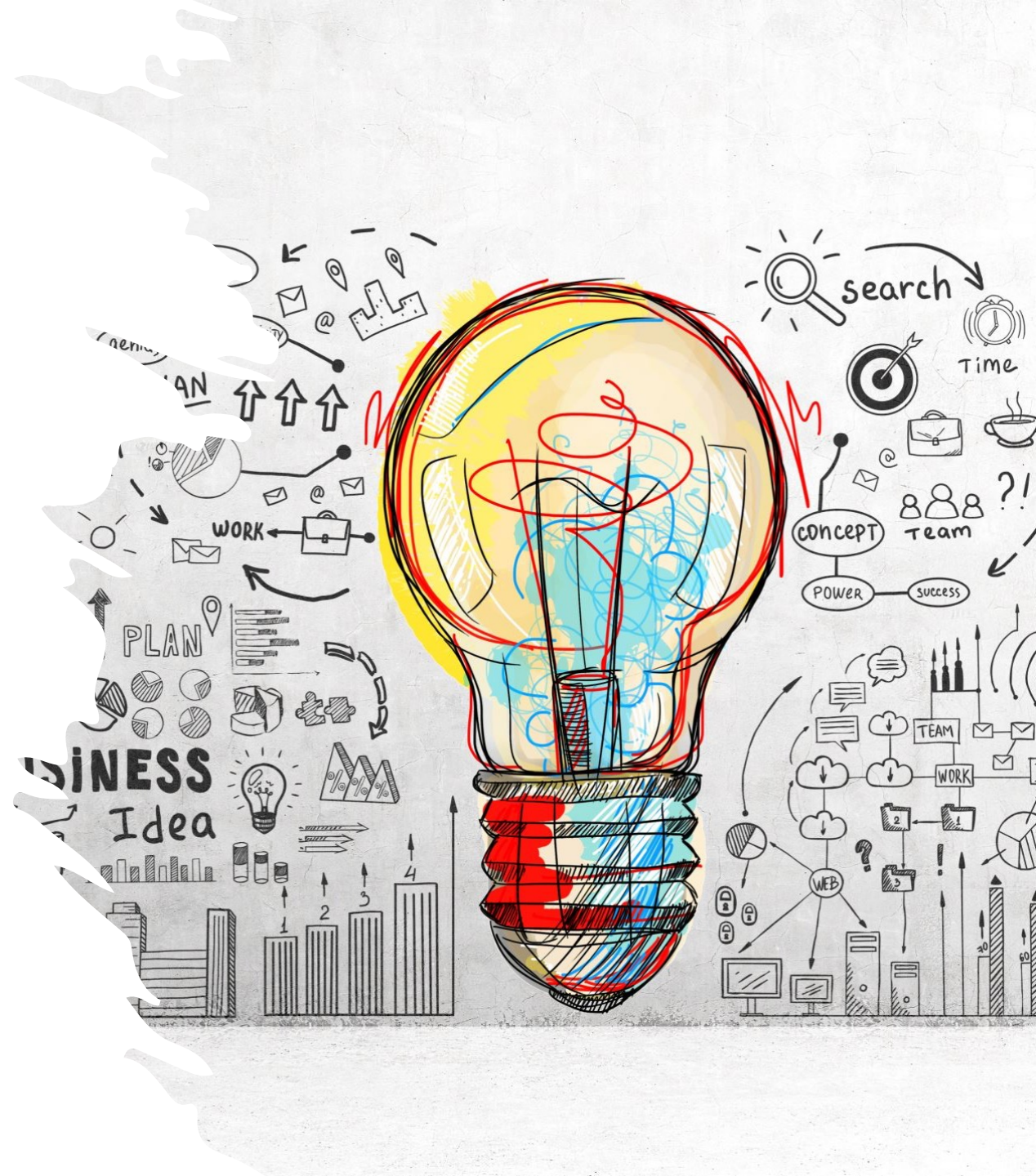


Federated Learning Methods for Analytics of Big and Sensitive Distributed Data & Survey

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Computational Intelligence and Informatics

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Introduction to Federated Learning & Our Work

- Our work focuses on analytics of Big Distributed Sensitive Data on Federated Learning Base
- Federated Learning brings two things by **Brendan McMahan in 2017** Big Data, Privacy
- The focus is on the most common-use Frameworks: TensorFlow Federated, PySyft, Flower
- Interesting in terms of usability on the edge
- Differential Privacy - a mathematically rigorous framework for quantifying the anonymisation of sensitive data

Federated Learning

Google Research Blog

Collaborative Machine Learning without Centralized Training Data

APRIL 2017

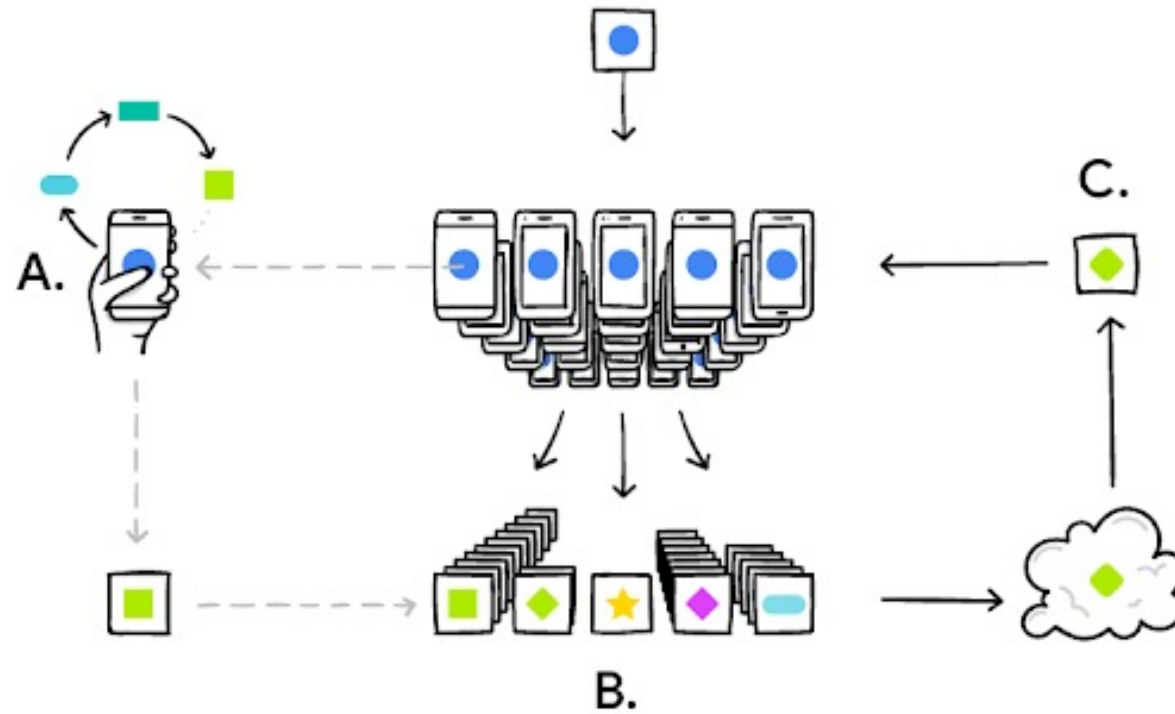
Brendan McMahan and Daniel Ramage, Research Scientists Google

Interesting Paper by citation in Federated Learning

Communication-Efficient Learning of Deep Networks from Decentralizes Data

Brendan McMahan, Eider Moore et al.

Federated Learning – a simple explanation of the use



Your phone personalizes the model locally, based on your usage (A). Many users' updates are aggregated (B) to form a consensus change (C) to the shared model, after which the procedure is repeated.

Federated Learning – Interesting Researcher

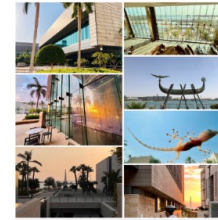
May 23, 2023

Talk @ Apple

Today I am giving a talk at Apple, targeting their Federated Learning team. My talk title: "On 5th Generation of Local Training Methods in Federated Learning".

One week ago, in our department, we had the same lecture as Apple on May 23, 2023

A couple of minutes ago, we had a very interesting Lecture from Prof. Richtárik again
About Permutation Compressors for Provably Fast Distributed Nonconvex Optimization



On 5th Generation of Local Training Methods in Federated Learning

Peter Richtárik

*King Abdullah University of Science and Technology
Kingdom of Saudi Arabia*



Talk @ Apple
May 23, 2023

A long-term goal of many research & development teams (covering databases, cryptography, and machine learning) is to learn and analyse from data distributed between many clients without publishing that data

Federative Learning brings solutions

The name 'Federated Learning' was created for the learning task that draws a loose federation of clients

The clients or Sites of this idea are the devices

Specialised hardware to speed up the computation

- GPU – Graphics Processing Unit
- TPU – Tensor Processing Unit
- FPGA – Field Programmable Gate Array

GDPR since 2018

After 6 Years, we have two points of view

- Increase in distributed data analytics using AI/ML with the need to share data between organizations
- Data privacy and security increased

The state-of-the-art frameworks in FL

TensorFlow Federated – open source, fast creation and testing of models

PySyft – open source, creation of secure decentralised applications for ML

Flower – open source, fast creation and manage the models

Matlab FL Toolbox – not open source, pre-trained models and algorithms

Orchestration

- It is important in terms of coordinating learning between clients and server
- The role is to allocate tasks evenly between clients
- Allocates management of computational resources and memory
- The role is to protect sensitive data and access to it only by authorized clients
- Kubernetes , [Consul/Nomad](#)

Consul/Nomad

- The [Consul](#) prototype has been deployed in two regional OpenStacks located in Bratislava, Slovakia and Santander, Spain and helped to implementation of the platform
- The [Nomad](#) takes care of the network communication layer and workload management

Keys metrics that can be used to evaluate of efficiency

- accuracy of the model
- model training speed
- communication management

Challenge task for Federated Learning

- it seems logical to use this approach for [airports](#)
- airports must meet strict safety criteria for communication
- fog and visibility interfere with the safety of landing and take-off

Challenge task for Federated Learning



Airports need a model to estimate the accuracy

Summary

The choice of a federated learning framework for classifying airport images will depend on several factors, such as the specific requirements of the project and the available resources. However, TensorFlow Federated (TFF) is a good framework to consider for this type of project. TFF has a wide range of features and tools that can be used for image classification tasks, including optimisers for efficient training. TFF also has good support for distributed computing, which can be helpful when training models on large datasets.

Thank you

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