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Summative Assessment Guide Understanding Artificial Intelligence

771763-2022/2023

Introduction

This module will be assessed via a portfolio of work that will be carried out in the course four labs. The areas of the lab are centred around: design of intelligent agents, application of supervised and unsupervised learning in data analysis, computer vision application in image processing, and ethical analysis. Please, follow the timetable schedule for your respective lectures.

The due date for submission of the assessment is the 15th of December at 2:00 p.m. (14:00 hours) BST time at the latest.

The pass mark for the module is 50%.

Assessment

The assessments will be via 4 components and the maximum number of words allowed for each component is 1000 words.

The portfolio should use a formal academic writing style and references in Harvard style, see link: https://libguides.hull.ac.uk/referencing/harvard for guidance

DO NOT include programming code into the report, i.e., screenshots or similar. If you want to present an algorithm, neural network architecture etc., then use pseudocode, a diagram or some other presentation that is not copy-pasted code.

ALL 4 COMPONENTS should be combined in the same PDF document.

Submission deadline

The portfolio is due by 15 December 2022, 2:00 pm (14:00 hours) British Standard Time (BST) at the latest. Please note that the submission will be via Canvas.

Component 1 – Design of an intelligent agent

Design an agent for the following underlisted domains:

a. Office productivity
b. Climate change
c. Hazardous environment (chemical)
d. Cancer detection
e. Physical theft prevention
f. Brain surgery

For each of the agents designed:

1. State the task environment
2. State the PEAS description for the agent
3. State the possible percepts of the agent
4. What external stimulus (actions) could affect (trigger) the behavior of the agent in its environment? State at least two!
5. State the properties of the task environment of the agent
6. Can the agent exist as simple reflex, model-based, goal-based, utility-based and learning agent?
7. Justify your answers for questions 2,3, and 5 above.

The assessment criteria can be found in the **module assessment criteria section**.

Component 2 – Fuel consumption rating

Fuel consumption has implications to climate change and the general environment hence the need for accurate prediction and classification of motor vehicles. The dataset can be obtained from: https://open.canada.ca/data/en/dataset/98f1a129-f628-4ce4-b24d-6f16bf24dd64/resource/80894b62-7b45-4150-946d-ab756814c4be

The task is to predict the CO_2 emission of the vehicles and to classify the vehicles based on the categorical variables.

You should answer the following questions:

1. Describe the steps required to train a model.
2. Attempt to use all the numerical continuous variables in the dataset provided to build a model to predict the CO_2 emission. Perform exploratory data analysis to select a subset of the variables and repeat the procedure. Compare your models and report if there are any differences in the models' performances? Explain your findings.
3. Determine whether there were any noticeable improvements in the CO_2 emission from year 2010 to year 2014? Explain your findings.
4. Using each categorical variable as the target variable at each instance, determine which of the variables performed best in classifying the dataset. Explain your findings.
5. How did you check whether your models did not overfit?
6. State the performance measure(s) you were most interested in and the reason(s).
7. Can your models be deployed based on their performances? Explain.

8. Use only the non-categorical variables to form groups. Using internal and external evaluation metrics, determine which categorical variable best describes the groups formed.

The assessment criteria can be found in the **module assessment criteria section**.

Component 3 – Emergency Vehicle Identification

The ability to identify emergency vehicle aids, reducing any confusion in the event of an emergency. The task here is to classify emergence and non-emergence vehicles. The dataset can be found here: https://www.kaggle.com/datasets/abhisheksinghblr/emergency-vehicles-identification?resource=download

You should also consider the following:

1. What steps did you consider prior to building the model?
2. What effect does increasing the number of layers have on the model's performance and time?
3. Was there a case of overfitting in the model? Explain.
4. State the performance measure(s) you were most interested in and the reason(s)?

The assessment criteria can be found in the **module assessment criteria section**.

Component 4 – Identify five ethical challenges in AI systems using suitable examples and references; concisely discuss how the ethical challenges you have identified can be addressed.

The assessment criteria can be found in the **module assessment criteria section**.

Portfolio assessment criteria and weighting:

Criteria	Distinction	Merit	Pass
Component 1 – Design of an intelligent agent (20%)	All questions are answered (correctly). The specifications provided are appropriate for the agents. There is evidence for the justification of the various components of the agents. There is demonstration of how the agents will be implemented and the demonstration is appropriate to the task. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *100 points max*	Most questions (4) are answered (correctly). The specifications provided are appropriate for the agents. There is some evidence for the justification of the various components and the evidence are correct. There is some demonstration of how the agent will be implemented and the demonstration is appropriate to the task The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *69 points max*	Some questions (3) are answered (correctly). The specifications provided are appropriate for the agents. There is some evidence for the justification of the various components and the evidence are correct. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *59 points max*
Component 2 – Fuel consumption rating (40%)	All questions are answered (correctly). There is evidence of insight in answering the questions. There is evidence of evaluation and quantification. A description of the dataset is shown in the report as evidence.	Most questions (6) are answered (correctly). There is evidence of insight in answering the questions. There is evidence of evaluation and quantification. A description of the dataset is shown in the report as evidence.	Some questions (4) are answered (correctly). There is some evidence of insight in answering the questions. There is some evidence of evaluation and quantification. A description of the dataset is shown in the report as evidence.

	Code is submitted, well commented, and fully replicates the results. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *100 points max*	Code is submitted, well commented, and fully replicates the results. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *69 points max*	Code is submitted, well commented, and fully replicates the results. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *59 points max*
Component 3 – Emergency Vehicle Identification (20%)	All questions are answered (correctly). There is demonstration of insight in answering the questions. There is evidence of evaluation and quantification. A description of the dataset is shown in the report as evidence. Code is submitted, well commented, and fully replicates the results. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *100 points max*	Most questions (3) are answered (correctly). There is demonstration of insight in answering the questions. There is evidence of evaluation and quantification. A description of the dataset is shown in the report as evidence. Code is submitted, well commented, and fully replicates the results. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *69 points max*	Some questions (2) are answered (correctly). There is some demonstration of insight in answering the questions. There is some evidence of evaluation and quantification. A description of the dataset is shown in the report as evidence. Code is submitted, well commented, and fully replicates the results. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *59 points max*

Component 4 – Identify five ethical challenges in AI systems using suitable examples and references; concisely discuss how the ethical challenges you have identified can be addressed (20%)	Five ethical challenges are identified with suitable references. The solutions to the ethical challenges are presented and insightful. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *100 points max*	Four ethical challenges are identified with suitable references. Most solutions to the ethical challenges are presented and insightful. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *69 points max*	Three ethical challenges are identified with suitable references. Some solutions to the ethical challenges are presented and insightful. The study is presented in a well written format. For example: abstract, introduction, methodology, result and conclusion. *59 points max*

All codes will be submitted along with the portfolio of work.

Distinction (Overall mark: $70-100\%$), **Merit** (Overall mark: $60-69\%$)

Pass (Overall mark: $50-59\%$) and **Fail** (Overall mark: Below 50%).

We wish you all the best in your studies!