

Description:

The assessment for this module will consist of two components: (a) a single research project in an area of applied AI (written up in the form of a **3,000 word report**) and (b) a short **1-minute recorded presentation** of the project. Topics for the research project will be based on one of the areas we will cover this semester, including feedforward neural networks, natural language processing or computer vision. Specifically, the idea is to choose **one** of the areas below and extend a lab session into a full project + report.

Please note - you may not be taught all aspects relating to your topic explicitly in class. It is expected that you will do further reading and research and find out what you need in terms of theoretical background or code base.

Topics are as follows:

- *Feedforward neural nets with hyperparameter optimisation*: this project will implement a feedforward neural network for a dataset of choice (but the data should be different from the lab), and experiment systematically with a number of hyperparameter configurations, e.g. the learning rate, batch size, number of hidden units, layers, etc. The project will need to explore systematic approaches for hyperparameter optimisation such as random or grid optimisation or genetic algorithms. Note that the specifics will not be taught directly, you'll need to research and find out how to implement these in Python yourself. You may use any software libraries available, as long as referenced. The approaches named above e.g. come with `sk_learn` and do not need to be implemented from scratch. The neural network's performance should be evaluated in different settings and compared against other approaches, such as decision trees, Naive Bayes or other classifiers. Results should be supported with visualisations, such as graphs.

- *Text classification*: this project will implement a deep learning system for text classification (e.g. using the news dataset from the lab, or any other you can find). You can choose what classes you want to learn (i.e. classify) from your dataset. You will need to make an informed choice of neural network (such as recurrent or transformer) and implement it using a deep learning library. This part can be based on a lab session we did together. The project should also include at least one additional component, e.g. a specific hypothesis you want to investigate, a comparison against another technique, or a data augmentation technique, such as language modelling (i.e. embed features into vector space using one or more techniques e.g. Word2Vec, GloVe, BERT, GPT-2, etc.). Regardless of what you choose to do concretely, make sure that you use baselines in your project, i.e. choose the system you want to “pitch” and make sure you compare it another setup. Results should be supported with visualisations, such as graphs.

- *Sentiment analysis from text and/or images*: this project will implement a deep learning-based system for sentiment analysis. You will need to choose a dataset (e.g. not the one used in our sentiment analysis lab please) and make an informed choice of architecture. Then implement it using a deep learning library. You can then either focus on sentiment analysis from text (as we’ve done before) or image analysis, e.g. predicting sentiment from images. In either case, please make sure to benchmark your results against an alternative setting, e.g. experimenting with more than one neural network architecture, or experimenting substantially with your chosen architecture itself, e.g. using hyperparameter optimisation. Results should be supported with visualisations, such as graphs.

Marking and components

Report - 80%

Presentation - 20%

Report details:

Your report should have **3,000 words** (10% more or less is ok) and include sections:

Introduction - an introduction to the topic, NOT to your report. Present your topic in the context of the field of AI, why is your topic important, why does it matter? What is your main research question? What is the expected outcome?

You can also prepare your readers for the rest of the report here, “Section 2 will introduce related work, Section 3... etc.” but this is often boring and might take words away from more important things.

Background - introduce related work to your project, i.e. the context in which your research should be seen and interpreted. What related work does already exist? This will require some background reading and literature review. Don't just describe what research already exists, but discuss it in relation to your project - what is similar, what is different?

How does the related work link with your project? Are you aiming for an alternative method, an extension? a new dataset or application?

Objectives - state concisely your research objective/s. These need to be SMART - specific, measurable, attainable, realistic and time-bound. Don't choose anything you couldn't achieve within the time frame, but also be ambitious - don't just replicate an online blog.

Methodology - introduce your methodology from a technical but high-level point of view. You can use equations here or choose to describe your methodology (still needs to be concise, clean and technical though). Provide references to the model you have chosen for your project.

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

You may wish to include an architecture diagram of your approach or any other visual presentation. This normally helps the reader and makes the report look nicer.

Experiments - Describe your experimental setup. What hyperparameters are you using for training? What dataset/s? What training-test split? What baselines, evaluation metrics?

Results - Present your results, ideally supported with tables and / or graphs. Discuss them, how do they compare with baselines? Did you meet your objectives? If not, why not? Did you find anything interesting, unexpected? Anything worth investigating further?

Conclusion - A brief section summarising the main points of your paper and findings. Make suggestions for future work - what experiments may follow from the work you did?

References - include a substantial number of relevant references. These should go beyond the literature resources provided for the module.

In your marking criteria there is also a smaller rubric “quality of presentation” - this refers to the overall structure of the document, level of proofreading, and general presentation. It *should* be an easy section to get full marks on.

Presentation details:

Your presentation should be a short and concise **1-minute** pitch of your project idea. This is deliberately short to encourage you to focus on the main detail. You could structure your presentation around the format of an “elevator pitch”, see examples and ideas under these links:

<https://www.mmu.ac.uk/media/mmuacuk/content/documents/research/Impact-Tool---Elevator-Pitch.pdf>

https://graduateschool.nd.edu/assets/76988/elevator_pitch_8_28_2012.pdf

https://medschool.vanderbilt.edu/wp-content/uploads/sites/9/files/public_files/Elevator%20Pitches%20for%20Scientists_Uyen_0.pdf

<https://versatilehumanists.duke.edu/2018/10/23/crafting-an-academic-elevator-speech-that-stands-out/>

Please keep to the time of 1 minute. I’m not expecting any results in this as your project will still be under investigation/ development. You can support your presentation with a clean slide (recommended), and it should be pre-recorded and uploaded to Canvas.



Criteria	First	2:1	2:2	Third	Poor
Intro, aims	<p>Clear scope and aims of project are provided, objectives are SMART</p> <p><i>10 points max</i></p>	<p>Clear project scope is mostly provided, with some shortcomings, objectives are SMART</p> <p><i>8 points max</i></p>	<p>A project scope is presented but is not clear or not sufficient. Objectives are SMART.</p> <p><i>6 points max</i></p>	<p>A limited project scope is presented, objectives do not follow the SMART principle.</p> <p><i>4 points max</i></p>	<p>No clear scope is presented, objectives do not follow the SMART principle.</p> <p><i>2 points max</i></p>
Background	<p>Comprehensive background is provided, research is clearly embedded in a wider context of research; statements are supported by references</p> <p><i>20 points max</i></p>	<p>Comprehensive background is mostly provide with small shortcomings, research is embedded in context and some references are provided</p> <p><i>15 points max</i></p>	<p>Relevant background to the study is presented and partially supported with references.</p> <p><i>10 points max</i></p>	<p>Background research is provided but is unclear or not supported with references.</p> <p><i>6 points max</i></p>	<p>Background is not present or is insufficient, no sufficient references are provided.</p> <p><i>4 points max</i></p>
Method	<p>Method is appropriately chosen from a comparative analysis and a justification for the choice of method are provided; the method is implemented and fully functional</p> <p><i>30 points max</i></p>	<p>Method is appropriately chosen and a clear justification is provided for the chosen method. Some comparison with alternative methods has taken place. The method is functional but potentially has shortcomings.</p> <p><i>20 points max</i></p>	<p>A methodology is chosen and justified, but only limited comparison has taken place.</p> <p>The method is implemented but does not deliver full functionality.</p> <p><i>15 points max</i></p>	<p>A methodology is chosen but is not appropriate for the task at hand, or has not been justified.</p> <p>Code is presented but does not run, or only in a limited way.</p> <p><i>8 points max</i></p>	<p>Methodology chosen is not suitable for the task at hand.</p> <p>Code is not sufficiently implemented to support the experiments.</p> <p><i>5 points max</i></p>
Evaluation	<p>The approach is evaluated using appropriate metrics and multiple (e.g. 3) baselines to support the results. Full details of the experimental setup are given.</p> <p><i>30 points max</i></p>	<p>An evaluation is provided and appropriate methods are mostly chosen; at least one baseline is also presented. Nearly full details of the experiments are given.</p> <p><i>20 points max</i></p>	<p>An evaluation is provided but no comparison with baselines is given. Insufficient details to support replication.</p> <p><i>15 points max</i></p>	<p>An evaluation is present but insufficient to support the objectives.</p> <p><i>8 points max</i></p>	<p>No evaluation is provided.</p> <p><i>5 points max</i></p>

Criteria	First	2:1	2:2	Third	Poor
Referencing	A substantial number of references are provided and embedded into context; Harvard referencing is used throughout. <i>5 points max</i>	A number of relevant references are provided and are mostly cited correctly. <i>4 points max</i>	Few references are provided and / or given in the incorrect format. <i>3 points max</i>	References are cited incorrectly, i.e. in terms of format or content. <i>2 points max</i>	No references, or relevant are irrelevant. <i>1 point max</i>
Presentation	The organisation of the report is clear and supported with appropriate tables and graphs <i>5 points max</i>	The organisation of the report is clear with some shortcomings. Limited tables and visualisations are provided. <i>4 points max</i>	The organisation reasonable with shortcomings. Limited visualisations are given. <i>3 points max</i>	The organisation of the report is confusing in places, no visualisations are provided, or they are inappropriate. <i>2 points max</i>	Confusing organisation and presentation, no visualisation or tables. <i>1 point max</i>

Presentation marking criteria and weighting:

Introduction and aims: 30%

Background: 30%

Methodology / technical scope: 30%

Quality of slides: 5%

Presentation skills: 5%

Note that marking criteria for Introduction, Background, Method and Evaluation will as above (scaled to 20% of the overall mark). The additional criteria applying only to the presentation are follows:

Criteria	First	2:1	2:2	Third	Poor
Quality of slides	Slides are clear well organised and convey the message successfully <i>5 points max</i>	Slides are mostly clear and organised and mostly convey the overall message <i>4 points max</i>	Slides are mostly clear and organised with some notable problems <i>3 points max</i>	Slides are confusing in places and do not always convey the overall message <i>2 points max</i>	Slides are confusing and not effective in delivering the intended message and contents <i>1 point max</i>
Presentation skills	A clear and well conveyed presentation that kept audience in mind throughout (e.g. in terms of delivery speed, eye contact, pointing out relevant slides contents, etc.) <i>5 points max</i>	A mostly clear and well conveyed presentation that kept the audience in mind most of the time. <i>4 points max</i>	A well structured presentation with some notable issues. <i>3 points max</i>	A presentation that was confusing at times, lacked structure, or left the audience behind for significant periods of time. <i>2 points max</i>	A presentation that was confusing throughout and did not make an attempt to engage the audience. <i>1 point max</i>