

University of Westminster

School of Computer Science and Engineering

6COSC020W Applied AI – Coursework (2024/25)

Module leader	Artie Basukoski
Unit	Coursework 1
Weighting:	50%
Qualifying mark	30%
Description	Research, justify and implement one or a combination of AI techniques to achieve the stated goal.
Learning Outcomes Covered in this Assignment:	<p>This assignment contributes towards the following Learning Outcomes (LOs):</p> <ul style="list-style-type: none"> - LO2 Implement and use AI techniques across a broad range of AI sub-fields. - LO3 Evaluate when and under what conditions it is appropriate to use an AI technique. - LO4 Prepare data and ensure requirements are met to apply AI techniques correctly, and critically evaluate whether the results are sound.
Handed Out:	21 st October 2024
Due Date	8 th January 2025. Submission by 1:00pm
Expected deliverables	Deliverables will be an implementation as a Jupiter notebook report, and a presentation video, demonstrating the use of the implementation and justifying the rationale behind the choice of technique/s. Ensure that data and any required libraries are included in your notebook file so that the notebook can be run without modification. Demonstrations will be held online or in person. A penalty of 50% will be applied if you fail to demonstrate your work.
Method of Submission:	<p>Electronic submission of Jupiter notebook uploaded as .ipynb file on BB via a provided link close to the submission time. The file you upload should have the following naming format:</p> <p style="text-align: center;"><Cw1_StudentNumber_FullName.ipynb> E.g. Cw1_w123456_HamzaAbada.ipynb</p>
Type of Feedback and Due Date:	<p>Feedback and marks 15 working days (3 weeks) after the submission deadline.</p> <p>All marks will remain provisional until formally agreed by an Assessment Board.</p>

Assessment regulations

Refer to section 4 of the “How you study” guide for undergraduate students for a clarification of how you are assessed, penalties and late submissions, what constitutes plagiarism etc.

Penalty for Late Submission

If you submit your coursework late but within 24 hours or one working day of the specified deadline, 10 marks will be deducted from the final mark, as a penalty for late submission, except for work which obtains a mark in the range 40 – 49%, in which case the mark will be capped at the pass mark (40%). If you submit your coursework more than 24 hours or more than one working day after the specified deadline you will be given a mark of zero for the work in question unless a claim of Mitigating Circumstances has been submitted and accepted as valid.

It is recognised that on occasion, illness or a personal crisis can mean that you fail to submit a piece of work on time. In such cases you must inform the Campus Office in writing on a mitigating circumstances form, giving the reason for your late or non-submission. You must provide relevant documentary evidence with the form. This information will be reported to the relevant Assessment Board that will decide whether the mark of zero shall stand. For more detailed information regarding University Assessment Regulations, please refer to the following website: <https://www.westminster.ac.uk/current-students/guides-and-policies/academic-matters/academic-regulations>

Coursework Description

Problem Statement

Choose one of the domain areas from the list in Part A below. State a goal and then research, justify and implement one or a combination of AI techniques to achieve the stated goal. Deliverables will be a jupyter notebook report (or equivalent) detailing all the sections described in Part A – Part E below. You will also be required to do a presentation, demonstrating the application, and justify the rationale behind the choice of technique/s. It is important that you include references for any work that is not your own.

Part A – Application area review.

Choose one of the problem domains from the list below. For example, 'Algorithmic trading'. Do a brief and focused literature review (200-500 words) exploring **how AI has been applied within this problem domain**. Include references and state clearly if and how ChatGPT was used. **[10]**

Market analysis, Algorithmic trading, personal portfolio management, Education, Games, Robotics, Hospitals and medicine, Human resources and computing, Transportation, Chatbots, News publishing and writing, Marketing, Music recognition and composition, Speech and text recognition, Data mining, E-mail and spam filtering, Gesture recognition, Voice recognition, Scheduling, Traffic control, Robot navigation, Obstacle avoidance, Object recognition.

Part B – Compare and evaluate AI techniques.

Select three AI techniques that can be applied to the problem. We prefer if you used the techniques taught in the module: Search techniques, Minimax and alpha-beta pruning, ML techniques such as Neural Networks, clustering, regression, Deep Learning, CNN's (Computer Vision), etc. You may choose other techniques but please provide some justification for why you chose that specific technique.

State your goal clearly. For example, if your chosen domain is “Algorithmic Trading”, you could choose to explore

Stock price prediction using Neural Networks, Regression, and Bayesian Networks.

Discuss the strengths and weaknesses, advantages, and disadvantages of each of your chosen techniques. Give examples of how each technique can be applied to your specific problem. Compare and evaluate the type of input data required and expected output from each technique. Then select a specific technique to explore in-depth for your prototype implementation in part C. **5 marks for each technique [15]**

Part C – Implementation.

Select one technique from part B to explore in depth and implement it as a prototype using **jupyter notebook**. Please ensure that the domain and AI technique you implement is different from the domain and technique you chose for your FYP, or you will be susceptible to self-plagiarism.

- a. Create a high-level diagram describing how all the elements of your project work together to achieve the desired result. **[5]**
- b. Describe the input required for your implementation: graph, time series, etc. Where will you get the data? Does the data need to be prepared in a specific format? **[10]**
- c. Include a working example prototype in your jupyter notebook. The prototype should include input data and preprocessing, the implementation of the technique, and the output and visualisation of your results. The implementation must be done as a Jupiter notebook. Marks will be awarded based on data handling [5], code quality [10], technique implementation [20], output and visualisation [5] **[40]**

Part D – Software Testing.

Verify the correctness of your AI implementation. Compare expected/correct results with those produced by your implementation.

Describe the appropriate testing methods for your chosen technique (5). Compare expected/correct results with those produced by your implementation (5). **[10]**

Part E – Evaluate results.

Assess the performance and effectiveness of your AI implementation in solving the stated problem. Discuss and evaluate your results.

Discuss the accuracy of your results with reference to your evaluation metrics (5). How do you interpret the results in the context of your chosen domain. What are the strengths and limitations of your implementation. (5). **[10]**

Coursework Marking scheme

The Coursework will be marked via BB rubric based on the following marking criteria:

Criteria	Marks	Comments
PART A Application area review.	10	Choose a domain and write a review of between 500-1000 words on how AI is applied to the problems in your chosen application domain. List relevant techniques and describe any notable results from using the techniques. (LO1)
PART B Compare and evaluate three AI techniques.	15	Choose 3 specific techniques from part A and describe how each has been applied to your chosen problem domain. Focus on data availability, time to setup, time to produce results, and output. 5 marks each (500 words per technique described) (LO3)
PART C Implementation (notebook)		Choose one technique and implement prototype demonstrating its use. (Working notebook file)(LO2,LO4)
- Diagram	5	- A diagram or flowchart showing the architecture and data flows, transformation, and outputs of the system.
- Input/Data	10	- Include the input data in the notebook. Describe the format of the input data(5) and any pre-processing required (5).
- Prototype	40	- A jupyter notebook of your prototype. This must be self contained and runnable by the marker with clear output and description of the results. (Marking based on the grade descriptors at the end of this document). Data handling [5] , code quality [10] , technique implementation [20] , output and visualisation [5]

PART D Testing	10	Describe the appropriate testing methods for your chosen technique (5). Compare expected/correct results with those produced by your implementation (5).
PART E Evaluate results	10	Discuss the accuracy of your results with reference to your evaluation metrics (5). How do you interpret the results in the context of your chosen domain. What are the strengths and limitations of your implementation. (5).
Total	100	

80-100	<p>An outstanding piece of work: All assessment criteria have been met at an exceptionally high standard</p> <ul style="list-style-type: none"> • Demonstrates exceptional independent thought and reflection in relation to complex ideas and concepts. • Provides creative analysis of techniques/knowledge. • Critically analyses information sources, techniques and approaches to analysis. • Demonstrates extensive research across a range of sources. • Communicates ideas and complexity with confidence, using appropriate format and excellent presentation.
70-79	<p>An excellent piece of work: All assessment criteria have been met at a high standard.</p> <ul style="list-style-type: none"> • Takes a confident approach to critical analysis/reflection across a range of techniques/knowledge. • Shows in-depth understanding of ideas and concepts. • Demonstrates insightful/independent contextualisation and implications of theories/practices. • Synthesises independent research across a range of authoritative sources. • Communicates with clarity using appropriate format and excellent presentation.
60-69	<p>A good piece of work: All assessment criteria have been met at a good standard.</p> <ul style="list-style-type: none"> • Demonstrates systematic understanding across a range of techniques/knowledge in specialised area. • Demonstrates confident analysis/reflection on key concepts/frameworks. • Explores relationship of theories/practices within the wider context. • Provides additional independent research across a range of authoritative sources. • Communicates clearly, using appropriate format and with sound presentation.
50-59	<p>A sound piece of work: All assessment criteria have clearly been met.</p> <ul style="list-style-type: none"> • Demonstrates clear understanding of techniques/knowledge in specialised area. • Demonstrates some independent synthesis and reflective analysis across key techniques. • Provides evidence of research across a range of resources provided within the module. • Communicates using appropriate format with satisfactory presentation.
40-49	<p>An adequate piece of work: All assessment criteria have just been met.</p> <ul style="list-style-type: none"> • Demonstrates descriptive understanding of techniques/knowledge. • Provides limited evaluation of ideas and concepts. • Undertakes minimal research within module content. • Communicates work using appropriate format with some weaknesses of presentation.
30-39	<p>FAIL: An inadequate piece of work: One or more relevant assessment criteria are not met</p> <ul style="list-style-type: none"> • Applies techniques/knowledge with limited with some weaknesses/omissions. • Demonstrates inadequate knowledge of key concepts and principles. • Uses a minimal amount of relevant information from within the module. • Communication is unclear with poor standard of presentation.

0-29

FAIL: A poor piece of work: Most of the relevant assessment criteria area not been met.

- Applies techniques/knowledge with significant weaknesses and omissions.
- Demonstrates major inaccuracies and/or misunderstandings flaws of key concepts and principles.
- Uses inadequate information sources from within the module.
- Communication is unclear with poor standard of presentation.