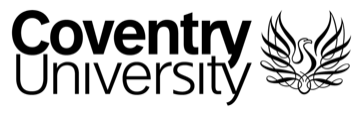
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Student Assignment Brief

**This document is intended for Coventry University Group students for their own use in completing their assessed work for this module. It must not be passed to third parties or posted on any website. If you require this document in an alternative format, please contact your Module Leader.**

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The work you submit for this assignment must be your own independent work, or in the case of a group assignment your own groups’ work. More information is available in the ‘[Assignment Task](#_Assignment_Task)’ section of this assignment brief.

# Assignment Information

**Module Name:** Machine Learning

**Module Code:** 7072CEM

**Assignment Title:** Written Coursework

**Assignment Due:** Monday, 25/03/2024,18:00 UK time

**Assignment Credit:** 15 credits

**Word Count (or equivalent):**  2000 words +/- 10%

**Assignment Type:** Coursework

**Percentage Grade** (Applied Core Assessment). You will be provided with an overall grade between 0% and 100%. You have one opportunity to pass the assignment at or above 40%.

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# Assignment Task

**7072CEM Coursework:**

Machine learning algorithms for solving real-world challenges

Title: **Machine learning algorithms for solving real-world challenges**

Individual Research Paper: 100% of the module mark

# Context

During this module, you learned about different machine learning techniques, associated concepts and applications. We explored a number of classification/regression algorithms, such as Logistic Regression, Linear Discriminant Analysis, Optimized K-nearest Neighbour, Bayesian and Statistical Methods, Support Vector Machines and Decision Trees and the Regression methods delivered in this module. Also, we covered clustering algorithms, such as K-means, and feature selection and extraction methods, such as PCA. In this assignment, you will have to select an application related to a classification, clustering, or anomaly detection problem, and explore how best to apply machine learning algorithms, learned during this module, to critically examine and solve it.

1. Feel free to select from the provided datasets or, upon **agreement with your module leader**, choose an alternative dataset. Your task is to apply a minimum of **THREE (for individual submission) or FOUR (for Group submission)** classification or clustering techniques to analyse the chosen dataset.
2. [Bags of Words](https://archive.ics.uci.edu/ml/datasets/Bag+of+Words)  (Classification)
3. [Daily and Sports Activities Dataset](https://archive.ics.uci.edu/ml/datasets/Daily+and+Sports+Activities) (Classification and Clustering)
4. [Dresses Attribute Sales Dataset](https://archive.ics.uci.edu/ml/datasets/Dresses_Attribute_Sales) (Regression)
5. Or [other](http://archive.ics.uci.edu/ml/index.html) (choose as you wish, but match techniques with the dataset)

**Notice: The example datasets used in the labs are NOT allowed.**

# You can combine and choose from the above-mentioned algorithms or you can use or come up with a new classification or clustering algorithms. of this coursework is to

* Examine the fundamental concepts of machine learning, their implementation and application.
* Perform appropriate preparation of a dataset and evaluate the performance of different learning algorithms on this dataset.
* Gain practical experience in selecting machine learning algorithms for solving a real-life classification or clustering problem.
* Demonstrate effectiveness in project teamwork and leadership.
* Ideally work in groups of 2, developing a paper/report by providing the details of contributions of each group member in developing/writing the project report. If you are working in a group of two, you need to consider applying a minimum of Four machine learning algorithms for the selected task and dataset. If you are submitting your work as an individual submission, you need to consider applying at least Three machine learning algorithms for the selected task and dataset).
* Actively participate in all activities.
* Write up individually on your own (using your own expression for describing the deliverable and emphasizing your contributions as well)
  + Contact the lecturer if you have doubt about this.
* Welcome to submit progress on your work regularly to get formative feedback and improve the final submission.
* Before your start, READ the four samples at the bottom of “Module Essentials >> Assessments” page. This is critically important for you to understand the elements and requirements of the CW.

# Marking Criteria for the paper

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| --- |
| Notes:   1. You are expected to use the [Coventry University APA](https://libguides.coventry.ac.uk/apa) style for referencing. For support and advice on this students can contact [Centre for Academic Writing (CAW)](http://www.coventry.ac.uk/study-at-coventry/student-support/academic-support/centre-for-academic-writing/?theme=main). 2. Please notify your registry course support team and module leader for disability support. 3. Any student requiring an extension or deferral should follow the university process as outlined [here](https://share.coventry.ac.uk/students/Registry/Pages/Deferrals-and-Extension.aspx). 4. The University cannot take responsibility for any coursework lost or corrupted on disks, laptops or personal computer. Students should therefore regularly back-up any work and are advised to save it on the University system. 5. If there are technical or performance issues that prevent students submitting coursework through the online coursework submission system on the day of a coursework deadline, an appropriate extension to the coursework submission deadline will be agreed. This extension will normally be 24 hours or the next working day if the deadline falls on a Friday or over the weekend period. This will be communicated via your Module Leader. 6. You are encouraged to check the originality of your work by using the draft Turnitin links on Aula. 7. Collusion between students (where sections of your work are similar to the work submitted by other students in this or previous module cohorts) is taken extremely seriously and will be reported to the academic conduct panel. This applies to both courseworks and exam answers. 8. A marked difference between your writing style, knowledge and skill level demonstrated in class discussion, any test conditions and that demonstrated in a coursework assignment may result in you having to undertake a Viva Voce in order to prove the coursework assignment is entirely your own work. 9. If you make use of the services of a proof reader in your work you must keep your original version and make it available as a demonstration of your written efforts. 10. You must not submit work for assessment that you have already submitted (partially or in full), either for your current course or for another qualification of this university, with the exception of resits, where for the coursework, you may be asked to rework and improve a previous attempt. This requirement will be specifically detailed in your assignment brief or specific course or module information. Where earlier work by you is citable, i.e. it has already been published/submitted, you must reference it clearly. Identical pieces of work submitted concurrently may also be considered to be self-plagiarism. |

### Submission Instructions:

Submission arrangement online via AULA:

**Submit before 18:00, late work will receive a mark of zero.**

File types and method of recording: **Submit a Single Word file (preferred) or a pdf file.**

Mark and Feedback date: **08/04/2024**

### Mark and Feedback method: given on each script.

**Your final submission will be scientific outputs of two folds:**

1. **A “scientific paper” of up to 6 A4 pages (written individually, not as a group, if you worked in a group), based on the experience and results gained during the project work. You will have to acknowledge the contributions of all group members in your paper.**
2. **A viva video recording your introduction to the dataset preparation, data wrangling, model training and testing, demonstration of running the pipeline (especially producing prediction outputs from your model), and model evaluation etc.**

**You are encouraged to target a certain conference or journal and submit the proposed paper to it. Submission guidelines can be found on the conference or journal web page you choose to submit to.**

**List of reputed conferences and journals:**

* 1. [IJCNN Conference](https://www.ijcnn.org/)
  2. [NeurIPS Conference](https://nips.cc/)
  3. [International Conference of Machine Learning](https://icml.cc/Conferences/2020)
  4. [Machine Learning Journal](http://www.springer.com/computer/ai/journal/10994)
  5. [Neural Networks Journal](http://www.journals.elsevier.com/neural-networks)
  6. Others (please let us know)

# The paper should broadly include the following sections:

* **Abstract**
* **Introduction** (where you introduce the problem along a short literature review of related work; if the literature review is longer, it is recommended to be a section on its own, which would be better)
* **Problem and Data set(s)** description (where you describe in detail the problem you want to solve and its significance)
* **Methods** (where you shortly describe the machine learning methods and/or other methods employed to solve the problem)
* **Experimental** **setup** (including data pre-processing, feature selection and extraction, classification/clustering parameters)
* **Results**
* **Discussion and Conclusions**
* **References**

These are **generic section titles**, which you may adapt appropriately to the application/problem that is being investigated. You may include sections describing modifications of algorithms or developments that are novel and specific to your work.

**You will need to follow the formatting guidelines of the** [**IEEE Manuscript Template for Conference Proceedings**](https://www.ieee.org/conferences/publishing/templates.html) **(A4)**

You may include figures, tables, pseudo-code, and appendices with the actual code that has been developed. You are free to use any programming language you are comfortable with (e.g., Matlab, Python, R, etc.)

More information of how to write a paper is available at the following link: “[Crafting Papers on Machine Learning](https://pdfs.semanticscholar.org/5cc8/ac44952b9be26eee2cb4e36728dc2d5d41f7.pdf)”, by Pat Langley

(which can be found here if the previous link does not work <http://www.machinelearning.ru/wiki/images/0/07/Langley00crafting.pdf> ).

**The group project general guidelines and milestones:**

Please note, the following guidelines are good practice and should lead to better result, but you have the freedom to pick whatever is suitable for your style:

* Working in groups of 2 (or 3, not recommended unless you have an extremely complex project which justifies collaboration with more people). If you work in pairs or in groups, you need to inform the lecturer before week 10, 18th March 2024.
* You have to select a real-world classification/clustering problem and one or more appropriate dataset(s) as suggested above. You may also use the following links, which have numerous problems and datasets:
* UCI Machine Learning Repository: <http://archive.ics.uci.edu/ml/>;
* ICML 2019 accepted papers: <https://icml.cc/Conferences/2019/Schedule?type=Poster>;
* Kaggle competitions: <http://www.kaggle.com/competitions>;
* Stanford machine learning projects:

<http://cs229.stanford.edu/projects2013.html>, <http://cs229.stanford.edu/projects2012.html>, <http://cs229.stanford.edu/projects2011.html>,

<http://cs229.stanford.edu/projects2016.html> .

* You do not need to write the proposal about the dataset and machine learning problem.
* In the following weeks until the submission deadline you have to select, implement and apply appropriate machine learning algorithms to the selected problem, performing data pre-processing, if needed, and record the results from the experiments.
* You have to write up your final paper, and submit it by the deadline specified on the first page.

# Marking and Feedback

**How will my assignment be marked?**

Your assignment will be marked by the module teams or TAs.

**How will I receive my grades and feedback?**

Provisional marks will be released at 08/04/2024.

Feedback will be provided by the module team alongside grades release on each script, which was submitted to Aula.

Your provisional marks and feedback should be available within [2 weeks (11 working days)].

**What will I be marked against?**

Details of the marking criteria for this task can be found at the [bottom of this assignment brief](#Marking_Rubric).

# Assessed Module Learning Outcomes

The Learning Outcomes for this module align to the [marking criteria](#Marking_Rubric) which is provided above. Ensure you understand the marking criteria to ensure successful achievement of the assessment task. The following module learning outcomes (highlighted in bold) are assessed in this task:

1. **Examine the fundamental concepts of machine learning, their implementation and application.**
2. **Prepare appropriate preparation of data sets and evaluate the performance of different learning algorithms on these data sets.**
3. **Appraise the different learning methodologies, their associated algorithms and their appropriateness to solve real-world problems.**
4. **Select and apply learning algorithms to various practical scenarios and evaluate their performance.**

**5. Critique trends in the current machine learning developments.**

# Assignment Support and Academic Integrity

If you have any questions about this assignment please see the [Student Guidance on Coursework](https://share.coventry.ac.uk/students/Registry/Pages/Coursework.aspx) for more information.

### Spelling, Punctuation, and Grammar:

You are expected to use effective, accurate, and appropriate language within this assessment task.

### Academic Integrity:

The work you submit must be your own, or in the case of groupwork, that of your group. All sources of information need to be acknowledged and attributed; therefore, you must provide references for all sources of information and acknowledge any tools used in the production of your work, including Artificial Intelligence (AI). We use detection software and make routine checks for evidence of academic misconduct.

Definitions of academic misconduct, including plagiarism, self-plagiarism, and collusion can be found [on the Student Portal](https://eur01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fshare.coventry.ac.uk%2Fstudents%2FRegistry%2FPages%2FEssential-definitions.aspx&data=05%7C01%7Cab5576%40coventry.ac.uk%7C96dc42ffe3484dd999e808db0e964c5d%7C4b18ab9a37654abeac7c0e0d398afd4f%7C0%7C0%7C638119810903032146%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=%2FggkmIN9ZackqogiKZxEXKYD3QaXAk0jCME%2F1ne82YU%3D&reserved=0). All cases of suspected academic misconduct are referred for investigation, the outcomes of which can have profound consequences to your studies. For more information on academic integrity please visit the [Academic and Research Integrity](https://eur01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fshare.coventry.ac.uk%2Fstudents%2FRegistry%2FPages%2FAcademic-and-Research-Integrity.aspx&data=05%7C01%7Cab5576%40coventry.ac.uk%7C96dc42ffe3484dd999e808db0e964c5d%7C4b18ab9a37654abeac7c0e0d398afd4f%7C0%7C0%7C638119810903032146%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=%2BPYuaO%2FDqY2x3ajLRlKjxHoEvTPzEqm%2B8wuQ%2FMvxlZk%3D&reserved=0) section of the Student Portal.

### Support for Students with Disabilities or Additional Needs:

If you have a disability, long-term health condition, specific learning difference, mental health diagnosis or symptoms and have discussed your support needs with health and wellbeing you may be able to access support that will help with your studies.

If you feel you may benefit from additional support, but have not disclosed a disability to the University, or have disclosed but are yet to discuss your support needs it is important to let us know so we can provide the right support for your circumstances. Visit [the Student Portal](https://livecoventryac.sharepoint.com/sites/students-healthandwellbeing/SitePages/Disabilities.aspx) to find out more.

### Unable to Submit on Time?

The University wants you to do your best. However, we know that sometimes events happen which mean that you cannot submit your assessment by the deadline or sit a scheduled exam. If you think this might be the case, guidance on understanding what counts as an extenuating circumstance, and how to apply is [available on the Student Portal.](https://livecoventryac.sharepoint.com/sites/students-registry-extensions-deferrals/SitePages/CU-Extensions-and-Deferrals-Guidance.aspx)

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# Administration of Assessment

**Module Leader Name:** Omid Chatrabgoun

**Module Leader Email:** ad8337@coventry.ac.uk

**Assignment Category:** Written

**Attempt Type:** Standard

**Component Code: CW**

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| --- | --- |
| Assignment Marking Criteria: | **Mark** |
| **Technical quality**  1) Rigour and extent of the experiments.  2) Correct application of the selected algorithms and suitability of the methods.  3) Data preparation - technical quality.  4) Evidence of running the experiments provided in appendices and the **informal VIVA video**. Is there sufficient information for the reader to reproduce the results? | 10%  10%  10%  10% |
| **Evaluation**  5) Evaluation and discussion of the results. Why the results are important? How would the results be useful to other researchers or practitioners?  6) Is this a “real” problem or a small “toy” problem? How does the paper advance the state of the art? | 20%  5% |
| 7) **Social, ethical, legal and professional considerations** related to the problem in question. (99% lost this easy-to-get mark by getting 0) | 5% |
| **Clarity of the writing:**  8) Is the language used in the paper good?  9) References and general presentation; Are results clearly presented, with appropriate visualisations? | 10%  10% |
| **Originality:**  10) Is there some original approach to the problem, original use of techniques? Is there any (and how much) difference from previous contributions? | 10% |

**General marking guidelines**

**Mark allocation guidelines to students (to be edited by staff per assessment)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 0-39 | 40-49 | 50-59 | 60-69 | 70+ | 80+ |
| Work mainly incomplete and /or weaknesses in most areas | Most elements completed; weaknesses outweigh strengths | Most elements are strong, minor weaknesses | Strengths in all elements | Most work exceeds the standard expected | All work substantially exceeds the standard expected |

**Generic Marking Rubric**

**PG**

|  |  |  |
| --- | --- | --- |
| **Mark band** | **Outcome** | **Guidelines** |
| 90-100%  Distinction | Meets learning outcomes | Distinction - Exceptional work with very high degree of rigour, creativity and critical/analytic skills. Mastery of knowledge and subject-specific theories with originality and autonomy. Demonstrates exceptional ability to analyse and apply concepts within the complexities and uncertainties of the subject/discipline.  Innovative research with exceptional ability in the utilisation of research methodologies. Demonstrates, creativity, originality and outstanding problem-solving skills. Work completed with very high degree of accuracy, proficiency and autonomy. Exceptional communication and expression demonstrated throughout. Student evidences the full range of technical and/or artistic skills. Work pushes the boundaries of the discipline and may be strongly considered for external publication/dissemination/presentation. |
| 80-89%  Distinction | Distinction - Outstanding work with high degree of rigour, creativity and critical/analytic skills. Near mastery of knowledge and subject-specific theories with originality and autonomy. Demonstrates outstanding ability to analyse and apply concepts within the complexities and uncertainties of the subject/discipline.  Innovative research with outstanding ability in the utilisation of research methodologies. Work consistently demonstrates creativity, originality and outstanding problem-solving skills. Work completed with high degree of accuracy, proficiency and autonomy. Outstanding communication and expression demonstrated throughout. Student demonstrates a very wide range of technical and/or artistic skills. With some amendments, the work may be considered for external publication/dissemination/presentation |
| 70-79%  Distinction | Distinction - Excellent work undertaken with rigour, creativity and critical/analytic skills. Excellent degree of knowledge and subject-specific theories with originality and autonomy demonstrated. The work exhibits excellent ability to analyse and apply concepts within the complexities and uncertainties of the subject/discipline.  Innovative research with excellent ability in the utilisation of research methodologies. Work demonstrates creativity, originality and excellent problem-solving skills. Work completed with very consistent levels of accuracy, proficiency and autonomy. Excellent communication and expression demonstrated throughout. Student demonstrates a very wide range of technical and/or artistic skills. |
| 60-69%  Merit | Merit - Very good work often undertaken with rigour, creativity and critical/analytic skills. Very good degree of knowledge and subject-specific theories with some originality and autonomy demonstrated. The work often exhibits the ability to fully analyse and apply concepts within the complexities and uncertainties of the subject/discipline.  Very good research evidence and shows very good ability in the utilisation of research methodologies. Work demonstrates creativity, originality and problem-solving skills. Work completed with very consistent levels of accuracy, proficiency and autonomy. Very good communication and expression demonstrated throughout. Student demonstrates a wide range of technical and/or artistic skills. |
| 50-59%  Pass | Pass - Good work undertaken with some creativity and critical/analytic skills. Demonstrates knowledge and subject-specific theories with some originality and autonomy demonstrated. The work exhibits the ability to analyse and apply concepts within the complexities and uncertainties of the subject/discipline.  Good research and shows some ability in the utilisation of research methodologies. Work demonstrates problem-solving skills and is completed with some level of accuracy, proficiency and autonomy. Satisfactory communication and expression demonstrated throughout. Student demonstrates some of the technical and/or artistic skills. |
| 40-49%  Pass | Pass - Assessment demonstrates some advanced knowledge and understanding of the subject informed by current practice, scholarship and research. Work may be incomplete with some irrelevant material present. Sometimes demonstrates the ability to analyse and apply concepts within the complexities and uncertainties of the subject/discipline.  Acceptable research with evidence of basic ability in the utilisation of research methodologies. Demonstrates some originality, creativity and problem-solving skills but often with inconsistencies. Expression and presentation sufficient for accuracy and proficiency. Sufficient communication and expression with professional skill set. Student demonstrates some technical and/or artistic skills. |
| 30-39%  Fail | Fails to achieve learning outcomes | Fail - Very limited understanding of relevant theories, concepts and issues with deficiencies in rigour and analysis. Some relevant material may be present but be informed from very limited sources. Fundamental errors and some misunderstanding likely to be present. Demonstrates limited ability to analyse and apply concepts within the complexities and uncertainties of the subject/discipline.  Limited research scope and ability in the utilisation of research methodologies. Limited originality, creativity, and struggles with problem-solving skills. Expression and presentation insufficient for accuracy and proficiency. Insufficient communication and expression and with deficiencies in professional skill set. Student demonstrates deficiencies in the range of technical and/or artistic skills. |
| 20-29%  Fail - | Fail - Clear failure demonstrating little understanding of relevant theories, concepts, issues and only a vague knowledge of the area. Little relevant material may be present and informed from very limited sources. Serious and fundamental errors and virtually no evidence of relevant research. Fundamental errors and misunderstandings likely to be present.  Little or no research with no evidence of utilisation of research methodologies. No originality, creativity, and struggles with problem-solving skills. Expression and presentation insufficient for accuracy and proficiency. Insufficient communication and expression and with serious deficiencies in professional skill set. Student has clear deficiencies in range of technical and/or artistic skills. |
| 0-19%  Fail | Fail - Clear failure demonstrating no understanding of relevant theories, concepts, issues and no understanding of area. Little or no relevant material may be present and informed from minimal sources. No evidence of ability in the utilisation of research methodologies. No evidence of originality, creativity, and problem-solving skills. Expression and presentation deficient for accuracy and proficiency. Insufficient communication and expression and with deficiencies in professional skill set. Student has clear deficiencies in range of technical and/or artistic skills. |