

# Word Prediction in a Mobile Device Federation

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## 1. Context

The Machine Learning (ML) models training usually requires collecting and transporting data from its source to cloud environment where the training algorithm runs. However, this becomes an issue when the data used in training consists of personally identifiable information. With that in mind, the federated learning technique can be a good alternative for use private data.

## 2. Objectives

The objective of this work is to explore the use of Federated Learning (FD) with Natural Processing Language (NPL) from private data from mobile devices. For this, paper [McMahan et al. 2017] will be replicated, which uses a language model to predict the next word. The Figure 1 provides an example: given the text, "I love you", the model predicts the user is likely to type "and", "too", or "so much" next.

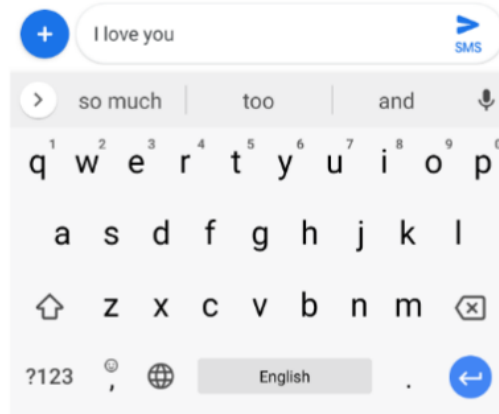


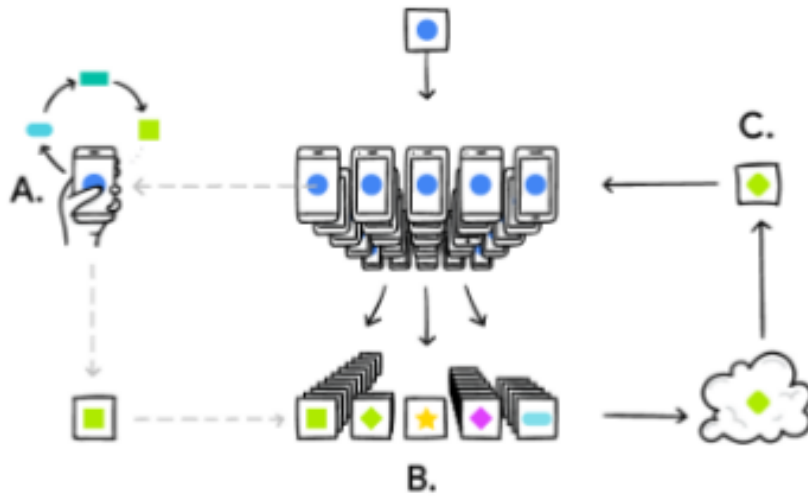
Figure 1. Next word predictions in Gboard keyboard. Ref. [Hard et al. 2018]

## 3. Methodology

The project will follow the phases and tasks of the CRISP-DM methodology.

## 4. Results Proposing

It is expected that it will be possible to train an LSTM based neural network model in a distributed way, in which the data and model training took place on the user side. From then on, these locally trained models sent only the LSTM parameters to the central server where they will be aggregated into the global model. Then the global template will send the template update to the devices that belong to the federation. The Figure 2 provides an illustration of the process.



**Figure 2. An illustration of the FD process. (A) client devices compute updates on locally-stored data, (B) a server aggregates the client updates to build a new global model, (C) the new model is sent back to clients, and the process is repeated. Ref. [Hard et al. 2018]**

## References

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