

TEMPLATE FOR STUDENT PROJECT FOR CS-E4740 FEDERATED LEARNING

N.N.

Aalto University, Espoo, Finland

ABSTRACT

This paper studies federated learning methods for high-precision weather forecasting.

Index Terms— Federated Learning, Networks, Personalized Machine Learning, Trustworthy AI

1. INTRODUCTION

- Explain the background (real-life scenario) of your ML application (see [1, Ch. 2]).
- Summarize the relevant literature (state-of-the art).
- Briefly outline the structure of this paper.

2. PROBLEM FORMULATION

- Discuss the source of the data used in your project.
- Formulate your application as an instance of GTV minimization (GTVMin) [2, Sec. 7]:
 - Discuss your choice/construction of the empirical graph whose nodes carry local datasets and local models.
 - Provide a precise definition of the local datasets, its data points and their features and labels.

3. METHODS

- Clearly state the number of data points in each local dataset.
- Explain your feature selection process, which might involve advanced ML methods (“representation learning”).
- Describe your choice of local models and the measure for their variation across edges in the empirical graph.
- Describe the FL algorithms you have used to train the local models [2, Sec. 9]
- Describe and explain (why?) your choice of loss functions, e.g., logistic loss.

- Explain the process of model validation, e.e., how did you split the data into training set, validation set and test set.

4. RESULTS

- Compare and discuss the training error and validation error obtained for each node of the empirical graph
- What is the final chosen method? A federated learning (FL) method consists of a choice for the empirical graph, local models and measure for their variation as well as a FL (=distributed optimization) algorithm.
- What is the test set error (for each node in the empirical graph) of the final chosen method?

5. CONCLUSION

- Provide a succinct summary of your findings.
- Are the results suggesting that the problem is solved satisfactorily, or might there be room for improvement?
- Ponder about possible limitations of the considered methods and how they can be further improved (see [1, Sec. 6.6.]).

6. REFERENCES

- [1] A. Jung, *Machine Learning: The Basics*, Springer Singapore, 1 edition, Feb. 2022.
- [2] A. Jung, “Federated Learning,” Lecture notes of the course CS-E4740, Aalto University, 2023.