

科技论文写作用文献检索

联邦学习中的通信优化

叶茂青 王琚

Friday 12th June, 2020

总览

- 1 介绍
- 2 文献搜索
- 3 文献阅读
- 4 未来方向

1 介绍

2 文献搜索

3 文献阅读

4 未来方向

联邦学习的定义

- 联邦学习的数学模型被 McMahan et al.[1] 定义为

$$\min_w F(w), \text{ where } F(w) := \sum_{k=1}^m p_k F_k(w)$$

- 通俗来说，就是多个客户端通过中心服务器的协调合作解决一个机器学习问题

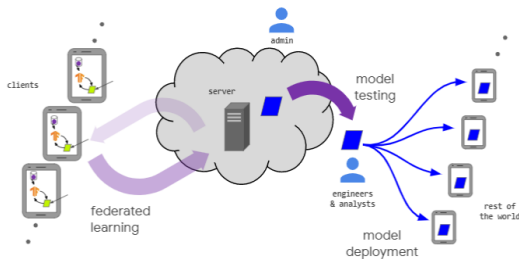


Figure: The lifecycle of an FL-trained model.[2]

联邦学习的特点

- 客户端数据保存在本地，不会上传给服务器

联邦学习的特点

- 客户端数据保存在本地，不会上传给服务器
- 数据不满足 IID(独立同分布) 假设

联邦学习的特点

- 客户端数据保存在本地，不会上传给服务器
- 数据不满足 IID(独立同分布) 假设
- 客户端的处理能力，带宽是有限的，且不一定可靠

联邦学习的分类

- 横向联邦学习
- 纵向联邦学习
- 联邦迁移学习

横向联邦学习

适用于特征重叠多，但用户重叠少的情况，比如不同地区之间的银行、医院，参与的设备数一般较少，且客户端基本可保持稳定

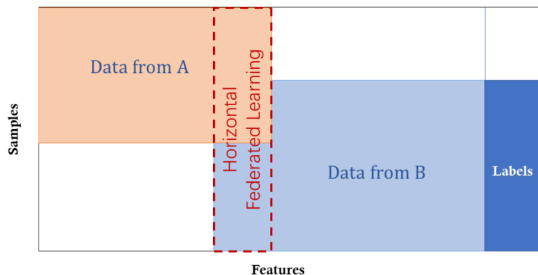


Figure: Horizontal Federated Learning[3]

纵向联邦学习

适用于特征重叠少，但用户重叠多的情况，比如使用同一个 app 的用户，参与的设备数数量级庞大，客户端不可靠，不能保证稳定在线，且有可能存在攻击者

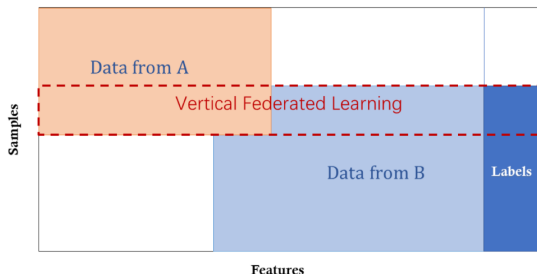


Figure: Vertical Federated Learning[3]

联邦迁移学习

对于特征和用户重叠都较少的状况，比如不同领域的不同公司，需要利用迁移学习来提升模型的效果

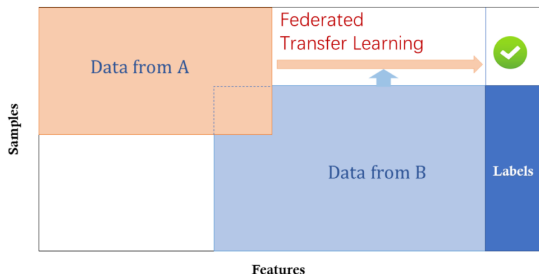


Figure: Federated Transfer Learning[3]

1 介绍

2 文献搜索

3 文献阅读

4 未来方向

寻找综述论文

federated learning review



找到约 66,100 条结果 (用时0.04秒)

Federated learning: Challenges, methods, and future directions

[PDF] arxiv.org

[T Li](#), [AK Sahu](#), [A Talwalkar](#), [V Smith](#) - arXiv preprint arXiv:1908.07873, 2019 - arxiv.org

... decentralized training has been demonstrated to be faster than centralized training when operating on networks with low bandwidth or high latency; we defer readers to [47, 67] for a more comprehensive review. Similarly, in federated learning, decentralized algorithms can in ...

☆ 99 被引用次数: 95 相关文章 所有 3 个版本 🔗

Mitigating sybils in federated learning poisoning

[PDF] arxiv.org

[C Fung](#), [CJM Yoon](#), [I Beschastnikh](#) - arXiv preprint arXiv:1808.04866, 2018 - arxiv.org

Page 1. Mitigating Sybils in Federated Learning Poisoning ... Existing approaches, such as federated learning, collect the outputs computed by a group of devices at a central aggregator and run iterative algorithms to train a globally shared model ...

☆ 99 被引用次数: 39 相关文章 所有 3 个版本 🔗

Federated machine learning: Concept and applications

[PDF] acm.org

[Q Yang](#), [Y Liu](#), [T Chen](#), [Y Tong](#) - ACM Transactions on Intelligent ..., 2019 - dl.acm.org

... This requires security models and analysis to provide meaningful privacy guarantees. In this section, we briefly review and compare different privacy techniques for federated learning. We also identify approaches and potential challenges for preventing indirect leakage ...

☆ 99 被引用次数: 216 相关文章 所有 7 个版本 🔗

Federated learning in mobile edge networks: A comprehensive survey

[PDF] arxiv.org

[WYB Lim](#), [NC Luong](#), [DT Hoang](#), [Y Jiao](#) ... - Surveys & Tutorials, 2020 - ieeexplore.ieee.org

... Recently, in light of increasingly stringent data privacy legislations and growing privacy concerns, the concept of Federated Learning (FL) has been introduced ... Then, we highlight the aforementioned challenges of FL implementation and review existing solutions ...

寻找综述论文

federated learning survey



找到约 49,500 条结果 (用时0.05秒)

Federated learning in mobile edge networks: A comprehensive survey

[PDF] arxiv.org

WYB Lim, NC Luong, DT Hoang, Y Jiao... - ... Surveys & Tutorials, 2020 - ieeexplore.ieee.org

In recent years, mobile devices are equipped with increasingly advanced sensing and computing capabilities. Coupled with advancements in Deep Learning (DL), this opens up countless possibilities for meaningful applications, eg, for medical purposes and in vehicular ...

☆ 99 被引用次数: 33 相关文章 所有 2 个版本

Federated machine learning: Concept and applications

[PDF] acm.org

Q Yang, Y Liu, T Chen, Y Tong - ACM Transactions on Intelligent ..., 2019 - dl.acm.org

... We survey existing works on federated learning, and propose definitions, categorizations, and applications for a comprehensive secure federated-learning framework. We discuss how the federated-learning framework can be applied to various business successfully ...

☆ 99 被引用次数: 216 相关文章 所有 7 个版本

Federated learning: Challenges, methods, and future directions

[PDF] arxiv.org

T Li, AK Sahu, A Talwalkar, V Smith - arXiv preprint arXiv:1908.07873, 2019 - arxiv.org

... In Section 3, we outline several promising directions of future research. 2 Survey of Related and Current Work The challenges in federated learning at first glance resemble classical problems in areas such as privacy, large-scale machine learning, and distributed optimization ...

☆ 99 被引用次数: 95 相关文章 所有 3 个版本

Threats to federated learning: A survey

[PDF] arxiv.org

LLyu, H Yu, Q Yang - arXiv preprint arXiv:2003.02133, 2020 - arxiv.org

With the emergence of data silos and popular privacy awareness, the traditional centralized approach of training artificial intelligence (AI) models is facing strong challenges. Federated learning (FL) has recently emerged as a promising solution under this new reality. Existing

了解定义及相关问题

- 什么是联邦学习？
- 联邦学习有哪些核心问题？
- 对于这些核心问题，解决方案有哪些？研究方向是什么？

整理脉络



1 介绍

2 文献搜索

3 文献阅读

4 未来方向

联邦学习中的通信优化方法主要有三类

- Local update
- Compression Schemes 梯度压缩模型广播压缩减少本地计算
Decentralized Training

1 介绍

2 文献搜索

3 文献阅读

4 未来方向

结论

References I

- [1] H. B. McMahan, E. Moore, D. Ramage, S. Hampson *et al.*,
“Communication-efficient learning of deep networks from decentralized data,” *arXiv preprint arXiv:1602.05629*, 2016.
- [2] P. Kairouz, H. B. McMahan, B. Avent, A. Bellet, M. Bennis, A. N. Bhagoji, K. Bonawitz, Z. Charles, G. Cormode, R. Cummings *et al.*,
“Advances and open problems in federated learning,” *arXiv preprint arXiv:1912.04977*, 2019.
- [3] Q. Yang, Y. Liu, T. Chen, and Y. Tong, “Federated machine learning: Concept and applications,” *ACM Transactions on Intelligent Systems and Technology (TIST)*, vol. 10, no. 2, pp. 1–19, 2019.

Thank You!