FEDERATED LEARNING PROJECT REPORT TEMPLATE

First Last, email@address.com

Instructions (Remove before submission). Your report must adhere to the following formatting and length requirements:

- Use a font size of at least 9 points throughout the report.
- The report must not exceed 5 pages in total. This includes the abstract, all six main sections, and any figures or tables.
- The 5th page must contain only the references.

We strongly recommend using TEX for writing your report. You can get started by editing the provided template.[1]

ABSTRACT

Instructions (Remove before submission). This abstract provides a concise summary of the project, including the FL application, empirical graph modeling, variation minimization approach, and the FL algorithms used.

Keywords: Federated learning, networks, personalized machine learning, trustworthy artificial intelligence

1. INTRODUCTION

Instructions (Remove before submission). Introduce the background and motivation for your FL project:

- A real-life scenario motivating your FL application.
- Summary of state-of-the-art methods relevant to your project.
- Brief outline of the structure of your report.

2. PROBLEM FORMULATION

Instructions (Remove before submission). Model your FL application as an FL network (see [1, Ch. 3]). In particular, clearly define and explain:

- Nodes: What real-world devices do they represent?
- Local Models: Describe the ML models used at each node.
- Loss Functions: Specify local loss functions used at each node.
- Edges: How are edges and their weights chosen? See [1, Ch. 7] for data-driven methods to choose the edges of an FL network.

3. METHODS

Instructions (Remove before submission). The project requires you to apply GTVMin-based methods to the FL application modelled in Section 2. In this section you need to clearly state and explain:

- Your choice of variation measure, e.g., $\phi(\mathbf{w}^{(i)} - \mathbf{w}^{(i')})$ for parametric models.
- Your choice of FL algorithm (i.e., optimization method for solving GTVMin) and its message passing implementation.

4. NUMERICAL EXPERIMENTS

Instructions (Remove before submission). Discuss the following.

- Data sources used. One example of such a source is the Finnish meteorological institute https://en.ilmatieteenlaitos.fi/open-data.
- Model validation, selection, and diagnosis methods (see [2, Sec. 6.6]).
- Training, validation, and test losses for each node of the FL network.

Important: Your submission must include a zip archive containing a single Python script along with any necessary data files. Minimize the use of non-standard Python packages to ensure ease of execution and reproducibility.

5. CONCLUSION

Instructions (Remove before submission).

- Discuss whether the obtained results solve the problem satisfactorily.
- Identify limitations and suggest potential improvements.

[1] https://github.com/FederatedLearningAalto/FederatedLearningAalto.github.io/blob/master/project/ReportTemplate_25.tex

6. REFERENCES

[1] A. Jung, *Federated Learning: From Theory to Practice*, Aalto, 2025. Available: https://github.com/alexjungaalto/FederatedLearning/blob/main/material/FLBook.pdf.

[2] A. Jung, *Machine Learning: The Basics*, Springer, 2022.

Instructions (Remove before submission). Please try to follow the IEEE reference guide http://journals.ieeeauthorcenter.ieee.org/wp-content/uploads/sites/7/IEEE_Reference_Guide.pdf.