. The results cannot be interpreted or discussed at all.	The findings of the project in a very basic or incomplete manner. The results may not be interpreted or discussed at all.	The findings of the project in a basic manner but may be incomplete or unclear. The results may be interpreted and discussed, but the discussion may be very basic.	The findings of the project in a generally complete manner but may lack some detail or organisation. The results may be interpreted and discussed, but the discussion may be less insightful	The findings of the project in a clear and concise manner. The results are interpreted, and their implications are discussed in a well-organised and insightful way.
Format and References (5 Marks)	0 – 1 pts Fail (0-39%)	1 – 2 pts Pass (40- 49%)	2 – 3 pts Lower Second-Class (50-59%)	3 – 4 pts Upper Second-Class (60-69%)	4 – 5 pts First Class (70-100%)
	Poorly written, with required elements missing. Poor structure and organisation. Little or no use of illustrations/figures/ tables.	Written to an acceptable standard and includes most required elements. Acceptable structure and organization. Limited use of illustrations/ figures/ tables.	Written to a good standard and includes some elements. Good structure and organisation. Some use of illustrations/ figures/ tables.	Written to a very good standard and includes all required elements. Logical structure and organisation. There are minor issues in the use of illustrations/ figures/ tables.	Written to an excellent standard and includes all required elements. Logical structure and organisation. Appropriate use of illustrations/figures/tables.