Project Report Guidance/Instructions

Please follow the instruction below for your mid-term and final project report. See the deliverable at the end of this document.

Your project report should contain the *1) title, 2) abstract, 3) introduction, 4) Related work, 5) Methodology, 6) Experimental Setup, 7) Results and analysis, 8) discussion, and conclusion, 9) References.* Follow the instruction below to see example sections that should be in that section. You can have additional sections or subsections, but this is just the general template you may follow.

[Formatting Style: Times New Roman 10 pt., Single spacing, either Single Column or Double Column]

1) **Title of the Project Report**
[Name of all the Authors with their affiliation]

2) Abstract:
A concise summary of your entire project, what was done, why, how, and with what results.

Structure: it should contain a single paragraph that should have the following information.

- Problem Statement: What challenge or question are you addressing?
- Objective: What is the goal of your project?
- Approach: What methods, models, or frameworks did you develop or apply?
- Key Results: Quantitative/qualitative outcomes (accuracy, speedup, etc.).
- Conclusion/Implication: What's the significance or takeaway?

Writing Instructions: 150-250 words maximum. Avoid jargon; write for a broad technical audience. Include numerical results if available (e.g., "achieved 92.4% F1 score on XYZ dataset"). Remember you don't need to provide title for each of the above structure. Just need to write a clean paragraph that should contains the above information.

3) Introduction: Establish the background, motivation, and importance of the work. Follow these steps to organize your introduction.

Structure:
Context and Motivation: Describe the general area (e.g., NLP, CV, robotics).
Problem Definition: Identify the specific gap or limitation you're solving.
Challenges: Highlight key technical or theoretical challenges.
Objective and Scope: Define clear project goals and boundaries.
Contributions: Summarize your key innovations or deliverables.

Example: "We propose a lightweight attention-based model for real-time classification." Paper Organization: (optional) One sentence about what each section covers.

Writing Instructions: Clearly connect your project to a real-world problem or research need. You need write multiple paragraphs to reflect the above. You don't need to mention title above (e.g. Context and motivation – do not use these categories at the beginning of the paragraph). Organize your thought in paragraph base on the provided above category and simply write in your own words. *We are not expecting you to write a niche research paper however, we are expecting you to follow the structure*. At least 4-5 paragraphs for the introduction and each paragraph containing 200-300 words.

4) Related work: Situate your project in the context of existing literature or systems.

- **Topic Categorization:** Organize related work by methods, datasets, or application areas. Your identified each category can be a single paragraph that contains multiple papers on a single theme (category) and citation. Each paragraph should contain comparison with existing work vs yours.
- **Comparison:** Discuss how each relevant approach works and its limitations. Gap Identification: Show explicitly where prior work falls short and how your project improves on it.

Writing Instructions: Based on your categorization write your own text and statements and cite existing works within each paragraph. This way it is going to be easier to write the related work faster. Then compare your current project with the existing works. Cite 7-10 key papers (more for research projects, fewer for coursework). Be analytical, not just descriptive, point out why other methods fail or differ. In addition, you may use a table comparing approaches across dimensions (method, dataset, accuracy, complexity). *How to read papers for the categorization: For reading research paper:* you may just read their abstract, introduction, identify existing methods they used and conclusion to create your own categorization.

5) Methodology: Describe your proposed method or system in detail.

Overall Architecture: Diagram and short explanation (each functional component) of pipeline or system. You must present your overall pipeline diagram in the report. The diagram will contain high-level functional blocks that take some input and produce some output. Example key components that may be in your project as below. Label all modules clearly in diagrams.

Key Components: Data Preprocessing, Model Architecture**,** Algorithms / Mathematical Formulation**,** Training Strategy or Optimization Procedure, etc.
Novel Contributions: Highlight what is new or unique in your design (e.g., "Knowledge-guided attention fusion").
Complexity or Theoretical Notes: Optional if you provide algorithmic analysis (e.g., time or space complexity).

Writing Instructions: Write a paragraph giving high-level overview of your pipeline and how it work and it produce and refer your overall diagram. Then discuss each component in details (may one paragraph for each component that contains 200-250 words). Include equations or pseudocode for clarity. Clearly state assumptions and constraints.

Additional details (may be helpful): What approaches you follow to solve this problem. Show your project pipeline diagram and each component description. Please follow project details slide to get an idea about your pipleline. For example, you process some text by the following cleaning, stop word removal, stemming, etc. You then use some classifier to classify it (i.e., sentiments). You can discuss why do you choose this classifier? Discuss how did you do this classification. For example, you select some class labels, also mention why you select those labels, etc. Then a little bit about the classifier description. Example classifier - Logistic regression, what it is, how it works, any mathematical equation, etc. In summary, discuss in detail your proposed approach, any algorithmic or technological solution you have adapted for this work.

6) Experimental setup:
Explain how you tested your method for reproducibility.
You can mention two parts in your experimental setup – (i) *implementation details* and (ii) *dataset description, iii) metrics*.

(i) *Implementation Details:*
Writing instruction: Hardware/Software Environment: e.g., Python 3.10, PyTorch 2.2, NVIDIA RTX 4090, 32 GB RAM. Hyperparameters: Learning rate, epochs, batch size, optimizer. Baselines: Which existing models/methods you compared against.
How did you implement your codebases. For example, we used python to implement my logistic classifier regression. Then, we use scikit-learn to implement it. Finally, we conducted our experiment in a local computer machine, etc. Mention random seed control and reproducibility details if applicable. Discuss the device setup, requirement and any software you have installed. Include the details about the data collection process including the number of users, environment, time span etc. Organize your implementation details as much as possible so that other can understand.

(ii) ***Dataset description:*** Discuss the dataset. How did you collect this dataset? How large is the dataset? Show some tables for the dataset statistics and discuss them. For example, total training instances 1000, and testing instances 100. The total number of tokens, sentences, etc. Total number of positive classes, negative classes, etc. Use tables for dataset statistics and parameter configurations. Name, size, split ratios, preprocessing, etc. Please note that even if you provide these stats information in the table, you should write in the text as well.

iii) Metrics
Specify the evaluation metrics used (e.g., accuracy, precision, recall, F1-score).
Justify why these metrics are suitable for your task.

7) Results and Analysis: Mention your project results here. For example, you classify sentiments and mention the accuracy. What is the accuracy, precision, recall, F1, etc.? If you compare your methods with other baselines, then compare your results with the baseline. To present these results, you can draw some figures (line chart, bar chart, tables, etc.) that might be helpful.

Results should contain the following sub section of results. You may have more than this subsection of results.

i) **State of the art algorithm (SOTA) performance comparison:** You need to provide your proposed methods results and along with other state of the art algorithm model/algorithm performance in a table/figure/chart etc.

Table 1: SOTA model performance

Algorithms	F1	Precision	Recall	Accuracy
Your current approach	x	y	z	
Algorithm 1				
Algorithm 2				

Writing instructions: You should provide details of your experimental condition and how you conducted this experiments. For example, we use our xx training data examples to train our proposed model with parameter a, b, c etc. Finally we tested our model/approach using the test dataset containing xxx examples. We follow the similar settings for algorithm 1 and algorithm 2 and obtained the results as shown in figure/table 1. We see that our model achieves x F1 score, and precision y, recall z and accuracy k. From the table/figure, we also see algorithm 1 and algorithm 2 achieves … performance. We observed that our model perform better than algorithm 1 and algorithm 2 by m%, because our algorithm/approach [provide logical reasoning]. [if your algorithm performs poor than it is fine also but provide your analytical/logical reasoning]. Then provide your conclusion.

ii) **Scenario 1 performance:** Generate a scenario based on your specific project. Now draw diagram (e.g. barchart/linechart/table) of your algorithm performance. For example you have a barchart containing precision, recall, f1 and accuracy.
Now follow the same pattern above (SOTA) to structure your writing for this section. Discussion how you obtain this results, what is your observation and conclusion etc.
Example scenarios:
Scenario 1: Vary dataset size or noise level.
Scenario 2: Change model parameters or architecture.
Scenario 3: Real-world vs. synthetic data.

iii) **Scenario 2 Performance:** similarly provide scenario 2 results and follow the same pattern to write it here.

iv) **Ablation study:** Show the effect of removing or modifying model components and formulation your writing following the same template/patterns above.

v) **Error Analysis:** Identify failure cases, interpret patterns, or model limitations. It could be quantitative or qualitative results. Provide your experimental details and explanation based on the specific error analysis you have conducted.

8) Discussion and Conclusion: Summarize what was learned, implications, and next steps.
Structure:
Summary of Key Findings, Interpretation of Results, Limitations, Future Work

Writing instruction: follow the above structure to write 1-2 paragraph. What are your findings so far based on your project result. What are the challenges you think can also be addressed in the future? What is your conclusion on this project? Don't just repeat results instead interpret why they matter. Propose how the method could generalize or be extended.

9) References: Cite all the relevant references like any scholarly articles, conference papers, journals or industrial resources you have looked at or found out helpful for this project work with numbers. This number you will be used in the above while citing.

Acknowledgement: If any. For example, if you are using HPC/VHPC etc. mention that also

Project Report Expectation: (See the example paper to get concrete idea for your report):
We have multiple course projects that have been published in various conferences.
Those works were refined through multiple review cycles and benefited from reviewer feedback, resulting in highly polished technical writing. For this course, you are not expected to produce writing at the same level of quality as those published papers. However, you are expected to follow the provided structure carefully when preparing your project report.

General Writing Style:
Throughout the report, use collective pronouns such as "we," "our," and "us" instead of "I," "he," or "she."

Example: "We trained our model on 5,000 examples and evaluated it on a separate test set."
Do not write in this style: "I trained my model on 5,000 examples."
Use formal, objective language. Avoid conversational phrases or personal reflections.
Keep sentences concise, clear, and technically precise.

Deliveable Report Expectations:
Mid-Term Report:

1) **Title:** Completed, 2) Abstract (completed – may not have full results or SOTA comparison that is fine), 3) introduction: **completed**, 4) related work: **completed**. 5) methodology: **partially completed**, diagram must be present and descriptions, 6) Experimental setup: implementation details: **partially completed**, ii) dataset description: **completed**, iii) metrics: **completed**, 7) Results and Analysis: Partial results should be

presented and discussed, 8) conclusion and discussion: **Partially completed**. 9) References: **Completed**.

Final-Report: All of the above section and subsection should be completed.