References on Federated Learning

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This is a list of references on Federated Learning (FL), a.k.a. Federated Machine Learning (FML). Since it is impossible for me to know every single reference on FL, please pardon me if I missed any of your work. If you want me to add your work to this list, you are welcome to send me a message. I will try my best to keep this list up-to-date. **Last updated: Oct. 22, 2019.**

Tutorial

1. Qiang Yang, "Federated Machine Learning", Aug. 2019. Available: https://img.fedai.org.cn/fedweb/1566285582852.pdf

2. Qiang Yang, "GDPR, Data Shortage and AI," Jan. 2019. Available: https://img.fedai.org.cn/fedweb/1552916659436.pdf

3. Yang Liu, Qiang Yang, Tianjian Chen, and Zhuoshi Wei, "Federated Learning: User Privacy, Data Security and Confidentiality in Machine Learning," Jan. 2019. Available: https://img.fedai.org.cn/fedweb/1552916850679.pdf

4. 刘洋，范涛，"联邦学习的研究与应用"，Mar. 2019. Available:

   https://img.fedai.org.cn/fedweb/1553845987342.pdf

5. 范涛，"FATE：新一代联邦学习技术及应用实战"，Jul. 2019. Available:

   https://img.fedai.org.cn/fedweb/1565748921396.pdf

6. 曾纪策，"构建端到端的联邦学习 Pipeline 生产服务"，Jul. 2019. Available:

   https://img.fedai.org.cn/fedweb/1565770899777.pdf

Introduction and Survey

1. Qiang Yang, Yang Liu, Tianjian Chen, and Yongxin Tong, "Federated Machine Learning: Concept and Applications," Feb. 2019. Available: https://arxiv.org/abs/1902.04885

2. Qinbin Li, Zeyi Wen, Zhaomin Wu, Sixu Hu, Naibo Wang, and Bingsheng He, "Federated Learning Systems: Vision, Hype and Reality for Data Privacy and Protection," Oct. 2019. Available: https://arxiv.org/abs/1907.09693

3. Tian Li, Anit Kumar Sahu, Ameet Talwalkar, and Virginia Smith, "Federated Learning: Challenges, Methods, and Future Directions," Aug. 2019. Available: https://arxiv.org/abs/1908.07873

4. 杨强，刘洋，陈天健，童咏昕，"联邦学习"，Nov. 2018. Available:

   https://dl.ccf.org.cn/institude/institudeDetail?id=4150944238307328&from=groupmessage&i

sappinstalled=0&_ack=1, or https://wemp.app/posts/a3771dc7-6722-4690-bf25-23ba36f7b78c?utm_source=latest-posts

5. WeBank, "Federated Learning White Paper V1.0," Sep. 2019. Available: https://img.fedai.org.cn/fedweb/1552917186945.pdf

6. Solmaz Niknam, Harpreet S. Dhillon, and Jeffery H. Reed, "Federated Learning for Wireless Communications: Motivation, Opportunities and Challenges," Sep. 2019. Available: https://arxiv.org/abs/1908.06847

Federated Optimization

1. H. Brendan McMahan, Eider Moore, Daniel Ramage, Seth Hampson, and Blaise Agüera y Arcas, "Communication-Efficient Learning of Deep Networks from Decentralized Data," Feb. 2017. Available: https://arxiv.org/abs/1602.05629

2. H. Brendan McMahan, Eider Moore, Daniel Ramage, and Blaise Agüera y Arcas, "Federated Learning of Deep Networks using Model Averaging," Feb. 2017. Available: https://uk.arxiv.org/abs/1602.05629v1, or https://pdfs.semanticscholar.org/8b41/9080cd37bdc30872b76f405ef6a93eae3304.pdf

3. Hao Yu, Sen Yang, and Shenghuo Zhu, "Parallel Restarted SGD with Faster Convergence and Less Communication: Demystifying Why Model Averaging Works for Deep Learning", Nov. 2018. Available: https://arxiv.org/abs/1807.06629

4. Tian Li, Anit Kumar Sahu, Manzil Zaheer, Maziar Sanjabi, Ameet Talwalkar, and Virginia Smith, "Federated Optimization in Heterogeneous Networks," Sep. 2019. Available: https://arxiv.org/abs/1812.06127

5. Xiangyi Chen, Tiancong Chen, Haoran Sun, Zhiwei Steven Wu, and Mingyi Hong, "Distributed Training with Heterogeneous Data: Bridging Median- and Mean-Based Algorithms," Jun. 2019. Available: https://arxiv.org/abs/1906.01736

6. Cong Xie, Sanmi Koyejo, and Indranil, "Gupta Asynchronous Federated Optimization," Sep. 2019. Available: https://arxiv.org/abs/1903.03934

7. Avishek Ghosh, Justin Hong, Dong Yin, and Kannan Ramchandran, "Robust Federated Learning in a Heterogeneous Environment," Oct. 2019. Available: https://arxiv.org/abs/1906.06629

8. Xiang Li, Kaixuan Huang, Wenhao Yang, Shusen Wang, and Zhihua Zhang, "On the Convergence of FedAvg on Non-IID Data," Oct. 2019. Available: https://arxiv.org/abs/1907.02189

9. Yue Zhao, Meng Li, Liangzhen Lai, Naveen Suda, Damon Civin, and Vikas Chandra, "Federated Learning with Non-IID Data," Jun. 2018. Available: https://arxiv.org/abs/1806.00582

10. Jakub Konečný, H. Brendan McMahan, Daniel Ramage, and Peter Richtárik, "Federated Optimization: Distributed Machine Learning for On-Device Intelligence," Oct. 2016. Available: https://arxiv.org/abs/1610.02527

11. Chenghao Hu, Jingyan Jiang, and Zhi Wang, "Decentralized Federated Learning: A Segmented Gossip Approach," Aug. 2019. Available: https://arxiv.org/abs/1908.07782

12. István Hegedűs, Gábor Danner and Márk Jelasity, "Gossip Learning as a Decentralized Alternative to Federated Learning," Jun. 2019. Available: http://www.inf.u-szeged.hu/~jelasity/cikkek/dais19a.pdf

13. Krishna Pillutla, Sham M. Kakade, and Zaid Harchaoui, "Robust Aggregation for Federated Learning," May 2019. Available: https://krishnap25.github.io/papers/2019_rfa.pdf

14. Liping Li, Wei Xu, Tianyi Chen, Georgios B. Giannakis, and Qing Ling, "RSA: Byzantine-Robust Stochastic Aggregation Methods for Distributed Learning from Heterogeneous Datasets," Nov. 2018. Available: https://arxiv.org/abs/1811.03761

Incentive Mechanism

1. Jiawen Kang, Zehui Xiong, Dusit Niyato, Han Yu, Ying-Chang Liang, and Dong In Kim, "Incentive Design for Efficient Federated Learning in Mobile Networks: A Contract Theory Approach," May 2019. Available: https://arxiv.org/abs/1905.07479

2. Adam Richardson, Aris Filos-Ratsikas, and Boi Faltings, "Rewarding High-Quality Data via Influence Functions," Aug. 2019. Available: https://arxiv.org/abs/1908.11598

Communication Efficiency

1. Jakub Konečný, H. Brendan McMahan, Felix X. Yu, Peter Richtárik, and Ananda Theertha Suresh, Dave Bacon, "Federated Learning: Strategies for Improving Communication Efficiency," Oct. 2017. Available: https://arxiv.org/abs/1903.07424

2. Yang Chen, Xiaoyan Sun, and Yaochu Jin, "Communication-Efficient Federated Deep Learning with Asynchronous Model Update and Temporally Weighted Aggregation," Mar. 2019. Available: https://arxiv.org/abs/1903.07424

3. Felix Sattler, Simon Wiedemann, Klaus-Robert Müller, and Wojciech Samek, "Robust and Communication-Efficient Federated Learning from Non-IID Data," Mar. 2019. Available: https://arxiv.org/abs/1903.02891

4. Xin Yao, Tianchi Huang, Chenglei Wu, Rui-Xiao Zhang, and Lifeng Sun, "Federated Learning with Additional Mechanisms on Clients to Reduce Communication Costs," Sep. 2019. Available: https://arxiv.org/abs/1908.05891, or https://github.com/thu-media/TwoStreamFederatedLearning

5. Luping Wang, Wei Wang, and Bo Li, "CMFL: Mitigating Communication Overhead for Federated Learning," Jul. 2019. Available: https://www.cse.ust.hk/~weiwa/papers/cmfl-icdcs19.pdf

Privacy and Security

1. Keith Bonawitz, Vladimir Ivanov, Ben Kreuter, Antonio Marcedone, H. Brendan McMahan, Sarvar Patel, Daniel Ramage, Aaron Segal, and Karn Seth, "Practical Secure Aggregation for Federated Learning on User-Held Data," Nov. 2016. Available: https://arxiv.org/abs/1611.04482

2. Keith Bonawitz, Vladimir Ivanov, Ben Kreuter, Antonio Marcedone, H Brendan McMahan, Sarvar Patel, Daniel Ramage, Aaron Segal, and Karn Seth, "Practical secure aggregation for privacy-preserving machine learning", Oct. 2017. Available: http://delivery.acm.org/10.1145/3140000/3133982/p1175-bonawitz.pdf?ip=218.17.197.194&id=3133982&acc=OA&key=4D4702B0C3E38B35%2E4D4702B0C3E38B35%2E4D4702B0C3E38B35%2E5945DC2EABF3343C&__acm__=1571662060_4f2a2d1bef834cdc4d870f323416263a

3. Stacey Truex, Nathalie Baracaldo, Ali Anwar, Thomas Steinke, Heiko Ludwig, Rui Zhang, and Yi Zhou, "A Hybrid Approach to Privacy-Preserving Federated Learning," Aug. 2019. Available: https://arxiv.org/abs/1812.03224

4. Arjun Nitin Bhagoji, Supriyo Chakraborty, Prateek Mittal, and Seraphin Calo, "Analyzing Federated Learning through an Adversarial Lens," Mar. 2019. Available: https://arxiv.org/abs/1811.12470

5. Eugene Bagdasaryan, Andreas Veit, Yiqing Hua, Deborah Estrin, and Vitaly Shmatikov, "How To Backdoor Federated Learning," Aug. 2019. Available: https://arxiv.org/abs/1807.00459

6. Robin C. Geyer, Tassilo Klein, and Moin Nabi, "Differentially Private Federated Learning: A Client Level Perspective," Mar. 2018. Available: https://arxiv.org/abs/1712.07557

Federated Transfer Learning

1. Yang Liu, Tianjian Chen, and Qiang Yang, "Secure Federated Transfer Learning," Dec. 2018. Available: https://arxiv.org/abs/1812.03337

2. Yiqiang Chen, Jindong Wang, Chaohui Yu, Wen Gao, and Xin Qin, "FedHealth: A Federated Transfer Learning Framework for Wearable Healthcare," Jul. 2019. Available: https://arxiv.org/abs/1907.09173

Federated Multi-Task Learning

1. Virginia Smith, Chao-Kai Chiang, Maziar Sanjabi, and Ameet Talwalkar, "Federated Multi-Task Learning,", Feb. 2018. Available: https://arxiv.org/abs/1705.10467

2. Luca Corinzia, Joachim and M. Buhmann, "Variational Federated Multi-Task Learning," Jun. 2019. Available: https://arxiv.org/abs/1906.06268

Federated Reinforcement Learning

1. Hankz Hankui Zhuo, Wenfeng Feng, Qian Xu, Qiang Yang, Yufeng Lin, "Federated Reinforcement Learning," Jan. 2019. Available: Federated Reinforcement Learning

2. Boyi Liu, Lujia Wang, and Ming Liu, "Lifelong Federated Reinforcement Learning: A Learning Architecture for Navigation in Cloud Robotic Systems," May 2019. Available: https://arxiv.org/abs/1901.06455

3. Chetan Nadiger, Anil Kumar, and Sherine Abdelhak, "Federated Reinforcement Learning for Fast Personalization," Jun. 2019. Available: https://ieeexplore.ieee.org/document/8791693

4. Jianji Ren, Haichao Wang, Tingting Hou, Shuai Zheng, and Chaosheng Tang, "Federated Learning-Based Computation Offloading Optimization in Edge Computing-Supported Internet of Things," Jun. 2019. Available: https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8728285

Applications

1. Keith Bonawitz, Hubert Eichner, Wolfgang Grieskamp, Dzmitry Huba, Alex Ingerman, Vladimir Ivanov, Chloe Kiddon, Jakub Konečný, Stefano Mazzocchi, H. Brendan McMahan, Timon Van Overveldt, David Petrou, Daniel Ramage, Jason Roselander, "Towards Federated Learning at Scale: System Design," Mar. 2019. Available: https://arxiv.org/pdf/1902.01046.pdf

2. David Leroy, Alice Coucke, Thibaut Lavril, Thibault Gisselbrecht, and Joseph Dureau, "Federated Learning for Keyword Spotting," Feb. 2019. Available: https://arxiv.org/abs/1810.05512

3. Santiago Silva, Boris Gutman, Eduardo Romero, Paul M Thompson, Andre Altmann, and Marco Lorenzi, "Federated Learning in Distributed Medical Databases: Meta-Analysis of Large-Scale Subcortical Brain Data," Mar. 2019. Available: https://arxiv.org/abs/1810.08553

4. Muhammad Ammad-ud-din, Elena Ivannikova, Suleiman A. Khan, Were Oyomno, Qiang Fu, Kuan Eeik Tan, and Adrian Flanagan, "Federated Collaborative Filtering for Privacy-Preserving Personalized Recommendation System," Jan. 2019. Available: https://arxiv.org/abs/1901.09888

Federated Dataset

1. Carnegie Mellon University, "LEAF: A benchmark for federated settings, Jul. 2019. Available: https://leaf.cmu.edu/, and https://github.com/TalwalkarLab/leaf

2. WeBank, "FedVision - Street Dataset," Oct. 2019. https://dataset.fedai.org/#/

Open-source Platform

1. WeBank/FATE, Available: https://github.com/FederatedAI/FATE

2. OpenMined/PySyft, Available: https://github.com/OpenMined/PySyft

3. Uber/Horovod, Available: https://github.com/horovod/horovod

Similar Lists of References on FL

1. innovation-cat/Awesome-Federated-Machine-Learning, Available: https://github.com/innovation-cat/Awesome-Federated-Machine-Learning

2. tushar-semwal/awesome-federated-computing, Available: https://github.com/tushar-semwal/awesome-federated-computing

3. timmers/awesome-federated-learning, Available: https://github.com/timmers/awesome-federated-learning