A General Template for 21st Century Machine Learning Papers

Thommen George Karimpanal
Applied Artificial Intelligence Institute
Deakin University
Geelong, Australia

[1] *Abstract—*

- **1st few sentences: Generic sentence talking about the general theme of the paper (eg: the problem of $xxxxx$ has been a challenging problem in the field of $yyyyyyy$). However, the problem of $xxxxxx$ remains largely. unaddressed/hasn't been explored.**
- **2nd sentence: In this work, we investigate/propose $xxxyyy$ to address sentence 1.**
- **3rd sentence: We validate our proposed approach analytically/empirically in a range of environments and compare its performance to various baselines.**

Fig. 1: Figure caption should describe the figure such that one need not read the text to get a general idea of what we are trying to explain.

I. INTRODUCTION

The introduction sets the context for your work. This is where we describe the general gap in literature, the importance of filling this gap, and the high level idea behind your proposed method. This section need not include every technical detail; just the high level ideas are sufficient.

- 1st paragraph: General description of the problem. Why is it important to solve it?
- 2nd paragraph: Recent attempts at solving the problem
- 3rd paragraph: However, these attempts do not address the issue of $xxxxxx$. In this work, we propose a new method/framework/algorithm, $xxxyyy$ which addresses $xxxxxxx$. Explain the high level intuition(s) of the method. Use teaser figure, Figure 1 to explain. At this point, the reader should be convinced that this is an important problem to solve.
- 4th paragraph: In summary, the main contributions of this work are (write them as bullet points):
  1) Main contribution 1
  2) Main contribution 2
  3) Main contribution 3
- The introduction shouldn't be too long (we don't want the reader to lose interest by making them read unncecessary details). It should ideally be limited to 1.5 to 2 columns in a double column format.

---

[1] This is not the only way to write a machine learning paper. It is just *one* template that I think is useful to follow.

II. RELATED WORK

- Write about general approaches that have tried to address similar issues.
- Take the most related papers, state in 1 or 2 sentences what they do. If there are other methods that do similar things, mention them as well. Then say what is similar or different about the proposed method. Repeat same process by adding separate paragraphs for each of the most related papers.
- Lay particular emphasis on baselines that you will be using to compare your approach with. Ideally, there should be at least 2-3 baselines (apart from 'vanilla' versions of algorithms. Eg:DQN is a 'vanilla' learning algorithm in reinforcement learning).

III. METHODOLOGY

This is the section where all technical details the proposed method are mentioned. No new technical detail must be introduced before (say, in the introduction) or after (say, in the results/experiment section) this section.

- Introduce all formal notations, definitions and jargon.
- Add the problem formulation and suggested solution (all in terms of previously introduced notations/definitions/jargon).
- Add paragraphs stating the motivation/logic/intuition behind the steps in your approach. Simply writing down the approach is not enough.
- Theorems/proofs/guidelines for selecting hyperparameters can also be added here.
- Add an algorithm table summarizing your entire approach.

IV. Results

This section should only describe experimental results performed to validate the methods introduced in the Methodology section. It should not introduce any new idea/concept.

- Describe experiment setup. What environments have you chosen? Why? Brief description of each of them. Experimental results should be shown in at least 3-4 different environments to show that the results are not specific to one chosen environment.
- Show experimental results. If there is space, include hyperparameter values used. If not, put them in the supplementary and mention that hyperparameters used are provided in the supplmentary materials. Explain and interpret them. Think of possible sources of confusion, and clarify them. Eg: Method m would usually be expected to handle x situation, but is unable to do so because of y, whereas our approach does not suffer from such limitations because of z.
- By now, you should have explicitly shown, either analytically or through experiments, each point (1,2,3) mentioned in the 4th para of the introduction.

V. Conclusion

- 1st sentence- In this work, we introduced a novel approach for addressing $xxxxxx$ issue.
- 2nd sentence- Our proposed approach, $xxxyyy$, based on the idea of abc, was explicitly designed to handle $xxxxxx$ issue.
- 3rd sentence- We demonstrate the convergence/effectiveness of the proposed approach through experiments using a set of $zzzzzz$ environments, where it outperformed other competing baselines.
- Note that each point in the conclusion has a corresponding point in the abstract.

References

Other General Tips

- The focus should be to minimize the cognitive load of the reviewer. Write the paper so that the reviewer has to do as little thinking as possible. Eg: Use consistent terms throughout the text, avoid long sentences, make sure figures are neat and are close to the corresponding text.
- Wherever possible, ensure the main contribution/framework is represented in the form of formal notations and equations (Equations leave no room for ambiguity; qualitative explanations can ambiguous.).
- Always make sure your sentences flow nicely - each sentence should provide context to the next. When you have finished making a point, start a new paragraph. But make sure the new paragraph also connects to the previous one (You can do this with connecting phrases like 'Apart from pqr issue discussed above, xyz is also an important factor to consider due to ...')
- Avoid over-claims/grandiose language. Reviewers can be put off by this.
- Use active voice to write about your work. Eg: 'We did xyz' instead of 'xyz was done'. This has become the norm, so just follow it to avoid upsetting particularly fussy reviewers. Use 'We' even if you are the only author.
- Always read the text from the point of view of someone who knows nothing about your paper. Everything you talk about in the paper should be backed up with references and/or solid arguments.
- If you want the reviewer to pay particular attention to some aspect, create a subheading with that aspect clearly mentioned (Eg: If your method involves a complicated equation that might need further interpretation, create subheading 'Interpreting the XYZ update equation')