29 May 2023

# Assignment - Applied AI

## 771767 - 2022/2023

### 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-words 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 natural language processing and 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.** You are expected to do further reading and research and find out what you need in terms of theoretical background or code base.

### Topics are as follows:

• *Text classification*: this project will implement a deep learning system for text classification - e.g. one we covered in a lab or any other you can find, e.g. from Kaggle. You can choose what classes you want to learn (i.e. classify) from your dataset, e.g. sentiments, emotions, topics, named entities, etc. The project should state clearly a research question or hypothesis and make direct reference to the existing academic literature on the topic. How does your project fit into the wider area of comparable research, how is it similar and how is it different? 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, or code you found online - as long as you specify this. The project should also include at least one additional technical component, e.g. a comparison of your chosen method against another technique, or a data augmentation technique, such as language modelling (e.g. with

Word2Vec, GloVe, BERT, GPT, etc.). Pay attention to evaluation metrics and make sure that your experimental set-up is convincing and designed to show what you are trying to show (e.g. consider the majority baseline, whether your data is balanced, etc.). Regardless of what you choose to do concretely, make sure you use baselines in your project, i.e., choose the system you want to "pitch" and compare it to an alternative setup. Results should be supported with visualisations, such as graphs, tables, and other materials. A generous list of academic references is expected.

• *Image analysis*: this project will implement a deep learning-based system for image analysis. As above, you will need to choose a dataset (one used in class, or online), and make an informed choice of architecture. Then implement it using a deep learning library, and make sure to compare it with at least one other technique (e.g. using pre-trained weights). As above, your project should state clearly a research question or hypothesis and make direct reference to the existing academic literature on the topic. How does your project fit into the wider area of comparable research, how is it similar, and how is it different? The specific classification task you want to address is up to you, e.g. object identification, sentiment analysis from images, etc. In any 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, tables, etc, and you need to consider the metrics that you apply to accurately test your hypothesis. A generous list of academic references is expected.

## 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, and 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 a 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. To see examples of what would be ideal in this section, consult any academic paper and look for the methodology section.

DO NOT include programming code in 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 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 are baselines, and 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, or unexpected? Is 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://versatilehumanists.duke.edu/2018/10/23/crafting-an-academic-elevator-speech-that-stands-out/

Please keep to the time of 1 minute. We're 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.

### Code submission:

You will need to submit your code alongside your report. It will not be marked separately but will be checked to ensure that it supports the functionality described in the report and is not plagiarised. As before, *please note that anything you want me to see is in the report as I'm not awarding marks for the code separately.*

### Hand-in and deadlines:

The presentation video is on **7 July 2023, 2 pm**
The report is due: **25 August 2023, 2 pm**

Hand-in will be via Canvas.

The presentation is due on purpose before the report, so any feedback can still be incorporated towards the report. If you need an extension for any reason, please apply for this via the Student Hub with sometime in advance so that it can be accounted for. We are not able to give out ad-hoc extensions based on individual requests.

### Marking criteria:

**Report** marking criteria and weighting:

Introduction and aims: 10%
Background: 20%
Methodology / technical scope: 30%
Critical evaluation (experiments + discussion): 30%

Referencing: 5%

Quality of presentation: 5%

Specific marking criteria are as follows (continues on next page):

| Criteria | First | 2:1 | 2:2 | Third | Poor |
|---|---|---|---|---|---|
| **Intro, aims** | Clear scope and aims of project are provided, objectives are SMART<br><br>*10 points max* | Clear project scope is mostly provided, with some shortcomings, objectives are SMART<br><br>*8 points max* | A project scope is presented but is not clear or not sufficient. Objectives are SMART.<br><br>*6 points max* | A limited project scope is presented, objectives do not follow the SMART principle.<br><br>*4 points max* | No clear scope is presented, objectives do not follow the SMART principle.<br><br>*2 points max* |
| **Background** | Comprehensive background is provided, research is clearly embedded in a wider context of research; statements are supported by references<br><br>*20 points max* | Comprehensive background is mostly provided with small shortcomings, research is embedded in context and some references are provided<br><br>*15 points max* | Relevant background to the study is presented and partially supported with references.<br><br>*10 points max* | Background research is provided but is unclear or not supported with references.<br><br>*6 points max* | Background is not present or is insufficient, no sufficient references are provided.<br><br>*4 points max* |
| **Method** | Method is appropriately chosen from a comparative analysis and a justification for the choice of method is provided; the method is implemented and fully functional<br><br>*30 points max* | Method is appropriately chosen and a clear justification is provided for the chosen method. Some comparison with alternative methods have taken place. The method is functional but potentially has shortcomings.<br><br>*20 points max* | A methodology is chosen and justified, but only limited comparison has taken place.<br><br>The method is implemented but does not deliver full functionality.<br><br>*15 points max* | A methodology is chosen but is not appropriate for the task at hand, or has not been justified.<br><br>Code is presented but does not run, or only in a limited way.<br><br>*8 points max* | Methodology chosen is not suitable for the the task at hand.<br><br>Code is not sufficiently implemented to support the experiments.<br><br>*5 points max* |

| Criteria | First | 2:1 | 2:2 | Third | Poor |
|---|---|---|---|---|---|
| **Evaluation** | The approach is evaluated using appropriate metrics and multiple (e.g. 3) baselines to support the results. Full details of the experimental setup is given.<br><br>*30 points max* | 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.<br><br>*20 points max* | An evaluation is provided but no comparison with baselines is given. Insufficient details to support replication.<br><br>*15 points max* | An evaluation is present but insufficient to support the objectives.<br><br>*8 points max* | No evaluation is provided.<br><br>*5 points max* |
| **Referencing** | A substantial number of references are provided and embedded into context; Harvard referencing is used throughout.<br><br>*5 points max* | A number of relevant references are provided and are mostly cited correctly.<br><br>*4 points max* | Few references are provided and / or given in the incorrect format.<br><br>*3 points max* | References are cited incorrectly, i.e. in terms of format or content.<br><br>*2 points max* | No references, or relevant are irrelevant.<br><br>*1 point max* |
| **Presentation** | The organisation of the report is clear and supported with appropriate tables and graphs<br><br>*5 points max* | The organisation of the report is clear with some shortcomings. Limited tables and visualisations are provided.<br><br>*4 points max* | The organisation reasonable with shortcomings. Limited visualisations are given.<br><br>*3 points max* | The organisation of the report is confusing in places, no visualisations are provided, or they are inappropriate.<br><br>*2 points max* | Confusing organisation and presentation, no visualisation or tables.<br><br>*1 point max* |

**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 be 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<br><br>*5 points max* | Slides are mostly clear and organised and mostly convey the overall message<br><br>*4 points max* | Slides are mostly clear and organised with some notable problems<br><br>*3 points max* | Slides are confusing in places and do not always convey the overall message<br><br>*2 points max* | Slides are confusing and not effective in delivering the intended message and contents<br><br>*1 point max* |
| **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.)<br><br>*5 points max* | A mostly clear and well conveyed presentation that kept the audience in mind most of the time.<br><br>*4 points max* | A well structured presentation with some notable issues.<br><br>*3 points max* | A presentation that was confusing at times, lacked structure, or left the audience behind for significant periods of time.<br><br>*2 points max* | A presentation that was confusing throughout and did not make an attempt to engage the audience.<br><br>*1 point max* |