Artificial Intelligence

ASSIGNMENT SPECIFICATIONS

Aims	1. Enable students to analyse and employ appropriate A.I. techniques to design intelligent systems and solve problems. 2. Enable students to use any relevant tools and technology, such as python programming, to develop intelligent computer programs.
Learning Outcomes Assessed	CLO 2: Propose AI techniques and strategies to solve a given problem (A3, PLO9). CLO 3: Produce AI application using programming language or other relevant technology (P4, PLO3).
Outline of Problem	This is a **group assignment**. All members from each group are required to critically evaluate the current technologies, and then propose a project for the selected A.I. topic, implement an A.I. solution to solve the problem in the proposed project using either Python or other relevant tools.
Details	This assignment consists of **TWO** (**2**) parts that are related to each other. Each group is required to develop a program using Python or any other relevant tools. Kindly refer to **Project Details Part 1** and **Project Details Part 2** for more information. Form a group of **TWO** (**2**) to **THREE** (**3**) members. Each group has to complete and submit a **Documentation** (**Part 1**) and **Program/Prototype with source code** (**Part 2**). Team leader has to compile and submit the deliverables before the due date. **SIX** (**6**) options of research areas are listed in the following section named **TITLE**. Each group should select **ONE** (**1**) option and is expected to produce ideas that originated from the respective group members, but not to take the work or an idea of someone else (including from the Web) and pass it off as your own. Besides, **NO GROUP is allowed to share the same idea**. In other words, each group must propose a unique title or solution. The basic requirements for each research area are available in the **TITLE** section (see the following page). It is important to note that, fulfilling those requirements might only be helping you to get an **Average** or **Good grade**. In order to achieve an **Excellent grade**, extra efforts are required such as learning new skills, introducing new ideas, implementing complex A.I. algorithms, demonstrating the ability to process big data, and/or producing excellent reports with a working prototype.

TITLES	**1. Machine Learning (Supervised/Unsupervised)**

1. Machine Learning (Supervised/Unsupervised)
  a. Identify a classification / clustering problem to be solved.
  b. Perform background study on the problem and method to be used.
  c. Search for the respective dataset (you may download the public online dataset or perform data gathering by yourself).
  d. Perform data pre-processing and data representation.
  e. Each member provides a solution by applying a preferred classification method (e.g. ANN, SVM, KNN, etc.) or clustering method (e.g. K-means, MeanShift, etc.).
  f. Compare the results of different classification methods (e.g. accuracy, precision, recalls, etc.).
  g. **Hint: students may refer to the web page for idea and dataset:**
     - https://archive.ics.uci.edu/datasets
     - https://www.kaggle.com/datasets
     - https://www.openml.org/search?type=data&sort=runs&status=active

2. Recommender System
  a. Identify a real-life scenario that a recommender system can be introduced to recommend products or services for spending or procurement activity. For example: to recommend relevant products/brands when a company wishes to buy computers.
  b. Perform background study of the problem/scenario and the recommender system to be implemented, with the expected functionalities.
  c. Design the algorithms for the development of the recommender system.
  d. Test your robot to evaluate how efficient its action is as compared to a human worker.
  e. Compare and discuss the outcome of the algorithms, and suggest improvements needed for future work.
  f. **Hint: Students may refer to the source below for idea:**
     - https://github.com/IBM/product-recommendation-with-watson-ml
     - https://stackabuse.com/creating-a-simple-recommender-system-in-python-using-pandas/
     - https://towardsdatascience.com/how-did-we-build-book-recommender-systems-in-an-hour-the-fundamentals-dfee054f978e

3. Natural Language Processing
  a. Identify a problem related to sentiment analysis or other types of analytic such as to classify personality, or to determine the probabilities that people are positive or negative about a product. Example:
     - http://text-processing.com/demo/sentiment/
  b. Perform background study on the problem and method to be used.
  c. Create a web crawler to crawl sample data from a forum/social media or to use the dataset from any reliable website.
  d. Text pre-processing and classification according to positive and negative sentiments.
  e. Each member provides a solution by applying appropriate methods (e.g. Statistics, Bayes, K-nearest neighbor, etc.).
  f. Compare the results of different classification methods (e.g. accuracy, precision, recalls, etc.).
  g. **Hint: Students may refer to the web page for idea and dataset:**
     - https://www.cs.uic.edu/~liub/FBS/sentiment-analysis.html
     - http://adilmoujahid.com/posts/2014/07/twitter-analytics/
     - https://www.yelp.com/dataset
     - https://ai.stanford.edu/~amaas/data/sentiment/

4. Robotic Process Automation

a. Identify a real-life scenario that a robot can be introduced to solve the problem for spending or procurement activity. For example, to automate a procurement process.

b. Perform background study of the problem/scenario and the robot to be implemented, with the expected functionalities.

c. Design system testing routine for RPA. Examples are shown below. You may propose your own process for your RPA.

- Retrieve items from purchase requisition forms ➤ create a table and sort according to required date ➤ notify manager
- Search prices from multiple websites ➤ build a table of comparisons ➤ create quotation invitation letter to multiple vendors.
- Search prices from multiple quotations ➤ build a table of comparisons ➤ create a minute for the purchase committee ➤ select the lowest price.

d. Test your robot to evaluate how efficient its action is as compared to a human worker.

e. Compare and discuss the outcome of the RPA, and suggest improvements needed for future work.

f. **Hint: Students may refer to the webpage for idea and tools:**
- https://enterprisersproject.com/article/2020/4/rpa-robotic-process-automation-6-open-source-tools

5. Chatbot Development

a. Identify a real-life scenario that a chatbot can be introduced to solve the problem for spending or procurement activity. For example: handle Q&A to improve customer service experience.

b. Perform background study of the problem/scenario and the chatbot to be implemented, with the expected functionalities.

c. Design system testing routine for chatbot. For example:
- Search for an online dataset. Test your chatbot to evaluate how well their responses are.
- Design a real-life testing environment, by asking your classmates to test on the chatbot.
- The tutor is able to test the chatbot by passing in some sentences and logical output is able to be generated by the chatbot, for 2-3 minutes.
- Compare and discuss the outcome of the chatbot, and how to improve the chatbot responses.

d. **Hint: Students may refer to the webpage for idea and dataset:**
- https://www.pandorabots.com/
- https://www.ibm.com/watson/how-to-build-a-chatbot/

6. Image Processing and Computer Vision

a. Identify an image processing or computer vision problem to be solved. For example:
- Text detection and Optical Character Recognition (OCR)
- Object Detection and Classification
- Pedestrian Detection and Human Action Recognition
- Face Recognition

b. Perform background study on the problem and method to be used.

c. Search for the respective dataset (you may download the public online dataset or perform data gathering by yourself).

d. Data pre-processing and representation.

	e. Each member provides a solution by applying a preferred method. Alternatively, each member can contribute to part of the solution pipeline, and provide necessary comparison to different system configurations/parameters.
	f. Compare the results of different methods (e.g. accuracy, precision, recalls, etc.). Demo the development system in real-life scenario.
	g. Based on the results, explain the performance of the chosen methods (e.g. compare the advantage, disadvantage, and characteristic of the methods).
	h. Hint: students may refer to the webpage for idea and dataset:
	   ● http://yann.lecun.com/exdb/mnist/ (Handwritten Digits recognition)
	   ● http://host.robots.ox.ac.uk/pascal/VOC/voc2012/index.html (Object detection and recognition)
	   ● https://www.kaggle.com/c/cifar-10 (Object recognition)
	   ● http://vis-www.cs.umass.edu/lfw/ (Face Recognition)

Submission Deadlines	Submit **Documentation** and **Prototype Source Code** by the <mark>**13th of Sept 2024 (Week 11, Friday, before 11.59pm)**</mark> Please submit your work to Google Classroom. Late submission will be penalized. A demo session to present the prototype is required in week 12 to 14.
Contribution	This assignment consists of the following **TWO** (**2**) components: 1. **Documentation** (**40%**) 2. **Prototype development** (**60%**). Please check **Appendix 1** and **Appendix 2** for the assessment criteria.
Academic Integrity and Plagiarism	There must be **ORIGINALITY** in your work. Thus, do not copy or refer to other group(s). You may only work with your team member(s) to produce the solution of this assignment. You must not share with nor refer to any part of the assignment (including the code) of anyone else except your team member(s) and your tutor. Before submitting your assignment, please make sure that you have complied with TARUMT plagiarism Policy. Any cheating, attempt to cheat, plagiarism, collusion and any other attempts to gain an unfair advantage in assessment will cause the students concerned to be penalized. **IMPORTANT**: Students found to be dishonest are liable to disciplinary action.

Late Submission & Penalty	Late submission without valid reason will **NOT** be tolerated. For late submission, there will be a reduction of total marks:
	   ● Late 1 to 3 days after deadline of submission: **Deduction of 10 marks**
	   ● Late 4 to 7 days after deadline of submission: **Deduction of 20 marks**
	   ● Late more than 7 days after deadline of submission: **Deduction of 100 marks**
	In certain circumstances, a student may be allowed to submit the assignment late with valid reason. S/he must contact the tutor at least one week before the assignment is due. The tutor will evaluate whether the circumstance warrants submitting the assignment late, but no guarantee that the students will not be penalized.
	Failing to submit the reports and code will lead to failure of the coursework.

Project Details Part 1: Documentation

Introduction	Your task for this part of the assignment is to identify a problem for the selected A.I. topic, perform a literature review and propose your respective A.I. solution(s) that helps in solving the problem in the proposed project.
How to write a documentation?	The documentation for your selected A.I. topic should contain the following: **Section 1: Introduction** ● Brief description or introduction with problem statement/background ● Objectives/aims ● Motivation ● Timeline/milestone **Section 2: Research Background** ● Background of the applications **Section 3: Methodology** ● Description of dataset ● Application of algorithms ● System flowchart/activity diagram ● Proposed test plan/hypothesis **Section 4: Result** ● Results ● Discussion/interpretation **Section 5: Discussion and Conclusion** ● Achievements ● Limitation and future works **References** ● Sources of the dataset and tool(s) used for the development ● Articles or other references cited in the text The report shall be completed using the given Google Doc template in the Google Classroom.

Project Details: Part 2 – Prototype Development

Introduction	Your task for this assignment is to implement an A.I. solution using Python or any other relevant tools, perform testing and evaluation on the system and finally present the work to your tutor.
What to hand in?	Submit all of your source code to **Google Classroom** submission page. **EACH team member is required to present their own work, demonstrate the prototype and be ready for a Q&A session in Week 12-14 based on the arrangement.**
Format for Deliverable	Compress the entire source code using zip format and submitted by leader.

APPENDIX 1

Documentation Assessment Rubrics (40%)

CLO	Item	Missing or Unacceptable (0-4)	Poor (5-9)	Accomplished (10-15)	Good (16-20)
2	Introduction	No or very little discussion on existing problem and the project. The proposed project already exists, or with very minor change.	Little discussion on existing problem and introduction of proposed project. Minor ideas are modified from existing system(s).	Good discussion and evaluation of existing problem and the proposed project. Ideas modified from existing system, with some creative ideas are added.	A very good discussion and evaluation of existing problem and the proposed project. Majority of the ideas are creative.
2	Research Background	Background study are retrieved directly from the literature without any paraphrasing. No discussion or very little of introduction given to the related system or technology.	Background study is lengthy, contents are retrieved directly from the literature without any critical evaluation. Introduction to the related system is given, but no evaluation provided.	Background study is concise and clear, which integrates critical and logical details from the peer-reviewed theoretical and research literature. Brief discussion and evaluation of the related system.	Background study is concise and clear, which integrates critical and logical details from the peer-reviewed theoretical and research literature. A very good discussion and evaluation of the related system.
2	Methodology	The description does not relate the case study. Brief design of proposed method is provided but lack of explanation or irrelevant.	Brief description of system design, with some explanations. Introduction to the related application of the methods is given but lack of examples, understanding or explanation.	System design is well-illustrated, and with clear explanation. Good discussion and evaluation of the methods applied.	System design is well-illustrated, with good explanation. Good discussion and evaluation of the relevant and practical methods applied to the project.
2	Results	Testing methods were missing or inappropriately aligned with data and research design. Results were confusing.	Testing methods were identified but the results were confusing, incomplete or lacked relevance to the research questions, data, or research design.	The testing methods were identified. Results were presented. All were related to the research question and design. Sufficient metric or measurement is applied.	Testing methods and results presentation were sufficient, specific, clear, structured and appropriate based on the research questions and research design. Extra metric or measurement is applied.
2	Discussion and Conclusion	Discussions or answers to the research objectives and results were omitted or confusing. No or very little discussion on limitation and future improvement.	Little discussions were presented. Answers to the research question and results were unclear or confusing. Only little discussion on limitation and future improvement.	Discussions of the results were presented. The research question and system performance were answered and identified. Some discussion on limitation and future improvement were given.	The significance of the results and achievements of objectives were answered and evaluated. Limitations and future improvements of the studies were identified.
					Final score = sum of scores/100*40 (base 40%)

APPENDIX 2

Prototype Assessment Rubrics (60%)

CLO	Item	Criteria		
		Poor (0-4)	**Accomplished (5-7)**	**Good (8-10)**
3	User interface / Output (10%)	Poor or confusing design of UI or output, which provides inadequate information/outputs. Most of the information/outputs generated are less accurate. Layout of information is not organized.	Adequate information/outputs needed are generated. The information/output generated are accurate but some with errors. Layout of information is organized.	All the necessary information/outputs are generated. All or most of the information/outputs generated are accurate. Minor errors can be ignored. Layout of information is well-organized.
3	Programming (20%)	The end product fails with many logic errors, many actions lacked exception handling. Solutions are over-simplified. Programming skill needs improvement. Minimal validations are provided. Business rules are not validated. **(0-8)**	Major parts are logical, but some steps to complete a specific job may be tedious or unnecessarily complicated. Program algorithm demonstrates acceptable level of complexity. The student is qualified to be a programmer. Important and necessary validations are provided. **(9-15)**	Correct and logical flow, exceptions are handled well. Demonstrates appropriate or high level of complex algorithms and programming skills. Thorough and thoughtful validations are provided. All important business rules are validated. **(16-20)**
3	Degree of completion (10%)	Too much still remain to be done. Basic requirements are not fulfilled. The end product produces enormous errors, faults or incorrect results.	All required features present in the interface within the required scope, but some are simplified. Or one or two features are missing. The system is able to run with minor errors.	All required features present in the interface within or beyond the required scope. No bugs during demonstration.
3	System implementation (10%)	The end product is produced with different system design or approach, which is not related to the initial proposal.	The end product conforms to most of the system design, but some are different from the specification.	The end product fully conforms to the proposed system design.
3	Presentation and on-the-spot coding (10%)	The student is unclear about the work produced, sometimes not even knowing where to find the source code.	The student knows the code whereabouts, but sometimes may not be clear why the work was done in such a way.	The student is clear about every piece of the work done.

***Student must at least pass 30% of the rubrics consist of CLO3-PLO3.