
2021/22 Semester 2

ICA 4: BM4215 (40%)

Investment Analytics & Portfolio Management
Assignment Guide

Assignment Title: Machine Learning

Date of Issue: Monday, 13 Dec 2021 (via Blackboard)

Date of Submission: Monday, 21 Feb 2022, 9am

ASSIGNMENT GUIDELINES

1. Assignment Outline

This assignment constitutes 40% of the total assessment for the module, BM4215 – Investment Analytics & Portfolio Management. Students will submit on a group basis a type-written report and perform a group presentation. You will be randomly assigned into an assignment group by your module tutor. This assignment is designed to allow learners to implement machine learning relating to investment management.

2. Learning Outcome

After the completion of this assignment, learners will be able to:

1. Implement a machine learning cycle from data preparation to model evaluation, with the aid of machine learning techniques relevant to investment management.

3. Requirements

1. Assignment brief for each assignment group:

Your team will be provided a financial dataset. You will perform predictive-type or classification-type supervised learning on this dataset using RapidMiner.

There are two datasets.

1. Raw dataset

The raw dataset, or *Global Equity Market RAW.xls*, has 32,912 observations.

2. Scoring dataset

This dataset, or *Global Equity Market SCORING.xls*, has 10 observations.

From the raw dataset, your group is to undertake prediction-type and classification-type supervised learning to score a new dataset (scoring dataset). The scoring dataset retain the actual values of the labelled attribute for comparison purposes.

There are eleven variables in the datasets – (i) Name of *Company*, (ii) *Sector* the company is from, (iii) *Market* the company is based in, (iv) *Category* of the Market, (v) *Current PE* representing the current price-to-earnings ratio of the company, (vi) *Trailing PE* representing the price-to-earnings ratio of the past 12-months, (vii) *Forward PE* representing the price-to-earnings ratio typically based on the predicted forward 12-month earnings, (viii) *Beta* representing a measure

of the stock's volatility relative to the overall market, (ix) *Payout ratio* representing the percentage of earnings paid out as dividends, (x) *3yr Avg Earnings Growth Rate*, and (xi) a stock's risk premium (*Market ERP*) representing the excess return earned by an investor when they invest in the stock market over a risk-free rate.

	A	B	C	D	E	F	G	H	I	J	K
1	Company	Sector	Market	Category	Current PE	Trailing PE	Forward PE	Beta	Payoutratio	3yr Avg Earnings Growth Rate	Market ERP
2	General Motors	Automotive Industry	United States	Developed M	9.174337427	10.32196364	9.438799076	1.49	0	0.606	0.05
3	Ford Motor Co	Automotive Industry	United States	Developed M	10.74363636	10.65150508	11.02142857	1.5	0.2398	-0.0766	0.05
4	The Home Depot	Business & Consumer Goods	United States	Developed M	25.56855568	21.50072316	19.28337237	0.93	0.395	0.204	0.05
5	Target Corp.	Business & Consumer Goods	United States	Developed M	13.33517839	16.5805141	14.51146789	0.63	0.4013	-0.0509	0.05
6	Amazon.com	Business & Consumer Goods	United States	Developed Markets	1382.876515	174.9078947	10.05	1.05	0	-0.51	0.05
7	Comcast Corp	Business & Consumer Goods	United States	Developed M	21.75253909	21.01401651	18.6942446	1.01	0.2937	0.216	0.05
8	Lowe's Companies	Business & Consumer Goods	United States	Developed M	26.45267994	22.83860732	19.50787402	1.04	0.3186	0.0554	0.05
9	Best Buy Co.	Business & Consumer Goods	United States	Developed Markets	14.9924812	14.9924812	1.15	1.15			0.05
10	The Walt Disney Company	Business & Consumer Goods	United States	Developed M	21.88008475	21.88008475	19.39086294	1.09	0.2158	0.157	0.05
11	Johnson & Johnson	Pharmaceuticals	United States	Developed M	29.48904924	29.48904924	15.73619632	1.4	0.4355	-0.0341	0.05
12	Sears Holding Corp	Business & Consumer Goods	United States	Developed Markets	12.3048491	12.13206286	12.17989418	0.84	0	0.246	0.05
13	DIRECTV (Nasdaq)	Business & Consumer Goods	United States	Developed M	20.89340841	16.11578947	17.08823529	0.9	0.2708	0.171	0.05
14	Time Warner	Business & Consumer Goods	United States	Developed M	11.24362407	13.04069292	21.8447205	1.1	0.0678	0.307	0.05
15	Twenty-First Century Fox	Business & Consumer Goods	United States	Developed M	14.73925094	14.00491103	12.89855072	1.05	0.2456	0.31	0.05
16	Macy's, Inc.	Business & Consumer Goods	United States	Developed M	17.66721563	17.28698299	16.70051635	0.56	0.5518	0.0431	0.05
17	McDonald's Corp	Business & Consumer Goods	United States	Developed M	23.77128022	20.98462892	20.23174603	0.68	0.1734	0.154	0.05
18	The TJX Companies	Business & Consumer Goods	United States	Developed M	28.15074447	24.53686426	24.42236025	0.76	0.2715	0.119	0.05
19	Nike, Inc.	Business & Consumer Goods	United States	Developed M	21.3854231	21.3854231	12.31782946	1.15	0.6329	-0.167	0.05
20	Staples, Inc.	Business & Consumer Goods	United States	Developed Markets							

There are seven objectives. The class may be split *up to* seven groups, with each group assigned one objective. There should be no more than 5 members in each group. Objectives are as below:

No.	Objective	Labelled Attribute
1	To correctly classify the correct market category of a scoring dataset	<i>Category</i>
2	To correctly predict the 3-year average earning growth rate of a scoring dataset	<i>3yr Avg Earnings Growth</i>
3	To correctly predict the dividend payout ratio of a scoring dataset	<i>Payout ratio</i>
4	To correctly predict the beta of a scoring dataset	<i>Beta</i>
5	To correctly predict the current P/E ratio of a scoring dataset	<i>Current PE</i>
6	To correctly predict the trailing P/E ratio of a scoring dataset	<i>Trailing PE</i>
7	To correctly predict the forward P/E ratio of a scoring dataset	<i>Forward PE</i>

In your team's analyses, you are to undertake the following:

a. Data preparation

Identify the labelled attribute. Clean and prepare the dataset to a format suitable for modelling using the k-Nearest Neighbor algorithm. You will only evaluate example sets with no missing values. Describe the data preparation procedures.

Print your RapidMiner process and enclose in your report.

b. Parameter tuning

Split the dataset into 70% training and 30% test datasets. Using the k-Nearest Neighbor algorithm, find an optimal k , where $0 \leq k \leq 50$. Describe the parameter tuning procedures. Interpret why this is the optimal k .

Print your RapidMiner process and enclose in your report.

c. Applying the Model

Split the dataset into 70% training and 30% test datasets. Apply the k-Nearest Neighbor algorithm using the optimal k . Interpret the results. Discuss the performance of the predictive-type or classification-type learning.

Print your RapidMiner process and enclose in your report.

d. Scoring

Apply the trained model on a new test dataset. Interpret the results. Discuss if there is a difference in performance, as compared to part (c) above, and the reasons for the difference.

Print your RapidMiner process and enclose in your report.

e. Improving prediction or classification accuracy

Propose ways to improve the prediction or classification accuracy of the labelled attribute.

2. Prepare a PowerPoint report on your findings and present your findings at the assignment presentation.

4. **Submissions**

Report

A type-written report in Microsoft PowerPoint format is to be submitted by each group and it should **not be more than 20 slides**, excluding cover slide and appendices. The report should consist of the following parts:

1. **Cover Slide** Include a cover slide with the assignment title, module group, name and admission numbers of assignment members.
2. **Background and Introduction.**
3. **Machine Learning Implementation.** Refer to Requirements for details.
4. **Appendices** Sources of research data or any other supporting schedules.

Submission through SafeAssign in Blackboard and Due Date

1. The report is to be submitted through SafeAssign latest by **21 Feb 2022, 9am**. Only **ONE (1)** learner is to submit per group. You are to name the file according to the assignment, module group and your group number, for example: *ICA4_ModuleGroup_Group1*.
2. SafeAssign is a plagiarism prevention tool that allows your instructor to check the originality of an assignment submission. It is the responsibility of the learners to ensure that the matching text highlighted in the originality report by SafeAssign is properly referenced.
 1. Please read the following guide on how to submit your report through SafeAssign in Blackboard:
https://help.blackboard.com/SafeAssign/Student/Submit_SafeAssign
 2. Learners can also view the following video to learn how to submit your report through SafeAssign in Blackboard:
https://www.youtube.com/watch?v=IKlwnKYTY_I

Late submission and penalties

Regarding late submission, a penalty of 5% on the base marks to be deducted for each working day of late submission from the respective assessment marks allocated should the report be submitted late. Any late submission after 5 working days will be awarded zero marks. For avoidance of doubt, submission after **0900hrs on Monday, 21 Feb 2022** is Day 1 and submissions received after **1800hrs on Friday, 25 Feb 2022**, will be awarded zero marks.

Plagiarism

Plagiarism is serious matter. Plagiarism is the act of taking and using the whole or any part of ideas, words or works of other people and passing it off as one's own work, without acknowledgement of the original source. The act of plagiarism is an offence under NYP Academic Integrity Policy: <https://www.nyp.edu.sg/current-students/academic-matters/nyp-academic-integrity.html>. Any act of plagiarism may be construed as academic dishonesty. A candidate who, after due disciplinary process, is found to have committed an act that contravenes academic integrity in any assessment of a module would be liable for disciplinary action under NYP Academic Integrity Policy.

It is also important not to share your or your group's work with other learner(s) or team(s). **ALL** parties involved in any act of plagiarism (**including learner(s) or team(s) who have shared their work with others**) would be liable for disciplinary action under NYP's Policy on Academic Integrity. If any learner had asked you to share your work with him/her, it is important to turn down his/her request and report the incident immediately to your module tutor to safeguard your integrity.

All content from online or other primary sources should be properly referenced (even if you are paraphrasing). Learners can use <https://www.scribbr.com/apacitation-generator/> or other online citation generator to properly state the source of the reference (websites, journal articles, books and reports) in the American Psychological Association (APA) format. The APA format is a writing style and format for academic documents such as scholarly journal articles and books. When in doubt, the rule is to acknowledge the source.

A SafeAssign Originality Report generated provides detailed information about the matches found between a learner's submitted work and existing sources. Learners can use the report to review their submissions for originality and identify the specific areas of their submitted work where proper referencing are required. Failing to do so may lead to plagiarism being reported in Safe Assign.

When an assignment is submitted using SafeAssign, the SafeAssign Originality Report is normally available within 15-30 minutes. However, a slight delay may occur between the upload and the availability of the Originality Report during periods of high usage. Hence, learners are encouraged to submit their report at least one day before the submission deadline so that they have sufficient time to make any necessary amendment and resubmission before the submission deadline expires.

Useful Resources, Free-rider Problem and Adjustment of Free rider's Project Score

1. Useful Resources for Project Management

The **Checklist to Guide Group Project Development** in the appendix will provide your team a guide to work effectively as a team during your project development.

Self-awareness & management, leadership, interpersonal & collaboration as well as communication & inclusivity skills are important life skills that team members must possess to do well in the group project. Below are also some useful resources that can help you manage the project well together as a team.

- Self-awareness & management for effective teamwork:
https://www.youtube.com/watch?v=0xaRd_gOI0E
- Leadership, interpersonal & collaboration skills:
<https://www.youtube.com/watch?v=JtKC2vnXjPE>
- Communication & inclusivity:
<https://www.youtube.com/watch?v=v2PaZ8NI2T4&t=11s>
- Conflict resolution:
<https://www.youtube.com/watch?v=QyXFirOUeUk>

2. Interim Reporting of Non-Contributor/ Free Rider

All learners are expected to contribute actively to their group project. Any non-contribution/ free rider must be brought to the attention of the module tutor as soon as possible so that early intervention measures can be implemented. Free-riders who are only highlighted at the end-of-project peer evaluation exercise may not be penalised if they are not highlighted during the interim reporting of non-contributor/ free rider. The e-survey to report any free-rider(s) can be accessed via URL (login using NYP account) by **24 Jan 2022, 9am:**

<https://forms.office.com/Pages/ResponsePage.aspx?id=7bo-JNAAKEar3HWJOw2fmA-AVFBIW2ZJgT1FIVTa-QxUNFFETUZORzYzWIZROFc3QUNCRExJN0s2Vy4u>

3. Adjustment of Free rider's Project Score

There are 2 components to peer evaluation: a) Peer evaluation score makes up 10% of the overall score. b) If the average peer evaluation score awarded by other team members is less than 5 points out of 10 and highlighted during the interim reporting of non-contributor/ free rider, a learner will be identified as a free rider and consequently, the average peer evaluation score will determine the penalty to the free-rider's group component score. Please also provide reasons/ justifications/ examples on team members highlighted as free riders in the peer evaluation form.

Each learner will rate the contribution of other team members using a 10-point scale through a confidential digital peer evaluation form administered by their module tutor. The award of peer evaluation scores for other team members should be based on the quality of each team member's collaboration practices (self-awareness & management, leadership, interpersonal & collaboration, as well as communication & inclusivity skills). You should also take into account each team member's attendance and punctuality during project meetings.

Your module tutor will only deduct a free rider's group component score if his/her average peer evaluation scores awarded by team members is less than 5 points out of 10. (i.e. team members had rated that the free rider had contributed, on average, less than 50% to the group project.) **As such, you should award less than 5 points (less than 50%) for a free rider's peer evaluation score with substantiative reasons/ justifications/ examples** so that he/she can clearly be identified as a free rider.

As an illustration, if a learner had obtained an average score of 4.5 points out of 10 (less than 5 points) for his/her peer evaluation, he/she would be identified as a free rider who had only contributed 45% to the group project. This free-rider learner would only be awarded 45% of the group component score. On the other hand, another learner who had obtained an average score of 5 points and above for his/her peer evaluation would not be rated as a free rider. This learner would be awarded 100% of the group component score (no deduction to group component score).

5. Presentation

Each group would present your assignment findings during your tutorial class in a 15-minute presentation (15-minute presentation and 10-minute Q&A) at the week beginning **21 Feb 2022**. All group members must present as the evaluation criteria for the presentation include individual and group components. The dress code for the presentation is formal.

6. Assessment

This assignment carries a total of 100 marks and constitutes 40% of the overall grade for the module. The breakdown of marks is as follows:

Report	60%	Group basis
Presentation	10%	Group basis
	20%	Individual basis
Peer evaluation	<u>10%</u>	Individual basis
Total	<u>100%</u>	

1. **PowerPoint report (60 marks)**

The evaluation criteria for the report is as below:

1. Clear, appropriate and technically accurate
 - a. Data preparation
 - b. Parameter tuning
 - c. Applying the model
 - d. Scoring
 - e. Improving prediction or classification accuracy
 2. Professionalism of submission.
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2. Presentation (30 marks)

The evaluation criteria for the presentation is as follow:

1. Verbal technique: Pitch, Tone of voice, Enthusiasm and Language (Individual 10 marks)
2. Ability to handle Q&A (Individual 10 marks)
3. Quality of presentation slides and teamwork (Group 10 marks)

3. Peer Evaluation (10 marks)

Students are to submit their completed confidential Peer Evaluation Form in the Peer Evaluation Form Inbox in Blackboard by **21 Feb 2022, 9am**. This is an individual submission. Submission is compulsory. Late submission penalties apply.

Each member in the group must complete a confidential peer evaluation form and submit it individually. The peer evaluation e-form can be accessed via URL (login using NYP account): <https://forms.office.com/r/iyXsnHxxdE>

Detailed scoring rubrics for all the above criteria are attached in the appendix.

- END OF ASSIGNMENT INSTRUCTIONS -

Appendix

Scoring Rubric of Report

Evaluation Criteria	A	B	C	D	F
Marks	8-10 marks	7-7.5 marks	6-6.5 marks	5-5.5 marks	0-4.5 marks
A. Data Preparation (10 marks)	Data loading and data cleaning are completely and clearly outlined. Detailed, clear and relevant use and descriptions of correct RapidMiner operators and steps. The underlying logic is explicit.	Most details of data loading and data cleaning are outlined. Mostly clear and relevant use and descriptions of correct RapidMiner operators and steps. The underlying logic is mostly explicit.	Details of data loading and data cleaning are clear in parts or only partially described. Somewhat clear and relevant use and descriptions of correct RapidMiner operators and steps; some aspects may not be connected or minor errors in logic are present.	Only superficial details of data loading and data cleaning given. Details show some inconsistent use and descriptions of RapidMiner operators and steps, with some errors in logic present.	Details of data loading and data cleaning are vague. Details of use and descriptions of RapidMiner operators and steps may not be clear and the connections to the objectives are incorrect or unclear. Underlying logic has major flaws.
B. Parameter Tuning (10 marks)	Parameter tuning process flow is completely and clearly outlined. Detailed, clear and relevant use and descriptions of correct RapidMiner operators and steps. The underlying logic is explicit.	Most details of parameter tuning process flow are outlined. Mostly clear and relevant use and descriptions of correct RapidMiner operators and steps. The underlying logic is mostly explicit.	Details of parameter tuning process flow are clear in parts or only partially described. Somewhat clear and relevant use and descriptions of correct RapidMiner operators and steps; some aspects may not be connected or minor errors in logic are present.	Only superficial details of parameter tuning process flow given. Details show some inconsistent use and descriptions of RapidMiner operators and steps, with some errors in logic present.	Details of parameter tuning process flow are vague. Details of use and descriptions of RapidMiner operators and steps may not be clear and the connections to the objectives are incorrect or unclear. Underlying logic has major flaws.

Evaluation Criteria	A	B	C	D	F
C. Applying the model (10 marks)	Details of applying the model are completely and clearly outlined. Detailed, clear and relevant use and descriptions of correct RapidMiner operators and steps. The underlying logic is explicit. Performance of the predictive-type or classification-type learning is clearly and correctly discussed.	Most details of applying the model are outlined. Mostly clear and relevant use and descriptions of correct RapidMiner operators and steps. The underlying logic is mostly explicit. Performance of the predictive-type or classification-type learning is mostly well discussed.	Details of applying the model are clear in parts or only partially described. Somewhat clear and relevant use and descriptions of correct RapidMiner operators and steps; some aspects may not be connected or minor errors in logic are present. Performance of the predictive-type or classification-type learning is somewhat well discussed, with minor flaws.	Only superficial details of applying the model are given. Details show some inconsistent use and descriptions of RapidMiner operators and steps, with some errors in logic present. Performance of the predictive-type or classification-type learning is superficially discussed, with errors in logic.	Details of applying the model are vague. Details of use and descriptions of RapidMiner operators and steps may not be clear and the connections to the objectives are incorrect or unclear. Underlying logic has major flaws. Performance of the predictive-type or classification-type learning is poorly discussed, with major errors in logic.
D. Scoring (10 marks)	Model scoring is completely and clearly outlined. Detailed, clear and relevant use and descriptions of correct RapidMiner operators and steps. The underlying logic is explicit. Interpretation of accuracy is clearly and correctly discussed.	Model scoring is mostly well outlined. Mostly clear and relevant use and descriptions of correct RapidMiner operators and steps. The underlying logic is mostly explicit. Interpretation of accuracy is mostly well discussed.	Model scoring is clear in parts or only partially described. Somewhat clear and relevant use and descriptions of correct RapidMiner operators and steps; some aspects may not be connected or minor errors in logic are present. Interpretation of accuracy is somewhat well discussed, with minor flaws.	Model scoring is only superficial described. Details show some inconsistent use and descriptions of RapidMiner operators and steps, with some errors in logic present. Interpretation of accuracy is superficially discussed, with errors in logic.	Model scoring is vague, or not described. Details of use and descriptions of RapidMiner operators and steps may not be clear and the connections to the objectives are incorrect or unclear. Underlying logic has major flaws. Interpretation of accuracy is poorly discussed, with major errors in logic.

Evaluation Criteria	A	B	C	D	F
E. Improving prediction or classification accuracy (10 marks)	Proposed ways to improve prediction or classification accuracy are clearly outlined, technically correct and well-researched.	Proposed ways to improve prediction or classification accuracy are mostly well researched and outlined, and appropriate.	Proposed ways to improve prediction or classification accuracy are somewhat well researched and outlined, and appropriate. Some minor errors in logic are present.	Proposed ways to improve prediction or classification accuracy are superficially researched and outlined. Details show some inconsistencies, with some errors in logic present.	Research and outline of proposed ways to improve prediction or classification accuracy are vague or absent. Details are incorrect or unclear. Underlying logic has major flaws.
F. Professionalism of submission (10 marks)	Report is well-formatted and professionally presented. Information is presented in a logical sequence which the readers can follow. High quality output that exceeds assignment requirement.	Report is mostly well-formatted and professionally presented. Information is mostly presented in a logical sequence which the readers can follow. High quality output that mostly matches assignment requirement.	Report is adequately formatted and presented. Reader has some difficulty following the report. Average quality output that meet some of the assignment requirement.	Below average formatting and presentation of the report. Reader has difficulty following the report, and there exist some spelling and grammatical errors. Below average quality output that meet a few of the assignment requirement.	Report is poorly formatted with a lack of professionalism. Reader cannot understand the report as there is a lack of logical flow of information, and there exist many spelling and grammatical errors. Unacceptable quality of output that do not meet the assignment requirement at all.

Scoring Rubric of Presentation

Evaluation Criteria	A	B	C	D	F
Marks	8-10 marks	7-7.5 marks	6-6.5 marks	5-5.5 marks	0-4.5 marks
A. Verbal technique - Individual (10 marks)	<p>Exhibits ease in use of formal language.</p> <p>Listener appreciates line of reasoning due to effective use of links.</p> <p>Ideas are linked to present big picture with impact and clarity.</p> <p>Skilled in selecting discipline/ industry specific knowledge suitable for topic.</p> <p>Absence of fillers</p> <p>Careful selection of diction to enhance content delivery.</p>	<p>Consistent use of formal language.</p> <p>Listener can follow line of reasoning due to consistent use of links to connect ideas.</p> <p>Demonstrates discipline/ industry specific knowledge.</p> <p>Limited presence of fillers</p> <p>Evidence of having given some thought to use of diction.</p>	<p>Formal language used for major part of presentation with some slips.</p> <p>Some confusion present at some points/ not much attention given to linking ideas.</p> <p>Some evidence of discipline/ industry specific knowledge.</p> <p>Fillers appear in speech but generally do not impede understanding.</p> <p>More thought could be given to diction.</p>	<p>Infrequent use of formal structure or slips in grammar.</p> <p>Missing links might generate some confusion/ ideas tend to stand alone.</p> <p>Use of discipline/ industry specific knowledge is questionable.</p> <p>Fillers can be distracting.</p> <p>Lapse in judgement can be seen in use of diction.</p>	<p>Colloquial terms/ slang used liberally. Slips in grammar.</p> <p>Relevance of explanation is in question during parts of presentation.</p> <p>Fillers are distracting and signal lack of preparation/ familiarity with content.</p> <p>Diction leaves much to be desired.</p>
B. Ability to handle Q&A - Individual (10 marks)	<p>Quick response exhibiting a clear understanding of question requirement. Well-expressed, including specific examples to demonstrate learning. Provides a complete answer by highlighting +/- where necessary. Shows genuine interest in providing a succinct /</p>	<p>Answers the question fully.</p> <p>Clarity in expression is not in question - examples might be cliché/ generic though suitable.</p> <p>Attempt to weigh response can be discerned. Attempt to be succinct can be discerned.</p>	<p>Answered the question. Some support may be lacking, or sentences may be a bit awkward. Absence or little attempt to evaluate. Hastiness can be detected in response.</p>	<p>Has some difficulty addressing concerns raised in question, no real evidence of learning. More specific information is needed. Examples, if present, do little to support response. Lacking in providing a coherent response.</p>	<p>Has difficulty comprehending question requirement. No clear or specific explanation in answer to the question. Weak thought process.</p>

	informative answer to the audience.				
C. Quality of presentation slides and teamwork - Group (10 marks)	Comprehensive and rich development of topic, information is appropriate and very relevant; presentation and analysis of information is professional, thorough, engaging, and sophisticated. Demonstrates critical thinking.	Clear development of topic, shows evidence of progression of ideas from purpose to findings to analysis to recommendations, discussion is oriented to the purpose but not to the best effect.	Some development of the topic, some attempt at analysis, progression is not always clear, discussion is somewhat oriented to the purpose.	Presentation was poorly structured, consisted of simplistic matter-of-fact statements, development of topic is unclear or topic was poorly analysed.	Presentation lacked structure and organisation, content has serious logical flaws, no analysis done and no value add.

Scoring Rubric of Peer Evaluation

Instruction: Please rate each team member's contribution in the group project during group meetings, research, data analysis and report writing. Peer evaluation scores should be awarded based on the quality of each team member's collaboration practices (self-awareness & management, leadership, interpersonal & collaboration, as well as communication & inclusivity skills). You should also take into account each team member's attendance and punctuality during project meetings. Refer to the rubric below for the award of peer evaluation scores. **Please highlight any free-rider in the team and provide reasons/ comments on team members highlighted as free-riders.**

Evaluation Criteria	A	B	C	D	F
Marks	8-10 marks	7-7.5 marks	6-6.5 marks	5-5.5 marks	0-4.5 marks
Self-awareness & management	Not observable as learner is absent from most meetings.	Learner is largely not aware of his emotions and behaviours, and does not manage them well during most group meetings and discussions.	Learner is somewhat aware of his emotions and behaviours, and manages them well during some group meetings and discussions.	Learner is largely aware of his emotions and behaviours, and manages them well during most group meetings and discussions.	Learner is totally aware of his emotions and behaviours, and manages them well during all group meetings and discussions.
Leadership, interpersonal & collaboration	He/she does not demonstrate leadership qualities and initiative during the project development. No evidence that the project ideas and project requirements are co-developed with other team members.	He/she has provided suggestions for the team to consider during the project. He/she gathers inputs from others to develop project ideas and complete the project requirements.	He/she has contributed ideas to the group that help to improve the project. He/she exchanges information with others to develop project ideas and complete the project requirements.	He/she has guided or facilitated group discussions or meetings during the project development. He/she cooperates with others to develop project ideas and complete the project requirements.	He/she has led the team for at least one phase of the project development. He/she includes different and opposing views and manages the team dynamics well to jointly develop project ideas and complete the project requirements.

Communication & inclusivity	No evidence that communication techniques are used to discuss an idea with other team members. He/she is totally not enthusiastic to collaborate with people with different cultures, values, beliefs, perception and attitudes, and does not display sensitivity and empathy during all group meetings and discussions	He/she tries to use communication techniques to explain an idea during group discussions on project ideas and project requirements. He/she is largely not enthusiastic to collaborate with people with different cultures, values, beliefs, perception and attitudes, and does not display sensitivity and empathy during most group meetings and discussions.	He/she uses multiple communication techniques to explain an idea during group discussions on project ideas and project requirements. He/she is somewhat enthusiastic to collaborate with people with different cultures, values, beliefs, perception and attitudes, and displays sensitivity and empathy during some group meetings and discussions.	He/she applies an assortment of communication techniques to gather responses during group discussions on project ideas and project requirements. He/she is largely enthusiastic to collaborate with people with different cultures, values, beliefs, perception and attitudes, and displays sensitivity and empathy during most group meetings and discussions.	He/she applies an assortment of communication techniques to engage others during group discussions on project ideas and project requirements. He/she is very enthusiastic to collaborate with people with different cultures, values, beliefs, perception and attitudes, and displays sensitivity and empathy during all group meetings and discussions.
Attendance and Punctuality	He/she does not attend any project meeting and gives excuses for not attending the meetings and does not contribute to the development of the project. He/she cannot be contacted most of the time.	He/she has attended and is punctual for very few of the project meetings but must be reminded by team members to complete his/her given task on time.	He/she has attended and is punctual for most of the project meetings.	He/she has attended and is punctual for every project meeting.	He/she has attended and is punctual for every project meeting.

Your peer evaluation mark is the average of all your group members' ratings.

Important: If you had reported a free-rider earlier through the e-survey AND the free-rider problem persists even after the module tutor had counselled the team member, please highlight it in the peer evaluation form and provide reasons/ comments on team members highlighted as free-riders. Please note that

only learners with a combined average score of less than 5 out of the 10 marks are considered to be free-riders and the score you give them must reflect this.

Checklist to Guide Group Project Development

Project Initiation		√
1	Is the team clear about the project requirements, goals, deliverables and submission deadline?	
2	Do team members know one another and has the team nominated a leader for the project?	
3	Has the team set the ground rules for team collaboration such as respect each other's opinion, everyone is encouraged to contribute, be inclusive and displays sensitivity and empathy when collaborating with people from different cultures?	

Project Planning		√
1	Is the team able to break down the project goals into S.M.A.R.T (specific, measurable, attainable, realistic, timely) deliverables?	
2	Is the team able to come up with a detailed project schedule and the deliverables at each milestone?	
3	Is the team able to assign the deliverables to each team member?	
4	Is each team member clear, comfortable and committed to his roles and responsibilities assigned at each project milestone?	
5	Has the team decided on a (online) collaboration platform for the project?	
6	Has the team decided on a communication channel or platform for project discussion and problem solving?	

Project Execution		√
1	Are team members actively working on the project using the collaboration platform?	
2	Are there active project discussion and problem solving by team members using the communication channel or platform?	
3	Is there a need to report any free rider to the module tutor?	

Project Monitoring and Controlling		√
1	Are team members able to complete their assigned deliverables at each project milestone?	
2	Are there active project discussion and problem solving by all team members at each project milestone meeting?	
3	Do team members obey the ground rules for team collaboration at each project milestone meeting?	

Project Closing		√
1	Has the team conducted a final review of the project output against the project requirements, goals and deliverables?	
2	Has the team conducted a plagiarism check of the project output and performed the necessary amendment and resubmission before the submission deadline?	
3	If a project presentation is required, is the team able to meet the project presentation requirements and all team members are clear about their roles and responsibilities?	

Assignment Score Sheet

Assignment Score Sheet					
Evaluation Criteria	Name of learner				
<u>Report</u>					
A. Data preparation (10 marks)					
B. Parameter tuning (10 marks)					
C. Applying the model (10 marks)					
D. Scoring (10 marks)					
E. Improving prediction or classification accuracy (10 marks)					
F. Professionalism of submission (10 marks)					
<u>Presentation</u>					
Quality of presentation slides and teamwork (10 marks)					
Group component total (70 marks) (Sum of the above components) ¹					
Adjustment factor by Module Tutor based on work done by learner. (Average peer evaluation mark/ peer evaluation component score). [in percentage] ²					
Adjusted group component score ^(1 multiply by 2)					
Verbal technique (10 marks)					

Ability to handle Q&A (10 marks)					
Peer Evaluation Score (10 marks)					
Final score					