Federated Learning: Evaluating Popular Frameworks and Developing a Sever to Mimic Real Scenarios

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A Thesis Submitted in Partial Fulfilment of the requirements for the

Degree of

Master of Science in Data Analytics



September 2024 Supervisor: Sam Weiss

**Abstract**

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**Abbreviations**

|  |  |
| --- | --- |
| FL | Example of Abbreviation |
| AEA | Another Example Abbreviation |

**Figures**

Figure 1.1. Illustration of a single FL communication round in FL for mobile keyboard prediction.

**Tables**

Table 1.1. XXXXXX.

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# Introduction

## Motivation

Within the domain of Data Analytics (DA), there is an important field known as Machine Learning (ML), which is embedded in everyday people's lives. A significant topic within this field is Federated Learning (FL). FL occurs when different devices collaborate to build a common model without exchanging their data; instead, the data remains on the devices, and only model updates are sent to a central server where aggregation occurs.

A good example for FL in everyday people’s lives is when phone users are typing a message, and the keyboard predicts words to complete the sentence (Hard *et al.*, 2019).

A diagram of a phone system

Description automatically generated  
Figure 1.1. Illustration of a single FL communication round in FL for mobile keyboard prediction.

But I must explain to you how all this mistaken idea of denouncing pleasure and praising pain was born and I will give you a complete account of the system, and expound the actual teachings of the great explorer of the truth, the master-builder of human happiness. No one rejects, dislikes, or avoids pleasure itself, because it is pleasure, but because those who do not know how to pursue pleasure rationally encounter consequences that are extremely painful. Nor again is there anyone who loves or pursues or desires to obtain pain of itself, because it is pain, but because occasionally circumstances occur in which toil and pain can procure him some great pleasure. To take a trivial example, which of us ever undertakes laborious physical exercise, except to obtain some advantage from it? But who has any right to find fault with a man who chooses to enjoy a pleasure that has no annoying consequences, or one who avoids a pain that produces no resultant pleasur

Table 1.1. Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusant

## Problem Statement

## Research Objectives

## Thesis Overview

# Background

## What is Federated Learning

## History of Federated Learning

## Types of Federated Learning

## Federated Learning vs Distributed training

# Literature Review

## Theme A Federated Learning Frameworks

### Theme AA

## Theme B Theme

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## Theme Theme Theme Cc

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### Theme Theme DD

## Theme Ed

## Conclusion

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Identification of gaps

# State of the Art

# Research Methodology

## Methodology Frameworks

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## Project Management Framework

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## Business Requirements

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## Data Synthetic and Medical

## Data Preparation

## Limitations and Ethical Considerations

# Data Analysis

## Data Collection

## Initial Data Extraction and Exploration

### Data Elaboration

### Data Elaboration 2

## Conclusion

# Data Preparation

## Data Cleaning

### AAAAA

# Experimentation

## BBBB Option

## CCCC Option

## Aaaaaa Option

## BBBB Option

### CCCCC Option

# Validation of the Experimentation’s Results

## Validation BBBB

# Research Conclusion: Summary, Limitations, and Recommendations

# References:

Hard, A., Rao, K., Mathews, R., Ramaswamy, S., Beaufays, F., Augenstein, S., Eichner, H., Kiddon, C. and Ramage, D. (2019) ‘Federated Learning for Mobile Keyboard Prediction’. arXiv. Available at: http://arxiv.org/abs/1811.03604 (Accessed: 18 July 2024).