Other topics

Sang Yup Lee

Continual learning

Continual learning

- What is it?
  - a.k.a. Incremental learning
  - 새로운 데이터를 이용해서 지속적으로 학습을 수행
- References
  - Zhou, D. W., Wang, Q. W., Qi, Z. H., Ye, H. J., Zhan, D. C., & Liu, Z. (2023). Deep class-incremental learning: A survey. arXiv preprint arXiv:2302.03648.
  - Wang, L., Zhang, X., Su, H., & Zhu, J. (2023). A comprehensive survey of continual learning: Theory, method and application. arXiv preprint arXiv:2302.00487.

Continual learning

- Three types of CL
  - Task continual learning
    - Sequentially learn to solve a number of distinct tasks
  - Domain continual learning
    - Learn to solve the same problem in different contexts
  - Class continual learning
    - Discriminate between incrementally observed classes

Continual learning

- 주요 문제
  - Catastrophic forgetting
    - 과거 학습 내용을 잊어 버린다.
- 주요 해결 방법
  - Regularization methods
    - Kirkpatrick, J., Pascanu, R., Rabinowitz, N., Veness, J., Desjardins, G., Rusu, A. A., ... & Hadsell, R. (2017). Overcoming catastrophic forgetting in neural networks. Proceedings of the national academy of sciences, 114(13), 3521-3526.
  - Rehearsal methods
    - Rebuffi, S. A., Kolesnikov, A., Sperl, G., & Lampert, C. H. (2017). icarl: Incremental classifier and representation learning. In Proceedings of the IEEE conference on Computer Vision and Pattern Recognition (pp. 2001-2010).

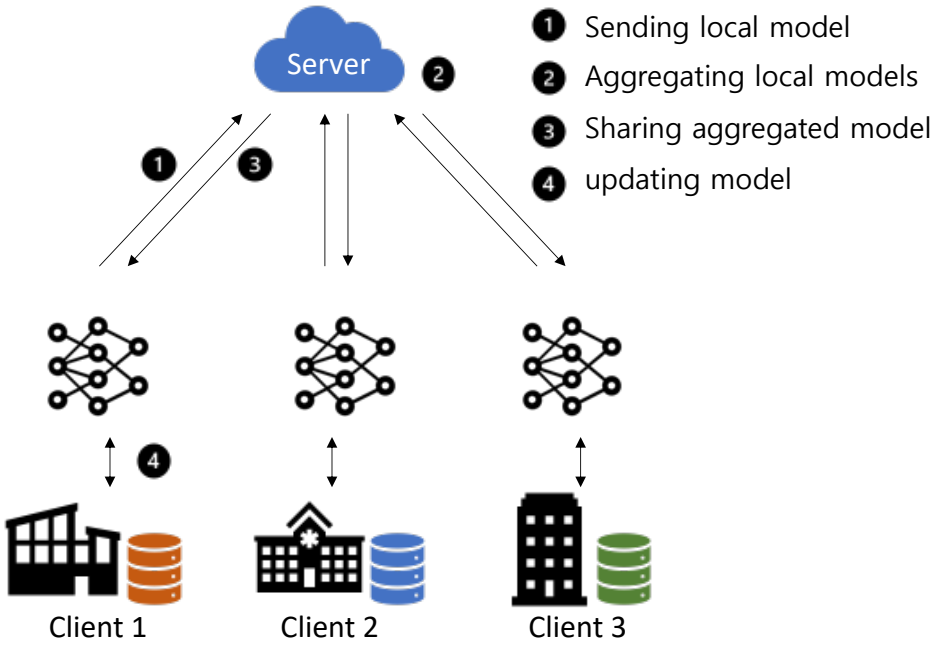
Continual learning

- 주요 해결 방법 (cont'd)
  - Architectural Methods
    - Madotto, A., Lin, Z., Zhou, Z., Moon, S., Crook, P., Liu, B., ... & Wang, Z. (2020). Continual learning in task-oriented dialogue systems. arXiv preprint arXiv:2012.15504.
  - Knowledge Distillation Methods
    - Jin, X., Zhang, D., Zhu, H., Xiao, W., Li, S. W., Wei, X., ... & Ren, X. (2021). Lifelong pretraining: Continually adapting language models to emerging corpora. arXiv preprint arXiv:2110.08534.

Federated learning

Federated learning

- What is it?
  - 다수의 로컬 클라이언트와 하나의 중앙 서버가 협력하여 데이터가 탈중앙화된 상황에서 글로벌 모델을 학습하는 방법
  - a.k.a. collaborative learning
- 구조



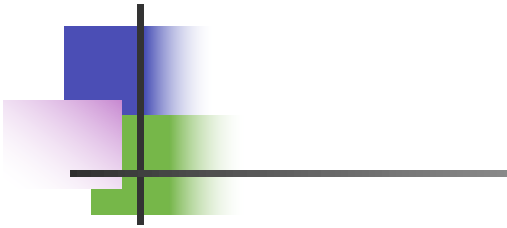
McMahan, B., Moore, E., Ramage, D., Hampson, S., & y Arcas, B. A. (2017, April). Communication-efficient learning of deep networks from decentralized data. In *Artificial intelligence and statistics* (pp. 1273-1282). PMLR.

Federated learning

- Why is it important?
  - Privacy
    - training occurs locally on the edge device
  - Access to heterogeneous data
    - Federated learning guarantees access to data spread across multiple devices, locations, and organizations.

Federated learning

- Types of FL
  - Centralized FL
    - It requires a central server.
  - Decentralized FL
    - It does not require a central server to coordinate the learning. Instead, the model updates are shared only among the interconnected edge devices.
  - Heterogeneous FL
    - It involves having heterogeneous clients such as mobile phones, computers, or IoT (Internet of Things) devices.



Q & A